QRP Quarterly

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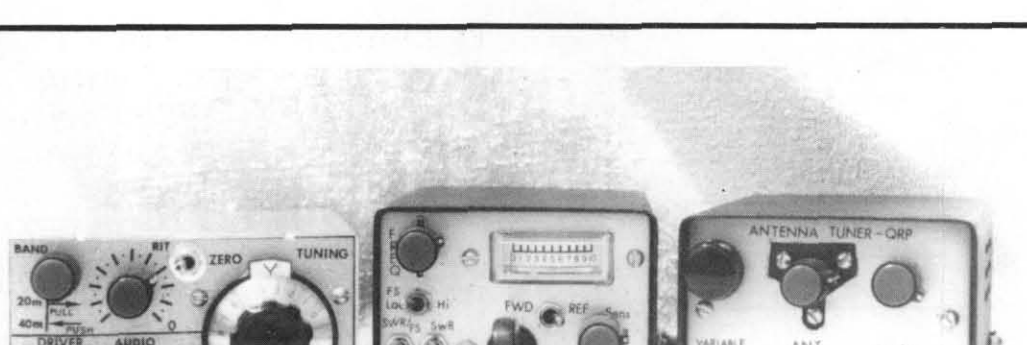


This fine work (above), belonging to Jeff, WK7D, is a dual-band version of the classic W7EL transceiver with accessories. Turn to page 4 for details.

Newstand Price $3

EDITORIAL

Previous editorials have covered the topic of membership recruiting and its importance to the organization.

Two members have sent letters about their activities in this regard. Both are to be commended. Burl N5DUQ (who happens to be a director of QRP ARCI) and Doug KI6DS have both produced flyers at their own expense to send out to prospective QRPers. Their enthusiasm towards QRP and the QRP ARCI is to be applauded.

Whereas these two members may perhaps be a bit exceptional, undoubtedly there are many more like them who are doing a similar job to help promote QRP. Let's not forget the average QRPer who may not be quite as enthusiastic, but who in fact brings one or two more members into the QRP fold each year.

To all of you who have tried, a big Thank You! To Burl and Doug, keep up the great work.

- W9NJP

HELP WANTED

The QRP Quarterly is looking for an enthusiastic individual to become the non-technical/editorial editor. The pay isn't much ($0.00). Needed to start around November 1, 1993 to prepare for the January 1994 issue. Please contact the QRP ARCI president ASAP.

New Addresses for Tejas RF Technology

Tejas RF Technology has new addresses and telephone numbers:

New Shipping Address:
10535 Rockley Road, Suite 103
Houston, Texas 77099

New Mailing Address:
P.O. Box 720331
Houston, Texas 77272-0331

Phone: 713-879-9300 Fax: 713-879-9494

Silent Key

We are extremely sad to report that Bob Spidell, W6SKQ, died June 15, 1993. Bob was very active in the QRP-ARCI, was an avid DX'er, and was a "sparkplug" of the Zuni-Loopers in California. We'll have more information and a complete obituary in the next issue of the Quarterly.

ERRATA

Phil Salas, AD5X, writes with corrections to the schematic from "Hot Receiver for your HW-9" (*Jan '93 Quarterly*). Phil has supplied additional parts information and also relocated the tap point for the feedback network as shown below. We regret any inconvenience this may have caused our readers - *NN1G*.

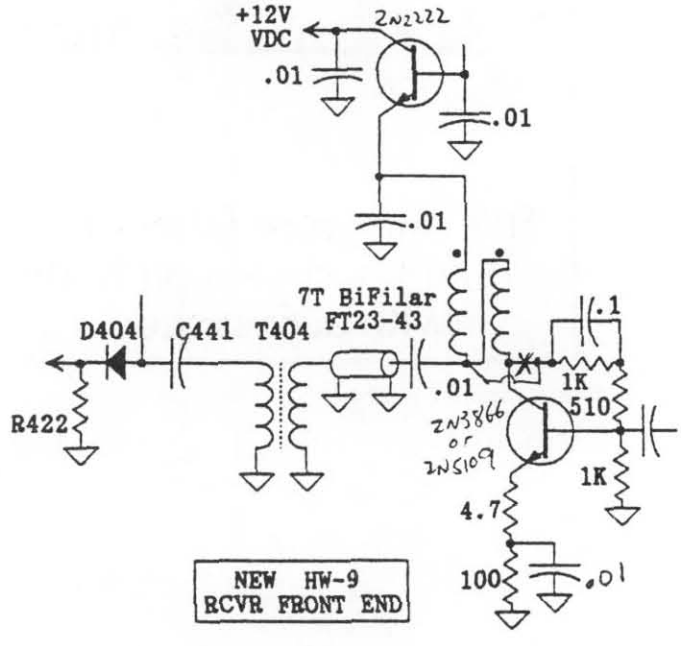


Table of Contents

Technical

Antennas

Operating

Reviews

Classified ads are on page 9.

DOUBLE-UR PLEASURE

A Two Band Version of the Popular W7EL Optimized QRP Transceiver

Jeff Glissmeyer, WK7D
9653 South 2200 West South
Jordan, UT 84065

I wonder to what extent **Roy Lewallen, W7EL** realized how popular his Optimized QRP Transceiver would be among the QRP homebrew crowd when he published the article in *QST* back in 1980 (See *QST*, August 1980). Its popularity is attested to by the fact that we still see projects published and kits available that are based on his sure-fire design. Based on my experience, its popularity is due to its simplicity and its rock-solid performance.

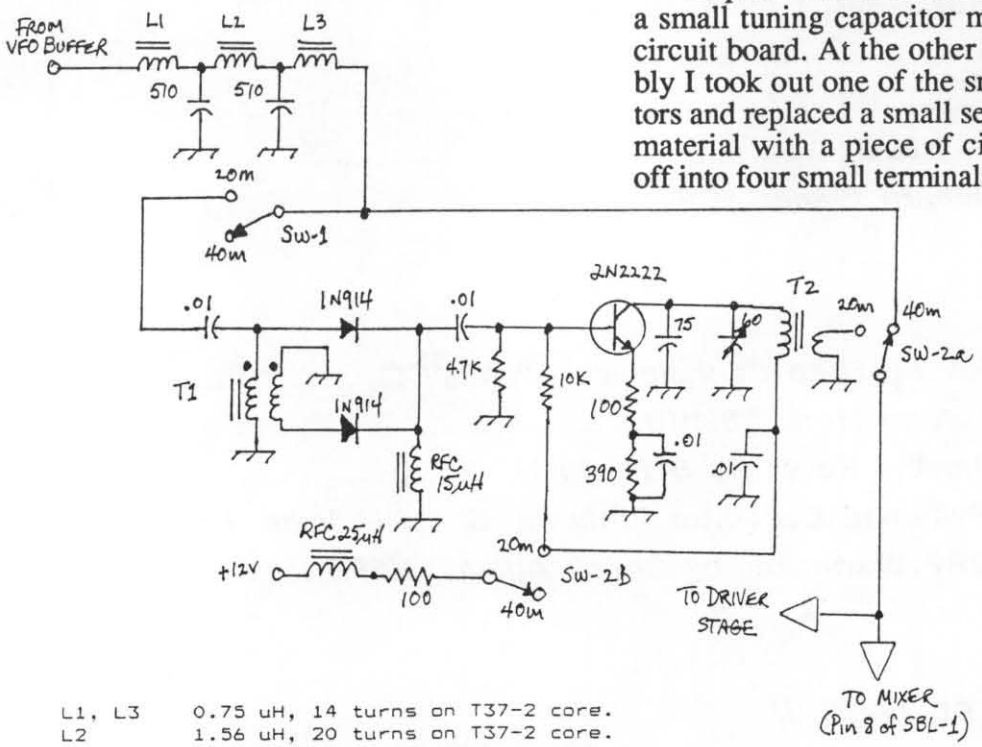
Having tried other circuits and ideas without optimum success, I was excited to try the W7EL circuit. As I built my version of this transceiver, I incorporated some ideas from other published projects and books, as well as some of my own modifications. Because the basic circuit and project description are contained in the original and subsequent articles, I'll only present the details here that are modifications of the original project.

VFO:

A stable VFO was foremost in the needs hierarchy as I planned my project. I appreciate the extensive discussion that Roy Lewallen put into his original article about VFO construction. By following those instructions and ideas he gave me through one-on-one correspondence I was able to build a VFO that even surpassed my expectations. I regularly get reports of no drifting and of a pure sounding CW note. Many of my contacts are surprised that a homebrew rig can generate such a stable, chirp-free signal.

From my own unsophisticated tests, I find no noticeable drift from the time I turn on the rig. I might add that it did take some trial and error experimentation with capacitors to optimize the VFO's stability. Roy's approach, starting with NPO type capacitors in the tuning circuit and then optimizing stability with other types, seemed to work for me. Because I read in various sources that isolation and shielding add greatly to VFO stability, and because I desired a compact package, I decided to build the VFO in an old I-F "can".

I replaced the terminal and coil assembly with a small tuning capacitor mounted on a piece of circuit board. At the other end of the I-F assembly I took out one of the small adjusting capacitors and replaced a small section of the insulating material with a piece of circuit board sectioned off into four small terminals.



L1, L3 0.75 uH, 14 turns on T37-2 core.
L2 1.56 uH, 20 turns on T37-2 core.
T1 10 bifilar turns, FT37-61 core.
T2 Pri (4.5 uH) 33 turns, T37-2 core.
Sec 4 turns.

Figure 1
Doubler and Amplifier

These terminals became my feedthrough points for power, RIT control, and VFO output. I used the remaining original I-F adjusting capacitor to set the lower band edge of the VFO. The main VFO circuitry and buffer are built on small pieces of copper clad perf-board which I hot-glued onto the assembly frame.

DOUBLER CIRCUIT:

Having successfully built the VFO, I thought I would like to double my pleasure with this rig by adding 20 meter capability. I did this by doubling the 40 meter VFO output frequency. Successful balancing of the popular push-push doubler seemed to require some test equipment that I don't have so I opted for the simpler diode doubler described in *Solid State Design for the Radio Amateur* by Wes Hayward and Doug DeMaw (see figure 1).

To minimize harmonics being input to the doubler, I placed a filter between the VFO output and the doubler circuit. The tuned amplifier after the diode doubler seems to minimize the 7 MHZ component adequately. The doubler takes the 7.000-7.080 MHZ signal up to 14.000-14.160 MHZ. The only drawback of using a doubler to achieve a second band is that the useable portion of the tuning dial is cut in half for 20 meters. I found that this is not a major detractor from this design, however.

BAND SWITCHING:

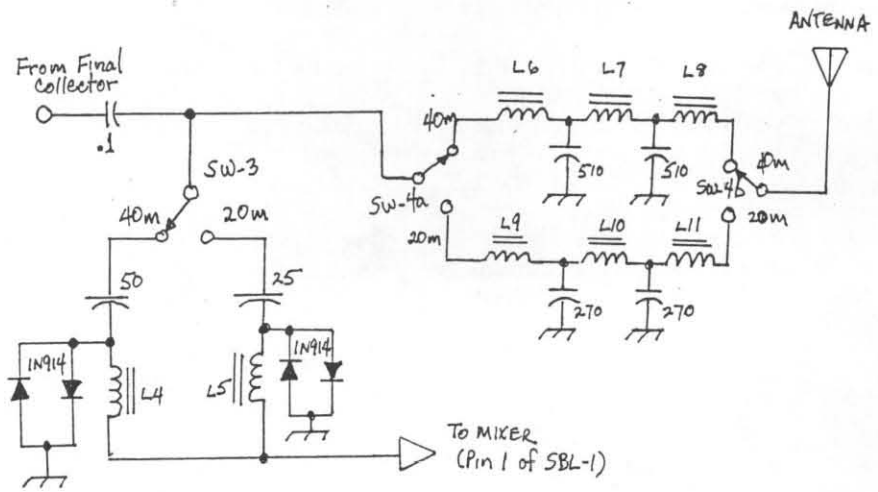
Perhaps the biggest challenge to building a small multiband rig is the band switching arrangement. Again I met this challenge primarily by using an example out of Solid State Design. By using strategically placed slide switches ganged together with an assembly of circuit board pieces soldered together, switching can easily be done by pulling out or pushing in a knob on the front panel.

In my rig, I switch to 20 meters by pulling out the knob. When switching to 20 meters, the doubler is turned on and placed in the circuit, the 40 meter output filter is switched out and the 20 meter output circuit is switched inline, and the receiver signal pickoff circuit is changed (see figure 2). I used the broadband driver amplifier from KN1H's TWO-FER project so I wouldn't have to switch in a different driver amplifier tuned circuit (see *QRP Quarterly*, July 1986).

OTHER MODIFICATIONS:

In order to have versatility, I used a panel-mounted driver control to vary the input to the driver thereby varying the transmitter output power. Although I usually operate at the maximum power the rig will put out (about 2 watts on 20 meters and about 1.5 watts on 40 meters), I find it fun to experiment on occasion with less power. The sidetone circuit I chose uses an NE555 timer chip. Of course this doesn't provide a sinewave tone for those who like to use the sidetone to zero-beat incoming stations. Instead, I find zero-beating to be quick and easy by turning off the RIT and tuning to the center of the signal.

"Double-Ur Pleasure" Transceiver - WK7D



L4	10.2 uH, 50 turns on T37-2 core.
L5	5.1 uH, 36 turns on T37-2 core.
L6, L8	0.75 uH, 14 turns on T37-2 core.
L7	1.56 uH, 20 turns on T37-2 core.
L9, L11	0.40 uH, 10 turns on T37-2 core.
L10	0.84 uH, 14 turns on T37-2 core.

Figure 2
Receiver Signal Pickoff and Output Filter Switching

There are two modifications to the receiver. The first is the use of an SBL-1 diode ring mixer, as has been done by many others when building this transceiver. At first I tried to use an NE602, but wanting to simplify band switching, I decided that the required tuned circuit up front for each band would not fly. The other modification is the use of an LM386 audio output circuit. I just recently added a few components to the standard LM386 circuit to make it similar to NN1G's audio output on the Superhet Transceiver for 20 Meters shown in the January 1993 *QRP Quarterly*.

PHYSICAL CONSTRUCTION: The driver and final circuits are enclosed in a separate inner enclosure (which takes up about a third of the total space) made out of double sided circuit board to help shield and isolate the output circuit from the VFO circuit. Also, I have placed these circuits on the opposite side of the chassis from the VFO assembly. In order to squeeze all of the transceiver circuits into the small outer enclosure (4"x4"x2"), I have three levels of circuit boards in the center of the enclosure. The lowest level circuit board is placed with the etched foil side up directly on the bottom of the enclosure. The components for the voltage regulator, sidetone and keying circuits are soldered on top of that circuit board. The second level contains the doubler circuit and the third level contains the receiver circuit, excluding the audio output. The audio output circuit is placed on top of the VFO assembly.

FINAL THOUGHTS: I had a lot of fun building this transceiver and enjoy hearing the signal reports about its clean signal. Many thanks to those who have the ability to design projects simple enough for those of us who lack similar skills but who love the thrill of homebrewing our own equipment. My project would not likely have come about without the sharing spirit of Roy Lewallen and the others whose circuits and ideas became a major part of the DOUBLE-UR PLEASURE transceiver.

The "QRP Cannon", A Resonant Speaker For CW Operation

George D. "Danny" Gingell, Jr. K3TKS
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Silver Spring, MD 20904

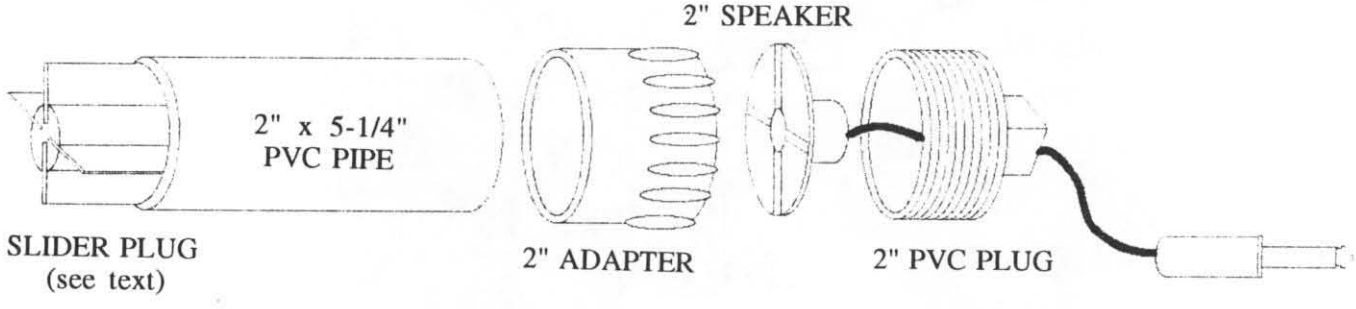
This speaker is my version of a Resonant Speaker for CW listening. The idea was suggested to me by Wally Millard, K4JVT, based on an article originally published years ago in *QST*.

It's constructed out of 2" PVC pipe and fittings so the materials are easy to come by. The tuning plug is made out of a 1-1/2"length of broom handle (1" dowel) with four 1/4"-deep slots sawn the length of the dowel. Each of these slots is fitted with a 3/4" x 1 1/2" piece of sheet aluminum or printed circuit board material.

The PVC plug has a 1/8" hole drilled in its end to pass the speaker cord out of the assembly. The 2" speaker rim is slightly larger than the PVC threads and will need to be ground and filed slightly so that it may be screwed into the adaptor. When assembling the speaker, be sure to include a strain relief knot in the speaker cord between the speaker and PVC plug.

I wound a loop of #6 wire around the length of PVC pipe and used the protruding ends to fashion a pair of mounting feet. The wire stands the speaker up at one end so the nickname "QRP Cannon" is self-evident when you view the finished product.

To use the QRP Cannon, simply adjust the plug assembly in or out of the barrel to set the peak response frequency. I've chosen 750 Hz but there's no reason you couldn't select your own favorite. You'll need a longer pipe, of course, if you prefer a pitch much below the one I've chosen. This is a narrow filter and really cleans up the QRM!



More QRP Satellite Work, Part One

Some More "User Comments" On This Newest QRP Activity

by Michael A. Czuhajewski WA8MCQ
7945 Citadel Drive
Severn, MD 21144

Several issues ago, **Mike Herr, WA6ARA**, had a pair of articles on the Russian RS-10/11 and RS-12/13 satellites. Since I was technical editor at the time, I got the jump on everyone and had a lot of fun on them. At first it sounded rather bizarre, having satellites with both uplink and downlink on HF, but it seems to work out quite well. The first question was how they could get a long HF antenna on a satellite.

After thinking about it for a bit, it doesn't seem that much of a problem. A quarter wavelength at 21 MHz, the lowest frequency used here, is only about 17 feet, which isn't that much by satellite standards, and nothing says it has to be even that long. (I'd love to see some technical info on the antennas, such as type, material, construction, method of deployment, orientation, etc.) Here are a few notes and observations based on my experience with them–or at least with Mode K, with its 15 meter uplink. Mode K is currently active on RS-12, while RS-10 is currently operating with a 2 meter uplink and 10M downlink.

Remember, these are sensitive birds and high power is not necessary to get in. I work Mode K on RS-12 regularly with 4 watts on the 15M uplink, and many other QRPers have worked it at QRP levels.

NO TIME TO WASTE!

Mike recommended that you get everything ready a few minutes before the scheduled pass–pay attention to this one! Just like he said, you WILL be busy once it starts, and there's no time to waste getting set up. And it never hurts to know when the next pass is well before it starts. Several times I've found myself wondering if the satellite might be visible fairly soon. I turn on the computer, load the tracking program, set all the parameters and have it start plotting, only to find that the bird is already visible. There is nothing to compare with the panic you feel at that point, almost killing yourself as you trip over everything in sight to hook up the rigs and antennas and get everything on the right frequency and get the antenna tuned.

WHEN DOES IT COME WITHIN RANGE?

The best way to find out is to run off a listing of the scheduled passes for the next couple weeks. You don't need to go much farther than that, since the Keps (Keplerian data elements) which you must load into your satellite tracking program are updated about that often and it's always best to use the most current set. (The same thing still happens, though–wondering if the bird is coming soon, and looking at the printout and seeing it's already on the way out!)

The Keps are available via bulletins on packet radio, or landline BBSes which are tied into the packet system. The one I use is KA3DXX.MD. In addition to being accessible via on-the-air VHF packet radio, George has a landline port on (410)-551-6517, up to 2400 baud. (He also has a file area dedicated to QRP, which K3TKS and I keep stuffed with information. Use the W ("what?") command to see what's in it.) I would imagine there are many other packet BBSes across the country which can also be accessed by landline.

"TRAK" THE "SAT"

How do you compute the times when the satellite will be visible to you? There are said to be many computer programs available for this purpose, some available through AMSAT. One I've tried, which works well once you get the hang of it, is TRAKSAT. This is shareware, which means you can legally get a copy from someone and try it out. If you like it and use it regularly, you are expected to register with the author, for a fee. This one is written by **Paul Traufler**, 111 Emerald Drive, Harvest, AL 35749. It comes with documentation on the disk, over 70 pages worth. The order form at the end gives the following prices for non-commercial use: non-registered version, $10; registered version, $25. This program runs on an IBM compatible, the bigger and faster the better.

To use it, you must first do the initialization, which includes identifying your location, to include latitude and longitude. It has many larger cities across the country in memory already, or you can load your own. I found it easier to use the preloaded Annapolis rather than Severn, since it's only about 15 miles away by air. I never tried to calculate the error in the tracking results, but it has to be quite minimal.

You must already have the Keplerian data for the satellites you want to track loaded into .TXT files in your computer. The first thing you do when starting a session is select the FILE option and load the data. Keps on the packet network are in two different formats, although they contain the same information about the satellite. TRAKSAT requires the two-line format. If you receive a set of Keps in the different format, you can still use the data but have to shuffle it to fit this format.

Under TIME you have the option of Real Time or Delta Time mode. In Real Time, it tracks the satellite position second by second at that actual moment. This one isn't too useful for predicting the next pass, as you have to run it for almost 2 hours to see one complete orbit. However, it's great for tracking the position in real time while you're working through the satellites, especially with the footprint display turned on. In Delta Time, by far the most useful, you select the starting time and date as well as interval between positions; this speeds up the process, like using Fast Forward and Fast Play on your VCR. I usually use an interval of 3 minutes, which makes the marker move fairly fast, and it takes just a couple minutes (on my '286/12 MHz machine) to plot several orbits.

There are many different modes under the OUTPUT option on the menu. The ones I've settled on as most useful are Ground Track and Analytical. Ground Track shows a map of the world and plots the progress of the satellite as it goes around. This lets you see where it is at any given time, when it will pass within range, how far east or west and how far away. (This is the old, familiar NASA-type "sine wave on the world map" display.)

Under OUTPUT you can also select Display Sensor Yes/No; this draws an oblong line around the marker, representing the footprint on the ground, which is handy for telling how far you might be able to talk on a given pass. It slows down the processing slightly, so I don't normally use it. It's useful when you're getting started, but after a while you have a good feeling for the size of the footprint and can turn it off to speed things up.

An option which I do NOT recommend under any circumstances is Display Sun Terminator. This shows the day/night

terminator lines, and slows down processing drastically (at least on my machine, which has no math coprocessor) since it is recomputed continuously. Since it serves little useful purpose anyhow, I always turn it off.

The Analytical Solution mode is very handy and very fast. This one doesn't involve any graphics, just a list of times when the satellite is visible to your station. According to the documentation there is a slight decrease in accuracy, but that's not normally a problem for ham use; just tune in your receiver a few minutes ahead of the predicted time to be safe. Select this option, select Visible Passes (to eliminate the ones which you can't hear anyhow), and run it. Every few seconds a new pass will be added to the list on the screen, giving the time it will appear, duration, distance, etc. You can run this one starting at a date and time of your choosing, for as many days as you want. Hit the PRINT SCREEN button on the keyboard before the top line scrolls off, and you have a handy reference chart.

If you don't have a computer, or don't want to get the software and put up with having to update the Keps all the time, there is one more tried and true method which some folks use (and I've done myself in the past)–leave a ten meter receiver going all the time while you go about your business and wait until you hear the satellite telemetry beacon, which is 20 WPM CW. It's crude but effective. Unfortunately, you can't come back a few days later and find them again within a few minutes of that time, since the period of the orbit is an odd fraction of an hour–about 105 minutes, or 1 3/4 hour. You just have to keep listening or do some manual calculations to find the passes, remembering that only 6 orbits per day will produce a usable signal.

AN EXCLUSIVE NEIGHBORHOOD

Folks who use the Russian RS satellites are a very exclusive group. An excellent article on RS-12, which I highly recommend reading, appeared in the March 1992 issue of *73 Amateur Radio Today*, by **Pat Gowen, G3IOR**, titled "Using RS-12". In it, he said that there were about 100 stations worldwide using that bird. I can't vouch for the accuracy of that figure, and it may well have increased somewhat since he wrote the article, due to all the publicity about the RS birds lately.

However, I certainly don't dispute it–this is definitely NOT "QRM City!" If you think the WARC bands are uncrowded, give a listen to RS-10 or RS-12 when they pass overhead, even during "prime time." (That's not to say you won't hear a lot of "spurious" signals on occasion. If 15 meters happens to be really hot at the time you'll hear some SSB signals trickling through on the downlink, although they're totally unaware that they're also being repeated on 10 meters via satellite. If you hear someone calling CQ, make sure he includes "RS" or "satellite" in the CQ before you answer him–if he doesn't, he's probably just doing normal 15 meter work.)

SATELLITE MODES

For the absolute newcomer who wants to get started right away and doesn't have immediate access to any other articles on RS-12, here are the frequencies: 15 meter uplink is nominally 40 kHz wide, from 21.210 to 21.250 MHz. You can use either SSB or CW. In general, CW tends to gather near the lower end of the passband, but don't forget to tune up into "SSB country," since I occasionally hear CW up there. The corresponding downlink is 29.410 to 29.450 MHz. The telemetry beacon, with 20 WPM CW, is on 29.408, and the ROBOT is at 29.454. (If the bird is out of sight and you get bored, you can always tune down to 29.357 and listen for the RS-10 beacon. You need 2 meter equipment to get into that bird, though.)

The G3IOR article mentioned that while they say it's a 40 kHz passband, there is some overlap at the edges and that you can be heard up to 15 kHz or more outside those edges (although sensitivity and efficiency are reduced). Unfortunately, though, you might not be heard since few people would be likely to listen outside the published frequency range.

There are different satellite modes (uplink/downlink combinations) available. At the time of writing, RS-10 was operating with a two meter uplink and ten meter downlink (Mode A), while RS-12 listens on 15 meters and comes back down on 10M (Mode K). The latter is my favorite, since it only requires HF gear–no need to go out and buy a 2 meter all-mode rig or build a transverter. There are usually about 6 passes a day, which for me are 3 in the morning and 3 in the evening. Of a set of 3 passes, the middle (and closest) one is usually the best and most productive. The other two passes are farther away and thus signals will be weaker, but they allow you to work greater distances.

Sometimes the beacon will actually move the S meter if it's a very close pass, under 1000 KM. The bird is not a powerhouse, being well under the 5 watt QRP "legal limit", but you can still hear it clearly. (No need for a fancy antenna, either; in fact, it's best to have something with a relatively broad pattern, since the satellite changes directions drastically during the pass.)

You don't really need that two meter all-mode rig to work Mode A on RS-10, by the way. I worked KFØN the low-tech way (contact by old fashioned atmospheric propagation on 20 meters) one night between RS-12 passes, and mentioned my work on it. He replied that he had so enjoyed the articles by WA6ARA that he had to try RS-10. He took his Icom 2M handheld FM rig, put a 5/8 wave antenna on it, laid it horizontally on the table, and sent CW by keying the PTT switch. I don't know if it chirped, but he said he worked several people that way! I've heard reports of others doing the same thing with good success.

SEEING THE INVISIBLE SATELLITE

An interesting quirk of HF satellites is mentioned in some articles. Since VHF and UHF are line of sight (LOS), birds using only those bands must be above the horizon before they can be heard or accessed. However, HF birds can sometimes be heard and accessed while they are still below the horizon, and technically out of sight, due to HF propagation. If conditions are good on 15 and 10 meters, you might want to listen a few minutes before the official "rise time," or maybe even at other times.

I'd often heard the bird several minutes before it was supposed to cross the horizon, but here's a really good example of the effect. On 27 December 1992, I tuned in 29.408 out of sheer boredom at about 1600 local time. I knew the next pass was about 3 hours away, but there it was–way down in the mud but unmistakably the CW telemetry signal of RS-12. I loaded up TRAKSAT as fast as I could, and sure enough the satellite was nowhere to be seen.

The approximate coordinates were 50 degrees north and 169 degrees east, passing from north to south over the ocean a couple hundred miles east of Kamchatka. (Look at a world map, at the eastern edge of Siberia in the former USSR–it's the peninsula hanging down, north of Japan.) At the time, the bird was thirty one degrees below the horizon. It was too weak to copy 50% and it was obviously out of the question to even think of trying to get in with QRP, but it WAS audible. (The prosecution rests.)

OPERATING ON THE BIRDS

I usually use my Kenwood TS-430S HF transceiver in the split frequency mode, receiving on VFO A on the 29 MHz downlink and transmitting on the 21 MHz uplink with VFO B. The

antenna tuner feeding the 40 meter loop is set for 21 MHz, to give me maximum possible transmitted signal, but it's still fairly good on receive–there isn't too much loss of signal on the downlink side, at least not in my case.

This is a good, simple way of working the satellite, since only one antenna and rig are involved, but it does have it's drawbacks. For instance, you can't tell if you're even getting into the bird. If you use a separate receiver and antenna to monitor the downlink while sending, you can tell how well you're getting in, and can also adjust your power as necessary–the rule of thumb is that you shouldn't be any louder than the beacon. If you're stronger, you're hogging too much of the limited transmitter power, which is divided between all signals on the downlink, and this is said to be a violation of good satellite etiquette.

Another important reason to monitor your signal is so that you DO know that you're getting into the bird with QRP. It isn't unknown to have passes where there is no activity at all, and you can call CQ for the entire time with no takers. Are you even getting into the bird? If you can hear yourself coming back you know you are, and that's a moral victory; even though you don't get any contacts because no one was there, RS-12 heard you!

I use a Kenwood TS-670S quad-band transceiver and a ceiling loop antenna to monitor my sending sometimes, via the downlink. Unfortunately, that antenna leaves a lot to be desired and it's often very difficult to hear the bird, so all serious listening is done on the TS-430S and outside antenna. However, there are times when the different orientation of the indoor antenna makes it better for reception. (The TS-670S was produced for a few years in the mid 1980's, and covered 7, 21, 28 and 50 MHz, with CW and SSB, as well as FM with an optional module. It runs ten watts output, making it a great QRP rig. It superseded the TS-660, which covered 21, 24.5, 28 and 50 MHz.)

It's also necessary to hear yourself coming back down if you want to call someone precisely on their frequency–it's difficult to predict Doppler shift, which changes all the time. When I call CQ, though, I usually tune up and down for calls, to be sure I don't miss anything. Speaking of Doppler, at the end of each transmission it's not a bad idea to tune your receiver if you don't hear the other station come back instantly. Sometimes I'll hear nothing until I tune off a bit and find that he's talking to me but had Dopplered out of my passband.

Sometimes you'll hear someone send a few dots, usually with a sliding frequency. What they're doing is changing their transmitter frequency a bit until they hear themselves coming down at a particular spot on the downlink. This is the normal way of zero beating a signal on a satellite.

Another problem with the split frequency operation is that I sometimes transmit on the downlink frequency. I'll flip over to check the transmit frequency on 15M to see if it's clear, and put the function switch in the wrong position when going back to 10M. On newer rigs with more sophisticated A/B VFO switching this may be less of a problem. Finally, if you're transmitting in the blind on 15M, without listening first, there is the chance of coming right on top of a QSO in progress. I usually check the frequency every now and then to be safe, although at QRP levels it's not usually much of a problem to anyone.

An interesting aspect of an HF satellite is that you can sometimes flip the receiver over to the 15M uplink frequency and hear the same signal that you're copying on the 10M downlink, occasionally a great deal better. There's a great temptation to cheat and copy only his uplink! Another temptation is being on the East Coast and hearing Alaska coming through but not being able to work it with QRP. It takes great inner strength to stop your hand as it inches toward the power control; it helps to chant, "I am a QRPer...I will remain pure..."

I've heard the RS-12 ROBOT calling CQ a few rare times, but it usually seems to be sending out garbage, which isn't even Morse code. By the way, the ROBOT is the "beacon 2 transmitter" referred to in the telemetry codes. (And the purpose of the ROBOT? When it calls CQ, you answer it on the appropriate uplink frequency and if it hears you, you get a QSO with the RS-12 computer! Unfortunately, it seems to be brain-dead. If this sort of QSO appeals to you, try the RS-10 bird, which also has the Robot function. While you need 2M gear to get into it, that one might be working.)

(Part Two will appear in a future issue of the QRP Quarterly.)

–QRP–

QRP Classifieds

WANTED: Chassis (with dial drive) for Ten Tec PM-1 Power Mite. Will consider entire or partial nonworking PM-1 to restore the chassis on my good old hacked-up rig! Rick Ferranti WA6-NCX, 254 Florence Avenue, Arlington, MA 02174-7248; TEL: (617) 646 6343.

FOR SALE

ARGOSY II 525D CW/SSB 50W or 5W. 2 filter CW, power supply, mike, mobile mount $595 includes shipping. Dennis Bryant N4MUS, 224 S. McIntosh Street, Elberton, GA 30635 TEL: (706) 283 2963.

GEM QUAD, damaged, repairable. 3 Element 20/15/10 M. Sale or trade for monoband 20 M yagi. Pickup only. Mike N4OHB, (205) 638 8928 after 8 PM CST.

TEN TEC ARGOSY 1, model 525 in metal suitcase, model 225 power supply, model 227 antenna tuner, plus bencher paddle & Curtis Keyer. $500. David Little, AF5U, 702 Rollingwood Drive, Richardson TX 75081, Home: (214) 238 0030/Office 1-800-676 5342.

Effects of Wire Size on Toroid Inductance, Part Two

by Michael A. Czuhajewski WA8MCQ
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Severn, MD 21144

Author's note—This is the second of two letters I sent to Technical Correspondence at QST. The first appeared in the January 1993 issue of the QRP Quarterly. I was asked to combine and condense the two letters for possible publication in QST. Parts One and Two are the original, uncut letters. —WA8MCQ

In response to my recent letter on inductance vs. wire size, Zack Lau sent me the lab data he used to support his statement that a significant increase of inductance could be realized by using smaller wire. My original comment about measurement devices with 0.1 microhenry resolution does not apply in this case; although his published figures were truncated to tenths of a microhenry (0.8 and 0.9), his lab data showed a resolution of hundredths. His test equipment is a Hewlett-Packard 4342A Q meter, using the same basic technique as my older Boonton 260A Q meter (resonating the unknown inductance with a calibrated capacitor at a selected frequency), so differing test principles are not a factor.

I believe the real culprit is variation in permeability (and thus inductance) among nominally identical cores. His data showed a noticeable difference in inductance among several coils having the same type and size core, number of turns and wire size, something I have noticed for years. This can distort the effects of changes in wire size if a number of coils are used to gather supporting data.

Zack's data showed seven coils with 15 turns on T37-6 cores, including three each with #22 and #28 wire. His lab book references appear to indicate that the tests were scattered over a long period of time, rather than being done all at once. This complicates a direct comparison, since there could have been slight variations in test methodology, as well as changes in equipment calibration with time.

The sidebar in the April 1992 issue of QST showed an increase of 0.8 μH to 0.9 μH (12.5%) by going from #22 to #28. Although he used the highest value seen with each wire size, average values would yield essentially the same results. However, do the few cores he used (3 for each wire size) fall near the average value of permeability for T37-6 cores, or were some near the outer limits? The core-to-core variation in permeability clouds the issue and must be eliminated (as I did in my earlier experiments with notched cores) to give meaningful results.

By quantifying and deliberately exploiting core to core variations, I was able to approach the difference Zack reported. I wound coils with 15 turns each on two T37-6 cores, checked them at 14.0 MHz and obtained the following data:

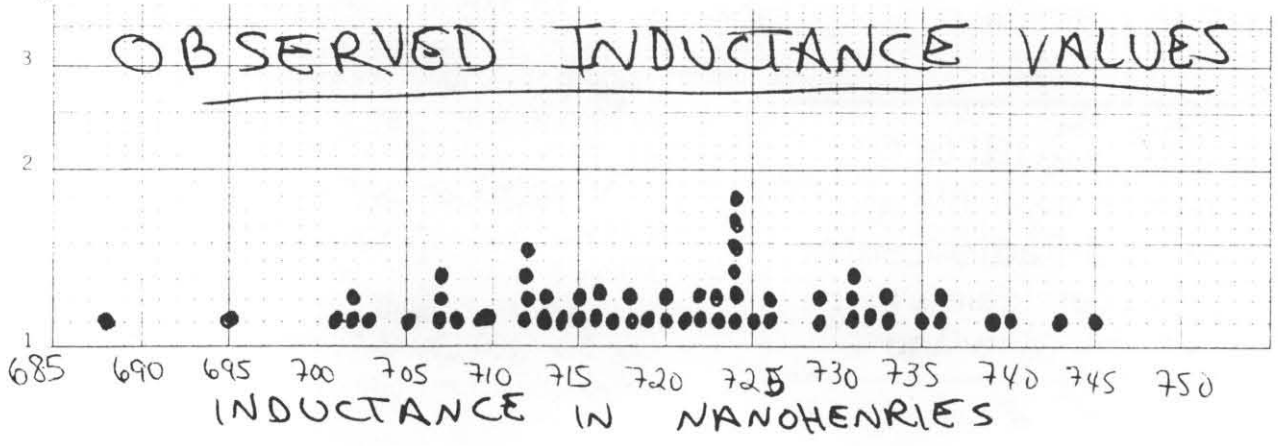
Coil 1: #22, 0.695 μH
Coil 2: #28, 0.752 μH

Taken at face value, this shows an apparent increase of 8%. However, here's "the rest of the story"—the cores were very carefully selected to give the greatest possible spread. I had first wound identical coils on ten cores with 15 turns of #22 wire. The one with the lowest inductance, and thus the lowest permeability, is Coil 1. Next, I chose the one with the highest inductance (and thus permeability), and rewound it with 15 turns of #28 to obtain the value shown for Coil 2. The inductance shows an exaggerated increase over Coil 1 due to the combined effects of smaller wire size and increased permeability. While the apparent increase from going to the smaller wire is 8%, the values on any one core contradict this:

Core 1: #22, 0.695 μH;
#28, 0.702 μH; 1% increase
Core 2: #22, 0.745 μH;
#28, 0.752 μH; 1% increase

Conversely, if the only coils I had wound were with #28 on Core 1 (0.702 μH) and #22 on core 2 (0.745 μH), and I was not aware of the substantial difference in permeability, I would think I had a decrease of 6% when going to the smaller wire. The key is to be aware of and eliminate the variable of permeability differences of nominally identical cores and compare different wire sizes on the SAME core.

Later, three of the remaining eight cores were randomly selected. They were measured once more, rewound with #28 wire and checked again. (Unlike the experiment in my previous letter, the cores were not notched to insure uniformity of spacing from coil to coil on a particular core, but were wound as uniformly as possible, following the accepted practice of covering the entire core except for a 30 degree gap at the ends.) Comparing the values with #22 vs. #28 on the same core, the difference averaged a bit under 2%.



In this particular set of experiments, with a sample size of 10 cores, the inductance spread due to core-to-core variations in permeability, for the same number of turns and wire size, is 0.695 to 0.745 μH, or 7%. I eventually borrowed as many cores as I could and expanded the sample size to 47 [later expanded to 58], and all but one fell within the original limits. (See attached figure.) That core produced a coil of 0.688 μH, which could be compared with Coil 2 above to show a 9.3% increase.

In their Catalog 3, Toroidal Cores for RF Applications, Micrometals (which manufactures powdered iron cores such as the T37-6) states, "Close uniformity within lots and relative uniformity from lot to lot are additional features. Inductance tolerances [are] +/- 5%." (My thanks to Ed Wetherhold, W3NQN, for pointing this out to me.) The mean inductance of my 47 [58] coils is 0.722 μH; while most are relatively close to that value, a few approach the 5% limits.

My basic conclusion remains the same, that changes in wire size on any given core will result in minimal change in the inductance.

Appendix:
Data provided by KH6CP/1:
Test frequency 25.2 MHz except * = 7.9 MHz All coils 15 turns on T37-6 cores

Ind (μH)	Wire size	Lab book reference
0.72	22	2p39
0.77	22	2p39
0.80	22	4p35
0.83	24	1p131
0.83	28	4p35
0.852*	28	4p35
0.91	28	1p149

My current experiments:

All coils wound with 15 turns #22 wire on T37-6 cores, Fo = 14.000 MHz, monitored by frequency counter; measurements performed on Boonton 260A Q meter, read out in picofarads of capacitance required to resonate at Fo and converted to inductance. Capacitance was read out to the nearest 1/10th picofarad. (Some coils were retested several times during the course of the experiments. In no case was the variation in resonating capacitance greater than 0.3 pf.) Calculations were performed on a TI-35 PLUS scientific calculator, using the full value of Pi (12 significant digits used internally, 10 displayed). No rounding was performed until recording of final results, which were rounded to the nearest nanoHenry (.001 μH).

Core 1	**0.718 μH**	
Core 2	**0.724 μH**	
Core 3	**0.729 μH**	
Core 4	**0.725 μH**	
Core 5	**0.729 μH**	
Core 6	**0.717 μH**	
Core 7	**0.695 μH**	****lower limit**
Core 8	**0.735 μH**	
Core 9	**0.745 μH**	****upper limit**
Core 10	**0.723 μH**	

On a later date, randomly selected cores from this group were measured again, stripped and rewound with 15 turns of #28 and remeasured immediately. (Cores were not notched to insure uniformity of windings; coils were wound as identically as possible.)

Core 3: #22, 0.728 μH; #28, 0.737 μH; 1.2% increase
Core 6: #22, 0.718 μH; #28, 0.730 μH; 1.7% increase
Core 10: #22, 0.720 μH; #28, 0.739 μH; 2.6% increase

Effect of number of turns on inductance;
Core 3, #28:
14 turns, 0.652 μH
15 turns, 0.737 μH
16 turns, 0.836 μH
17 turns, 0.937 μH

Test of 58 cores (including the 10 above), all T37-6, 15 turns #22 wire, tested at 14.000 MHz. Most cores were measured several times, over several sessions covering several weeks, in various combinations, to give cross-checks on procedures and results. Some values deviated slightly from earlier measurement(s), up to 3 nH, due to difficulty in precise positioning of capacitance dials from session to session. Core 9 above, 0.745 μH, remained the highest inductance. Once core fell below the value of Core 7 (0.695 μH), at 0.688 μH.

QRP

The Rev. George Dobbs, G3RJV, (right) presented the GQRP Club's G2NJ Trophy to Luke Dodds, W5HKA. The trophy is given in recognition of long service to the cause of international QRP. The presentation was made at Hamcom in Arlington, Texas, in June.

QRP BOOK REVIEW

RF Circuit Design by Chris Bowick (WD4C)

Reviewed by Michael A. Czuhajewski WA8MCQ
7945 Citadel Drive
Severn, MD 21144

Now here's a good book for the technically inclined QRPer! I passed up this book from SAMS for several years while copies sat on the shelf at Maryland Radio Center (meeting place of the Maryland Milliwatts). I was too cheap to part with the $25 for a large (8 1/2 X 11) paperback book of only 176 pages, even though it looked rather good. Eventually I started to realize that it fell in the category of "really good stuff and have to have it despite the price" after I read two articles in old issues of Ham Radio magazine which were adapted from the book.

Naturally, by the time I was ready to spend the money it had disappeared from the face of the earth. MRC owner **Jerry Johnson, WA3WZF,** told me that there was some corporate shuffling, selling off of divisions, etc, at the publisher and that he'd had it on back order for over nine months. He indicated that the particular part of SAMS which published it had been sold off, and it wasn't known if the book would be available again. Apparently the division was then sold once more, this time to Prentice Hall Computer Publishing, and the book suddenly appeared on the shelf again. I immediately snapped one up hungrily, and wasn't disappointed.

This is definitely a technical book, with lots of good math (but well below the PhD level), and plenty of Smith charts in later chapters. Quoting from an ad for it in *RF Design* (a trade journal with the same name as the book but no relation), "The author introduces RF circuit design at the most basic level, starting with individual components and proceeding through resonant circuits, transmission lines, filters, the Smith chart, impedance matching, small-signal amplifiers and power amplifiers. It is an excellent teaching text for beginning engineers, and a valuable reference for fundamental RF principles." Amen.

Copyrighted in 1982, *RF Circuit Design* is currently in the ninth printing (1992), attesting to its continuing popularity. Although it is advertised as having 176 pages, that includes title page, copyright page, table of contents, index, etc. (This seems to be a somewhat irritating but common practice in publishing, but at least they didn't include ads for other books from the publisher in the page count, which some folks do.) How many pages of "meat"? Including the two appendixes ("Vector Algebra" and "Noise Calculations"), there are 161.

If you want to get a taste for it, check out some old issues of *Ham Radio* (if you can get them). The April 1984 issue contained an article titled "Resonant Circuits", adapted from chapter 2. In June 1984 they had "Impedance Matching: A Brief Review", based on chapter 4.

This is definitely a technical book, with lots of good math (but well below the PhD level)

So, what are the chapters about? Chapter 1 talks about components and how they behave at RF, with a bit of toroid info thrown in. Chapter 2 discusses resonant circuits. Chapter 3 covers a variety of filter topics, and chapter 4 goes into impedance matching, with Smith charts all over the place. In Chapter 5 the topic is "The Transistor at Radio Frequencies", and he gets into Y and S parameters, although the Smith charts trickle off. Next comes "Small Signal RF Amplifier Design", and the charts pick up again. Finally we have "RF Power Amplifiers", followed by the pair of appendixes (or appendices, if you prefer–both are correct) mentioned above.

Overall impression–the technically inclined ham will probably love it. If some of it is over your head, don't worry–come back a few months later and try those parts again. As with any technical publication, even if you don't understand everything the first few times (and it does take a while to become proficient with Smith charts), you'll still pick up a lot of good info. If you liked the various technical tutorials in *Ham Radio* over the years, you'll probably like this book. Although it doesn't have any construction projects like Solid State Design for the Radio Amateur, it belongs right beside it on your book shelf.

Where to get it–if your usual book sources don't have it, you could order from the folks who publish RF Design magazine. The address is Cardiff Publishing Company, Attn: Circulation, 6300 S. Syracuse Way #650, Englewood, CO 80111. The price is $24, with a $3 shipping charge (which increases with the size of order until you go over $250, at which point shipping is free). If you want to order by phone with a charge card (and they do take American Express, as well as MC and Visa), call 1-800-525-9154 during normal business hours. ("The QRP ARCI and QRP Quarterly in no way warrant this offer.")

–QRP–

KENWOOD TS-50S

John Mori, N8MUU

The new Kenwood TS-50S is a very versatile radio and can serve as an all around rig, a fine ultra compact mobile radio, and as a fine full-featured QRP radio. The radio's versatility is due mainly to its small size, its numerous features, and its varying power levels. While there are features I would change in regards to CW operating, QRPers must face reality. The reality is that QRP enthusiasts are a minor (but rapidly growing) segment of amateur radio and that CW is not the mode of choice for most amateurs. A manufactured radio for just our interests is just not going to occur (the Ten Tec Argonaut 2 excepted). The TS-50S does have the potential to be a fine QRP radio however. The radio even has an advantage for the lonely QRPer, for it display's "HELLO" when you turn it on. You can't beat that!

The TS-50S is indeed a major departure in the manufacture of HF radios. One is immediately impressed with its small size (180 X 69 X 270 mm, or rough 10 1/2" X 7" X 2 1/4", projections included). The compactness is largely due to the extensive use of surface mount technology and the use of menus. Few compromises are made because these technologies also permit high performance and allow the inclusion of features usually found in radios of larger physical size.

The radio receives from 50 kHz to 30 MHz and transmits on all nine amateur bands in all modes. It weighs 6.4 lbs (6.9 kg) and draws 1.45 A in the receive mode. Its weight and power consumption do not make it an ideal backpacking radio! However, it should perform well under most field day and portable operations.

The rear panel has the following inputs and outputs: power, antenna tuner, antenna, ground, external speaker, key, ALC, and relay. I mention this specifically because early reports, supposedly from amateurs who saw the radio, omitted many of these rear panel features. The ALC connector should be most useful in lowering the output power to QRP levels. The simple circuit to allow this has appeared in most QRP magazines. See below for an easier way to adjust the power to QRP levels internally.

Some of the more prominent features of the radio are:

- 2 VFOs that allow split operation
- DDS
- AIP feature which Kenwood claims raises the dynamic range of the rig
- AGC - slow or fast
- CW reverse function selected from the menu
- All mode squelch
- IF shift, but no notch filter
- 20 db attenuator but no RF gain control
- A pulse noise blanker
- QSK or various delay times selected from menu
- A peak reading S meter and power meter (power meter is relative)
- Three power levels: 10 W, 50 W, 100 W
- A slightly noisy blower
- Automatic power off, if you prefer
- A full display panel with various levels of brightness

There are two menus that provide access to several functions of the radio. The "A" menu has 17 items that are changed more frequently. Examples include power level, AGC fast or slow, IF filter selection, QSK, and CW reverse. The "B" menu has 22 items that are usually changed less frequently. Examples include automatic power off, repeater tone frequency, peak meter hold, PTT disable, and the microphone assignments. Four parameters of your choice can be operated via the microphone. You can access the menus by pushing and holding the Frequency Lock button. You then advance through the menu one function at a time by using the main tuning knob.

You can vary the receive/transmit frequency a number of ways. One progresses through the amateur bands by pushing either the Up or Down button on the front panel. If you advance to another band and then return to the original band, you will return to the last frequency displayed. You can also use the MHz button to alter the frequency. The DDS coupled with the "fuzzy" logic control allows you to tune in a frequency precisely and to vary the tuning rate as you increase the velocity of the dial rotation. There is actually a slight delay between the turning of the knob and the registering of any change in frequency. The Up/Down buttons on the microphone will allow you to advance rather quickly through any band.

You can also retrieve a frequency from memory, including split frequencies. One memory is reserved for either simplex frequencies or start and end frequencies for scanning. All the memories, except for the latter, also store several parameters, such as mode, IF bandwidth, AGC fast or slow, and so on. A great deal of the instruction manual is devoted to the memories and how to use them.

The TS-50S has a lot going for it as either your main CW, QRP radio or as a mobile or portable unit. Its all band capability and small size now mean that you can take one small rig afield. You can insert a 500 Hz filter to reduce the bandwidth for tough situations and the IF shift works well for less serious QRM problems. Full QSK is a menu choice that most will want to use. A CW reverse function can also be accessed from the menu as still another way to deal with QRM. You can also vary the CW receive tone (not the sidetone) to suit your particular operating style.

The TS-50S has the potential to become a much used QRP rig. The double conversion receiver plus the AIP performs well and both CW reports and SSB reports have been excellent. The speaker delivers very good audio. There are some features which are somewhat inconvenient for the strict CW operator. The main CW functions such as

(TS-50S continued)
the insertion of the CW filter, the CW reverse and so on, are only accessible through the menu. Since access to the filter is important to me, I go to the "A" menu, tune the main dial until I reach the appropriate entry, and then exit menu.

Now, if you run into QRM during a QSO, you must perform the following tasks to go from 2.4 KHz to 500 Hz filtering: press and hold the Frequency Lock button until the menu appears. The 2.4 KHz selection should appear. Now press the Down button and the 500 Hz will be displayed. Now press the CLR button. This sounds like it is time consuming but the sequence can be performed quite rapidly. I personally like to tune around at the wider bandwidth and only use the filter for tough situation, even in a contest. There may be some clever ways to set the memories to make this process easier, but the radio is still too new for me to learn all the tricks.

There may be another way to access the CW filter. I doubt that many of us will use the Auto Tuner button. That button is approximately two inches away from the filter. It may be possible to use this switch to access the filter. It will likely not be an easy task, give the surface mount technology and compact nature of the radio.

There are also three potentiometers that control the power. According to Kenwood, VR 14 is the 100 W level, VR 16 is for the 50 W level, and VR 15 is for the 10 W level. You can simply adjust the value of VR 15 to the five watt (or less) level to reach QRP output levels. To find the potentiometer remove the cover. Then remove the speaker carefully. The speaker rests on a piece of metal that can be removed by lifting the rear upward past the black padding that sticks to the chassis.

VR 15 and VR 16 are located to the left of the elevated board which contains (if previously installed) the 500 Hz filter. One brass screw holds this elevated board to the TX/RX board below. To the left of this screw, on the main board below, are the two potentiometers. Their labels are to the left of the components themselves. VR 15 is the pot that is located closest to the front panel. The pot is extremely small and I used a jewelers screwdriver to insert in the slot. Be careful as the slot is rather shallow and it is easy for the screwdriver to slip out.

Actually, I needed some help here. A good friend and fellow QRPer, WF8X, Jack, held a flashlight while I used a magnifying glass and the screwdriver. The control is very sensitive, so you need to make the adjustments in small increments as you check it against your wattmeter. Jack had found a packet message from WA6ERB on a local BBS which provided the information I needed as to the location of the pots. I had forgotten to ask Kenwood that critical information when I call asking about the possibility of varying the power via the pots. Chalk it up to my inexperience with surface mount technology. I though they would be easy to find! Once you know where to look, the procedure takes five minutes.

The radio's small size is a great advantage but I find the tuning knob to be tiring after awhile, especially without a fingerhole. Also, the few small knobs are somewhat difficult to control if you are in a hurry.

My first impression is that this is a fine ultra-compact radio that appears to be well designed and manufactured; it compares favorably with my Icom 735. It performs well right out of the box. A rugged mobile mount comes with the radio. The price of the radio is around $1,000 and the filter is about $99. I believe the price to be in line with its features, performance, and uniqueness. One is now forced to decide whether to purchase several single band QRP rigs now on the market or to buy the new Kenwood. Three single band CW only rigs equal one half the price of the TS-50S and offer far less as a portable station. Think about it.

This radio is so new that one cannot tell if "bugs" will emerge. I have heard some comments about amateurs getting into other parts of the microprocessor and messing up the radio. Curiosity can not only kill the cat, but it can result in sending the radio back to Kenwood. In addition, one wonders about the durability of a combination of surface mount technology, ultra-compactness, 100 W output (for those "other" amateurs), and the sometimes harsh mobile conditions that can exist. At any rate, QRPers should be talking about the TS-50S for some time to come.

☛ QRP

EUROPE FOR QRP WEEKEND. 1600 UTC Oct 1 until 2359 UTC Oct 3. CW only around QRP frequencies. Power not to exceed 5 watts rf output. Call CQ EU QRP. Exchange RST, power output, and name of operator. Scoring: contacts with own country do not score. European stations score 1 point for each European contact and 3 points for each contact outside Europe. Stations outside Europe score 5 points for each contact with Europe. Final score is sum of points scored on each band used. Logs: separate log sheets must be used for each band, showing for each contact date, time, call, RST, name, power rcvd and sent. Summary sheet must be provided showing call, name and address, claimed score for each band, total score, and brief details of equipment used. Submit logs by 15 Nov. to P. Doudera, OK1CZ, U1 baterie 1, 16200 Praha 6, Czechoslovakia. Merit certificates will be awarded to the three leading stations from each continent. Judges decision final. Event organized jointly by G QRP Club and OK QRP Club.

EASY CW FILTER FOR TENTEC 505/509s

Larry East, W1HUE
1355 Rimline Drive
Idaho Falls, ID 83401

Attention TenTec owners - how would you like to build a CW filter that:

- Is inexpensive
- Is easy to build
- Needs no adjustments during use
- Uses very little power
- Really works great!

Then I've got just the thing for you: a passive filter supplied in kit form by Ed Wetherhold, W3NQN, with the addition of a simple amplifier to compensate for the filter insertion loss. The filter can even be switched in automatically when the rig's mode switch is set to CW!

TenTec 505 and 509 rigs derive their AGC control voltage after the audio detector, rather than before. They also have provisions to include an external filter (an active filter was originally sold as an accessory for these rigs) within the AGC loop before the audio output amplifier. Since the AGC voltage is derived after the audio filter, strong signals outside the filter passband cause no "AGC pumping" effects. This is an extremely effective use of audio filtering, in fact almost as effective as IF filtering!

W3NQN's filter has been mentioned several times in the *QRP Quarterly's* Ideas Exchange column, and is also described in the ARRL Handbook, beginning with the 1991 edition. It is basically a multistage bandpass filter using surplus telephone inductors and matched capacitors. It has an excellent shape factor and is free from ringing. For more information, I suggest you read the Ideas Exchange column in the Jan '91 *Quarterly*. If you have a serious interest in building the filter, send a business-sized SASE to Ed Wetherhold at 1426 Catlyn Place, Annapolis, MD 21401 for price information. Several filter center frequencies are available: 505/509s use a 750 Hz CW carrier offset (it wouldn't hurt to check that it's set properly) so specify the 750 Hz center frequency version.

In most applications, the filter is placed between a rig's audio output and speaker or headphones, and matching transformers are used to match it to the (approximately) 8 ohm input/output impedance. The transformers are not required in this application, however, because it is being used in a high impedance circuit; Ed will deduct them from the price of the filter kit if requested.

The filter has a significant amount of insertion loss, hence the amplifier shown in figure 1 was added in order to maintain proper AGC loop gain. A single LM386 audio amplifier IC is used, with its input level set by R1. An LM386 is a bit of an "overkill" for this application but it's cheap and widely available (Radio Shack part no. 276-1731) The voltage regulator U1 is used to provide a low impedance source for the LM386 and is not absolutely necessary. If used it can be any regulator that supplies between 5 and 9 volts from a 12 V input (7805, 78L05, 78L08, etc.) I don't recommend a Zener diode for this; it will waste more power than a 78xx regulator! I used a miniature relay (Radio Shack part no. 275-249), K1, to switch the filter in and out of the circuit. *(Do not omit the 10 uF cap shown in parallel with K1! In addition to stabilizing the regulator input, it also "swamps" K1's inductive kick when the relay turns off. - NN1G)* The relay allows easy "remote switching". If

you don't care for this feature, you can replace the relay with a DPDT switch and reduce the current drain by about 40 mA. The total current drain of the circuit as shown is about 60 mA.

The box labelled "Passive filter" in figure 1 contains the inductors and capacitors comprising the actual filter; these and a small plastic mounting box are included in the kit. All other components can be obtained from Radio Shack. Except for R2 and R3, component values are not critical. These two resistors are used to match the design impedance of the filter and should be close (5% or better) to the values shown. 1000 and 330 ohm resistors may be paralleled to make up the required 240 ohm value for R3.

I mounted the amplifier circuit components and relay on a piece of perfboard and mounted it in the box with the filter. The power switch and LED are mounted on the front of the box; the audio in/out and power leads are routed through a hole in the rear of the box. Shielded cable, such as miniature microphone cable, should be used for the audio leads to the rig. The input to the filter amplifier is taken from pin 5 of the TenTec accessory socket, and the filter output goes to pin 4. If automatic switching is not used (see figures), 12V power can be taken from pin 6 of the accessory socket. Don't forget the ground return (pin 1); I used the cable shields and had no problem with ground loops or noise pickup.

Figure 2 shows the simple circuit I use to provide power to the filter only when the rig's mode switch is in the CW position. If this filter's power switch is on, the relay K1 will engage and automatically switch in the filter. With this setup the power switch on the filter can still be used to manually switch it in and out - but only in the CW mode. Q1-Q3 should have reasonable current gains (30 or greater) and Q3 should be rated for a maximum collector current of at least 100mA. I used 2N2222As for all three; 2N4401s or nearly any other NPN general-purpose amplifier/switch would also work OK. D1 is used to isolate the circuit from anything else that might be connected to the mode switch. This diode should ideally be a Germanium type (1N34s are readily available) or alternatively a Schottky diode to ensure that Q1 turns off when D1's cathode is grounded. If a free section of the switch is available (on some editions of the 505/509), D1 is not required.

I built the switching circuit on a piece of perf board and mounted it "spider web"-style (hanging by three leads) near the 509's accessory socket. Pin 3 of the socket normally connects to the "defeat" input of the front end board. Since I have no accessories that use this signal, I removed the existing wire, taped it out of the way, and connected the output of the switching circuit (emitter of Q3) to this pin. Once the whole enchilada is put together (shouldn't take more than a couple of hours), check the wiring for boo-boos, connect the filter to the rig, and adjust R1 for proper amplifier gain. To make this adjustment, tune in a steady signal registering S6-S9 with the filter out (you can use a signal generator or another rig for the test signal). Switch in the filter, adjust the main tuning for maximum S-meter reading, and adjust R1 to match the previous S-meter reading. Once this adjustment is made, R1 should not have to be touched again.

Now sit back and enjoy the (almost) QRM-free CW reception provided by this filter. See you on the bands..... **W1HUE**

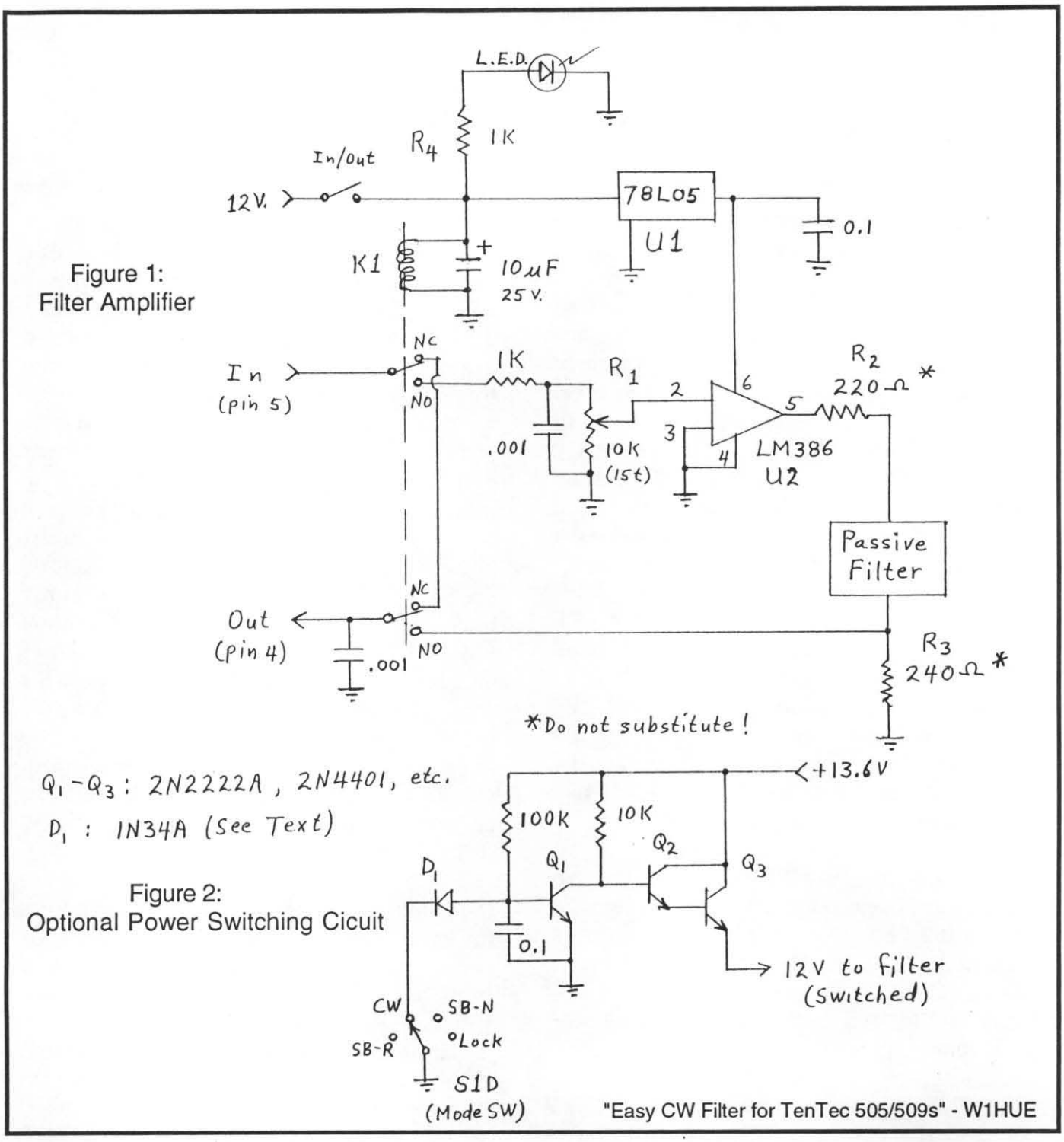


Figure 1:
Filter Amplifier

Figure 2:
Optional Power Switching Cicuit

EROTICA

Now that I have your attention, that should read "errata"! **Fokke Gerrits, PA3FHC,** was kind enough to point out several errors in my 20 Meter Superhet transceiver article in the Jan '93 *QRP Quarterly*. Here they are:

• Q7's collector choke (L4) should have 11 turns (per the parts list.) The schematic is incorrect.

• Q5's emitter components are as shown on the schematic. The pictorial (in the info package) erroneously shows a .01 uF cap instead of the correct 220 pF value.

Thanks to those who've written with comments and questions. I've mailed about 25 information packages so far- a gratifying response! - ***NNIG.***

EXPERIMENTS WITH THE MFJ ANTENNA BRIDGE

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

I want to describe some fun I've had experimenting with antennas, using the MFJ-204B Antenna Bridge. This piece of gear is very useful and not too expensive. To measure the frequency I use an Optoelectronics Model 2810 frequency counter that I got on sale. MFJ now makes a unit with a self-contained frequency counter. It is calibrated as a SWR device, but it is probably similar to my 204B, except calibrated for 50 ohms. The 204B has a self-contained RF oscillator which generates the low level RF signal needed for the bridge measurement. The idea behind the measurements is simple: hook up the unit to your antenna and adjust the frequency dial and resistance dial (they are interactive) for a minimum.

One caution: my MFJ 204B has gaps in frequency between the various scales, so one must be sure that a true minimum is reached. You should get a minimum of zero. Otherwise, the antenna resonance may lie in between the switched oscillator frequency ranges.

The 204B resistance is marked "A, B, C, ... G" and the values corresponding to each of these markings are given on the back of the unit. For mine this was : A=0, B=12, C=35, D=70, E=150, F=375, and G=infinity, all in ohms. I'd recommend plotting these values to permit interpolating between the dial markings. (*The resistance dial on the newer Model 205 reads directly in ohms, eliminating the need for mental gymnastics - NN1G.*)

To make it easier to do reproducible measurements, I decided to make a simple "test range" in my backyard. I put up two 25 feet high supports made from 2x4 and 2x2 treated lumber. I decided that this is about as high as I could safely go without adding the complication of guy wires, and without needing extra help getting the supports up or down. For ease in raising and lowering by one person, the supports swivel on 1/4 inch bolts about 4 feet off the ground. My supports are 36 feet apart between some trees in my back yard, about all the room I have without coming too close to power lines and trees. The bottom of each support is a vertical 2x4, six feet long and sunk 20 inches in the ground. I tamp down the good Iowa black soil (with a board and sledge hammer) tightly around each 2x4 and they hold very steady. In less "sticky" soil one might need to use cement.

I've used my bridge and antenna supports for experimenting with various wire and vertical antenna configurations. Here's a summary of a few results:

1. **The VERTICAL DIPOLE** hanging from a small nylon rope between the two 25 foot supports: The resonant frequency (f) was measured to be 29.96 MHz for a 16' 6" long dipole. The resistance (R) measured 72 ohms (with uncertainty of about 3 ohms, as best I could judge). This is very close to that predicted theoretically for a dipole in free space (about 72 ohms). The bottom of the dipole was 2 feet off the ground. When I lowered the bottom of the dipole to 4 inches above the soil, the resonant frequency did not change

(within the measurement scatter) but the resistance increased to about 96 ohms. The readings were very broad, suggesting that some ground losses were now occurring, perhaps 25 ohms or so. This would mean that for every 4 W to the antenna, 3 W would be radiated, and 1 W would heat the soil. Even this would still be a reasonably efficient antenna (if the truth were known about most antennas!).

The measurements were made over my old ground plane radial system of 48 radials 30 to 50 feet long, buried about 1 inch under the soil. In 1985 when I put these radials in, to save costs over all-copper wire, I used mostly galvanized electric fence wire, plus odds and ends of scrounged copper wire. I now wish I had spent the money for copper wire, because I see that the galvanized wire is rusting. However, it appears that the ground system is still pretty good, as shown by the next measurements.

2. **The GROUND PLANE**: To estimate the ground system resistance loss I put up a quarter wave vertical over the radials. This consisted of two electrical conduit pipes of total length 19 feet high and one foot off the ground at the bottom. The larger pipe (3/4 " dia) has slits cut with a hacksaw and the smaller (5/8 ") pipe fits inside it about 12". The pipes are held together with a steel hose-clamp. The pipes are held on a 3-foot high 2x4 post by electric fence insulators and two hose-clamps at right angles (see Fig. 1).

The theoretical resistance of a ground plane (quarter wave vertical above perfectly conducting ground) is close to 36 ohms. Any ground losses would add to the measured value. The resonant frequency of several tests for my antenna was in the 30 m band and R was measured to be 35-37 ohms. This suggested that my (rusting) radials still give a good account of themselves, and that the ground resistance loss is not more than 1 or 2 ohms. This I believe, because a few months later I mounted my old 19 foot-high 80 m short vertical (using a 5 foot top hat and large inductor for resonance). I was able to work VK6 and ZS4 (western Australia and South Africa) on 3.5 MHz with QRO (80 watts). I did not try much DX with QRP but did work the West Indies with 4 watts on 3.5 MHz, so I think the ground losses are still small, even after 7 years and some rusting. (I worked 80 m DXCC with this system in a couple of years, before I got interested in QRP.)

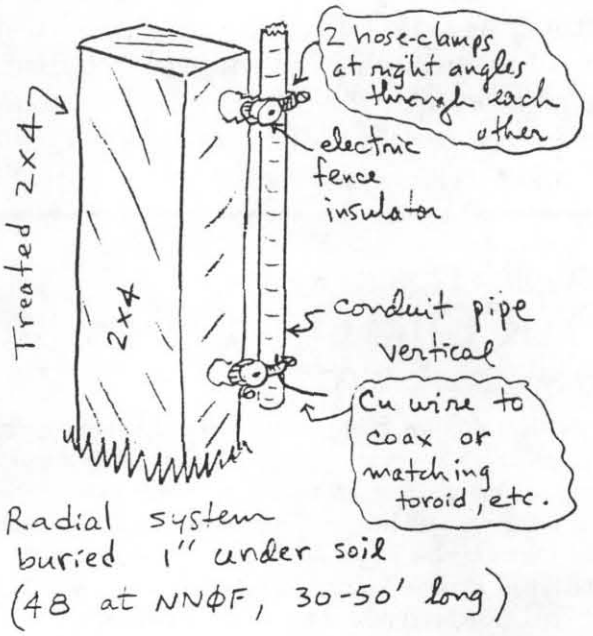


Figure 1

3. **The LOOP**: Later, I decided to put up a vertically polarized 30 m loop. The idea was to get a lower angle of radiation than possible with horizontal loop polarization (fed in middle of bottom leg).

The configuration was as in Fig. 2. The totallength of my loop was 96 ft, not quite

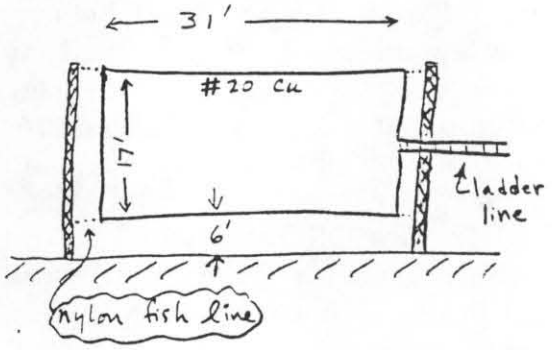


Figure 2

resonant on 10.1 MHz. However, this doesn't matter if you use ladder line and a tuner as I did. The loop performed well on 40 m through 15 m. Its characteristics as measured by the bridge were: resonant frequency of 10.43 MHz, resistance R =125 ohms. These are very close to the predicted values of 1005/L(ft) = 10.47 MHz and R = "about 125 ohms" (see *All About Cubical Quad Antennas* by Orr and Cowan).

In summary, I found the MFJ-204B Antenna Bridge and Optoelectonics 2810 frequency counter to be a nice duo for antenna experiments. The good agreement between the predicted and experimental values gave me confidence in the equipment and measurement technique. I then went on to do some experiments with some antenna configurations whose characteristics are less well known, including folded monopole radiators over the ground plane. I also did a series of experiments with reduced-space, "bent" dipoles, a topic of interest to me for some time. I plan to give some of those results in a future article. But enough for now - I hope some of you try various antenna configurations of your own. I'll be interested to read about some of your results!

Member Product Review

FAR Circuits' Curtis Iambic Keyer

by Skip Davis, NC9O

I decided to buy a circuit board to motivate me in completing a keyer project. FAR Circuits is a maker of printed circuit boards, featuring pc boards from articles of the many ham publications. Included with the pc board for the Curtis Iambic Keyer is the chip and socket for $25.00; the board alone is $4.50 (shipping and handling is $1.50).

The heart of this Keyer is the updated Curtis 8044-ABM keyer chip which is the new replacement for the 8044's. It has speed metering, speed adjust, sidetone, weight adjust, and iambic selection all in a 20 pin IC.

The board measures 1 3/4" x 2" which will fit into most of those QRP transmitter projects; this one is going into my HW-9. The pin out is also new so the old style 8044's cannot be used without some layout changes. Not all of the features are included with this board because it is just too small and it is intended to be used in other equipment. The parts layout is not cramped so if you decide to use junk box parts and not scout out the 1/4 watt resistors or mini capacitors, they will also work just fine here.

Features of the board that I like are provisions for a tune switch, hole spacing for more than one size trimmer pot for the speed adjustment, and mode "A" or "B" iambic selection. Sidetone hookup is not included on this board as it is intended to be added to your rig. I found a PC mount pot for speed adjustments that would fit on the board and this is how it is mounted to the rear panel of my HW-9. The circuit board is silk screened not only with the parts layout but also with the values for most of the parts. There was also a large circuit diagram and board layout included with the board.

One change I made was to add a trimmer pot in place of the fixed resistor that is in series with the speed pot to optimize the speed range adjustment. The keyer went together easily, works great, and fits into the HW-9 without any trouble. I mounted the keyer in the top left rear corner with a switch to select paddle or straight key. Its operation is smooth as was expected and is a welcome addition to any transmitter.

I would suggest that you send a business size SASE for FAR Circuit's complete listing of circuit boards available: Far Circuits, 18N640 Field Court, Dundee, IL 60118. ☞ QRP

Another Attic Antenna

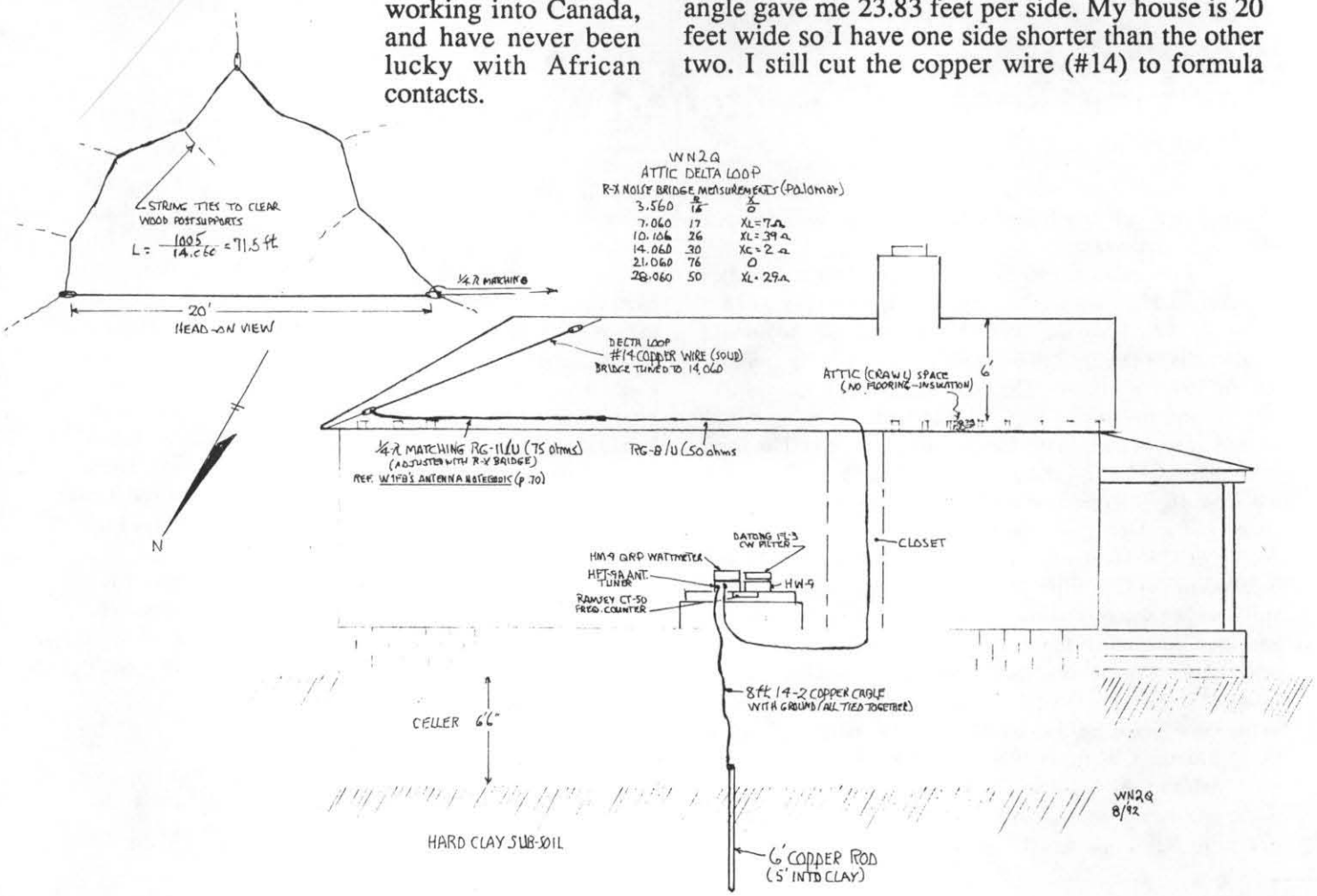
by Jack Cleary WN2Q
420 Cayuga St.
Syracuse, NY 13204

Editorial Two-Cents Worth: I was at WA4KAC's house recently, dividing and sharing several boxes of homebrew parts given to me by W3AKD, who is not an active QRPer but has a very low QRP ARCI number. I noticed a letter from WN2Q on the table, on indoor antennas. It looked like a natural for the Quarterly, so here it is, adapted slightly. —WA8MCQ

Actually and correctly, this is an attic delta loop. I got my information about the loop from Doug DeMaw's "W1FB's Antenna Notebook"—an excellent volume. Doug describes eight different loop configurations. I chose the delta loop for vertical polarization because of the low angle of radiation for best DX work. It has worked well for me so far. When conditions are good I work easily into Europe, have contacted quite a few USSR stations, work all over the US, have worked into New Zealand, Australia, Hawaii and into South America. I do have some problem with consistently working into Canada, and have never been lucky with African contacts.

I am not one who sits and calls CQ. All my QRP operating is listening and searching, and when I hear someone I want to work, I sit on him until I get him...much like fishing. QRP has taught me to be very patient. Even in pileups with plenty of QRO stations I have been able to push my little 4 watts for a QSO with the DX station. I find it very exciting when it happens because I always make sure I let him and those listening know that I'm "QRP 4 watts". Most of the others are running 100 watts or more. Of course, sometimes I might sit on a station for an hour and not catch him, but it all balances out over time. I would say I'm happy with the performance of my delta loop and only wish I could put up a full size 80 meter square loop. I have worked QRP stations that come in like a kW using big squares, really pounding in and working everything on the band.

Now the details. I calculated my loop for 14060 kHz from the formula in W1FB's book, L (feet) = 1005/F (MHz). That works out to 71.479 feet; call it 71.5. Divided by the three sides of a triangle gave me 23.83 feet per side. My house is 20 feet wide so I have one side shorter than the other two. I still cut the copper wire (#14) to formula



length as calculated. My house is 20 X 40, a small two bedroom, one story bungalow located on a city lot, close to other houses and the street. The roof is low angle, with a 6 to 7 foot standup space at the center. That meant everything had to be installed in a stooped position and crawling on hands and knees and belly. Lots of fun in a dirty old crawl space.

The biggest problem was walking from rafter to rafter, keeping balance, and being careful not to put my foot through the ceiling below (which I did, my leg hanging down into a closet, the XYL scurrying around down below trying to find me when she heard me go through, after she had told me a hundred times to be careful and *not* come through the ceiling. It took me two hours to repair the damage so I could continue with the antenna installation), and getting a nail in the head from roofing shingle nails. I finally got hold of a hard hat and used it for protection. One other thing, I had to build a ladder so I could get up into the crawl space.

Once I measured out my wire I coiled it up, after putting my insulators on the wire with nylon ropes for anchoring. I crawled on my belly into the far corners and secured the ropes after uncoiling the wire and generally laying it across the rafters (20 feet, approximately). The wire is secured in such a way that it is hanging about 6 inches above the rafters. I then uncoiled the rest of the wire and secured it through an insulator at the peak of the roof at an angle. My sketch will explain this more clearly. I should have mentioned that I had fabricated a Plexiglas insulating block to secure coax cable to the wire antenna. I did all this before going up the ladder. This ended the wire installation.

Next, I measured and cut a 1/4 wave coax matching section from some 75 ohm cable (RG-11/U) using a Palomar R-X noise bridge at 14060 kHz. This was installed, connecting it to the delta loop corner and played out along the roof rafters on my belly. RG-8/U was connected to the loose end and dropped down the closet closest to my station. To keep it hidden from view I dropped it clear into the cellar, across the floor joists and up through a hole in the floor to my antenna switch. (The antenna switch selects the delta loop, dummy load, and an 8JK which is also up in the crawl space, but I seldom use it because I like the loop so much.) I should mention that I did not worry about other electrical wires, chimneys, etc., nor do I have any idea how they might affect antenna performance. All I know is I get good results with the loop. I do wish it was higher and at a different launch angle, and I may try to put it outside on the roof this summer.

My final measurements using the R-X bridge at 14060 kHz were R 35 to 40 Ω, XL 11 Ω. It loads nicely with approximately 1.2:1 SWR when the roof is dry. When wet, or with snow on the roof, it's less than 2:1.

QRP

Member Product Review

Oak Hills Research Switched Capacitor Filter SCF-1A

by Chuck Adams, K5FO

I just finished the OHR SCF-1A filter. I now have to admit that copying has just become much easier, more enjoyable, and relaxed.

First of all the specs on the filter. This audio filter was designed by Sam Ulbing, N4UAU, and published in the October 1992 issue of QST. The filter has adjustable bandwidths at the -3dB point from 108 to 2440 Hz and low current drain of 50mA. The OHR cabinet is 1.75" x 4.25" x 3.75" and the kit is complete at $69.95.

I went back to the original article after building and using the kit. I did a test similar to what Sam did. I used the Icom IC-725 (he used a 735) with the optional filter to check out and compare the OHR audio filter. I found a couple of CW stations close together. I took the 725 and cranked in the CW filter. Some improvement, but I could still hear the second station. Back to the wide filter position and then cranked in the audio filter. As I cranked in the selectivity, two things happened. The second station disappeared and I noticed that something else was happening at the same time. Before, all the noise was not disappearing using just the CW filter of the rig. The reason was obvious. A lot of the noise was in the audio of the rig! White noise was being generated in the audio circuits of the rig, not from RF amps and IF amps in earlier stages. The resulting filtering from the OHR audio filter was an order of magnitude better than the CW filter. Addition of the inboard filter gained nothing.

The steps of bandwidth selectivity for the audio filter are 2440, 574, 459, 383, 230, and 180 Hz. I know, they are strange numbers, but refer to the original article to get the details or drop me a line (SASE appreciated) if you don't have the article. This filter is good. There is no attenuation of the desired signal or amplification as the bandwidth is narrowed. This is not typical of audio filters. I also have an Autek QF-1A which I also dug out of the closet to compare. I put the Autek back and advertised it on internet for sale. Hope it's gone by the time you read this review.

Needless to say, I'm impressed with this filter. Again, another satisfied customer of Oak Hills Research. *Oak Hills Research, 20879 Madison Street, Big Rapids, MI 49307, TEL: 1-800-842 3748.* ☎ *QRP*

(Editor's Note: Mark Gustoff WO7T sent in a similar product review of the Switched Capacitor Audio Filter. To quote his review, "To be blunt and simple this is the only filter you most likely will ever need.")

IDEA EXCHANGE

Technical Tidbits for the QRPer

by Michael A. Czuhajewski WA8MCQ
7945 Citadel Drive
Severn, MD 21144

In This Edition of the Idea Exchange–

The old saying is that if your antenna stayed up last winter, it wasn't big enough. What if it did stay up but died anyhow? The monster snow storm on the East Cost in April ate my 40 meter loop; it didn't blow it down, but the center conductor of the coax broke where it was soldered to the wire. A quick assist from fellow QRPer WA4KAC had me back in business as soon as the snow melted and it warmed up a bit. Walt is working on the Oak Hills Research version of the W7EL Optimized QRP Transceiver (40 meter version) and will have a few words for us about it in the future, such as an unexpected source of microphonics. In the meantime, here are some of the ideas you sent in...

TRAPPED RADIALS FOR MULTIBAND VERTICAL ANTENNAS

*From **Larry East, W1HUE** of Idaho Falls, ID–*

Over the years I have used various multiband antennas–dipoles, slopers and verticals–containing tuned traps to isolate unwanted sections of the antenna at various frequencies. Traps are, of course, also used in multiband beams (but real QRPers don't use beams, right!?!). Then one day while contemplating how to install radials for a five band trapped vertical mounted atop a 20 foot high pipe without the XYL complaining about the resulting "spider web" of wire, the idea struck me that if traps can be used in the radiating (or parasitic) element(s) of antennas, why not also in an antenna counterpoise? I didn't recall this being mentioned in any of my antenna handbooks, but what the heck, I decided to try it anyway. (Use of various "loaded counterpoise" systems have been described, but that is not quite the same thing.)

I installed three trapped radials configured as shown in Figure 1. They are evenly spaced around the vertical radiator, and slope down at about 10 to 15 degrees. The traps were wound from RG-174 miniature coax on short pieces of PVC plumbing pipe as outlined in Figure 2, with the number of turns as shown in the following table. The traps were designed using a BASIC program that I wrote some years ago; the program is described in "The ARRL Antenna Compendium", volume 2, page 100.

Band	Form O. D.	# turns	Length
10M	1.06"	4.6	1/2"
15M	1.06"	5.9	5/8"
20M	1.06"	8.25	1-3/16"
40M	1.33"	11.8	1-1/4"

Caution–don't wind the coils too tightly or you'll stretch the mini-coax! The dimensions above are for the CW portions of the bands. Actual resonant frequencies should be checked some way, such as with a dip-meter. Spread the turns to increase the resonant frequency, if required. The coils should be coated with a weatherproof sealant before installation.

Well, the antenna loads with reasonable SWR on all five bands and I have worked a lot of QRP DX with it, so I guess it works! However, I have not made any comparison measurements using "normal" radials. Maybe someday...

–DE W1HUE

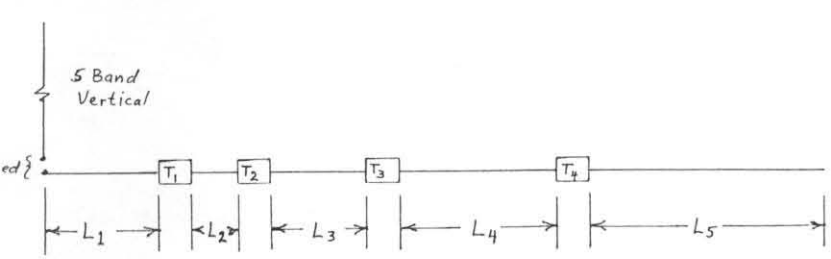


Figure 1

L1 = 9 ft. Ø in.
L2 = 1 ft. 2-1/2 in.
L3 = 4 ft. 10 in.
L4 = 15 ft. Ø in.
L5 = 29 ft. 9 in.

T1 = 10 m trap
T2 = 15 m trap
T3 = 20 m trap
T4 = 40 m trap

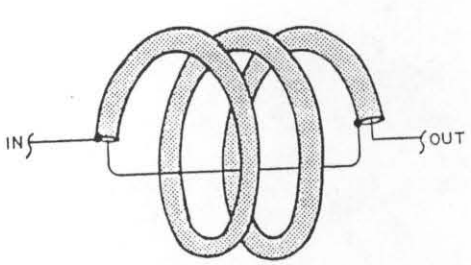


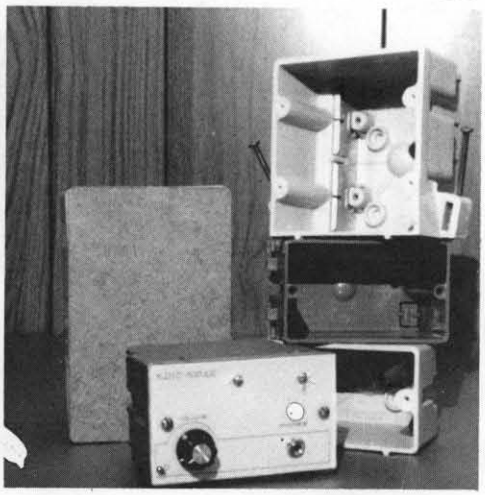
Figure 2
Coax Cable Trap Construction

JUNCTION BOX CABINETS FROM THE HARDWARE STORE

*From **W9NBG, Tom Pusateri** of Des Plaines, IL–*

QRPers have in the past come up with the most interesting cases. I found these electrical boxes to be inexpensive, rugged, and I think good looking. Note that when they are drilled a very fine white powder is produced; it would be wise to wear breathing protection.

–DE W9NBG



Junction Box Cabinets

RIT POT AND WEAK AUDIO FIX FOR MFJ-QRP

*A quickie (no relation to the N2CX Quickies) from **N5ODV, John Ziller** of Little Rock, MS–*

Weak audio on the MFJ 9015: replace R45 (volume pot) with Radio Shack 271-265, 25 ohm wire wound pot. It raises the output a bunch. Also, Mouser stocks a center detent pot for RIT control. Both seem to be working well. *[These should be equally applicable to the other MFJ QRP rigs. –WA8MCQ]*

–DE N5ODV

JOE'S QUICKIE #6– AUDIO AMP FOR RAMSEY

*Yet another in the aperiodic series of technical quickies from **Joe Everhart, N2CX** of Brooklawn, NJ, to whom I shall be eternally grateful for his gift of a Mini-Circuits Labs model ZSC-2-1B splitter/combiner which gets used in some of my experimenting–*

In these days of disappearing kit makers (remember EICO, Knight, World Radio Labs, Lafayette Radio and yes, even Heathenkit?), it's nice to have someone like Ramsey Electronics featuring a line of electronics and ham kits. Maybe they're not as fancy as the Yaesu and Kenwood class equipment, but they are orders of magnitude more affordable. And they're fun to experiment with. One of the joys of simple, inexpensive kits is playing around with them and adding your own mods. This quickie describes such a mod to the Ramsey HR-30, a 30 meter kit. *[And should be applicable to the various other versions of this receiver. –WA8MCQ]*

It's basically a two IC wonder, whose tuning is settable in small ranges between 9 and 13 MHz. With only an NE602 mixer/oscillator and an LM386 audio amplifier, it's a little lacking in gain. My Quickie is the single transistor audio amp shown in Figure 3. It is inserted between the HR-30's audio pot and the LM386. The receiver layout is open enough that you can easily cut a break in the appropriate PC trace for this connection. Drill two #60 holes in the board for connecting the amp in line, and two others to pick up +9V and ground.

The amplifier components are just "tack soldered" as in Figure 4 in typical Quickie style and laid on top of the board. No extra wires are needed for connection. Stick the input and output capacitor leads through their connecting holes, put the hot end of the collector resistor through the +9V hole and the transistor emitter lead through the ground hole. Naturally, these connections are "tack soldered" to the appropriate traces. If you want a more rugged mounting, goop the components onto the board with some hot glue. It took me less than half an hour to build the amp and it worked right off.

How well does it work? Pretty well indeed. You can get much better headphone volume with only a short antenna–and you definitely need a ground for both sensitivity and noise rejection. SSB aircraft weather stations in New York and Newfoundland were sometimes barely perceptible without the amp and generally usable with it. Thirty meter ham CW between 10.100 and 10.115, commercial FSK in the middle of the band and packet racket near 10.150 are always audible.

There's still more to do with the receiver. It is tuned by varying DC reverse bias on a rectifier diode serving as a cheap varicap. Yes, it's cheap, but it suffers from drift and lack of dial calibration. Hmm–maybe I could use the variable crystal oscillator in the companion QRP-30 transmitter and make a transceiver. Stay tuned; it may be my next Quickie!

–DE N2CX

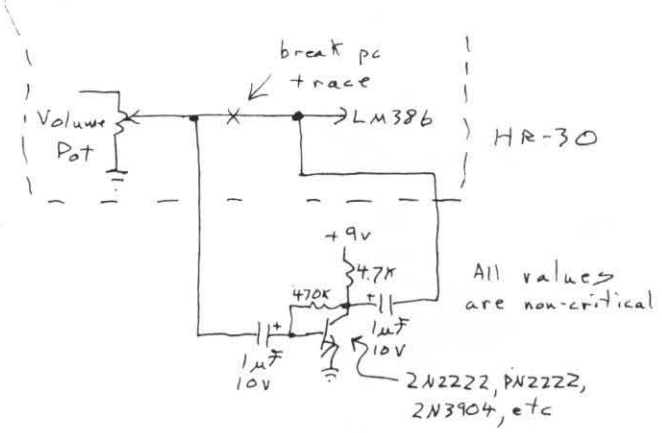


Figure 3 - Audio amp added to Ramsey HR-30 receiver

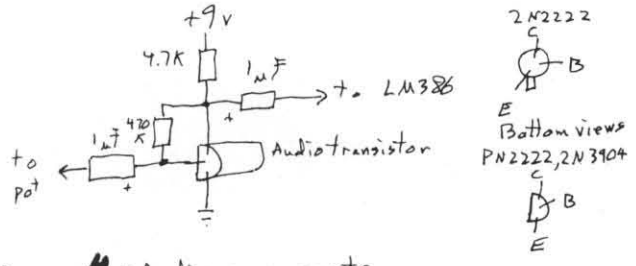


Figure 4 - Audio amp parts connection

THE "COPPER-TOP" DUMMY LOAD/WATTMETER

*From **James Johns, KAØIQT** of Groton, MA–*

Here are some notes and thoughts about a "free" QRP dummy load and wattmeter that actually works. I had wondered about possible uses for the little battery testers that come with Duracell batteries for some time now. Last weekend I put the finishing touches on a new Oak Hills Research in-line wattmeter kit. When I installed the battery in the wattmeter, I noticed the little Duracell battery tester on the package.

At that moment it struck me that 1 watt into 50 ohms is about 7 volts. The battery tester was designed to test 9 volt batteries. Nine volts into 50 ohms is about 1.6 watts. I then decided to check out the DC resistance of the battery tester. It measured 56 ohms on my Fluke model 77 DVM.

This was getting even better. Fifty six ohms should allow operation with any QRP transmitter, without frying the final, if the little gadget wasn't too reactive at RF. I connected my 40 meter QRP rig through a switchable attenuator to protect the transmitter if I fried the battery tester into an open circuit. The output of the attenuator connected to the input of the OHR QRP wattmeter. I then connected the battery tester to the output of the in-line wattmeter.

Starting with 6 dB of attenuation, I applied power to the rig and hit the key. No smoke. The wattmeter read 500 mW of forward power and the first section of the battery tester lit up. Switching out one of the 3 dB attenuator sections, the power meter read 1.0 watt and the entire display on the tester lit. The VSWR calculated out at 1.7:1, but much of that can be attributed to the flying leads on my test setup.

The Duracell battery tester appears to be a set of thick film resistors with liquid crystal temperature sensors mounted on the front. The 9 volt version has 4 resistive blocks and 3 display segments. I'm not sure what the rated power dissipation of the tester is, but I'd recommend that test periods be kept fairly short to avoid cooking the resistors. After about 30 minutes of testing, and allowing the device to return to room temperature, the DC resistance measured at 56.7 ohms, or about a 1% shift. This could have been due to changes in room temperature.

Now if one took one or two thousand of these devices and connected them in series/parallel you could fabricate a kilowatt dummy load & wattmeter and help to keep America green. (And Duracell very happy!) This type of QRP test equipment should prove useful to backpackers who want to determine if their rig is generating any RF but who don't want to carry a fragile and heavy QRP wattmeter.

I presented a slide show of this at a meeting of the MITRE Bedford Amateur Radio Club where I work. The QRPers thought it was a great idea, while the QRO crowd had a hard time getting excited about a 2" X 3/4" dummy load/wattmeter.

–DE KAØIQT

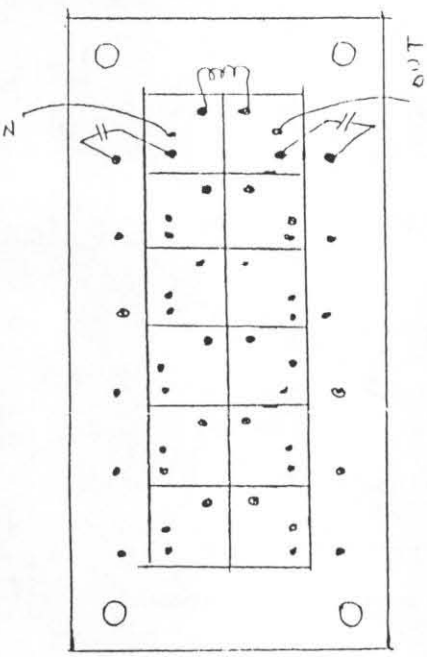
WA8MCQ COMMENTS ON THE COPPER-TOP LOAD

I played around with a couple of these and had a ball. The resolution isn't very good, with only 3 bars, but it's very small and light. Making a permanent connection can be tricky since the contacts don't take too kindly to soldering iron heat; these things were intended to be cheap and disposable. You could try clamping onto them with some washers and screws. The two I checked measured 62 and 65 ohms on my Fluke 77; not a perfect match to 50 ohms, but still useful. They have plus and minus marks printed on them, but you can ignore those; there is nothing polarized, just some resistors, and it works equally well either way. (My guess–the company probably found it easier to print polarity marks than to field a lot of phone calls asking which way to use it!) Give it a try–it's almost free (you had to buy the battery anyhow, so why not this brand?), as well as unique and a lot of fun.

–DE WA8MCQ

LOW PASS FILTER CONSTRUCTION AND VXO NOTES

Donald Younger, W2JEK of River Edge, NJ, read the articles on the Two-Fer transmitter in the July 1992 issue (which said "June" on the cover) and sent along some thoughts on his own version. His is a multi-band unit, with a switch for the output filters on the transmitter. (See Figures 5 and 6.) The filters are mounted on a piece of circuit board material, routed out to make isolated pads for component mounting. He also provided a bypass position for use of an external filter.



OUTPUT FILTER BOARD
HOLE SPACINGS ARE
APROXIMATE

As for the VXO (variable crystal oscillator) in the transmitter, he says, "Tests with various crystals, using a frequency counter, show that most change occurred when a small amount of capacitance was added; going from Ø to 25 pF gave more change than from 25 to 50 pF. Each crystal is different in the amount of change in a VXO. After reading DJ1ZB's article in SPRAT [reprinted later in this column –WA8MCQ] an inductor was placed in series with the crystal. To do this, an octal tube socket was mounted on an old FT-243 crystal holder and wired to allow the crystal to be used without, or with various series inductors. (See Figure 7.)

Figure 5

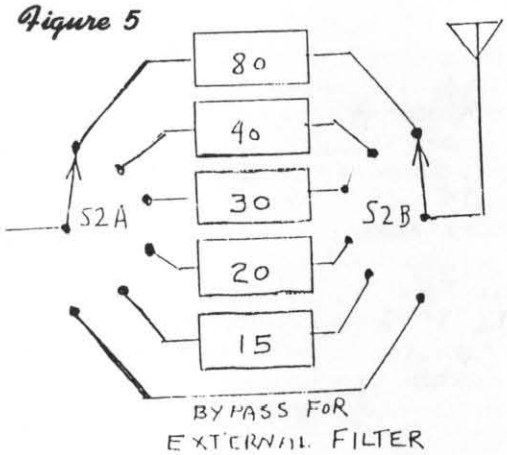


Figure 6

Output filter chart			
Band	Cap	Turns	Core type
80	820 pF	21	T50-2
40	470	14	T50-2
30	330	13	T50-2
20	220	10	T50-2
15	105 (100)	9	T50-6

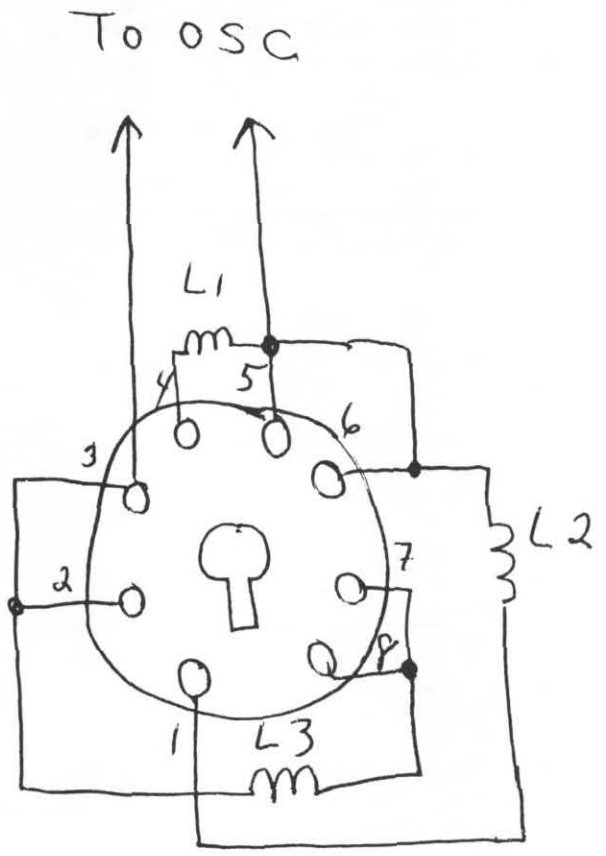


Figure 7--Octal Socket (bottom view)

Pins	Series Inductor
3–5	None
2–4	L1
1–3	L2
6–8	L3

"The first unit was built for 80M and has 3 coils mounted on the socket. With this arrangement it was found that the coil lowered the frequency of the crystal, and increased the frequency change when the VXO cap was used. One coil lowered the frequency quite a bit, and I suspect that the VXO [with that coil] is actually a VFO and may not be very stable–more testing is needed here before putting it on the air.

"Another coil unit was built for 30M, doing a good job on 20M as well. For 160M I was not able to get much shift, so have built a VFO. For a mono-band rig, inductors could be mounted on slide switches and be shorted out when not used, making a neater and more stable arrangement. *[See the January 1992 Idea Exchange for further info on switched coils in VXOs. –WA8MCQ]*

His first letter didn't specify the coils used. In his reply he said, "I used inductors that were salvaged from some old TV sets...Each inductor was temporarily connected to the adapter unit and a series of readings taken on my Drake 2B [receiver]. I was mainly interested in getting my 3563 crystal down to 3560, also trying my 3559 crystal in the process.

"As a reference, readings were taken on the 2B without the series inductor with the VXO capacitor unmeshed and fully meshed. Then each of the inductors (nine) were tried, both with and without the VXO cap fully meshed. With an inductor in series with the crystal, its frequency was lowered, and lowered further when the VXO cap was fully meshed. Out of the nine inductors, three were selected for the unit...." (Due to a number of different systems of marking parts values, he had difficulty deciphering the exact inductances, but most likely all were well under 100 μH.)

–DE W2JEK

A WIDE RANGE 80 METER VXO

*By **Ha-Jo Brandt, DJ1ZB,** reprinted from the Spring 1992 SPRAT (issue #70), journal of the GQRP Club–*

A newcomer request for a simple QRP TX initiated me to tackle the problem of an 80M VXO. On the higher bands I have never found it difficult to obtain sufficient pulling range; it had also been possible to pull the popular 5.0688 MHz crystal, doubled in frequency, over the most important CW portions of the 10 MHz band, down to 10100 KHz, but for unknown reasons 80M seemed to behave differently.

I started with my TTL oscillator circuit (SPRAT #51, Summer 1987) with a 3.579 MHz HC-18/U crystal, and inserted a variable 200 pF foil capacitor and a series inductor in the form of molded RF chokes.

Obviously a rather high inductor was needed to achieve a reasonable pulling range. But single chokes of 220 μH or more did not work, perhaps due to low Q. Finally, with a series of three 100 μH chokes, I got a pulling range from 3579 to 3568 KHz! Next, I built a 300 μH high Q coil, employing a Siemens 80K1 pot core. But this coil did not work. Measuring the self resonance frequency of this pot core coil showed a value of about 2.1 MHz. Therefore, at 3.5 MHz this coil must have acted like a capacitance! So it became clear what the real need for an 80M VXO coil was: A high inductance with very low parasitic capacitance! Surely you have to sacrifice some space to achieve this, and it became evident why only the series connection of small coils really worked.

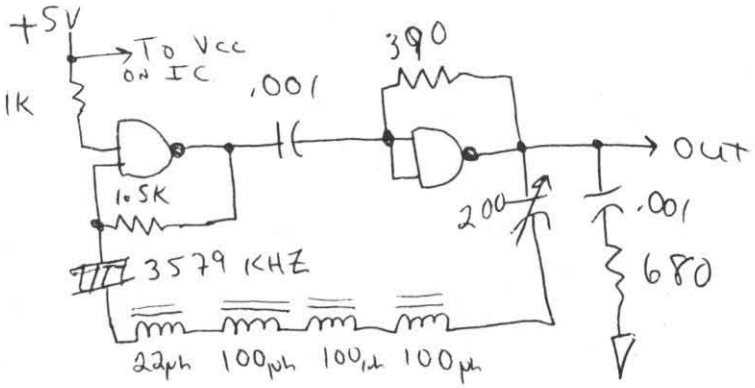
Then I added two 22 μH chokes in addition to the three of 100 μH. The pulling range increased from 3579 to 3557. This seems to be a way to trim the pulling range to personal needs. However, as the effects of very small parasitic capacitances will influence the pulling range, you may not wonder if you may need different choke values. Also, a 3579 KHz crystal in the HC-6/U case, or HC-33/U with wire leads, will need less inductance, about 250 μH. Besides the need for small parasitic capacitances, the Q of the choke is still of some importance, and physically larger coils in the form like a 0.5 to 2 watt resistor are to be preferred, especially for the higher inductance values.

Finally the oscillator scheme of Figure 8 was worked out. The rotor side of the variable capacitor was connected to the low impedance TTL output. Also, with this capacitor at its minimum value, some resistive loading of this point (1000 pF, 680 ohms) improved the starting of the oscillator when the supply voltage had been applied.

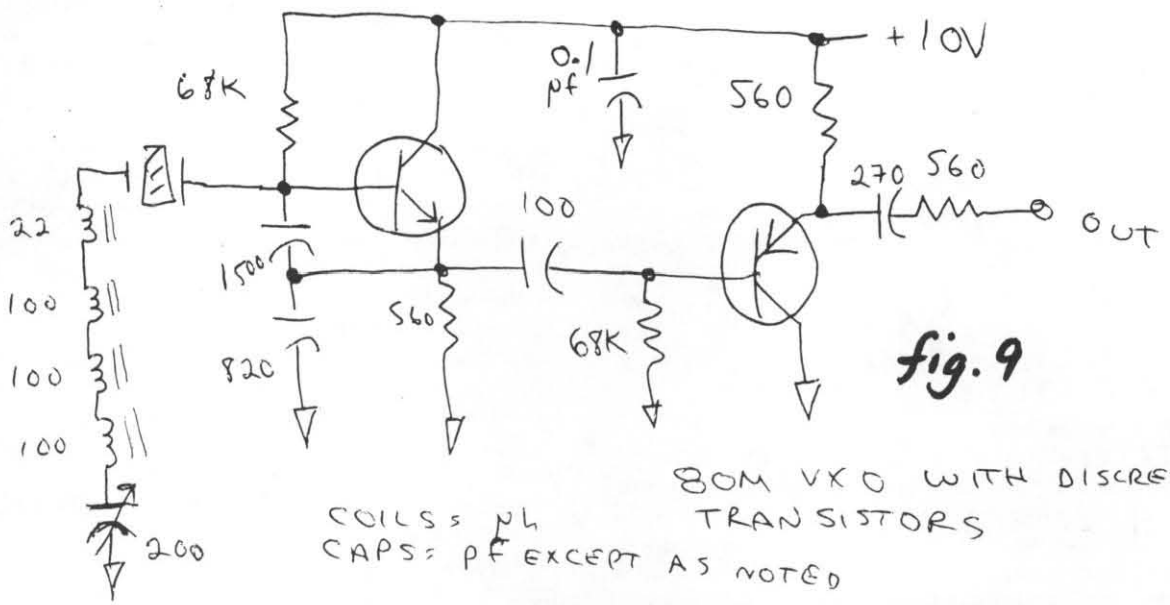
After these TTL experiments, the knowledge gained was also applied to a VXO with discrete transistors (Figure 9). The PNP transistor, which happened to be at hand, had been employed as a buffer stage between VXO and frequency counter. The same pulling range as with the TTL oscillator could be achieved. After the capacitance C2 had been reduced to 390 pF, the supply voltage could be reduced to 5 volts, maintaining the full pulling range.

Higher band TTL VXOs–Again referring to my former article on TTL transmitters (SPRAT #51, Summer 1987), I would like to withdraw my former statement that it was impossible to build TTL VXOs with large pulling ranges. If one finds that when tuning the VXO the frequency suddenly jumps to an entirely different frequency, the trick is to load the VXO coil by a parallel resistor that limits the Q to about 3 to 5, on the wanted operating frequency. In other words, the resistor value must be 3 to 5 times the reactance of the coil (Figure 10). However, when comparing TTL circuits to discrete transistors, the buffer action of a linear element will always be superior to that of a saturated stage.

–DE DJ1ZB [Ha-Jo Brandt is a regular contributor to SPRAT.]

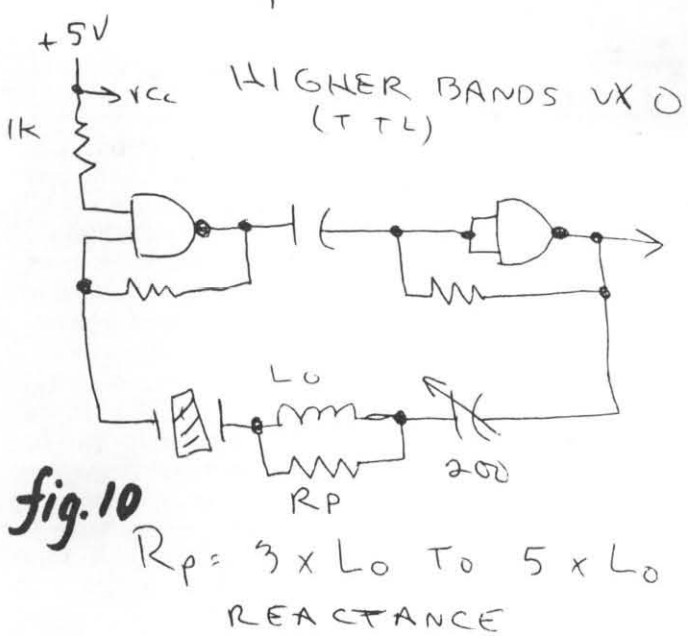


80M VXO WITH TTL GATES **fig. 8**



80M VXO WITH DISCRETE TRANSISTORS **fig. 9**

COILS: µH
CAPS: pF EXCEPT AS NOTED



HIGHER BANDS VXO (TTL)

fig. 10

R_p: 3 x L_o TO 5 x L_o REACTANCE

COMMENTS ON WA8MCQ'S "BAD HW-8 CORES"

*From **Dave Benson, NN1G**, our technical editor–*

The changes in ferrite characteristics referred to in Mikes article, "Bad HW-8 Cores" stems from core overdrive. In the olden days, ferrite cores were deliberately driven to saturation to provide non-volatile storage (remember core memories?). Dad–tell us again what it was like in the Mesozoic era!

Figure 11 shows the relationship between current through a core winding (H) and the resultant magnetic field density (B). In normal applications, the ferrite core starts its life at the origin "O". When operated out to the point P1, the core follows the path associated with P1 thereafter. The harder the core is driven, the closer to the corners (P3) the core operates, and the more the permeability is "permanently" shifted as the core adopts a new operating path. Permeability is the slope of this operating curve, so the ferrite has taken on a new effective value. The core isn't really damaged–it's just gone to live in a bad neighborhood! Unfortunately, the only way to get the core back to its birthplace is

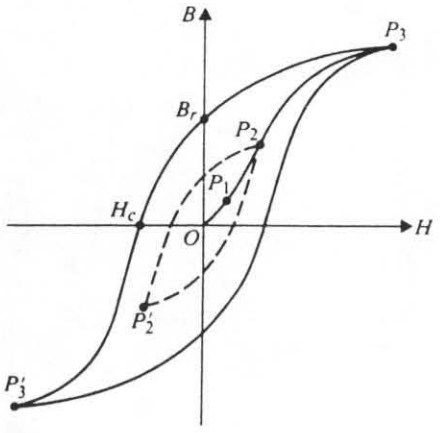


Figure 11

to bake it at high temperature. (Replacing the fool thing seems easier, somehow!)

I'd guesstimate that for a typical ferrite core a high current spike in the amperes range would be sufficient to cause the permeability to shift appreciably. Assuming your rig uses a high current power source like a storage battery, simply touching a grounded probe to the wrong point while the circuit is under power could cause this effect. (As a bonus, of course, you get smoke; this is known as the "Real Men Don't Use Fuses" school of design.) The lightning-induced surge damage that prompted Mikes investigation is also a very plausible cause for this phenomenon.

–DE NN1G

DELIBERATELY ZAPPING SOME PERFECTLY GOOD CORES

From me, WA8MCQ–

Naturally, I couldn't resist giving this one a try–deliberately hitting a core with a huge overload to see what would happen. I had a lot of fun and wrote a nice piece on my experiments, but then lost it. Through one of those freak accidents that happens sooner or later to everyone with a computer, about two weeks before my deadline for this issue I found out that the entire column had been obliterated from the main disk and the backup as well. Only two paragraphs remained, so here's a condensed version rewritten at the last minute, pieced together from memory and notes.

The basic idea was to wind several turns on various cores, charge a capacitor of tens of thousands of microfarads with a power supply, then short the coil across it. The capacitor would insure a healthy current spike. (This technique is from the "Hit 'Em with a Mack Truck Doin' 90" school of experimentation.) Inductances would be measured before and after. I tried a variety of voltages as high as 15 but eventually settled on 5V as my standard value, for no reason in particular; I found out it didn't make any difference if I used higher voltages. (It's like asking the death row inmate if he wants his electrocution to be done with 500 volts or 2000–the end result is the same either way.)

First, I took an already-bad FT50A-63 which came from an HW-8 output network, the eighth one I cured. I used it as-is, with the original wire still on it. Measurements were taken at 2.5 MHz on my Boonton 260A Q meter for this one; the results–

Bad core before zapping: 35.5 µH, Q 215
After zapping: 38.2 µH, Q 153
Fresh core, same # of turns: 27 µH, Q 360

Next, a good FT37-67 core, a type also used in the HW-8 output nets on both 80 and 40 meters. I put 19 turns of #24 wire on it, and measured 6.19 μH at 7.9 MHz, with a Q of 307. Zapping it with 5 volts from the cap made it jump to 10.97 μH, while the Q plummeted to 45! I cranked the voltage on the cap up to 15 but it didn't make the core any worse than it was. (This is the "Mack Truck vs. Freight Train Comparison.") I tried 15V again with reversed polarity, which made no change in the measurements, although the magnetic flux lines would be reversed. I tried zapping it several times with a lower voltage each time, with negative results.

How about an FT50-61? Interestingly, the inductance on this one went down for some reason, from 23.7 to 19.4 μH, instead of increasing like the others did. The Q dropped from 153 to 108. This was the only core tested which showed a decrease in inductance. An FT37-61 tested later showed the expected increase; I don't THINK I reversed the figures when I wrote them during the experiments, but a decrease sounds fishy.

I tried an FT50-43 with similar results. I couldn't measure the Q, since it wouldn't give a reading on the Boonton; I had to use a borrowed LCR meter instead, which measures inductance with a 1 KHz tone. Unfortunately I couldn't find my notes for this one, but it too showed a significant increase in inductance.

Is this phenomenon limited to ferrite cores with high permeability (μi)? Obviously not, since the type 63 (or 67) has μi of 40, type 61 is 125 and type 43 is 850. How about powdered irons? Their permeability is much lower, and the material is somewhat different. Conventional wisdom is that powdered irons return to their original value after overload is removed. (For example, see the W1FB toroid article in the June 1993 issue of CQ magazine, and my item in the Idea Exchange in July 1990, "Cooking With Toroids".)

Surprisingly, they exhibited the same permanent shift in inductance (and thus permeability) but to a much lesser extent. I checked type 2 (μi of 10) and type 6 (μi of 8) cores, and they had small but noticeable shifts in inductance and Q. These were done with various amounts of wire and at different frequencies–

T50-2: before, 1.74 µH; after, 1.77 µH
T68-2: before, 3.90 µH; after, 3.94 µH
T37-6: before, 0.725 µH, Q 207; after, 0.728 µH, Q 194
T50-6: before, 2.18 µH, Q 210; after, 2.21 µH, Q 208

My earlier experiments (July 1990 QRP Quarterly) were done with a good quality Hewlett Packard test unit, but I only had readout to tenths of a microhenry. The T37-2 cores which I had cooked read 1.8 μH before and after brutalization. This time I used my Boonton 260A Q meter, which resonates inductance with a well calibrated variable capacitor, with direct readout to 0.1 pF, allowing small changes to be easily observed. The earlier cores had changed, but I was unable to observe it.

Finally, another experiment with the FT37-61 I zapped. It had started at 7.2 μH and Q 340, and was zapped to 12.7 μH and Q 45. Dave had suggested the possibility of restoring cores by cooking them at high temperatures. I desperately wanted to take it to work and run it through the furnace used for firing thick film hybrid substrates, but the clean room supervisor made it abundantly clear that I would NOT put ANY foreign materials in HIS oven. On to the low-tech approach...

While my wife was baking a casserole one night at 350 degrees F, I popped the core into the oven for about 20 minutes (with the wire removed, just in case the enamel insulation might start smoking and stink up supper!). The core then measured 11.27 μH and Q60; not a dramatic change, but measurable. Of course, I had removed the wire and then rewound it, so the turn to turn spacing was somewhat different but I kept it as close as possible. Next, I removed the wire again and slipped the core over the tip of a Weller W60 soldering iron with 700 degree tip. I let it cook for about a minute, then melted a bit of solder on the core to make sure it was good and warm. After it cooled and I rewound it, the Q had increased a hair or two and the inductance went up to 13.23 μH. At this point I cut it in half with wire cutters and tossed it in the trash; I'd never trust THAT core in any of my circuits!

I have type 0 cores (tan) in a few sizes, but didn't bother zapping them since type 0 material is physically incapable of changing permeability. Although it is usually lumped together with powdered iron, it is actually made of phenolic and contains no iron of any sort. Its permeability, 1, is the same as air. As a Micrometals engineer told me on the phone once, it has the same magnetic properties as a block of wood. The Micrometals catalog makes it clear that it is actually phenolic, and that is also mentioned, but well hidden, in the Amidon toroid book (not their "road map" brochure), on page 44 of the February 1992 edition.

The bottom line? Although I didn't do a great deal of experimentation and there wasn't a great deal of precision, a reasonable conclusion is that ferrites of type 63/67, 61 and 43 can be changed substantially by gross overloads, while type 6 and 2 powdered irons exhibit the same characteristic but to a much lesser extent. In fact, with the latter you probably couldn't tell whether a given core had been zapped unless you had previously measured it and had a basis for comparison. The variations I saw on those were well within the 5% inductance tolerance that Micrometals specifies for them. Although no other types of ferrites or powdered irons were tested (it was starting to get expensive), it is reasonable to assume that all would behave in the same way.

THE FINE PRINT–

The Idea Exchange is your way to share those short technical goodies with the QRP community. The pay isn't great (in fact, it's zero, even for me!) but you get the fame and glory of being *** A CONTRIBUTOR ***! Good comments about the column keep trickling in; you deserve most of the credit for that, but it would be an awful lot smaller without your inputs. Keep those cards and letters and great QRP ideas coming to Severn! –QRP–

Member Product Review

Oak Hills Research QRP Wattmeter

by Chuck Adams, K5FO

Every radio amateur has one or more items that he or she thinks is indispensable. It may be that one's views change over the years. Probably the wattmeter ranks up there at the top of the list. For the serious QRPer, I know this is true. We all know how important and how valuable every milliwatt of power is at QRP and QRPp levels. Once it is generated in the transmitter and released out the back connector to whatever awaits it, any losses in coax and/or antenna systems are the only thing that we have control of. After the radiation gets to the "ether", it's out of our control forever.

We use the wattmeter to check for energy levels out and back from the antenna system. The OHR WM-1 wattmeter is what you need for this area. I was using the Palomar Engineering Tuner Tuner to match the system until the OHR Wattmeter came along.

The OHR Wattmeter has three ranges: 10W, 1W, and 100mW fullscale. The lowest range, 100mW, allows one to measure down to 1mW. This is really for the microwatters and rubbing two rocks together will generate more power than that (just joking!). The wattmeter is contained in a 4.5" x 3.5" x 5" cabinet and powered internally by a 9V battery. The cabinet and PC board work from OHR is first class on all their kits.

The wattmeter went together in an hour or so. Time to build will be dependent upon the builder's skill level. I took extra time to make sure that the bridge was balanced and mechanically secure. Setting full scale calibration is a snap by using a digital voltmeter with 3.5 digit accuracy. This is done without using any RF signals from a transmitter. This is especially important as I would endanger a rig and the meter in doing any adjustments with RF power output applied.

The circuit consists of a Bruene directional coupler and a meter amplifier circuit similar to that of Roy Lewallen, W7EL, in the latest ARRL Handbook, but modified for the ranges above and some changes to optimize the amplifier circuits. I compared the 2 watt readings for my homebrew rig with those of the Daiwa, the OHR WM-1, and a RF probe on a Heathkit dummy load and found that all matched. The first thing that I found upon using the OHR meter at 2W was that the MFJ Versa Tuner II meter was giving me the wrong readings. I found an improvement of some 1000% in reducing the reflected power from 0.10 to 0.01 watts. At these levels every bit counts folks.

In order to save power drain on the battery, there is no power indicator like a LED. I've left the meter on inadvertently for days on end, but it still worked and the battery was not dead. I don't recommend this procedure. My standard operating procedure is to turn on the rig and meter, adjust the tuner and turn the meter off. Again, another wonderful kit from the folks at Oak Hills Research.

☞ QRP

Meet the G-QRP Club!

by Michael A. Czuhajewski WA8MCQ
7945 Citadel Drive
Severn, MD 21144

Articles in the QRP Quarterly mention the GQRP Club and their quarterly journal SPRAT from time to time, but many of you have not been formally introduced. Instead of giving you little bits and pieces over the years, let's tell you the full story!

History

The GQRP Club started in 1974, springing from an innocent little item in Shortwave Magazine, an independent UK ham radio publication. **The Rev. George Dobbs, G3RJV,** wrote a letter asking that anyone interested in low power communication write to him. From that little spark has come the largest QRP club in the world, with literally thousands of active members in 62 countries (at last count), with a goodly number of those in the U.S. (He said that 34 people wrote in response to his letter, but it took another three years to raise 100 members!) Rev. George was also one of the four people inducted into the QRP Hall of Fame in 1992, in recognition of his considerable contributions to QRP.

I know I'm going to get in trouble for this one, but I consider them to be the oldest QRP club, as well as the largest. Admittedly, the QRP ARCI has issued more membership numbers, but the real test of any organization is active membership, of which current newsletter subscriptions is a good indication. The QRP ARCI has somewhere between 1000 and 1500, while GQRP has an active subscriber list of about 4500. As for being the oldest, the controversial part–while they started in 1974 and the QRP ARCI has been around since 1961, the ARCI didn't convert itself into a "real" QRP club until 1979. Until then, the club considered QRP as 100 watts (input), with the aim of voluntarily limiting power to reduce QRM on the bands, although there were some "real" QRP people in it. In 1979 the Club underwent a sea change to become what it is today. (Sorry, folks, that's simply a fact of history; take a look at the QRP ARCI History and Policies statement which appears in the Quarterly occasionally.)

SPRAT

The GQRP Club publishes their own quarterly journal, titled SPRAT. The title is a bit of a play on words; it's an acronym for *Small Powered Radio Amateur Transmitter*, but it's also a valid English word. I'll let you look it up yourself; it's more of a British than American word, I think, but it's still rather appropriate for their magazine. Jack Sprat could eat no fat, but he certainly knows his QRP!

A typical issue runs about 40 pages. The physical size is smaller than the QRP Quarterly; take an 8-1/2 X 11 sheet of paper and fold it in half from top to bottom–that's about how big it is. Although not as large in square inches, they pack a lot into it. They always have a lot of good technical information; in fact, their bylaws specify that SPRAT shall always contain at least 60% technical material. A few things do take a bit getting used to, such as the language (while it's still English, it's British rather than American), the style of the schematics and the occasional reference to the 70 MHz band (for which we have no equivalent). After an issue or two you'll get used to it all.

Their authors are mostly European, but you'll occasionally see some familiar American call signs as well. Some of their regular features are Novice News by **David Gosling, GØNEZ**; QRP Communications Forum by **Gus Taylor, G8PG**; SSB News by **Dick Pascoe, GØBPS**; VHF News by **John Beech, G8SEQ**; and Member's News by **Chris Page, G4BUE**. Their current issue numbers are in the 70's. You can sometimes buy back issues at Dayton, from their booth.

The GQRP Club has been sending a small contingent to Dayton almost every year since 1985. G3RJV is usually in attendance, along with one or two other prominent members. They did the HamCom in Texas one year, as well as 1993. Their club subsidizes a portion of their expenses, since it's great public relations and always results in many new members in the Colonies. In addition to subscriptions, back issues and other club items they also bring along a number of QRP kits to sell, by Kanga and others. They have quite a few different kits available in the UK. These include the Sudden Receiver, which is their equivalent of our Neophyte (NE602/LM-386 direct conversion receiver) and a number of fascinating kits from Blue Rose Electronics using surface mount devices. One of those is a Sudden Receiver on a small circuit board the size of a large postage stamp.

Joining Up

How to join the GQRP and get SPRAT? In the past you had to write directly to them, although they accepted "green stamps" in payment (US currency), which simplified things. However, for the last couple years the QRP ARCI and GQRP have had an agreement whereby people in one could join the other group by applying through a point of contact in their own country. For us, it's currently **Luke Dodds, W5HKA**. (His address is on the index page up front.) Just send your application and renewal money to him, and he forwards it on a regular basis. (The GQRPers also have a British contact point, Dick Pascoe, for the QRP ARCI and QRP Quarterly.)

How many Americans are eligible to have a GQRP number printed on their QSLs? The 1991-1992 edition of the Members Handbook, which lists active members only, showed about 340 of us, while the 1992-1993 version shows over 430. Although most of those are probably also

members of the QRP ARCI, there are some who are not. Interestingly enough, a couple years ago I was talking with a very technically competent local ham who is well known nationally and a member of GQRP, but had never even heard of the QRP ARCI! (By the way, the three Yanks inducted into the QRP Hall of Fame in 1992 are members; since the 4th was G3RJV, that gives GQRP a clean sweep!)

It's always fun to browse through the Members Handbook and study the U.S. calls there. It's interesting to see who is a member, and who is not, and who the old timers and newcomers are. (You can tell that from the member numbers; while QRP ARCI does not publish that information, GQRP does.) And here's a quiz for the sharp-eyed readers–name the three GQRPers who are VERY important people at three major ham radio magazines in the U.S. (Hint–while I consider **KH6CP/1** to be important, I'm after someone higher up where he works.)

Awards

GQRP also sponsors on-the-air contests and a number of awards. These include the usual ones for working different members, countries and continents. Their QRP Countries award is for working 25 DXCC countries while running QRP, with endorsements for each additional 25. They have another award for two-way QRP contacts with 10 DXCC countries, endorsed for additional 10's. The award for working members, which must be two way QRP contacts, is for multiples of 20. Their QRP WAC is pretty straight forward, for contacting all six continents while running QRP. Finally, there is the prestigious and difficult QRP Master. For this you must work 60 members, 75 DXCC countries and 20 countries with 2-way QRP. The number of American stations holding this award can be counted on one hand.

In addition to awards, GQRP also issues a number of trophies. Some are for the best articles in SPRAT in two categories and others are for operating events. The Chelmsley Trophy is one of the more interesting. It is given for the "best log" received during the year. The period runs from 1 January to 31 December. All authorized bands are used, CW and SSB, with power limited to 5 watts output CW or 10 watts PEP SSB. (Within the last couple years the GQRP Club changed their definition of QRP power; for some time they used 5 watts input, or 3 watts output, but now go along with the 5 watt output definition used by the rest of the QRP community.) Logs are submitted for each band used, and must include a list of all DXCC countries worked per band, along with a separate list of two way QRP DXCC countries per band. The applicant can include information on contacts which he considers outstanding for any reason, such as very low power, rarity, etc. For the last sheet of paper, he must include details of transmitting and receiving equipment, as well as antennas, plus any antenna or propagation development/studies carried out.

Finally, there's the Great Equalizer in the competition for this annual trophy: the antenna limit. Antennas may not exceed 35 feet in height or 132 feet in length. You may change antennas in use during the year, but cannot use more than one vertical and one horizontal antenna at any given time. All antennas may consist of only a radiator element–no reflectors or directors allowed. In other words, only low, simple antennas. No triband beams at 120 feet or multiband rhombics allowed here. There have been complaints over the years about the "unfair advantage" enjoyed by those QRPers blessed with the room and finances for killer antennas; the competition for this trophy is one place where the "little guy" who can only have modest antennas is on an equal footing

Miscellaneous

Being confined to a relatively small geographic area, getting together is easier for them than for us. The GQRPers have regular QRP gatherings throughout the year. The club also has a QSL bureau for members. For US members, outgoing cards may be sent via **David Gaulding, NFØR** in St. Louis, MO. While domestic GQRPers must supply address labels and stamps to get their cards, those located outside the UK (including us) will receive them in the same envelope with SPRAT.

The club has a few technical data sheets available, for receivers, transmitters, QRP transceivers and power amplifiers. (According to the latest members handbook, some of the sheets are available from **Mike Michael, W3TS,** who is an avid homebrewer and former writer of the Idea Exchange.) The club also has two officers who serve as technical advisors, one on antennas and the other on circuit and construction problems.

That's about it for the basics of the GQRP Club, an enthusiastic, technically oriented group with an interesting journal packed with homebrew and operating information. (My thanks to G3RJV for reviewing this article for accuracy and for his inputs.) If this appeals to you, send your money to W5HKA and join the rest of us in this fine QRP club.

–QRP–

LETTERS TO THE EDITOR

FIRST SUNDAYS

It hasn't been all that long since the First Sunday in each month would find scores of QRPers on the air, clustered around the traditional QRP frequencies, working each other without all the pressures of a contest, and having fun.

It was our event, and it was a popular item in the QRP list of activities. We would move from band to band during the day as conditions dictated, working all who showed up. There was opportunity to test the performance of an antenna or new rig on various bands. Some used the occasion to add to their count for WAS, WAC, DXCC, or club awards for working members. It was a laid-back way to pass a Sunday.

Unfortunately, these operating periods on the first Sunday of each month slid by the board. No one person or thing is to blame. It happened. But we can change that.

Let's resume First Sunday for QRPers starting July 4 or 11 at 1200 UTC.

There would be nothing formal. Just show up and start calling CQ QRP and go from there. The exchange could be anything or nothing. Rag chewing is encouraged. The main thing to remember is that these are not contests. There would be no scores, no hit-and-run contacts, no dueling with others in a pile up.

The earlier version of First Sunday had a pattern for operating that started with the lowest band that was open (usually 80 or 40 meters) and moved up on an hour-by-hour basis to successively higher bands as conditions improved and the bands opened for the day. As the bands closed, the process was reversed until by late evening, everyone was back where they started. Of course, one would have to choose if two bands were "hot" simultaneously, but that only adds to the enjoyment. The band pattern worked then and would now.

One major advantage we have now that we did not have earlier is the WARC bands. They offer us a haven in case the first Sunday should coincide with a major contest. Those not interested in the contest could show up on the WARC bands and carry on. Or, if the contest is, say, for CW, then head for the SSB QRP frequencies. There are plenty of options.

First Sundays were a well received part of the QRP scene a few years ago, and there is no reason they can't be again. No telling who you will run into. - *Fred Bonavita W5QJM, P.O. Box 2764, San Antonio, TX 78299*

ON MEMBERSHIP

In January '92 QQ on page 30 I voiced my concern about the necessity for an aggressive membership campaign. This concern was the main thrust of my resume as a new director. In April '92 QQ on page 12 Paul Schaffenberger voiced the same concern in his article "The Future of QRP". This concern is heightened every time I contact or meet a QRP operator who has NEVER heard of QRP-ARCI. They all seem conversant on HW-8's, HW-9's, VXO's, Argonauts, etc., but our club is a mystery. In the past year I have learned that the same mystery has popped up among many of my ARCI friends.

Since about February '90 when the article "WHY QRP?" showed up in QST the amount of QRP activity has steadily increased. Many ARRL publications have appeared with "QRP" in their title. The number of first rate kits for the QRP/homebrewer type has mushroomed. All the kits I'm aware of are excellent quality and perform well. The QRP market MUST be on the upswing because as you know MFJ, TEN TEC, A&A Engineering, etc. don't invest engineering and tooling money without good cause.

For some time, I have been using a 3 fold brochure I put together for my personal use. It has served several purposes. It fits in a business size envelope for mailing along with my QSL card. I had them out at every hamfest or ham get-together I attend. With this in mind I decided to write each one of you and share my concern and thoughts.

I believe we could and should supplement the fine work our club Publicity Officer, Mike Bryce, is doing with a well-done brochure (printed on both sides with an application) that would be made available to EACH AND EVERY member of QRP ARCI. The front and back could be printed in the QQ at least once or maybe twice to be available for members, especially new members to photocopy (at their expense) to hand out, mail, or pass out at places where hams get together - ham stores, EVERY hamfest (many smaller ones get ZERO exposure), VE training and testing groups, club meetings, and the list goes on. This type of info sheet could be supplied to known gung-ho QRP hams, QRP clubs in cities across the country, and other activities in front of a larger portion of the ham population. I suggest a grass roots (out-in-the-boonies) effort to reach many more hams.

I have expressed my thoughts and now it is in your hands to think about, act on, or just forget. But I repeat, from some of the articles in recent QQ, it seems to me that other members think we could do more to promote ARCI and QRP in general. - *Burl A. Keeton, N5DUQ (Editor's Note: this letter was sent to QRP ARCI officers, directors, and staff)*

MORE ON MEMBERSHIP

This letter is in response to your editorial in the January '93 issue of QRP Quarterly. I agree with your article, and would like to tell you what I have done to increase interest in QRP.

My home town is small, and there are only 7 hams here, of which only 2 of us are active. One of the things that we do have here is a very active Packet BBS in the area, K6RAU in Merced. Packet is a great way of getting information out, but you need to have a hook to get people to read your bulletins. This is what I did. I reprinted the QRP Informational flyer that was in the April '86 issue of the Quarterly. This 4 page flyer has several articles about QRP, plus plans to build a 1.5 watt 40 meter transceiver. I added a current application blank and copies of the current net schedules as I found them in the October '92 issue of the Quarterly. I then sent out bulletins on packet with short stories from past issues of the Quarterly; of course I gave the Quarterly and the author full credit. I then explained that if the reader wanted more information, I would send them a 4 page flyer if they would send me a large SASE.

The response has been fantastic. So far I have sent out over 100 flyers, and no one has sent me one complaint. Several have sent messages about how they enjoy the information and encouraging me to put out more on QRP. If anyone wants a sample of my flyer, all they need to do is send me a large SASE. Then they would have material to give their friends by making their own copies. By the way, it is really simple to send information this way. I get the letters in the mail, open them and stuff the enclosed SASE and send it in the next day's mail. The printer charges me 22 cents for each flyer. It is printed on 11 X 17 paper, 2 pages per side, and then folded to mail. - *Doug Hendricks KI6DS, 862 Frank Ave., Dos Palos, CA 93620 (Editor's NOTE: Doug also does the reprints of past Quarterlies. He is looking for the following issues: OCT 87, JAN 88, and APR 88. If you are interested in a yearly set of past issues, contact him.)*

FROM SAUDI ARABIA

The Quarterly does arrive here in Saudi Arabia, but usually three months late. Thought I would send you some details of the operations here.

The Oasis Amateur Radio Club, 7Z2AB, has been going for just over a year now, and membership consists of about 10 US licensed hams. Our QSL manager is AA0BC. There are two of us here who are interested in QRP operation, but not exclusively so. Normal QRO power is 100 watts. The QRP rig used is an ICOM 725 with an outboard QRP control which supplies a small negative voltage to the ALC jack on the rear panel. With this homebuilt unit, we can operate down to pretty low power levels, but usually run 3 to 5 watts. The antenna is a Cushcraft A3S up about 30 feet. The rig is run by using an infra red link between key and transmitter. The link is not really required but is a fun toy.

There are quite a few QRP QSOs in the log now, almost all being into Europe. There are a few into the states and we would like to see those increase, of course. Bands usually used are 15 and 20 meters. Our hours of operations are variable as the station is not located in my home, and family schedules often do take priority. Normally the station is operated 2 to 3 times a week from around 6 PM to 11PM local time (1500 to 2000 UTC). The weekend is Thursday and Friday and permitted operation hours those days are expanded. It is pretty normal to work pile ups whenever our call goes out. Nice to work people quickly, but I do enjoy a rag chew very much.

Jerry WB8VCP and I hope to work some of the contests and are looking at the Hoot Owl Sprints.

We are also members of the Michigan QRP club, as well as life members of the International Amateur Radio Club 4U1ITU in Geneva. Hope to work you QRP. - *David K. Hanson KB0EVM, P.O. Box 167 CC 956, Jeddah 21231 Saudi Arabia*

MOUNTAIN TOP QRP

I take QRP gear and operate from high and remote mountain tops in our area. I have very much enjoyed the experience and the QSO's from those locations have been about the most exciting thing I have done since my first CW QSO. It is one activity which I would like a whole lot more of. It is amazing how a high and clear location enhances successful QRP operation. There is a euphoria about a mountain top communication that is hard to describe.

I was wondering if there was interest in the QRP community to establish a scheduled mountain top event or events around another established activity like Field Day. If you are interested, or would simply like to work a mountain top QRPer, please contact me. - *Lowell Card AA7MU, 2051 E. Highway 40, Vernal, UT 84078*

A KISS IN LATIN

Keep it simple, stupid! The KISS principle could possibly be appropriate as a QRP motto. In latin it translates to:

Sit Simplex, Stiltus.

- *Fred Bonavita, W5QJM*

The "ZRO" QRP Satellite Receiving Tests

by Michael A. Czuhajewski WA8MCQ
7945 Citadel Drive
Severn, MD 21144

Occasionally people will complain that QRP seems to be strictly an HF CW game. There has been a bit of interest lately in QRP work on RS-12, one of the Russian satellites, but that's still HF. (It currently has mode K turned on, which is up on 15M and down on 10M.) For those interested in straddling the fence, there's Mode A, which is currently active on RS-10, up on 2 meters and down on ten. Here's a little different slant on the satellite QRP bit, brought to you by the AMSAT folks—someone sends you a QRP signal on a satellite, on either 144 or 432 MHz, cuts the power by half several times, and you see how low you can copy it. While this may not appear to be a QRP activity in the traditional sense, when you stop and think about it, it fits in perfectly. (As QRPers, we often make others listen for our pipsqueak signals down in the mud and noise while we lean back and enjoy easy copy on their 599+ signals. Here's an opportunity to see if we can take it as well as dish it out!)

Most of this information is based on a brochure put out by an AMSAT official, Andy MacAllister, WA5ZIB, 14714 Knights Way Drive, Houston, TX 77083. If interested in a copy, please send him a large SASE, with two units of postage.

The "ZRO Test" was started a few years ago, and was active on OSCAR 10 until they could no longer actively control the satellites attitude. The orientation is important since it must not favor any areas within the downlink footprint—to be fair, everyone should receive the same signal strength. The tests continue on another satellite.

The introduction of the brochure recounts the words of Heather, WB5RMA, originally published in the May 1988 issue of 73 Amateur Radio: "An award with a slightly different emphasis is the K2ZRO Memorial Station Engineering Award honoring Kaz Deskur, sponsored by the Radio Amateur Satellite Corporation. This is a test of operating skill and equipment performance. A control station sends and repeats numeric code groups at gradually reduced power levels. The operator measures the receive sensitivity of his satellite station as he monitors and records the content of the transmissions. Those who can copy the satellite's beacon can qualify for the basic award.

"The fun comes from pursuing endorsement stickers for the different power levels with the top award being for perfect copy at the lowest power level. AMSAT hopes to encourage stations to improve their downlink reception and thus reduce uplink excesses which are unnecessary and drain the satellites batteries."

For the full technical background behind the program you should read the brochure. In a nutshell, the idea is to use the satellite as a roughly calibrated signal source in the sky. While sensitivity of VHF/UHF receivers can be measured with well-calibrated signal generators, not everyone has access to them and there are other parts of the receiving system which also contribute to ultimate overall sensitivity—feedline, mast-mounted preamplifiers and antenna arrays. An on-the-air source of known strength is the answer.

During the tests, a signal from a control station is sent up to the bird and back down at a known power—level "0". This is the point at which it is equal in strength to the beacon transmitter on the satellite. A "secret" five digit number is sent three times in slow CW. (This is similar to the QRP test procedure mentioned by W7ZOI in Solid State Design, in which he used random five letter words as power was reduced. His tests were done on HF, however.) The power is then cut in half—3 decibels—and a new number is sent. This continues through level 9, 27 decibels total attenuation, at which point the signal is, at least theoretically, in the noise and uncopiable by all stations, no matter how sensitive. The idea is to correctly copy the numbers down to the lowest possible level, improving your station along the way to go ever lower. Endorsements are given for each level achieved; some people have already achieved the highest level.

The basic certificate isn't hard to obtain, but getting all the stickers to go on it is quite an undertaking. Quoting from an article by WA5ZIB in the brochure, "Those who can hear the satellites beacon will also be able to hear level zero (Z0) of the test and qualify for the basic award. The fun comes from pursuing endorsement stickers for the lower power levels. The goal is to encourage stations to improve their downlink reception. Those who hear poorly tend to resort to unnecessary uplink excesses which drain the satellites batteries and desensitize the satellite transponder for low power operators." We HF QRPers sometimes jokingly complain about the high power folks blasting holes in the ionosphere; when you get into satellite work, excessive power has very real effects on everyone's ability to communicate.

Technically, a lot of this should qualify for the QRP ARCI's 1000 Miles Per Watt Award, which is available for receiving as well as transmitting. However, there are complications when working with satellites—determining the precise distance of the satellite at a given moment, as well as the power output level. (Although the transmitter power of their linear transponders is known, to an approximate degree, all signals on the downlink share that power and it could be difficult to determine how much of it is going into a particular signal at a specific time.)

This should be an interesting challenge for those QRPers who are also interested in weak signal VHF/UHF work. If interested in further info, send an SASE (with two units of postage) to Andy at the address above, and start working on your receiving system.

(My thanks to WA5ZIB for reviewing this article for accuracy.) QRP

AWARDS

Bob Gaye, K2LGJ
25 Hampton Parkway
Buffalo, New York 14217

QRP ARCI AWARDS SUMMARY - FOURTH QUARTER 1992 04-January-93

CALL	DATE	BASIC	NOTES	MI/W	PWR	MODE	BAND
			- DXCC -				
WBØRXF	10/24/92	97C	175 SEAL				
AA2U	11/28/92	66C	300 SEAL				
			- WAS -				
WA8LCZ	10/24/92	329C	20 STATES		5.0	CW	21.0
AB5GC	10/24/92	330C	20 STATES		3.0	CW	14.0
N5DUQ	10/24/92	331C	20-50 STATES		1.0	CW	14.0
N5DUQ	10/24/92	332C	20-50 STATES		5.0	SSB	28.0
VE2ABO	10/24/92	272C	50 SEAL				
KB9GZG	11/28/92	333C	20-40 STATES		5.0	CW	MIX
N8PCX	11/28/92	327C	40 SEAL				
WA8LCZ	11/28/92	329C	30 SEAL				
VE1BUG	12/20/92	334C	20 STATES		5.0	MIX	MIX
W8MVN	12/20/92	335C	50 STATES		5.0	CW	7.0
WA8LCZ	12/20/92	329C	40 SEAL				
			- QRP-25 -				
W1XH	10/24/92	964	200 SEAL				
N8PCX	11/28/92	1036	100 SEAL				
KE8P	11/28/92	939	200 SEAL				
KH6CP/1	12/20/92	968	600 SEAL				
			- 1000 MILE / WATT -				
AAØJS	10/24/92	1320	TO WB4IUY	9,620	0.1	RTTY#3	14#352
WB4IUY	10/24/92	1321	FROM AAØJS	9,620	0.1	RTTY#4	14#353
KM4ZH	10/24/92	1322	TO 3DAØAH	9,659	0.9	SSB#274	28#193
KM4ZH	10/24/92	1323	TO D68JM	9,733	0.9	SSB#275	28#194
KM4ZH	10/24/92	1324	TO ZL4KF	9,767	0.9	SSB#276	21#408
KM4ZH	10/24/92	1325	TO 5H3TW	9,103	0.9	SSB#277	28#195
KM4ZH	10/24/92	1326	TO ZS5TF	9,758	0.9	SSB#278	28#196
JG4VGN	10/24/92	1327	TO JR7CLS	2,248	0.25	SSB#279	50#55
9V1YS	10/24/92	1328	TO ZS4S	5,279	1.0	CW#963	7#186
AB5GC	10/24/92	1329	TO ZL3JF	2,648	3.0	CW#964	14#354
9V1YL	11/28/92	1330	TO KØAB	9,063	1.0	CW#965	10.1#11
9V1UD	11/28/92	1331	TO KØAB	9,063	1.0	CW#966	10.1#12
KC4GTO	11/28/92	1332	TO N9JXY	1,872	0.5	CW#967	7#187
KM6TU	11/28/92	1333	TO ZL2BCH	1,484	4.5	CW#968	14#335
9V1YS	11/28/92	1334	TO JA8LP	3,615	1.0	CW#969	10.1#13
N5SAN	11/28/92	1335	TO KH3AE	1,190	4.0	CW#970	18.1#2
VE3DOM	11/28/92	1336	TO JE1VTZ	1,215	5.0	SSB#280	21#409
WB7NKD	12/20/92	1337	TO I5XIU	1,103	5.0	CW#971	21#410

Members' News

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

Coming out of the summer doldrums

This quarter's contributors deserve special recognition, as the late spring/early summer months are traditionally a time for "slim pickin's" on the Members' News front.

KI6SN
. . .Richard Fisher

There are so many distractions of life other than QRP at this time of year that those who sit down, take pen or camera to hand and drop MN a line deserve high marks for QRP Quarterly service above and beyond the call of duty.

If activity during May's **Hoot Owl Sprint** is any indication, QRP is alive and well — at least from this U.S. west coast vantage point. Lots of QRP exchanges to the east were heard prior to the 8 p.m. Pacific Time start-up. And western states activity was keen.

As is usually the case, operators showed the kindness, patience and prowess that so often is heard in QRP competition. And the sidebar mini-QSOs that so often accompany the contest exchanges were half of the fun.

Summer is winding down, and band conditions — especially on the lower frequencies — will be improving as we move into the cooler months.

It's a great time for QRP activity, and for sending a note or photograph for the Members' News column. Hey, why not share those great Field Day photographs with the membership?

Here's hoping to hear from you soon.

— R. E. F.

QRP mobile for the Spring 'Party'

Jim Lageson, WA0RPI, of Minneapolis, suggests that QRPers seize the opportunity to give mobile operation a serious look.

"When we planned our trip to Billings, Mont., I didn't realize it fell over the spring contest (the QRP ARCI Spring QSO Party).

WA0RPI
. . .Jim Lageson

"I really wanted to work the contest 'portable 7,' from Montana, but this was going to be a family trip — the contest had to take a back seat in our plans.

"I knew it was a long drive, about 14 hours, and with two young children, we found it much easier to travel at night when they would sleep. What better way to fill all those late boring hours than being on the radio. I have never worked mobile, but what a perfect time to try it. But QRP mobile? Would it work with such a small antenna? So, I bought a Ham Stick mobile antenna. I chose 20 and 40 meters."

Jim says he "dragged my ol' HW-9, stuck it between the front seats, tuned the antennas and was ready to go.

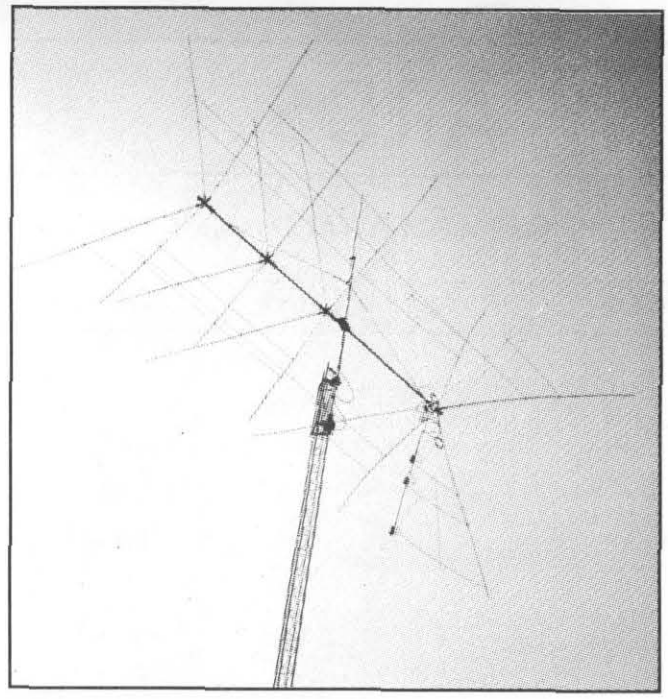
"I started out on 20 meters and when the band closed I would put the 40 meter stick on. It worked great! I was amazed at the signal reports I was getting while running about 3½ watts out. Even on 40 meters — the band I had my doubts about.

"The contest started about one hour before we got to Billings, but the QRN from the car engine made it difficult to copy the QRP stations.

"I threw up an inverted V in the trees behind my brother-in-law's house and was able to work the contest for a few hours on Saturday.

"We started for home late Thursday morning and was popular with the County Hunters driving through Southeastern Montana and Northeastern Wyoming. I even worked some DX — a KP4 (Puerto Rico), DL5 (Germany) and a 4X4 (Israel).

"So next time you're planning a trip, think about throwing the rig in the car. It was easy, inexpensive and a great way to kill those long hours on the road. My next goal is to try mobile on my bicycle."



After six months of use, Dan Walker reports that the five-element quad at WG5G is doing just fine. Its "poorly designed" older brother had earlier succumbed to 70 mph winds in the San Antonio area.

A QRPer's challenge of making 'The Honor Roll'

"Every time I think I'm within reach of making the DXCC Honor Roll with QRP, they add new countries to the list."

That's one of the biggest challenges **Dan Walker, WG5G,** says he faces in his quest for the award from his San Antonio QTH.

"Presently, my all-time total is 317 (countries), mixed mode, with 315 counting toward the honor roll. I need four more countries to make honor roll, but with the decline of this solar cycle, it's going to be rough.

Dan sent along pictures of his five-element quad. A "poorly designed" predecessor succumbed to 70-mph winds, but another attempt produced a much sturdier version that has held up for six months.

Dan, who is DX columnist of the Michigan QRP Club journal "The Five Watter," is eager to hear from any QRP ARCI member about DX activities. His mailing address is P.O. Box 10524, San Antonio, TX 78210.

From the UK, a mini-review of MFJ's QRP rig

Jim Challenger, G4EIB, writes from Dudley, West Midlands, United Kingdom, that he "recently purchased the MFJ 9020, and must say how pleased I am with its performance. Certainly value for money — around 180 pounds UK — and giving me lots of fun. I have already work a few W/Ks (United States), VEs (Canada) and lots of European stations, running four watts into a two element beam.

"My only criticism of the rig is the low output into the internal speaker. A further stage of amplification on the output would enable an external speaker to be used. I personally always use 'cans' (headphones) when on CW, so on problem. But anyone who dislikes wearing 'cans' would find the output a little quiet.

"Nevertheless, a great little rig for QRP. Unfortunately, I have yet to work a member of the club, but feel sure that will happen before too long.

Jim would like QRP ARCI to issue a membership list. "That would be very useful when working stations to check if they are in fact members of ARCI. I sometimes feel that I may have worked members — but not realizing they are members."

Off the grid, and looking for some gear

Jim Hale, N5WSZ, puts out a call for help from Kingston, Ark. "I'm looking for my first all-band QRP transceiver," and he needs to hear from some voices of experience.

Jim says his home is "on a mountain in the Ozarks and is *way* off the power grid.

"Since 1979 we have only had solar electric.

"When I became a ham in 1991, I went directly to QRP. The shack has its own set of seven 270 Ah lead acid batteries. The home runs on three sets of 1,000 Ah cells at 12 volts DC.

"So 3,000 Ah lasts a long time, even in cloudy months."

He uses fourteen 32-watt solar panels for the house. For the shack, it's one 32-watt panel, and two 10-watt panels.

Jim proudly says he hasn't had to pay an electric bill since 1979.

"Land that's far from power/water lines sells *a lot cheaper* than a lot in town. So solar panels were cost effective. BIG TIME!

"I cut wood off our 288 acres for heat in winter and the house is passive solar heated/earth cooled.

"Believe it or not, an old man found a water well with a forked stick. We dug down to where he said (12 feet) and we hit great tasting pure water.

"Just a few weeks ago, I passed my general (class license exam), and so I'm looking for an affordable, all-band transceiver.

"The Ten-Tec — U.S. made — rigs are interesting, but I don't know which one is best. The five-watt CW/SSB 509 and 535, and Triton transceiver look most interesting. The Triton IV and 509 might even be affordable."

Can anyone experienced with Ten-Tec gear give Jim some advice? He also asks about *simple* CW kits. He already has a rig working on 40 meters, and says he'll soon have one for 15. His address is HC 65, Box 261-B, Kingston, Ark., 72742.

Jim offers this advice to cell hunters:

"To locate cheap, used telephone batteries, talk to local hams who work for the phone company. I got a whole set (24 volts) of 1,080 Ah Gould cells (175 lbs., each at 2 volts per cell) for $100.

"The 20-year-old cells could last another 20 years if I take care of them."

Etc., and so on . . .

Coming up this month: the **Summer Homebrew Sprint-CW.** This is a chance to go head-to-head with other QRP homebrewers in a contest designed for the builder in our niche of amateur radio. The contest is **July 11, 2000-2400Z.** Make plans to participate. It's followed by the **Summer Daze Sprint-SSB.** That contest is an opportunity to dust off the microphone and see what the SSB gear will do. The contest is **Aug. 8, 2000-2400Z.** Both of these competitions are great tune-ups for the **Fall QSO Party,** from **1200Z Oct. 16** to **2400Z Oct. 17.** And while we're at it, round out the 1993 contest year with the **Holiday Spirits Sprint-CW.** It's on **Dec. 5,** from **2000-2400Z** . . .

Moe Lynn, VE6BLY, who writes the QRP column for "The Canadian Amateur" magazine, has several nice product reviews in the magazine's May 1993 edition. Included are **The Sudden Receiver, OXO Transmitter,** and **VE7GC Receiver Preamplifier.** Anyone interested in getting the magazine can write: **CARF Head Office, P.O. Box 356, 370 King St., W., Kingston, Ont. K7L 4W2.** For information by telephone, call **613-545-9100** . . .

Southern California's **Zuni Loop Mountain Expeditionary Force** held its annual pre-Field Day picnic at Table Mountain Campground, north of Los Angeles in May. QRPers attending included: **Fred Turpin, K6MDJ; Keith Clark, W6SIY; Bob Spidell, W6SKQ; Cam Hartford, N6GA; Ralph Irons, AA6UL; Tom Brown, W6JHQ; Rob Roberts, N7FEG; Charlie Lofgren, W6JJZ; H.T. Brown, W6DJX;** and **Richard Fisher, KI6SN.** Most brought families along, and operators seized the moment to shoot some lines over trees and erected a simple dipole — with lofty entanglements included. In short order, however, homebrew rigs and antenna tuners were called into service. While families ate and played, the QRPers were blazing away on 40 meters, and managed to check in to Sunday's TCN on 20 meters . . .

If you've never seen SPRAT, the journal of the G-QRP Club, you're missing some very interesting reading in the Members' News area. **Chris Page, G4BUE,** does an excellent job as SPRAT's MN editor, and his periodic roundup of operator news from around Great Britain, Europe and the world is well worth the price of the magazine. He can be contacted at: **Alamosa, The Paddocks, Upper Beeding, Steyning, West Sussex, BN44 3JW.**

Cycling along the Pacific Crest trail — QRP style

Can you imagine operating QRP bicycle mobile along the Pacific Crest Bicycle Trail through the Cascade Mountains of Oregon?

At least five radio amateurs will make the trip from Hood River to Crater Lake National Park during the week of July 11-17, according to **Bil Paul, KD6JUI** of San Mateo, Calif.

Guy Hamblen, AA7QZ, will be operating 20 meter QRP on approximately 14.060 MHz along with Paul.

Paul will also operate 40 meter QRP on approximately 7.040 MHz.

They will be operating from campgrounds along the way after approximately 2330Z each evening.

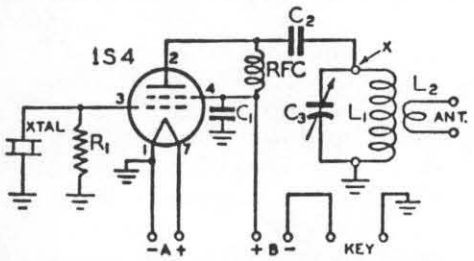
Other radio amateurs on the trip will be using 2 meter handheld transceivers.

The Goodie Giveaway

Most of us know that QRP is not a new phenomenon. Long before QRP ARCI, people were designing and using QRP rigs, as confirmed by **"A Bantam 1-Watter"** featured in the **January 1948 edition of QST Magazine,** which is this quarter's Goodie Giveaway.

In an article by **Ernest B. Lindsey, W4BIW,** the "6 oz., 12-cu.-inch" CW rig utilizes a single 1S4 tube and a handful of other components.

"Performance?," the article asks. "From Atlanta, W4BIW has blanketed Georgia and worked into Alabama with the rig." From Connecticut, one correspondent said that "using 80 meters and 0.8-watt input, 22 stations were QSOed in 12 hours — without high-



powered preliminaries."

Curious about component values? C1 and C2 are .0047 ufd. mica; C3 is a 140 pfd. trimmer; R1 is 47K ohms, and for 80 meters, L1 is 42 turns and L2 is 4 turns of No. 30 wire on a ¾-inch diameter plug in-form. The RF choke is 2.5 mh.

The 1S4 crystal oscillator is powered by a 1½-volt "A" cell, and 30 to 90 volts of "B." The plate-and-screen current under load is between 8 and 15 milliamperes.

The QST magazine comes by way of **Mike Czuhajewski, WA8MCQ,** who kindly donated some 1940s-vintage copies for the giveaways.

This quarter's winner is **Jim Challenger, G4EIB,** from Dudley, West Midlands, United Kingdom. A tip of ye olde QRP derby to Jim for his contribution from afar, and here's hoping that many more members will offer up their QRP successes, trials and tribulations in the form of a card, letter or a photograph.

Northern California QRP Club is on the air

Two ambitious QRPers in the northern climes of California have joined the increasing number of low power operators inclined to form a QRP club.

Doug Hendricks, KI6DS, of Dos Palos, and **Jim Cates, WA6GER,** of Sacramento have taken on the challenge by establishing the Northern California QRP Club, and producing an excellent periodical called **QRPp.**

Volume 1, No. 1 has product reviews, QRP operator profiles and features, and reprints of articles from SPRAT, the journal of the G-QRP Club.

QRPp is scheduled to come out each June, August, November and February.

Anyone interested in finding out more about the club, or to get a copy of the periodical, contact Doug. His mailing address is 862 Frank Ave., Dos Palos, CA 93620.

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.

WRITE FOR THE QRP QUARTERLY!

About once a year or so, someone takes a survey asking what you think about the QRP Quarterly. The results are always pretty much the same–too technical, not enough technical articles, too many general interest items, not enough, and so on.

As always, our reply is the same–*we print what you send us*! If there aren't enough technical articles, satellite articles, operating articles, product reviews, etc, it's because *you* aren't writing them for us! With the exception of certain areas such as contests, awards, Membership New and the Idea Exchange, no one is tasked with supplying us with material. (And all of those are dependent on your inputs in one way or another.) In general, we do not seek out people and ask them to write an article on a certain subject. People just take it on themselves to write about something they've done or built, or perhaps write a tutorial on some subject they know well, technical or non-technical.

We are always interested in construction projects, both simple and complex, product reviews, news of operating events and achievements, QRP commentary, etc; in general, we want more of the type of articles we've had in the past. If you have some subject we haven't printed, and it's QRP-related, write it up!

No one associated with the QRP Quarterly is paid, from the President on down to the officers and board members, editors, columnists, etc. Authors are in the same boat; we can't afford to pay for articles, but you *will* get the fame and glory of appearing in the QRP Quarterly, along with the satisfaction of giving enjoyment to your fellow QRPers.

Just about the only requirement for articles and reviews is that they be related to QRP in some way, and that leaves a lot of leeway. You can write about transmitters, receivers, transceivers, accessories, antennas, etc. How about operating? QRP DXing or contesting? Commentary? Philosophy? Humor? Stories of local QRP groups and gatherings? Satellite operating? (I've got a two part article awaiting publication on using RS-12, so we haven't forgotten about that subject! And the AMSAT Journal has already arranged to reprint it once we've run it.)

Those of us who've been around QRP for a number of years have "seen it all", but don't avoid writing on something just because you think it's too basic or it's been done before. Remember, there is always a constant influx of new QRPers who haven't read everything that you have over the years, and are eager to learn all they can. Also, there is always a wide range of experience and expertise among both the new and seasoned QRPers. We need both basic and complex articles in every area, both technical and non-technical.

I constantly get comments, both in writing and in person, from people who complain that there are not enough simple circuits and projects in the Quarterly–not everyone is a homebrewer; some folks just enjoy the operating aspects of QRP. Aim for the beginner as well as the seasoned veteran.

Something I've wanted to see for some time is a series or column aimed at the beginning QRPer, touching on all aspects of assembling a QRP station, operating, building, etc. I'm sure it would be well received and very popular. Anyone interested? Write to me in Severn and we'll discuss it.

Where to send your articles? As always, general interest items go to the general editor, member news to KI6SN, longer technical ones to the technical editor, and short technical tidbits to me for the Idea Exchange. If you're not sure which is appropriate, send it to one of us and we'll take it from there.

You're not a professional writer? Most of us aren't, either. While most of what we get is already well written and polished, don't worry if you have rough spots. We'll edit things as necessary, and work with you to polish it up.

Remember, *you* write the QRP Quarterly. We've been at 40 pages for some time, and have enough backlog to stay for a while but it could quickly shrink back to the 24 pages of the Lean Years not so long ago. If there is some subject you'd like to see more on, stop and think about what you know of it yourself–maybe YOU could write that next article! *–WA8MCQ*

QRP ARCI FINANCIAL REPORTS

I get comments occasionally from people wondering why we never publish QRP ARCI financial reports in the QRP Quarterly. Where is the money going? We're not hiding anything, are we, or taking trips to the Caribbean at Club expense?

Unfortunately, the truth isn't quite as juicy. No, there doesn't appear to be anything hidden. (There *was* an official trip by the President to England a couple years ago, at the invitation of the GQRP Club, for meeting their members around the country. That was authorized by the officers and Board, and included air fare only. All her other expenses were shared by her bank account and the GQRP folks.) The officers and Board of Directors get a copy of the report every quarter, have been for years and years, and everything certainly seems to be above board and honest.

Probably the main reasons that it isn't printed in the QRP Quarterly are that, 1) it's quite boring and of little interest to the membership at large, and 2) it would take away space from articles and information that DOES interest everyone. We currently have no plans to include it in the Quarterly. However, if any member is interested in seeing a current copy they may always send an SASE to the Secretary/Treasurer and request it. (Be sure to include your membership number.) –WA8MCQ

[Side note from the President: I'd also like to take this opportunity to point out that, other than for reimbursement of expenses like postage, no one in this organization is paid. The only person that does receive payment is the person who prints The Quarterly. Officers, directors, committee chairmen and Quarterly staff are all volunteers.–*WB9TBU*]

Problems, Questions, Comments?

Who To Contact— ***PLEASE include an SASE of an appropriate size if you expect a response.***

- **Subscriptions, dues, membership problems:** Mike Kilgore, KG5F; 2046 Ash Hill Road; Carrollton, Texas 75007
- **Technical articles:** Dave Benson, NN1G, 80 East Robbins Ave., Newington, Conn. 06111
- **Idea Exchange:** Mike Czuhajewski, WA8MCQ, 7945 Citadel Drive, Severn, Maryland 21144
- **QRP Contests:** Red Reynolds, K5VOL; 835 Surryse Road; Lake Zurich, Illinois 60047
- **Member News:** Richard Fisher, KI6SN, 1940 Wetherly St. Riverside, CA 92506
- **Nets:** Danny Gingell, K3TKS; 3052 Fairland Road; Silver Spring, Maryland 20904
- **Awards:** Bob Gaye, K2LGJ; 25 Hampton Parkway; Buffalo, New York 14217
- **Club Operations:** Paula Franke, WB9TBU; P.O. Box 873; Beecher, Illinois 60401; 708-946-2198
- **Club information packets** (include $2): Mike Bryce, WB8VGE; 2225 Mayflower, N.W.; Massilon, Ohio 44647

QRP ARCI History, Purpose and Policies:

The QRP ARCI was founded in 1961 by the late Harry Blomquist, K6JSS, with the aim of reducing QRM on the air, by members voluntarily limiting their power to 100 watts or less at all times. Due to increasing interest in true low power operation, and through the leadership of then-president Tom Davis, K8IF, the Club voted in the late 1970's to redefine its purpose in that direction, and adopted the generally accepted definition of QRP as 5 watts output CW and 10 watts PEP SSB.

The voluntary 100 watt power limit was later abolished; members may run any legal amount of power necessary at any time, for any purpose, although the 5 watt limit should be observed when claiming to be operating QRP. Club awards and activities are geared to the 5 watt and under level. The QRP ARCI does not advocate the reduction of the legal power limits of amateurs in any country, and serves only to provide a forum for those who enjoy the thrills and challenges of building and operating with low power equipment. The QRP ARCI is a member of the World QRP Federation and maintains ties with various other QRP organizations.

The QRP ARCI publishes the QRP Quarterly in January, April, July and October. All contributions are welcome and should be directed to the appropriate editor or columnist. (No payment is made for material published. Unless expressly requested, manuscripts, drawings, pictures and diskettes will not be returned.) Except for those items with a copyright indication, material may be reprinted elsewhere if proper credit is given to the author and the QRP Quarterly. The products, projects, features and fantasies described are intended solely for the enjoyment of our readers. No testing has been done unless explicitly stated, and no warranties are intended nor implied. The QRP ARCI and QRP Quarterly in no way warrant any commercial or private offers herein unless expressly stated.

To promote on the air QRP operation, the QRP ARCI promotes the use of designated QRP calling frequencies, regular QRP nets, and a program of QRP operating awards and contests. Information on these is found in the QRP Quarterly from time to time. Detailed information on the awards program is available from the Awards Chairman. To join the QRP ARCI or renew your subscription to the QRP Quarterly, see the form inside the back cover.

New Member/Renewal Data Sheet

Full Name_____ Call_____ QRP #_____

Mailing Address_____

City_____ State/Country_____ Postal Code_____

❑ New Adress?

USA

❑ New Member, $12
❑ Renewal, $10
Amount Enclosed in U.S. funds_____
Check or MO pay to QRP-ARCI.
Do not send cash.

Mail to: Mike Kilgore KG5F
2046 Ash Hill Road
Carrollton, Texas 75007

❑ New Call?

DX

❑ New Member, £7
❑ Renewal, £6
Check or MO pay 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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