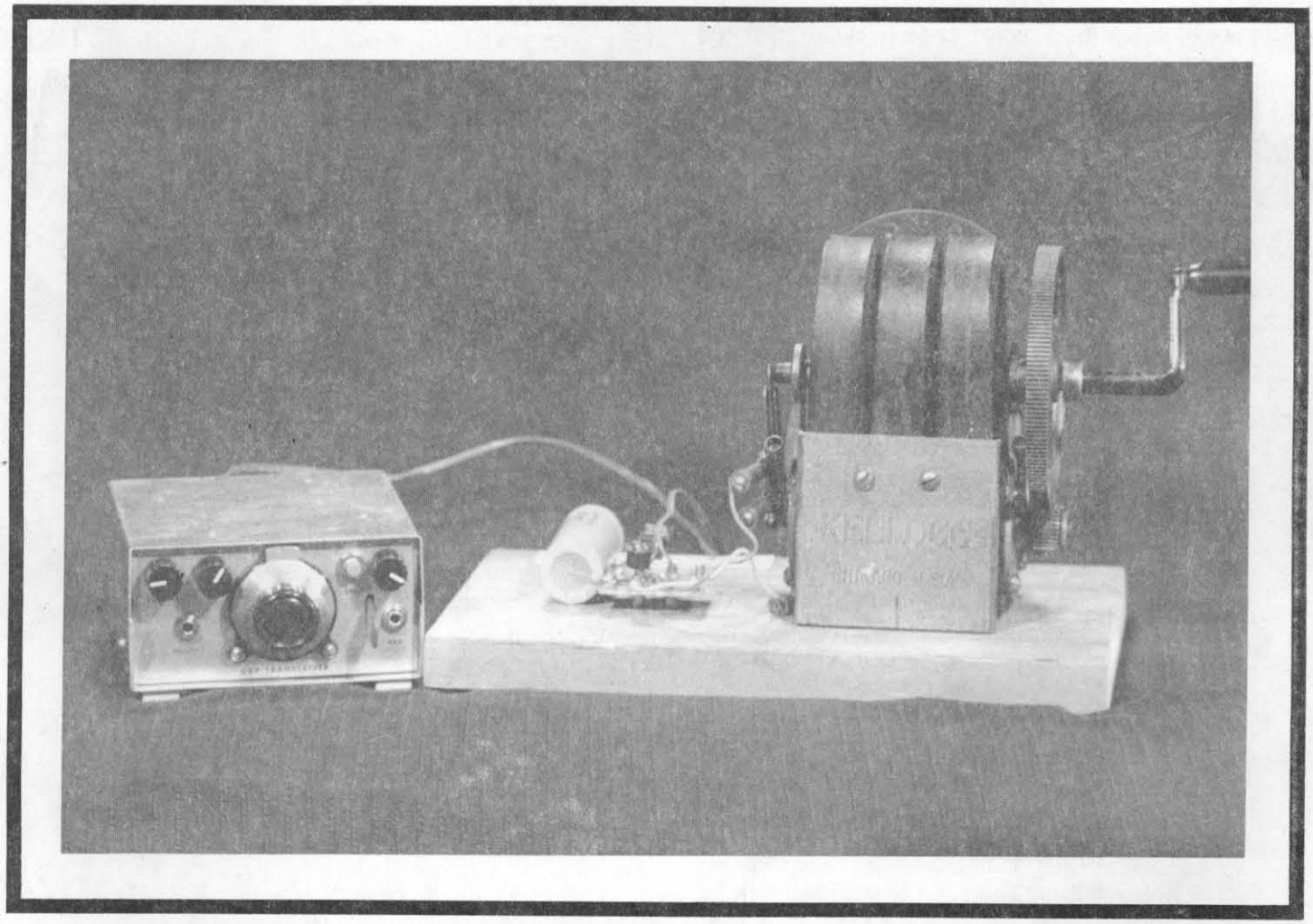
QRP Quarterly

Journal of the QRP Amateur Radio Club, International

July 1991 Volume XXIX Number 3



The "Huff and Puff" method of alternative energy.
Turn to page 9 to learn more.

Nominations Open For QRP ARCI Officers

Nominations are now open to fill several QRP ARCI offices that will expire at the end of the year.

Expiring on Dec. 31 are the three-year terms of directors Cam Hartford N6GA, Roger Rose W5LXS, and Doug Stivison NR1A.

Also expiring are the terms for the top three officers: President Paula Franke WB9TBU, Vice-President Buck Switzer N8CQA, and Secretary/Treasurer Luke Dodds W5HKA.

Incumbents and challengers wishing to run for any of these offices should send a brief biographical sketch including a definitive statement of the candidate's goals and interests in QRP.

Send nominations by Aug. 20 to Luke Dodds W5HKA, 2852 Oak Forest, Grapevine, Texas 76051. A ballot for election of three directors will appear in the October issue. Directors are elected by a simple majority of all ballots received from active members. Other club officers serve for two years and are elected by a 2/3 majority of the board of directors.

EDITOR'S WORD

Hi Gang,

First thing on the agenda is that we are losing our Technical Editor John Devon, KI6DQ. Due to personal obligations John has had to resign as Technical Editor. We wish John the best, and thank him for doing a fine job with the Quarterly.

Until we find a new Technical Editor, send all technical articles to me at my address in the Quarterly. Secondly, there seems to be a growing interest in some of the other modes of communications (RTTY, AMTOR, Packet, Satellites, etc.) among the QRP crowd. As one who has operated most of these modes QRP I know it can be done very easily. I have several articles addressing some of these modes of communications already, and if we can get a few more articles before the next issue hopefully we can have a special issue devoted to them. If there is enough interest in this I will take it upon myself to start a new column devoted to these new modes running QRP. So take a pen in hand and let me know what you think. This could be something new for some of the members. Has anyone worked any of these modes for any of the QRP ARCI awards? Let me hear from you. Until next time, have a good Summer.

Chaz, KD4XX.

CORRECTION

A slip of the typesetting keys resulted in an error in the Kanga Marker Generator Kit article. In the third paragraph, the end of the first sentence should read "...zero beat with WWV just below the 30 ***meter*** band", not 30 MHz, as written.

GSN SUSPENDED

Because of intense QRN and generally lousy band conditions during the Summer months, I am suspending the Gulf States Net on 3560 kHz until September. The next scheduled GSN will be 0200Z, Sept. 5, 1991. Thanks for your support. Have a great Summer, and give you ears a break. CU in September.

Ed Debuvitz, W5TTE; NCS, Gulf States Net

SUBSCRIPTION INFO ON QUARTERLY LABELS

by Mike Kilgore, KG5F
QRP ARCI Membership Chairman

Please notice a change on your mailing label: the top line now spells out the month of the expiration issue of your subscription. Your label will only say "LAST ISSUE" if your subscription is due to expire with the current issue.

Please notify me when you move. I have had several letters from members who say something like, "I haven't received my QRP Quarterly for more than a year. By the way, I moved twice in the past year. Here is my new address."

When renewing your subscription to the QRP Quarterly, please note that the yearly rate is $10 for members in the U.S. and $12 for members in foreign countries. Massachusetts is NOT a foreign country; Canada is. Please send the correct amount, as refunds for overpayment cause more work for both of us as well as unnecessary postage expense. I hope this helps to avoid some confusion in the future. Let me know if you have any questions about your subscription to the QRP Quarterly or need to change your callsign or address, please let me know.

PERSONNEL CHANGES

It is with regret we report the resignation of our Technical Editor John Devon, KI6DQ. As yet, we have no replacement. Anyone interested in taking over the position should contact the President, Paula Franke WB9TBU.

After a year and a half as Managing Editor, Chaz Wooten KD4XX is handing the reins over to Jim Griffin, W9NJP, 1216 Ash Street, St. Charles, IL 60174. Chaz and Jim are working together to ensure a smooth transition. We'll have more about Jim next time.

TURN TO PAGE 23 FOR PRESIDENT'S MESSAGE

The QRP ARCI is a non-profit organization dedicated to increasing world-wide enjoyment of QRP operation and experimentation. QRP, as defined by the club, is 5 watts output CW and 10 watts output PEP.

Table of Contents

DSB TRANSCEIVER

P. David Ingalls, KD7SE
671 Morton St.
Ashland, OR 97520

One of the most popular direct-conversion (DC) designs ever published is W7EL's "Optimized QRP Transceiver," featured in the August 1980 edition of QST. It's proven both reliable, and effective. After building several double-sideband rigs (DSB), the author settled upon the W7EL rig as the basis for a 40 meter DSB transceiver that can easily be duplicated, using standard mail-order parts.

While many QRPers have built CW transceivers using DC receivers, and appreciate the elegance of this approach, few appreciate that effective phone communication can be implemented with little increase in circuit complexity, by using the DSB transmitter. While this technique has been thoroughly covered in Solid State Design, DSB has received little attention in the amateur press. This is unfortunate, as the DC/DSB combination can serve as both an enjoyable addition to a QRP station, and an educational step along the way to more advanced projects.

It's no more difficult to construct than the original CW version. Though it requires a simple mic amp and balanced modulator circuit, it does without transmit frequency shift and sidetone that are necessary in a CW rig. RIT has been omitted, and not missed, but could easily be added with a varactor diode in the VFO tank.

In the block descriptions below, homebrewers will recognize that I have borrowed heavily from the published work of W7ZOI, W1FB, in addition to that of W7EL. Their contributions are acknowledged with admiration and gratitude.

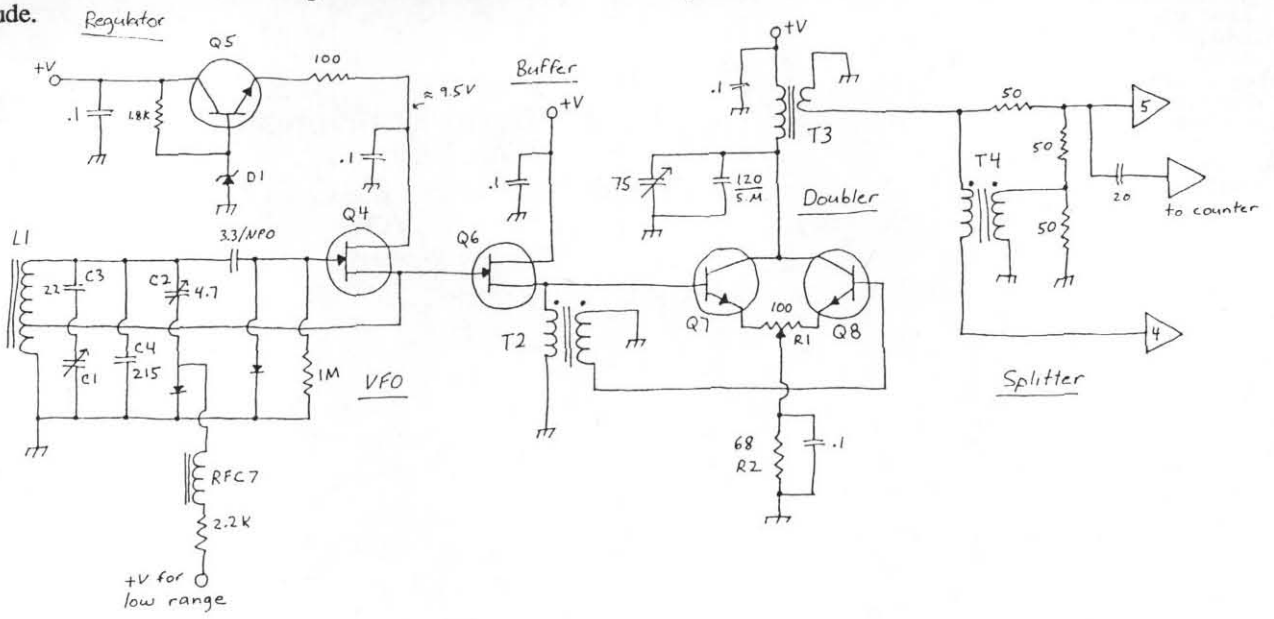
VFO

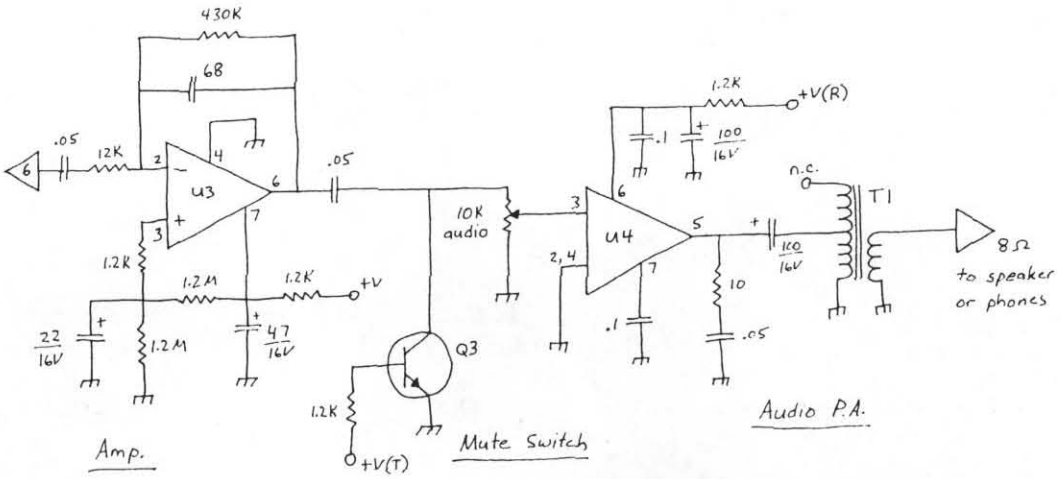
At least +13 dBm into a 50Ω load will suffice. This version of the familiar Hartley oscillator is tuned with C1, a three turn air variable with a range of 5 to 17 pf. The circuit associated with C2 was added so that the entire 40 meter phone band is covered in two switchable tuning ranges. C2 is adjusted to set the lower band edge. RFC7 is not critical, and C3 is a NPO cap chosen for the desired tuning segment.

In the prototype, 22pf proved to be the appropriate value. The main capacitance, C4, is a parallel combination of NPO and polystyrene caps. Final adjustment is simplified by an air piston or other small variable as part of C4. Another FET, such as the 2N5486, may be substituted for Q4, but watch for inadequate output. Q5 and D1 provides regulated voltage; an IC such as 78L08 would work just as well.

As suggested by W7EL, doubling is used to enhance stability and minimize disruption caused by unwanted RF coupling back into the VFO. Adjust R1 to balance the doubler while observing the output on a scope to maximize signal purity.

A power splitter at the doubler output insures that both the product detector and balanced modulator see 50Ω at the proper power level. Select R2 to provide +7dBm at the splitter outputs, with 50Ω resistors across each output, prior to connecting the modulator and PD. If desired, couple a frequency display to one output through a small capacitor.





RECEIVER

The receiver section closely follows the W7EL design, except for the power amplifier. An IC double balanced mixer (U1) replaces the diode ring and transformers. It's well worth the small cost to avoid the tedium of trifilar transformers. U1 is a Mini-Circuits SCM-1, a surface mount equivalent to the SBL-1, with the same pin out. It's principal virtue is its adaptability to "ugly" construction. The SCM-1 is available from the author at $5.50 each, postpaid.

U2 provides low-pass filtering, and U3 some passband shaping and amplification. The audio chain's 6 dB rolloff points are at 350 and 2600 Hz, measured at the PA output. U4, the audio power amp, yields sufficient power to drive a small speaker through T1. T1 tames the LM-386, which is prone to oscillation in a DC receiver. Muting is done by grounding the output of U3 through Q3, and removing voltage from U4.

MIC AMP

The mic amp input accommodates a low impedance dynamic mic. These mics are commonly used with CB rigs, and are inexpensive and readily available in surplus. RFC2 and the 560 pf capacitors form a filter that prevents RF from entering following stages.

The first half of U6 is an audio amplifier controlled by a panel-mounted 100K linear pot, the mic gain control. The second half serves as a low-impedance, low-pass filter to drive the balanced modulator. With the values shown for C5, C6, and C7, the -6dB rolloffs are at 350 and 2700 Hz. Vary these values somewhat to optimize the passband, if needed.

Adjust the mic gain pot to minimize flatopping as viewed on a scope, with the transmitter fed into a 50Ω load. Refer to the good and bad scope patterns found in the two-tone SSB testing section of the ARRL Handbook. For double sideband, only a single test tone is needed to produce the characteristic scope pattern.

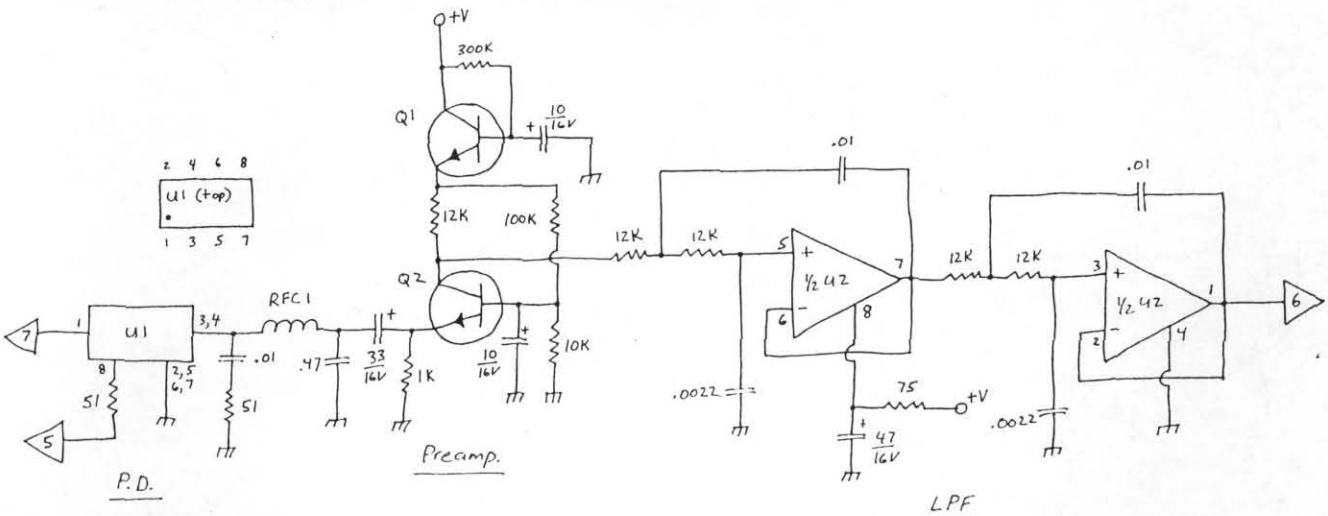
BALANCED MODULATOR

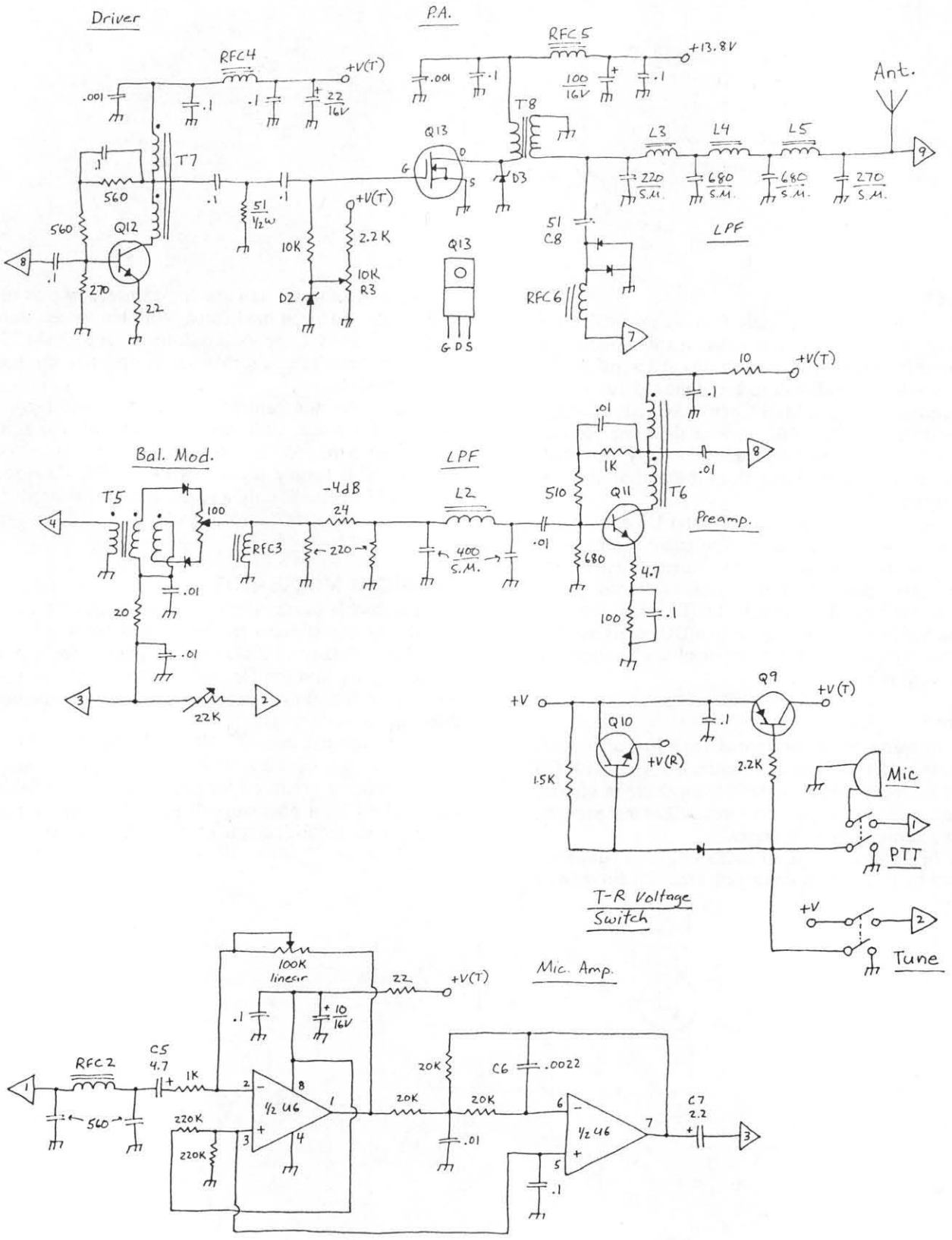
The double diode, singly balanced modulator appears here due to its usefulness and operational simplicity.

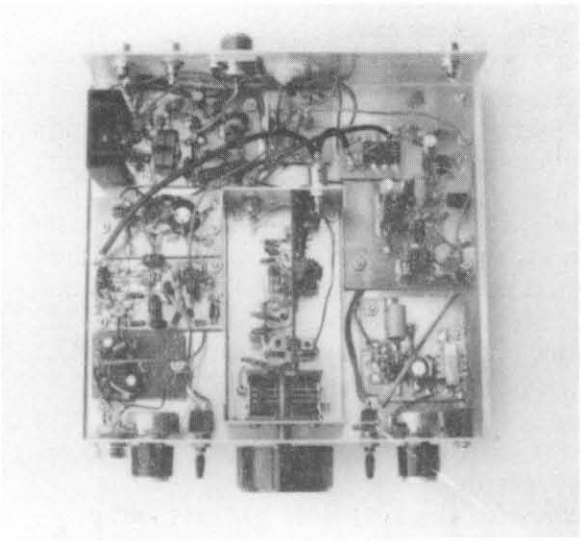
The modulator's 100Ω miniature pot may be adjusted by keying the transmitter with no audio. Observe the transmitter output on a scope, and set the pot for minimum carrier feedthrough.

The -4 dB pad insures a 50Ω termination and the following low-pass filter insures spectral purity.

A carrier is produced for tuneup by unbalancing the modulator with a positive voltage fed through a panel power equals the PEP output of the final amplifier.




Driver
P.A.
RFC4
RFC5
+V(T)
+13.8V
Ant.
T7
T8
Q13
L3
L4
L5
560
Q12
51 ½w
10K
2.2K
10K R3
D2
D3
51 C8
LPF
RFC6
Q13
G D S
10
Bal. Mod.
LPF
T5
-4dB
L2
510
Q11
T6
Preamp.
RFC3
220
400 S.M.
680
4.7
100
20
22K
Q9
Q10
+V(R)
1.5K
2.2K
Mic
PTT
T-R Voltage Switch
Tune
100K linear
Mic. Amp.
22
RFC2
C5 4.7
1K
560
220K
½ U6
20K
C6 .0022
C7 2.2



LINEAR AMPLIFIERS

Q11 and Q12 are conventional Class A feedback amplifiers, with input and output impedances of 50 ohms. Q12 puts out about 170 mW (22 dBm). Q12 requires a heatsink due to its minimum 75 ma current draw.

Q13, the final amplifier, is an inexpensive power MOSFET biased for Class AB operation, and requires care in handling due to possible static discharge damage. Once installed in the circuit, it's reassuringly rugged, as it's not subject to thermal runaway. Q13 should be attached to a heatsink of at least two square inches of surface area. A small pot, R3, sets the gate bias for an 80 to 90 ma current drain, with no gate drive applied.

The output impedance of Q13 is 23 ohms, which is transformed to 50Ω via T8, C8, RFC6, and the two associated diodes handle antenna switching. The final low-pass filter adequately attenuates harmonics.

TRANSMIT-RECEIVE SWITCHING

All +V points are supplied with 13.8 volts. Voltage is continuously applied to the VFO, Q13 drain (the drain may be permanently connected to V+ as no current flows unless the gate is biased), and the receiver section, except for U4, which is turned off as the transmitter is keyed. During transmit only, the mic amp, Q3 (mute switch), Q11 and Q12 (RF amps), and the Q13 gate bias network receive power.

Switching is accomplished by grounding the bases of Q9 and Q1 with the mic's PTT switch. Q9 is turned on, while Q10 is turned off. Q10's emitter supplies +V on receive, and Q9's collector supplies V+ on transmit. The latter can be any audio or switching PNP transistor that can handle 120 ma of collector current, with appropriate heat-sinking.

Closing the TUNE switch unbalances the balanced modulator to generate a carrier that puts the rig into transmit mode.

BARGRAPH OUTPUT INDICATOR

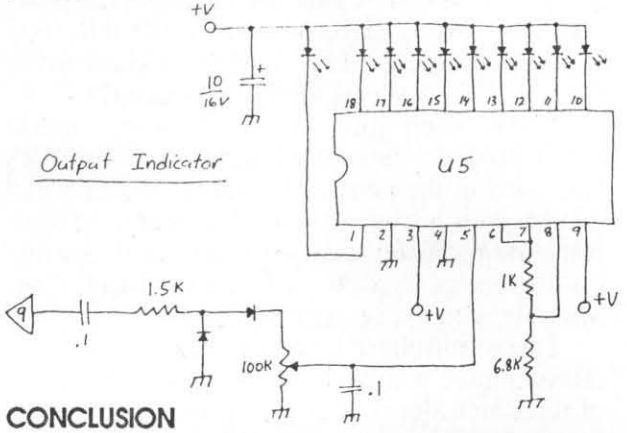
Because this simple rig lacks ALC, the transmitter must be monitored to insure it is not overdriven, which would result in flat topping and other distortion. This may be most conveniently done with the included bargraph display.

The ten LEDs are an integrated bargraph unit, though discrete LED's could be used. U5 is set up as a 0-10 volt meter, with each LED representing a 1 V step. The transmitter signal is rectified and applied to the meter through a 100K pot, either a PC type, or panel mounted. adjust the pot while viewing the transmitted signal on a scope. Set it so the meter peaks at maximum undistorted output. The mic gain pot is then used to control the transmitter output with different mics and speaking voice levels in conjunction with the bargraph display. This simple circuit's utility more than justifies its small cost.

CONSTRUCTION

All construction is done in the author's own "ugly" style. Components are soldered point-to-point over unetched boards are supported by the grounded parts. For extra support and IC mounting, a dental burr in a Dremel tool will cut isolated pads.

The VFO occupies a separate box within the main cabinet, and mechanical stability is enhanced by the use of stout insulated standoffs as tiepoints. The other stages are on separate boards horizontally mounted in a 7"x7"x2" cabinet. A substantially smaller box could be used for portability; the author squeezed a similar 15 meter rig into just eight cubic inches.



CONCLUSION

No quirks were observed during construction or operation of this handy rig. There is little doubt that experienced builders with access to scope and frequency counter or calibrated receiver can duplicate and probably improve upon it.

Reports from other stations have been uniformly complimentary, although it's telling that, when told they are working a DSB rig, most operators don't understand. The fact that the rig is homebrewed almost always elicits a favorable reaction, however. That's the return on this investment that makes the effort more than worthwhile!

QRP

IDEA EXCHANGE

by Mike Czuhajeski, WA8MCQ/DU3
1961st Comm Group
PSC #1, Box 48
APO San Francisco 96286

Where to write?

Okay, pay attention now: this is where things get tricky. As mentioned in the last issue, I closed Box 232 in Jessup and my new (and permanent) mailing address is 7945 Citadel Drive, Severn, MD 21144. In the meantime, through March or April 1992, you may also contact me at the APO address above. You can still write to the Severn address but it will take a bit longer for things to be forwarded. It now appears I'll be able to continue to do the Idea Exchange myself.

HW-9 Selectivity Improvement —A Parts Offer

From **Paul Levesque, KB1MJ:**

Perhaps the most annoying fault in the Heath HW-9 is its excessive 3 kHz bandwidth and the desensitizing of the receiver via AGC driven by strong signals in the pass band. (See Filter Mods for the HW-9 by Cam Hartford in the July 1988 issue of the QRP Quarterly.)

I have been quite successful with the 400 Hz 3-pole crystal filter suggested by Wes Hayward in the above mentioned article when driven with a high gain FET in order to simplify the required changes. I can now operate on 40 meters at night, a feat found to be impossible with the original design!

I have purchased a small quantity of crystals and have matched them very closely in sets of three in order to provide optimum filter performance. I have mounted three crystals and the two 680 pf capacitors on a small PC board, creating a "drop-in replacement" for the original Heath filter FL301. A high gain FET from the J308 family provides a direct substitute for Q301 and increases the IF gain. A small toroidal transformer establishes the impedance match between the FET and the input of the crystal filter.

I can provide a LIMITED NUMBER of complete parts kits with step by step instructions for this conversion to HW-9 users who are interested in improving the selectivity and AGC function of their transceivers. (Keep in mind, however, that you will forfeit the ability to copy SSB with this modification.) The cost for the kit is $30. Write me a note if you are interested in more details. Should the demand exceed my supply, orders will be honored in the order received. --Paul Levesque KB1MJ, 14 Wesley Street, Dedham, MA 02026

The Trombone Audio Filter

Jim Reid, KD3S of Laurel, MD, is always showing me neat little gadgets and projects. One of his latest ideas to play around with is this variable acoustic audio filter. Some of you have probably seen articles on using speakers inside plastic soft drink cups to form acoustic resonators (and Danny Gingell, K3TKS, uses empty push-up stick deodorant tubes the same way). Jim's idea works along the same lines, but is adjustable.

KD3S Trombone Filter

As you can see, it consists of little more than a couple blocks of wood, a piece of dowel and some chrome plated drain pipe from the hardware store. The transducer Jim used is a piezo speaker from a scrap computer board, mounted on the end of the dowel which fits into the pipe (not visible here). (Oldtimers note—back when I was a kid, they used those things as earpieces for those toy AM radios which consisted of a tuned circuit and diode detector. Once the computer age hit with a vengeance, piezo audio transducer technology came back into favor.) The cable runs through a hole drilled down the center of the dowel, and terminates in a phone plug. The dowel was reduced slightly in diameter to allow a good sliding fit with the pipe.

The plug is connected to a receiver, and as you slide the tube back and forth the frequency of peak response will change. In its present incarnation, Jim's trombone has relatively limited volume due to the piezo speaker; other transducers could be used for increased output. Also, his is a relatively low Q device and does not provide a great deal of attenuation to off-resonance frequencies, although there is a decided peak in response at resonance. While this doesn't provide competition for a passive LC filter, such as the W3NQN designs, or active filters, it does make the basis for some interested experiments

The Huff 'n Puff Generator Revisited

Jim, KD3S, has decided to bless us with details of his alternate power source, which was mentioned in the QRP Show and Tell article in the April 1989 Quarterly. At the time, we were forbidden to go into any detail since he had submitted an article on it to a ham magazine. He has now authorized me to relate the following: He submitted this to *73 Magazine* for one of their homebrew contests. They sat on it for about two years, and finally returned it with a note of apology saying that they had far too many articles to evaluate in a timely manner. In all fairness, they did extend his subscription for a year to try to make up a bit.

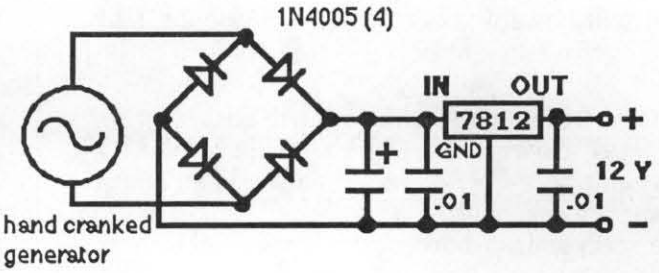
Here then, for the QRP community, is Jim's article on the Huff 'n Puff Generator, as rejected by *73 Magazine*. (He said the situation reminds him of the bum who was thrown out of a fancy restaurant after trying to get a free meal, and landed at the feet of a well-dressed matron. When she made a snooty comment about him to her husband, he said, "Lady, I may be a drunken bum, but I've been thrown out of the best restaurants in town!")

"The Huff 'n Puff Power Supply" or "Solar Power is for Wimps"

by Jim Reid KD3S

Oh yes, I know you're saying "ho hum, another hand-cranked power supply article", but read on a bit before you give up. What this project lacks in state-of-the-art it certainly makes up for in fun, fun and more fun. This rig draws kids like flies and the crank handle will be ever sticky from their grubby little hands.

The heart and soul of this project is a hand cranked telephone generator of ancient age (80 to 100 years old?). This beauty was made back when men were men and volts were volts. At cranking speeds, approaching CPR redline, the output will be about 90 volts. This is obviously too high to deal with in a sane manner to get 12 volts. Transformers do not work since the frequency is so low the efficiency is just a whisker above nil. The obvious solution is to rewind the generator. The original winding consisted of 3300 turns of #31 silk covered wire. This gave an internal resistance of about 350Ω. In addition to this large internal resistance, the armature is not laminated but rather a solid piece of soft iron. All of this conspires to make for low efficiency.



I laboriously unwound the original winding in order to count the turns but you can save a lot of labor by cutting away the fine wire. Rewind the armature with 1100 turns of #28 enameled wire. This will give you about 20

volts at top speed. The schematic tells the story. The AC from the generator is rectified by a full wave rectifier, filtered by a big electrolytic capacitor and regulated down to 12 volts. With an enthusiastic cranker, the upper limit on the current is 125 ma.

Where do you find the generator? I don't know. Try hamfests, flea markets, garage sales and antique stores. If this doesn't work, try ads in local papers, on supermarket bulletin boards and your local ham store bulletin board. But most of all, try word of mouth. These generators are out there in abundance but nobody knows just what a treasure they are, do they are gathering dust and are not on the market. As an example—I hadn't seen one for years until I put out the word I was interested and then it seemed everyone had one or knew someone who did. So advertise, and so shall ye reap.

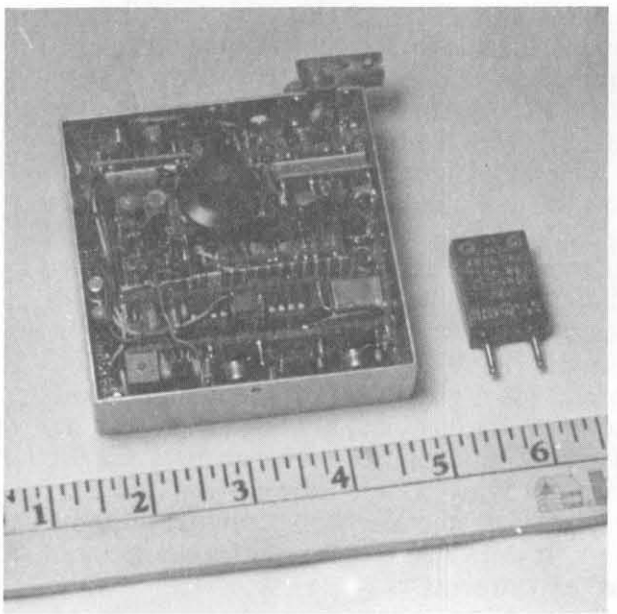
The picture on the front cover shows the unit powering the W7EL Optimized QRP Transceiver from Circuit Board Specialists. The rectifier and regulator are on the small circuit board to the left of the generator. Apply your hand vigorously to the crank on the right and the fun comes out of the antenna connector on the back of the transceiver.

A word of warning: I once took this rig to a Cub Scout meeting and made the mistake of setting it up before the meeting started. The kids could not be pried loose with a Scout axe and the meeting never did get underway. The kids were happy but the den mother was mighty miffed. The message here is that it's a great PR gimmick for the bubblegum crowd and will possibly make you more popular than you ever wanted to be.

The Latest WA5JAY Mini-Rig

Hal Bower, WA5JAY of Severn, MD, may not be a QRPer per se but he is an active homebrewer, and a good one. His DB-25 transceiver-in-a-bottle (and my hand) graced the cover of the April 1990 Quarterly. In an article in the January 1991 issue of the Quarterly, "More QRP Show and Tells", I mentioned that his latest project was a 3x3x1 inch QRP 20 meter SSB transceiver. He's had it done for some time now and moved on to "bigger" and better things. I talked to him for about nine minutes one evening on 20 SSB with it, and it sounded good. He currently has its power MOSFET final putting out 160 milliwatts.

As advertised, it is a complete 20 meter SSB transceiver, with crystal filter. It only has two poles, since he ran out of crystals for the unconventional IF frequency he used, but still sounds good. The knob on the potentiometer in the center controls the frequency, via varactor tuning. Readout is done by a small line scratched on the skirt of the knob and carefully calibrated components—pointing to this 1 K resistor is 14150 kHz, 14200 kHz is just to the right of that tantalum capacitor, etc.



WA5JAY SSB Rig

The BNC socket is the RF output, while all other connections are on a molex-type connector on the underside. Those include the PTT line, microphone input, audio output and power. I was wrong about one thing, which is obvious now that I have a photo which includes a ruler—it's actually 3-1/4 inch square instead of 3 as I claimed, but on the other hand, it doesn't really stand quite an inch tall after all—it's just a bit over 3/4 inch.

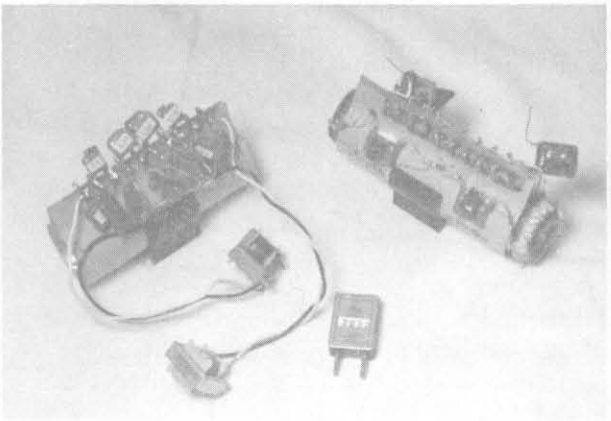
Hal is writing this up for a ham magazine, so no schematics or block diagrams are included here. I must apologize for the photo, which doesn't show as much detail as I'd like; I need to refine my photographic techniques. The rig really has to be seen in person to fully appreciate it. Hal's current project is another SSB transceiver, multiband this time.

Although the overall size will be larger due

to the tuning capacitor, gear reduction mechanism and ergonomic considerations, the basic electronics will be of the same compact technique used here.

W3NQN Passive Audio Filters in the Flesh

In two past columns I made mention of the excellent passive audio filter designs by **Ed Wetherhold, W3NQN**. Here at last is a picture of two of them before being installed in boxes. (My lawyer tells me that although these are nude, we can still print the pictures since it has redeeming social value.)



W3NQN Audio Filters

The filter on the left is for 534 Hz, and uses one toroid stack. As mentioned in the Idea Exchange last month, it uses quite a few capacitors. The filter on the right is for 750 Hz, as detailed in January. It doesn't use as many capacitors, but requires two additional toroids glued onto the ends of the stack. Although only shown connected to the filter on the left, both designs require transformers to match the impedance of the filters to that of your audio line.

If interested in obtaining parts for some very high quality audio filters, dig out your last two issues of the Quarterly and read about them in the Idea Exchange, then write to Ed at 1426 Catlyn Place, Annapolis, MD 21401. (He requests that only folks with a serious interest in building the filters write to him.)

Joe's Quickie #3

Joe Everhart, N2CX of Brooklawn, NJ, writes with his latest "quickie" circuit idea:

Many times in breadboarding QRP circuits, we need to measure RF voltage at a given point. And usually, the point to measured is buried in a cluster of components. This makes it difficult to hook up an RF probe. One quickie answer to this problem is to build the probes right into the circuit! Put one at each point where you'll want to measure the RF voltage. Then you can run a lead with the DC output of each detector to a convenient monitoring point. The RF probe components are cheap compared to the cost of the circuit you're building so why not add two or three test points?

Figure 1A shows the detector probe circuit which is probably familiar to most homebrewers. It's just a simple germanium diode, a capacitor and a resistor. Capacitor C1 is a decoupling capacitor to keep DC out of the probe. Diode D1 is a half-wave rectifier. R1 isolates the detector from the outside world. Unless you are doing very precision work, none of the component values are particularly critical. The capacitor can be anywhere from 0.005 µf to 0.1 µf (use an ordinary disc ceramic) and a resistor value of 22 K to 47 K is usually fine. The diode should be germanium for best sensitivity. Radio Shack carries a pack of 10 1N34s of 99¢ (catalog number 276-1123). A small signal silicon diode such as the 1N914 or 1N4148 can be used if you don't care about accuracy and the RF voltage is above a volt.

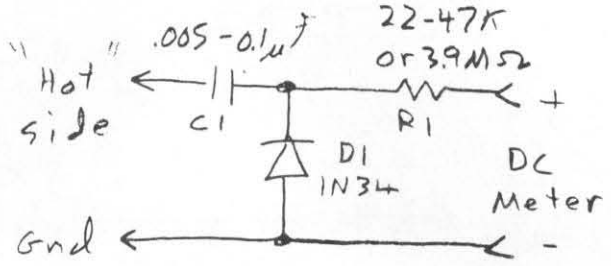


Fig. 1A: RF detector probe

What about calibration? Well, that depends. Often you just don't care exactly what the voltage is, you just want to tune for "maximum smoke". If so, you can hook up a VOM or 100 µa microammeter to the probe and not to worry. With the microammeter you may want to add a 100 K sensitivity control as shown in Figure 1B. You should be able to get usable meter deflection down to 50 mV of RF. More accuracy can be obtained with a VTVM or

FETVM. Since the detector is a half wave device, it will read the peak voltage of a sine wave. For 1 volt rms this is 1.414 volts; for 2 volts rms it's 2,828 volt, etc.

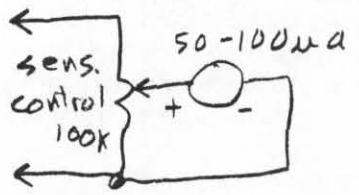


Fig. 1B: Uncalibrated meter circuit

An elegant method of reading rms voltage directly uses the 10 megohm input impedance of the VOM along with R1 to set the meter's scale factor. This trick has been in the ARRL Handbook for years. If you use a resistance of 4.14 megohm for R1, the meter will read rms voltage directly. A 3.9 megohm resistor gives less than 2% error. Be careful with the VOM however, since it may give strange readings when exposed to stray RF. Accuracy can be quite good above 1 volt rms, and suffers considerably below 1/2 volt. References listed below will tell you more than you ever cared to know about simple diode probes and their accuracy.

Figure 2 shows where the probes can be used in the popular Twofer transmitter. Three of them let you monitor voltages at several important points without affecting operation at all. I often use the "tacked component" connection method mentioned in my previous "quickie" audio oscillator write-up. Just tack solder C1 to the point to be measured and D1 to ground. Then use a clip lead to connect the meter to the probe output. If you're careful, you can often do this in projects on a printed circuit board, too. In fact, if you have an RF voltage you frequently want to monitor, leave the detector hooked up all the time. When you want to see what the RF voltage is, just hook up the external DC meter or oscilloscope.

P.S. I have several QRP dummy loads and I've put a detector on each with lugs to clip on a meter. This makes it very easy to see how much power my transmitter is running without any fancy measuring gear. I just interpolate the power from the chart in Figure 3.

Diode references:

1. Hints and Kinks, p. 44, May 1985 QST
2. Hints and Kinks, p. 47, March 1986 QST.
3. "A Simple and Accurate QRP Directional Wattmeter", R. Llewallen, p. 19, Feb 1990 QST

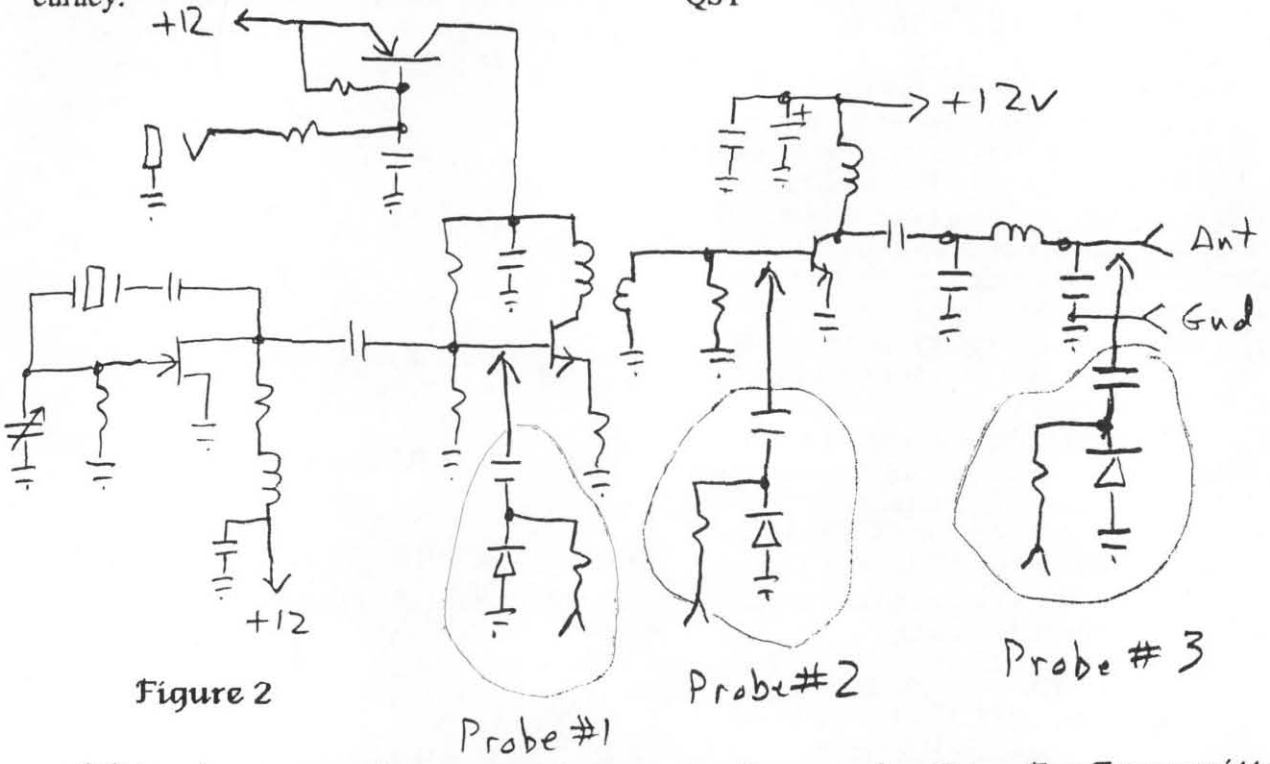


Figure 2

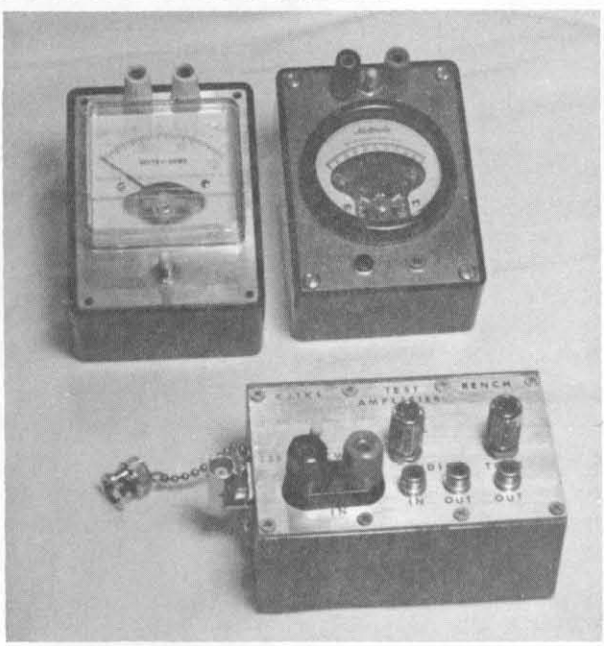
RF Probes to monitor several areas in the popular Two-Fer Transmitter

P-P voltage	Rms voltage	Power 50Ω load
0.707 V	0.5 V	0.005 W
1.41	1.0	0.02
2.24	1.58	0.05
3.16	2.24	0.10
4.47	3.16	0.20
7.07	5.0	0.50
10.0	7.07	1.0
14.4	10.0	2.0
17.3	12.2	3.0
20.0	14.1	4.0
22.4	15.8	5.0 (max QRP)

Figure 3—Calibration chart for power in 50Ω

K3TKS Meter Boxes

Danny Gingell, K3TKS, has been bringing these meter boxes to our QRP Show and Tells for some time, and now it's your turn to see them. His basic premise is that good meters are very expensive if purchased new and nice used ones aren't always that easy to find at hamfests, so they should be used sparingly. On top of that, it seems a shame to dedicate a meter to a project where it will see only occasional use at most, and keep it tied up. Why not put the good meters in their own boxes, with connectors, so they can be hooked up into seldom-used devices as needed, and shared between several circuits?



K3TKS meter boxes

Danny adds more versatility by putting shunts in the boxes to extend the range of the meters, with switches to cut them in and out as needed. Mounted in boxes, the meters are also much easier to use when experimenting. (The device below the meter boxes is an audio amplifier/keying monitor based on a kit sold by the GQRP folks. Danny added the Pomona box, connectors, panel, etc.)

K3TKS Emergency Key and Crystal Adapter

Here are two more interesting devices from Danny, K3TKS of Silver Spring, MD. This first is a plug-in emergency key. It uses a tiny microswitch with lever, scrounged from an old VCR. Similar switches with levers can probably be found in tape recorders, etc. For a knob, Danny glued on a button from one of wife's discarded blouses. The switch is wired to the 1/4" phone plug, and secured somehow. Danny taped his up and then covered it with the oversized cap from an old pen. He cut a slot in the side of the cap so it would slide over the switch.

At this point, the cap could be glued on for rigidity. As an experiment, after I took the picture I put a small radiator hose clamp over the slotted end of the cap. While rather hideous, it did provide good rigidity and had the advantage of allowing disassembly, which epoxy does not.

If you use miniature 1/8" phone plugs, this idea won't work, or at least won't be as easy to do. As an alternative, you could run a short piece of cable from the switch to the small plug and hold the switch in your hands while sending.

To use, simply plug into the key jack of the transmitter and have at it. It won't be as easy or convenient as a regular key, and it may be hard to send fast, but it will work fine for portable or emergency use.

Below the key is an adaptor to allow various types of smaller crystals to be plugged into an FT-243 socket. In the top of the holder is a molex-type connector which will accept wire leads or small diameter crystal pins. It's cut to fit in the holder and has six contacts. Three are wired together on each side so various pin spacings can be accommodated. Danny drilled holes in the end of the socket, or it could be cut out completely. He used a holder with a non-

Product Review:

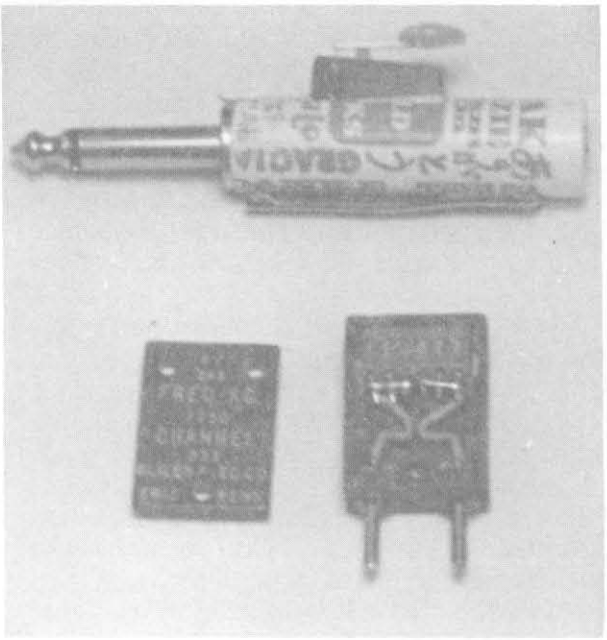
A & A Engineering's 20 Meter QRP Transceiver

by Bob Cutter, K1OG
701 19th Street
Glenwood Springs, CO 81601

Most of you have probably heard about the 20 meter QRP Transceiver featured in the December 1990 and January 1991 issues of QST. I met the designer, Gary Breed, K9AY, at last summer's meeting of the Team Colorado Group at W1XE's place in the mountains west of Boulder.

IDEA EXCHANGE, cont.

metallic cover to reduce added capacitance, which is important in some circuits. If all you have are metal covers, you could leave it off and fill the holder with epoxy.



K3TKS emergency key and crystal adapter

The Fine Print

I'm a bit far away for the time being and you can't call me to discuss them, but you can still write with your ideas for the column. Don't forget to check the first page for my address-of-the-month! Keep those ideas coming.

Gary had a prototype of his transceiver there, and I was very impressed by the innovative use of ICs, the layout, and the performance claims. When I saw the design in the December, 1990 QST, I decided to give A & A Engineering's kit version a try.

A & A Engineering, 2521 W. LaPalma, Unit K, Anaheim, CA 92801 (phone: 714-952-2114, fax 714-952-3280) has put out a very complete kit for $159.95. Features include a good looking punched enclosure, wire, and all parts. There were no shortages in my kit, and it went together easily, with the only error mine for installing a diode backwards. The assembly instructions include a copy of the two-part QST article and parts placement diagrams. The documentation is perfectly adequate for someone with a bit of building experience.

The tune-up procedures are simple and require no test equipment to speak of; I used my TWOFER as a signal source. A QSO was easy on the first try, and while I have not measured the performance, it appears to be in the same ballpark as the results published in QST. The enclosure includes a large speaker and allows plenty of room for experimenting. I built an "electronic hand key" (refer to QRP Classics, ARRL, pg. 271) into mine. I build these keying switches into my QRP rigs just to eliminate one more thing that would have to be backpacked or might be forgotten. I parallel them with the keyjack and use contacts made from circuit board material, or as in the case of the K9AY rig, two insulated brass bolt heads that fit the enclosure vent perfectly. I have no trouble making contact with one or two fingers and find I actually send CW more effortlessly than with a hand key.

If you are looking for a good, narrow-band transceiver with no obvious bugs, I would certainly recommend the K9AY, and if you are like me and have no practical way to gather the parts, the A & A Engineering kit is hard to beat. Their flyer indicates they are planning 40 and 30 meter versions. Gary did a good job in designing and bringing this rig to us, and I hope we will see more from him in the future.

A Funny Thing Happened On the Way to Saudi Arabia

by Jim White, WØNJB

[Editor's Note: This item comes from the "Watts Snoo Central Wisconsin Radio Amateurs" in Stevens Point, Wisconsin. It comes to us via a circuitous route from Bob Baird, W9NN, who sent it to Lowell Corbin, KD8FR, President, MI-QRP-Club, who sent it to us.]

If you are among the few of us who still get a big kick our of seeing the soft glow of filaments and enjoy the warmth emanating from within the old gray boxes, move over! We have a new fan in our midst: the United States military!

Saddam Hussein is not the only thing acting up in the mideast desert. Some time ago, the military phased out all of its Collins gear, mainly the classic KWM-2A, and purchased brand spanking new Harris solid-state equipment. As an aside, this is the same company which just set up the ARRL Headquarters station in Newington, CT.

Meanwhile, back in the desert, as part of Operation Desert Shield, the military techs were busy erecting support poles and stinging dipoles between them. All was well until the wind blew and the sand flew, resulting in Mother Nature's version of a Van de Graff static electricity generator. Down the coax and into the CMOS and FET front ends of all those nice. shiny, new, store-bought, fresh radios it came, then....silence.

One of the military techs remembered that a Collins engineer by the name of Dennis Brothers had been helpful in solving problems for the government in the pass. Dennis, who incidentally was one of the main designers of the KWM-2, had since retired from Collins, and currently operates Western Nebraska Electronics in Potter, NE. Dennis earns his living by keeping those old gray boxes talking.

The saga of the front ends was related to me by Dennis when I called him to find out why it was taking so long for him to perk up one of my prized gray boxes. The military had shipped 24 KWM-2A's for refurbishing ASAP. The government still had a few stashed in warehouses that we treasure hunters hadn't as yet found. Dennis tells me that he has now been hired by the Defense Department to travel around to various bases to teach military personnel the care and feeding secrets of the KWM-2.

For years, scientists have warned about the effects of EMP "electromagnetic pulse" as a result of a nuclear explosion. EMP would almost certainly wipe out the front end of any solid state device. Again, the mighty Collins KWM-2 to the rescue. We have been laughing at the Russian military for years because they continued to use tube-type equipment. Apparently, they have the last laugh in this case.

Red-faced engineers from the designers and manufacturers of the bright, shiny, full-of-bells-and-whistles stuff promise a quick-fix to the sand—windstatic electricity problem in the Saudi desert. Meanwhile, the late Art Collins is surely smiling down from the great Ham Shack in the Sky. So are the rest of us, who have always believed that "Real radios glow in the dark."

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
- **Non-technical articles:** Chaz Wooten, KD4XX; 103 W. 7th St.; Jasper, Tennessee 37347; 615-942-5116
- **QRP Contests:** Red Reynolds, K5VOL; 835 Surryse Road; Lake Zurich, Illinois 60047
- **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

The QRP Key (with a surprise inside!)

by Michael Czuhajewski WA8MCQ
Box 232; Jessup, Maryland 20794

I swap lots of parts and ideas with Danny Gingell, K3TKS. I gave him a neat little Pomona aluminum box, 1-1/8 x 7/8 x 2-1/4, with a BNC socket mounted on one end. He gave me a miniature CW key about two inches long, which came from an ancient Ma Bell telephone relay test set he got at Dayton for $5.

The set had four of them, which are pressed at various times during the procedure. I didn't really have any plans for it until Danny showed up one day with one of the keys mounted on top of his box and said we should build some tiny QRP transmitters with built-in keys.

The challenge was too good to pass up, and I scooped him by getting mine done first. Since Danny already has a CW keyboard with Twofer transmitter built into it, which I call his QRP Keyboard, this project was logically dubbed the QRP key. All but two of the people I worked in the July 1990 QRP Homebrew Sprint talked to this rig. (The other two heard my Tiny Weekender, the subject of another article.)

Construction is pretty much the same as my DB-25 rig (April 1990 QRP Quarterly) in size and type of components used. I made heavy use of monolithic capacitors, quarter inch diameter toroids and 1/8 watt resistors. Fortunately, such miniature parts are widely available nowadays.

The circuit is straight forward for the most part. I used a 2SC2498 for the oscillator due to its very small size; the clearance between the vertically mounted oscillator board and end of the chassis is very limited. If space is not a problem, a 2N3904 could be used. The VXO capacitor is a beautiful little 1/4" diameter Murata Erie trimmer that I bought from Danny Stevig, KA7QJY. There are better VXO's—the oscillator, as built, doesn't give a tremendous amount of frequency swing, but I didn't want to spend a lot of time optimizing it since the important thing was to get a functional rig in the box and beat Danny to it.

The coupling capacitor to the driver is another Murata Erie trimmer. I originally used a 270 pf fixed cap, but later decided I needed a drive control. I could have done that with a potentiometer somewhere in the circuit, but a tiny trimmer cap here saves a great deal of space, as even the smallest PC-mount pots I have are larger than the Murata Erie. Like the VXO capacitor, it is tuned with a jewelers screwdriver stuck through a hole in the box.

The driver started out with a 2N3904 and 24Ω emitter resistor, and drove the final as high as 4 watts output at times. The only problem, as I found out when I held the key down for several seconds, was that the 1/8 watt emitter resistor started to smoke and the 2N3904 ran quite hot. I replaced it with a metal 2N2222A so I could use a clip-on heatsink if needed, and changed the resistance and wattage of the emitter resistor.

The driver is the only keyed stage, controlled by the 2N3906. I chose to let the oscillator run all the time, applying constant voltage to it in transmit mode, to reduce the possibility of some of my old crystals chirping. The keying circuit is pretty much a standard, from circuits by W1FB and others.

The final amp is a Japanese CB output transistor, 2SC799, which I also bought from KA7QJY. It's billed as a good replacement for the 2N3553 in QRP rigs, but a lot cheaper since RF Parts recently raised the price on the latter to $3. It's rated at 3 amps maximum Ic, FT of 150 MHz and maximum Pd of 10 watts. While the 2N3553 has an FT of 500 MHz, the '799 beats it in the other two categories. For use at HF, either one has a high enough frequency rating.

The clip-on heat sink I use does not have fins to dissipate heat directly; rather, it is designed to be mounted on a chassis, which then dissipates the bulk of the heat. There is no room for fins in this rig, as spacing is quite tight all over. The idea was that when the lid was placed on the box, the heat sink would be screwed to it for additional sinking. As it worked out, I leave the cover off all the time, since I'm always showing off the rig, and at the 1.5 to 1.8 watt level the finless sink appears to be adequate by itself.

Note the ubiquitous 33 volt zener diode on the final for SWR protection. I had always intended to install it eventually. One day I put an RF probe on the collector of the final with the load deliberately disconnected, while the rig was still designed to put out 4 watts, and got a read-

ing of 52 volts RMS—that's 73 volts peak! The 2SC799 is rated at 40 volts on the collector, but this one survived. I quit procrastinating and put the diode in immediately.

The output net is a standard 50Ω low pass filter. I try to run the transmitter at 1.5 watts or so output, since that's the level at which the final has a 50Ω impedance. If I had left it at the 4 watt level, I would have had to wind a transformer on a ferrite core to match the final to the filter. I wound the coils, on T25-2 cores, to give the nominal value of inductance required, and then built the filter on a breadboard with the components that later went into the rig. I did some testing and adjusting to make sure it performed properly before shoehorning it into the box. For the center capacitor I used two 470 pf monolithic caps stacked on top of each other to save space; I didn't have a single unit with the right value.

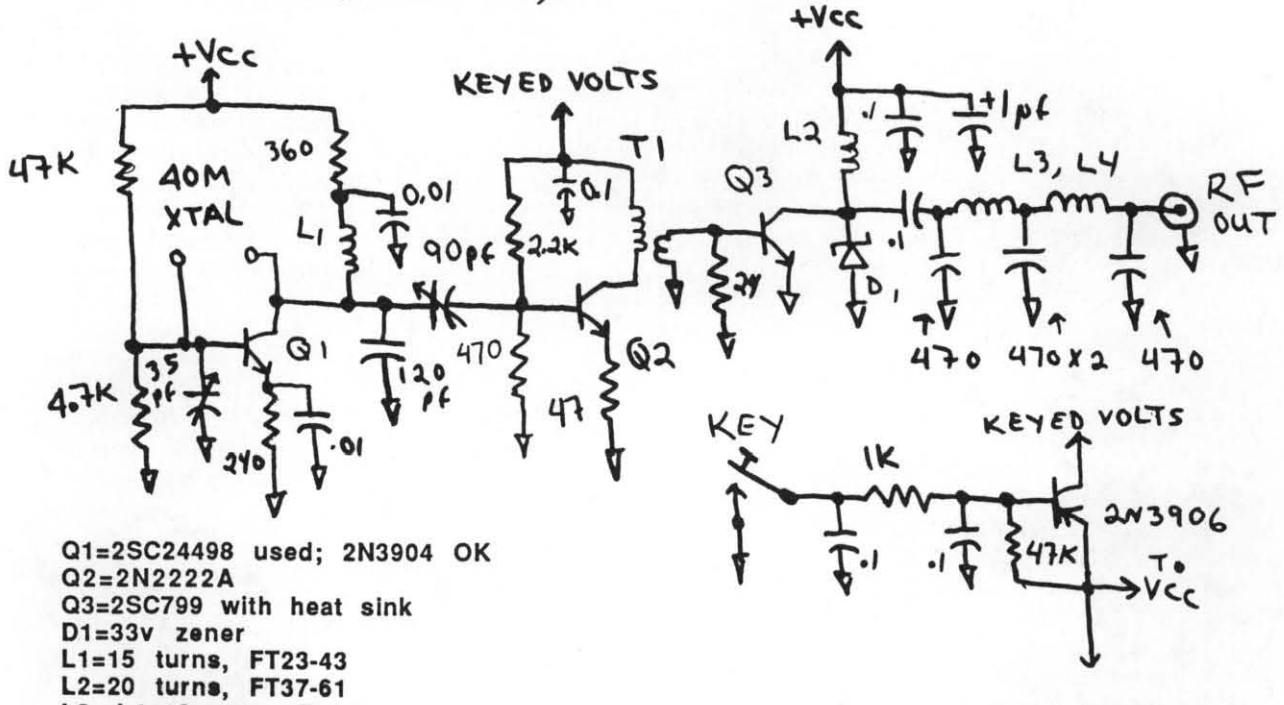
For the series coupling capacitor between the final and the filter, I used a physically large 0.1 µf monolithic. Some time ago KB1MJ warned me about the dangers of using monolithic caps to pass significant amounts of power—essentially the same principle as using a half-watt resistor when you should be using five watts.

Danny K3TKS pointed out to me that since the only frequency sensitive part of the rig was the output filter we should leave them out and use plug-in filters for the band in use. We both picked up a number of Pomona boxes with BNC connectors at a local hamfest last year, with that idea as one potential application. In fact, I did build filters for 40 and 20 meters into two of them. I didn't like the idea of using an external filter on this particular rig, though, as an add-on would detract from the visual impact. (I would also have to put everything into the box!) However, I do slap on the 40 meter filter sometimes as additional protection against TVI.

Power is fed into the rig with a piece of RG-174 miniature coax. The BNC output connector is mounted with only three screws; the fourth hole was drilled out a bit and threaded with a 6-32 tap. The coax is screwed into the hole and there is just enough bite from the threads to provide some strain relief.

Building something with this many parts in such a small box is not a trivial matter, as anyone who has actually done will quickly admit. Still, having built a DB-25 rig already, this one would be "just another tiny QRP rig" to me except for the key mounted on top, which gives it a bit of mystique. It should also silence some of the non-QRP hecklers around here who occasionally tell me I should build a QRP rig into the base of a key!

THE QRP KEY—WA8MCQ
(40 METERS)



Q1=2SC24498 used; 2N3904 OK
Q2=2N2222A
Q3=2SC799 with heat sink
D1=33v zener
L1=15 turns, FT23-43
L2=20 turns, FT37-61
L3, L4=16 turns, T25-2
T1=primary 15 turns, seconday 3 turns on FT23-43 Power: +12 to 13.8v in transmit

THE ROCKLOOP

by C.F. Rockey, W9SCH
Box 171
Albany, Wisconsin 53502

Note from Idea Exchange editor Mike Czuhajewski, WA8MCQ: C.F. Rockey, W9SCH is a long-time QRPer, going back to the days of the Milliwatt and provides the following info on his miniature antenna. While the general rule of thumb is that an outside or full size antenna is better than an indoor or reduced size one, not everyone can put up something outside and a compromise antenna is better than NO antenna! In sending along his article, Rock writes:

"Don't laugh, doggone it, the silly thing really works! (I wouldn't believe it either if I hadn't experienced it.) Even with my lackadaisical DX chasing ways I have worked 37 countries on all continents with the thing—no more than five watts, too. I think this might be one cheap bu t helpful answer to the poor fellow ensconced in a fancy condominium where outside wires are strictly verboten." (This article has previously appeared in The Five Watter, Journal of the Michigan QRP Club).

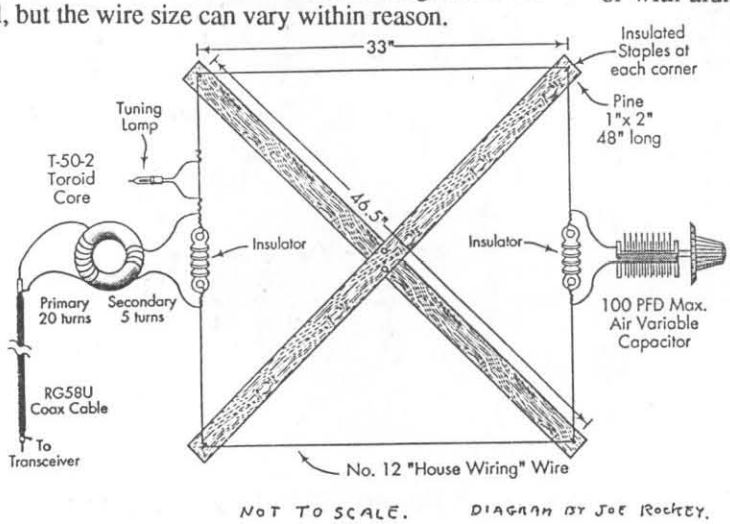
The Rockloop is an effective, easily constructed, compact antenna for the amateur frequency bands between 21.5 and 10.1 MHz and for a maximum power of 5 watts CW or 10 watts PEP SSB. Since it is compact enough to fit inside nearly any amateur shack, use it when an outside antenna may be inadvisable. You can easily make the Rockloop at a very small cost with ordinary hand tools.

Its performance has been proven on the air. Located in a ground floor ham shack and supplies with 5 watts, the Rockloop has completed contacts in 36 countries on five continents using the 21 Mhz and 14 Mhz bands. Other foreign contacts include Costa Rica and Cuba on the 10.1 MHz band. I've made domestic contacts from coast to coast and from Canada to Texas using only 100 milliwatts of power, and hope to increase this DX score as time passes.

BUILDING THE ROCKLOOP

Make the frame from two 48-inch lengths of one by two inch pine mortised together at a right angle at their centers. Finish and stain the wooden frame for neatness. Form the loop conductor itself from 12 feet of number 12 B&S "house wiring" wire (available from any hardware store). Fasten the wire to the frame at each corner using insulated staples.

Wind the coupling transformer between the loop and the RG-58 coaxial cable upon a T-50-2 iron core toroid. The primary winding (connected to the coaxial cable) consists of 20 turns and the secondary winding (connected to the loop itself) is of five turns. Number 22 enamelled magnet wire is suggested, but the wire size can vary within reason.



NOT TO SCALE. DIAGRAM BY Joe Rockey.

Use a 100 pf air dialectic capacitor for tuning since mica or plastic capacitors might not tolerate the RF voltage. Keep the leads between transformer and loop and capacitor and loop as short as possible.

Clip the tuning lamp out of a discarded 35 or 50 lamp miniature Christmas tree light string and shunt it across two inches of the loop conductor near the feed point (see diagram).

TUNING THE ROCKLOOP

Connect the coaxial cable to your transceiver to the middle of the band of your choice, and adjust the power output to about two watts. Rotate the tuning capacitor (allowing for the inevitable hand capacity effect) until the tuning lamp glows at greatest brilliance. Once the Rockloop is in tune, you may increase the transceiver output up to 5 watts if desired.

USING THE ROCKLOOP

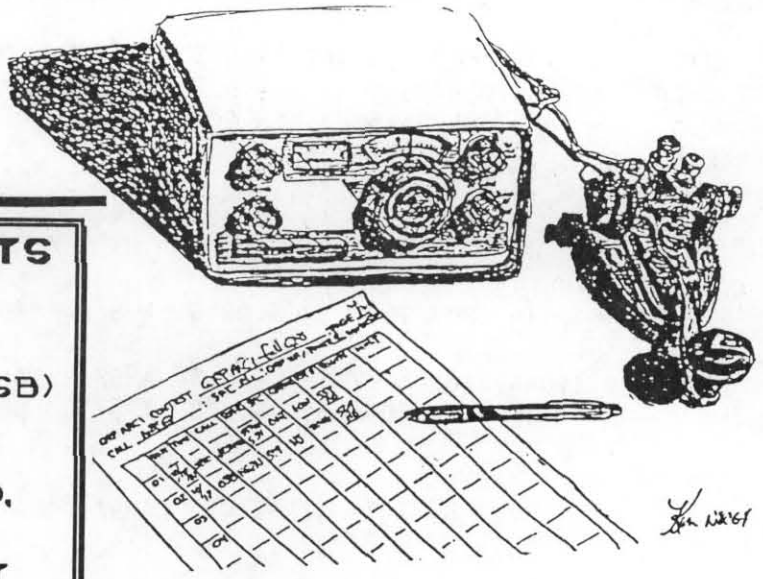
Keep the Rockloop as far as possible from large metal objects and wiring which might distort its radiation distribution. For best results, I recommend keeping the plane of the loop vertical, or nearly vertical. Although there is a sharp radiation null on each side of the loop plane, these are scarcely noticeable in operation, and the loop is nearly omnidirectional. Theory suggests pointing an edge towards your favorite direction, but it's hardly worthwhile providing for rotation.

One final caveat: If your home uses aluminum siding or with aluminum covered insulating board, no indoor antenna will work well for you (radiation from within a metal-shielded box can hardly be expected).

Gain figures for the Rockloop aren't available, but its performance compares quite favorably with an 80 meter, center fed Zepp outdoor antenna at W9SCH, particularly in the 21 MHz band. While performance is a bit less favorable at 10.1 MHz, the Rockloop still works surprisingly well. For a three foot indoor square of wire, what more can you ask? QRP

Contests

Red Reynolds, K5VOL
835 Surryse
Lake Zurich, Illinois 60047



UPCOMING CONTESTS

SUMMER HOMEBREW SPRINT (CW)
JULY 14, 2000-2400Z

***

SUMMER DAZE SPRINT (SSB)
AUGUST 11, 2000-2400Z

***

FALL QSO PARTY (CW)
OCT. 19, 1200Z, TO OCT. 20, 2400Z

***

HOLIDAY SPIRITS SPRINT (CW)
DECEMBER 1, 2000-2400Z

1991 SPRING QRP ARCI QSO PARTY RESULTS

TOP TEN

1	W3TS	1,761,560
2	W1XE	1,712,550
3	WØKEA	1,456,098
4	KH6CP/1	1,119,480
5	KR1S	1,044,228
6	K3TKS	850,500
7	W5TTE	578,200
8	WØUO	483,084
9	N1BYT	476,840
10	NN1G	415,844

SINGLE BAND

40M	W8MVN	232,766
20M	NZ8J	133,700
15M	WD7I	173,340
10M	WX7R	70,196

HI/LO BAND

LO-Band	KN1H	269,520
HI-Band	W5TTE	578,200

CALL	SCORE/POINTS/SPC	POWER	BANDS /TIME	RIG	ANTENNA
ALABAMA					
W4DGH	26,040/ 155/ 16	4.0 B	H-2/ 7	Argosy-2	Yagi
ARIZONA					
WD7I	173,340/ 321/ 27	1.0 S	15M/21	IC-725	Inv Vee Array
N7HID	15,288/ 91/ 12	5.0 S	H-3/ 3	HW-9	Yagi
CALIFORNIA					
W6MVW	216,580/ 455/ 68	5.0	A-5/ -	TS-580S	Gp/Zepp
KI6SN	12,920/ 880/ 9	1.0	40M/ 2	HB TX/RX(S)	Dipole

COLORADO							
W1XE	1,712,550	1165	105	4.0 S	A-7/24	IC-740/IC-551	Yagi/Vert/IV
WOKEA	1,456,098	937	111	5.0 S	A-5/21	Argo 509	Yagi
WOUO	483,084	648	71	5.0 B	A-4/ -	IC-740	Yagi
NO1BT	72,072	286	36	5.0	A-4/10	TS-830S	Dipole
K1OG	20,525	69	15	.99 B	20M/ 5	HB K9AY XCVR	Yagi/G5RV
NOMID	9,842	74	19	5.0	A-4/15	Argo/Drake	Yagi
CONNECTICUT							
KH6CP/1	1,119,480	767	72	.98 S	A-6/24	HB 160/80/40/ Argo 515	Dipole/Vert
KR1S	1,044,228	818	89	5.0 S	A-5/ -	Argosy 2/m	Dipole
NN1G	415,844	584	67	4.0 B	A-6/14	HB XCVR/TS-130	Windom
FLORIDA							
K4KJP	97,216	217	32	2.0 S	A-4/ 8	Argo 509	Yagi/Dipole
WN2V	45,472	203	32	1.8	A-4/ -	IC-725	Loop
ILLINOIS							
WD9IWP	342,000	342	50	.90 S	A-3/ 7	IC-735	Inv Vee
*K5VOL	178,451	481	53	2.0	A-5/ 7	Argo 509	Longwire/Gp
W9NJP	43,612	197	28	5.0	A-3/ -	HB XCVR/TS-820S	Zepp
W9AG	31,668	174	26	5.0	A-4/ 6	Heath 104A	Vertical
NF9X	23,850	106	15	.80 B	H-2/ 6	TS-130V	Vertical
WM9V	17,074	99	18	5.0	A-3/ 4	HB XCVR/TS-140	Dipole
W9ETU	8,948	47	8	2.3 B	40M/ -	HB W7EL/m	Inv Vee
KE9GG	8,332	34	7	5.0 S	20M/ -	HB Travel R	Yagi
WA9QMO	5,900	20	3	.80 B	40M/ -	HB W7ZOI XCVR	Zepp
MAINE							
WA1WPR	83,506	241	33	5.0 B	A-5/ -	HW-9	Dipole
MARYLAND							
K3TKS	850,500	567	75	.90 S	A-5/17	Argo 509	Loop/Vert
WA3EOP	187,460	515	52	5.0	A-5/ 8	FT-757	Indoor Dipole
WA3GYW	33,726	146	22	2.0 B	A-4/15	HW-8	Dipole
N2US	26,040	155	24	5.0	A-4/ 5	Argo 505	Vertical
MASSUSETTS							
N1BYT	476,840	486	47	.80 S	A-4/ -	HB XCVR(S)	Loop
WB1GJI	363,241	534	63	5.0 B	A-5/ -	HB 40/80/Argo 515	Quad/Dp
KZ1L	35,280	126	20	5.0 S	A-3/ 5	Tentec	G5RV/Loop
KB1RT	14,914	52	9	1.1 B	A-2/ 3	HB RCVR(S) (2) Ugly Weekender/Universal TX	Loop
NX1K	10,790	83	13	1.0	A-3/ 6	HW-8	Windom
MICHIGAN							
N8CQA	399,840	595	64	4.0 B	A-5/20	HW-9	Inv L
K8CV	30,209	137	21	5.0 B	20M/ 3	Argo 515	Yagi
MISSOURI							
KOLWY	119,679	278	41	4.0 B	A-4/13	HW-9	Yagi/G5RV
WOGWT	45,570	210	31	5.0	A-4/ -	IC-735	Vert/Random
NO1ZZ	26,754	147	26	5.0	A-4/ 2	TS-520	Zepp

NEVADA							
K9AY/7	27,134/	124/	17	5.0 B	20M/ 5	HB K9AY(S)	Vertical
NEW HAMPSHIRE							
N1CUU	305,584/	518/	56	5.0 B	A-5/24	HW-9	Butterfly/Windom
KN1H	269,520/	389/	34	.90 S	L-3/ -	Argosy/m	Dipole
NEW JERSEY							
W2JEK	40,540/	111/	20	4.0	A-5/ 5	HB 2-FER	Dp/Gp/Wire
K2HPV	30,744/	244/	18	4.0	40M/ 5	IC-725	Dipole
KE2WB	28,028/	154/	26	5.0	A-5/ 4	HW-9	Lw/Vert
NEW MEXICO							
W5TTE	578,200/	490/	59	.90 S	H-3/16	Argo 509	Loop
NEW YORK							
W2QYA	303,705/	397/	51	.90 B	A-4/18	HW-8	Longwire
K2LGJ	121,960/	311/	36	.90	A-2/12	HB 2-FER TX/ W7EL RX	Yagi/Vert
AA2Y	115,290/	366/	45	5.0	A-5/15	Argosy 525	Yagi/Inv Vee
WB2QAP	69,580/	284/	35	4.0	A-4/ 5	Argo 509	Yagi/Vert/I Ve
WN2Q	9,464/	104/	13	4.0	20M/ 2	HW-9	Attic Loop
OHIO							
NC8X	334,768/	488/	49	5.0 S	A-4/14	HW-9	Loop
W8MVN	232,766/	493/	33	2.0 S	40M/20	HB XCVR	Loop
NZ8J	133,700/	382/	35	.90	20M/14	Argo 515	Yagi
N8LRH	43,808/	198/	28	4.0	A-2/23	HB RX/TX/Wnwd	Vert/Dipole
KF8FF	19,880/	142/	20	5.0	20M/ 4	HW-9	Portable(ARRL)
OKLAHOMA							
WM4Z	86,247/	333/	37	5.0	H-2/ 4	Argo-2 proto	Yagi
WD5GLO	59,682/	203/	28	3.0 B	H-3/ 3	Argo 509	Yagi/Inv Vee
K5DP	43,500/	174/	25	.90	A-3/ 5	HW-9	Longwire
OREGON							
W7LNG	89,290/	290/	43	5.0	A-4/ 7	HB 1933 PP45/ R4B/T4XB	Yagi/Gp
WX7R	70,196/	218/	23	4.0 S	10M/10	IC-735	Quad/Lw/Vee Bm
PENNSYLVANIA							
W3TS	1,761,560/	981/	88	.90 S	A-7/16	HB XCVR(S)	Yagi/Tee/Dp
N3FGQ	19,152/	144/	19	4.0	A-4/ -	HW-9	Dipole/Vert
KA3YEA	3,220/	46/	10	5.0	A-3/20	TS-430	Dipole
RHODE ISLAND							
WA1OFT	149,086/	463/	46	4.0	A-4/ -	HW-9	Dipole/Vert
KA9HAO	67,620/	147/	23	.75 S	A-3/11	Argo 515	G5RV
TENNESSEE							
WB4O	146,400/	244/	40	1.0 B	A-3/ 6	TS-440S	Yagi/Windom
KV4B	94,830/	218/	29	.90 B	A-4/ 4	IC-745	Yagi/Inv Vee
TEXAS							
NK5V	28,350/	150/	27	4.0	A-4/10	IC-735	G5RV
AA5WE	6,272/	64/	18	5.0	A-2/ 1	TS-430S	DX VI

UTAH						
K6XO	183,540/ 460/ 57	5.0	A-5/ 7	---	---	
VIRGINIA						
W4XD	306,670/ 674/ 65	5.0	A-4/20	Swan 102BX	G5RV/Vert	
KI4RO	85,960/ 307/ 40	4.0	A-4/ -	HW-9	Longwire	
N4ROA	43,712/ 181/ 23	2.0 B	15M/13	HW-8	Quad	
WY7U	9,253/ 45/ 9	3.0 B	A-4/ 2	HW-8/CB/m	Dp/Vert/Loop	
WASHINGTON						
WM7P	265,697/ 433/ 58	5.0 B	A-5/19	HB TX-40/TS140S	Vertical	
WISCONSIN						
WN9U	114,245/ 285/ 27	.80 B	20M/ 8	Argo-515	Inv V	
KB9W	67,905/ 269/ 35	5.0	A-3/ 8	HB 40/HW-8/ 75A4	Yagi/Dipole	
QUEBEC						
VE2ABO	48,608/ 224/ 31	3.0	A-5/11	HW-9	Yagi/Loop/Dp	
VE2BLX	17,157/ 129/ 19	4.0	A-4/ -	TS-850S	Longwire	
ITALY						
IOKHP	1,372/ 28/ 7	5.0	H-2/ 1	TS-430S	Yagi/Loop/Dp	

CHECK LOGS: WX7R, KN1H, W9CUN, AE9G, WB5FKC

Time of operation rounded to nearest hour
S=Solar/natural power
B=Battery power
(SPC)=States/Provinces/Countries
(Dp)=Dipole
(Lw)=Longwire
(Gp)=Ground Plane
***=Contest Manager, not eligible**

(L-)= Low Bands (160-40)
(H-)=High Bands (20-6)
(A-)=All Bands (160-6)
/m=modified
(S)=Superhet
HB=Homebrew

TEAM COMPETITION

East Coast Milliwatts	**4,764,428**
(K3TKS, KH6CP/1, W3TS, KR1S)	
Colorado QRP Team	**3,651,732**
(W1XE, WØKEA, KRØU, WØUO, NØZA)	
Harper Air Hawks (HAH)	**520,451**
(WD9IWP, K5VOL)	
North East Illinois QRP Society	**66,792**
Team #1 (KE9GG, N9NJP, WA9QMO, W9ETU, WK9C)	

Results: Classic Sprint 1991

Class A—less than 1 watt out

Call	QTH	Band(s)	QSOs	QPts	S-P-C	Bonus	Total	Gear
KN1H	NH	40 meter	22	110	13	500	1,930	509/Dipole
WK1G	CT	40 meter	23	115	14		1,610	440/Loop
K8DD	MI	5 bands	19	95	13		1,235	515/Dipole
K2LGJ	NY	4 bands	12	60	9	500	1,040	509/Vertical

Class B—1-5 watts out

N8CQA	MI	5 bands	40	200	27	500	5,900	CLn/InvL
NN9K	IL	40 meter	17	85	12	500	1,520	509/InvL
N9GPF/8	WV	3 bands	15	75	10	500	1,250	509/InvV
N2CX	NJ	2 bands	7	35	6	500	710	C21-2A/GP
WA1OFT	RI	15 meter	10	50	8		400	HW9/Vertical
KB1MJ	MA	20 meter	5	25	5		125	HW9/Dipole
WA1WPR	ME	2 bands	3	15	2		30	HW9/Dipole

Only 11 logs were received, but not bad for rotten conditions and little PR. Contest will be listed in the major mags for 1992. K5VOL and I will get the certificate issue resolved at Dayton (including the 1988 certificates). Thanks to all who entered, see you in '92 (yes, the 509 is a "classic" now). de: Buck Switzer, N8CQA

PRESIDENT'S MESSAGE

by Paula Franke WB9TBU

If you've been watching the news lately, you're aware of the volcano eruption in the Phillipines. Readers of the Idea Exchange also know that the IDX editor, Mike Czuhajewski WA8MCQ, is stationed at Clark Air Force Base, which was recently evacuated.

We haven't heard from Mike since the evacuation, but we're assuming that mail delivery to him will be disrupted for a time. Those mailing items to him for the IDX should keep copies of everything. This holds true for anything that gets sent to anyone. Just in case.

On the home front, northeastern Illinois has been the site of a record number of tornados this spring/summer season. Since April, we've had tornado watches every other day and warnings at least once a week. Severe thunderstorms have been a regular occurrence and my basement has flooded so often I'm afraid the property tax assessor will add the value of an indoor swimming pool to my tax bill. Fortunately, the severe weather appears to be slacking off for the time being.

Just when life in general seems to be going along relatively smoothly, reality pops in to keep things in perspective. After two years of not-too-serious health problems, my husband suffered a major setback in June that put him back in the hospital for four days. Recovery this time will be tricky because a couple other problems were uncovered, but we'll continue to take things a day at a time and hope for the best.

There isn't enough room in this issue to go into detail, but the QRP gatherings were great successes at both the Dayton HamVention and Hamcom in Arlington, Texas. In our next issue we'll have an extensive photo spread and story of both conventions and the ARRL National Convention in Saginaw, Michigan.

New Member/Renewal Data Sheet

Full Name_____ Call_____ QRP Number_____

Address_____

City_____ State or Country_____ Postal Code_____

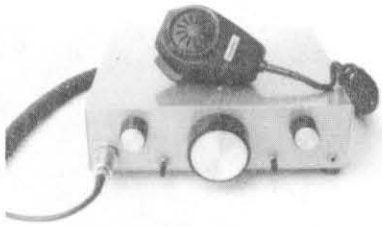
[ ] New Address?
[ ] New Call?
Amount Enclosed _____
**** Please do not send cash! ****

[ ] New Member (US $12, DX $14/£7)
[ ] Renewal (US $10, DX $12/£6)
Please make your check or money order payable to: **QRP ARCI.** Note: Renewals must be received 30 days be fore publication.

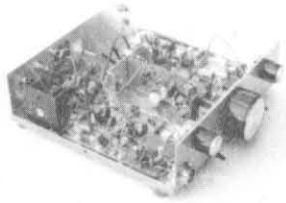
Mail to: Mike Kilgore KG5F
2046 Ash Hill Road
Carrollton, Texas 75007

UK address: Dick Pascoe GØBPS
3 Limes Road
Folkestone, Kent CT19 4AU

Warm up those soldering irons!



Turn to page 4 to see how
P. David Ingalls, KD7SE
put together this nifty
40 meter DSB transceiver



Coming up in the October 1991 issue:
- **A QSK Direct Conversion Transceiver for 80 meters**
- **QRP photos from Dayton, Arlington and Saginaw**
- **50 Ohm Loop Antennas**

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You don't want to miss the next issue!

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