October 1996

72

THE NEW ENGLAND QRP NEWSLETTER

NE-QRP Club
P.O. Box 2226
Salem, NH 03079

First Class Mail

TO:

72 - THE OFFICIAL
NEW ENGLAND QRP NEWSLETTER

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THE DEADLINE FOR THE NEXT ISSUE OF 72 WILL BE JANUARY 4, 1997.

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Have a Happy Thanksgiving

New England QRP Club

THE WHITE MOUNTAIN SSB TRANSCEIVER

-or-

How I Spent My Summer Vacation

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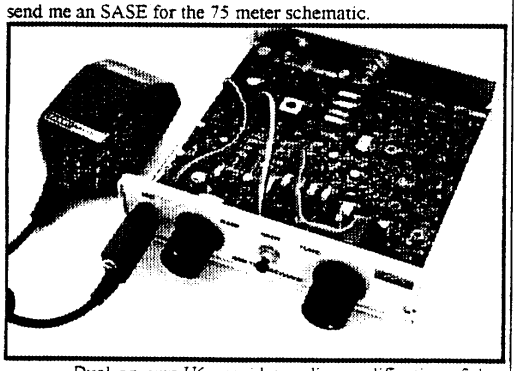
I have to admit right up front that this project took a bit more than a summer vacation to bring to fruition! I had mentioned it at Dayton '95 as being in the works, but spare time has a way of getting away from most of us. This effort has been under development ever since, and was inspired by the growing interest in home brew SSB. This time around, however, I've avoided the use of the ubiquitous NE602 mixer where practical, and the choice pays off in improved IMD performance.

The single-sideband transceiver uses a conventional design approach through its use of separate transmit and receive filtering. In these days of inexpensive microprocessor crystals, the dual filters aren't really a cost discriminator (and in addition, it eased the printed-circuit layout complexity). I developed both the 20 meter and 75 meter versions; the schematic shows the 20 meter version. Interested readers can send me an SASE for the 75 meter schematic.



Dual *op-amp* U6 provides audio amplification of the speech signal from the microphone. Gain is set through adjustment of potentiometer R1. Diodes D3-D4 and the associated 4.7K resistor provide "soft" limiting to prevent overdrive of the RF chain and subsequent splatter. The microphone function is handled by a standard HT speaker/mike. This transceiver uses the Icom/Yaesu-compatible unit, and Radio Shack and MFJ also provide compatible versions at about half the price. Although this isn't the cheapest approach, it's helpful from the packaging and standardization viewpoints.

A Colpitts oscillator (Q12) runs at approximately 6.2 MHz to furnish LO injection to both the transmitter and receiver. A varicap is used for tuning to provide coverage of roughly 150 kHz. Q13 and T6 provide buffering and deliver 5+ mW of LO injection to both transmit and receive mixers. The broad frequency coverage dictates that some kind of reduction drive be employed to make the tuning rate usable. I use a 10-turn 100K linear pot, although a good air-variable cap with verneir mechanism is also fine. If this approach is used, the capacitor ties to L3 or either end of C18.

Diode-ring mixer U7 generates 8.00 MHz DSB from audio and RF (oscillator stage Q9). Thanks to the mixer's good inherent balance, no carrier null adjustment is required. Diode-ring mixer U8 mixes the SSB signal with the 6.2 MHz LO to generate RF at both desired (14.2 MHz) and spurious (1.8 MHz) frequencies. In my first test of the receiver, I applied an antenna directly to the first mixer. I was startled to find a whopping CW signal from W1AW until I realized I was picking up the receiver's 160M image! [*food for thought* for top-band enthusiasts.] RF level at the output of U8 is approximately -10 dBm (0.1 mW) for each of these two signals. The tuned circuit following amplifier Q11 rejects the spurious energy as well as other unwanted mixer products.

The 75 meter version initially also used an 8.000 MHz IF, an attractive approach given my ample stock of crystals for that frequency. This proved to be a bad choice for reasons which became apparent when I ran the transmitter up to the high end of the band. With the LO approaching 4 MHz (from the high side), the LO feed-through from the second TX mixer was down only 30 dB, and spurs of all orders converged on the upper band edge! Equally annoying, the receiver heard super station WCC on 4345 kHz. This proved to be a product of the LO third harmonic (12+ MHz) and 8 MHz IF. A number of spreadsheet trials later, I settled on 9.83 MHz as an IF for 75 meter. Incidentally, most of the microprocessor crystal frequencies in the 6 through 10 MHz region prove to have strong short wave services parked on or near the frequencies, bad news for IF feed-through problems. The 75 meter version yielded several close-in spurs at two predictable "birdy" frequencies; however, the larger of these spurs is down 41 dB.

Driver stage Q14 delivers approximately 150 mW of drive to the power amplifier. The emitter biasing for this stage provides base bias for the PA, a neat idea from Zack Lau's '95 Handbook SSB design. This biases the PA just on the threshold of conduction.

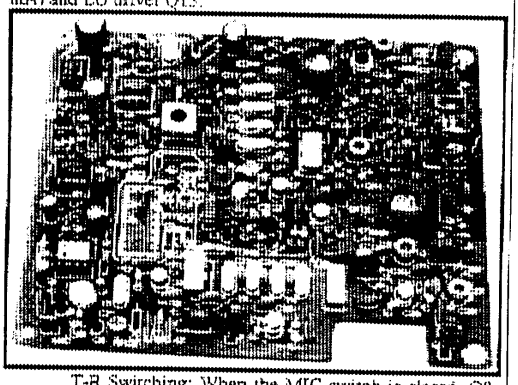
The PA stage is capable of delivering about 8-9 watts PEP on 20 meters. Performance is characterized at its design value of 6W PEP, and yields an IMD 3 result of -36dB PEP. Because the PA stage is single-ended rather than balanced (push-pull), second harmonic energy at the PA collector is significant. The output low-pass filter is a 7-pole Chebyshev design to provide rapid *rolloff* above its design cutoff frequency. Second harmonic energy, as well as 20 meter spurs, tested at -45 dB or better at 6W PEP.

The front-end filtering uses a pair of tuned circuits, comprising L1, L2 and C1-C6. The J309 FET (Q1) provides 8 dB of gain to overcome the conversion loss of the first mixer. The front-end filtering provides approximately 70 dB of 20 meter image rejection. Mixer U1 converts the filtered input signal to the 8.000 MHz IF. While the combination of *pre-amp* and mixer is more involved than the usual NE602 front end, this complexity pays off in superior intermod resistance. Mixer U1 is followed by a post amp with roughly 20 dB gain. This stage is followed by a 6 dB

pad to keep it stable. The pad is required because the crystal filter effectively presents a load only around its passband.

Crystals Y6-Y9 and associated capacitors form the receiver IF filter. Filter bandwidth is approximately 2.2 kHz. Adjacent-sideband rejection was measured at -40 dB and filter loss is 3 dB. The MC1350 following the filter provides approximately 30dB gain. The IF tuned circuit configuration is a direct lift from the earlier GM-series rigs.

The audio output stage is the 8-pin version of the LM380, rated at 0.6 watts output. This device draws more idling current than the usual LM386, but it's worth it in terms of audio quality. Idling current on the transceiver as a whole is about 120 mA, a consequence of the design emphasis on improved intermod performance. A significant portion of this total is budgeted to the mixer postamp (20 mA) and LO driver Q13.



T-R Switching: When the MIC switch is closed, Q8 begins conducting, and comparator U3 provides sequenced control signals to both the receive mute functions and the transmitter DC bias. Vsw (switched). Vsw turns on about 15 mS after the MIC is closed. This ensures that the large audio transient which accompanies the MIC switch closure doesn't go out on the air. There's a brief transient when the microphone opens: this "feature" is shared by many of the SSB rigs heard on the air.

Audio muting is provided by FET switches both before and after the receiver audio amp. This was necessary because the close proximity of the speaker and microphone elements in the Speaker-/Mike forces a high degree of "off-isolation." During development, I looked at using just a series switch at the receiver output. Unfortunately, the rail-to-rail output swing of the AF amp "bled through" the series FET. While the classic shunt FET at the input alone successfully shut off the AF amp input, the amplifier is designed to center its output at half the supply voltage. This means that the AF amp output swings in time with the voice modulation envelope when a run-down battery supply is used. The resulting audio feedback yielded a *garbling* sound, for lack of a better term! This effect was cured handily by **Heroic Measures** in the form of the two switches.

The transitions between receive and transmit are smooth and quiet, without unwanted clicks or pops. I couldn't resist adding AGC this time, despite the compromise an audio-derived scheme entails. The audio output signal is peak-detected and fed back to the gate of Q3 to serve as an automatic gain control (AGC). The onset of AGC is at a fairly high input level and serves mainly as ear protection when tuning across pileups. The PNP transistor Q16 inverts and slightly amplifies the AF output. Adjustment pot R2 compensates for variations in the control FETs turn-on threshold (0.8 to 3.0V) and allows adjustment of maximum audio level. Incidentally, the 2N7000 FET deserves a second look, since it offers some interesting characteristics. An enhancement-mode device, its gate is positively biased with respect to the source, like a bipolar device. Unlike the bipolar transistor, however, bias current is negligible. Transconductance is high, and my experience with several samples indicates that it hangs in there well into the VHF region. Gate-source capacitance is about 50 pF, though, so it's not a high-impedance input device for RF. On-resistance is low-about .5 ohms. The best part?-it's cheaper than the familiar MPF102.

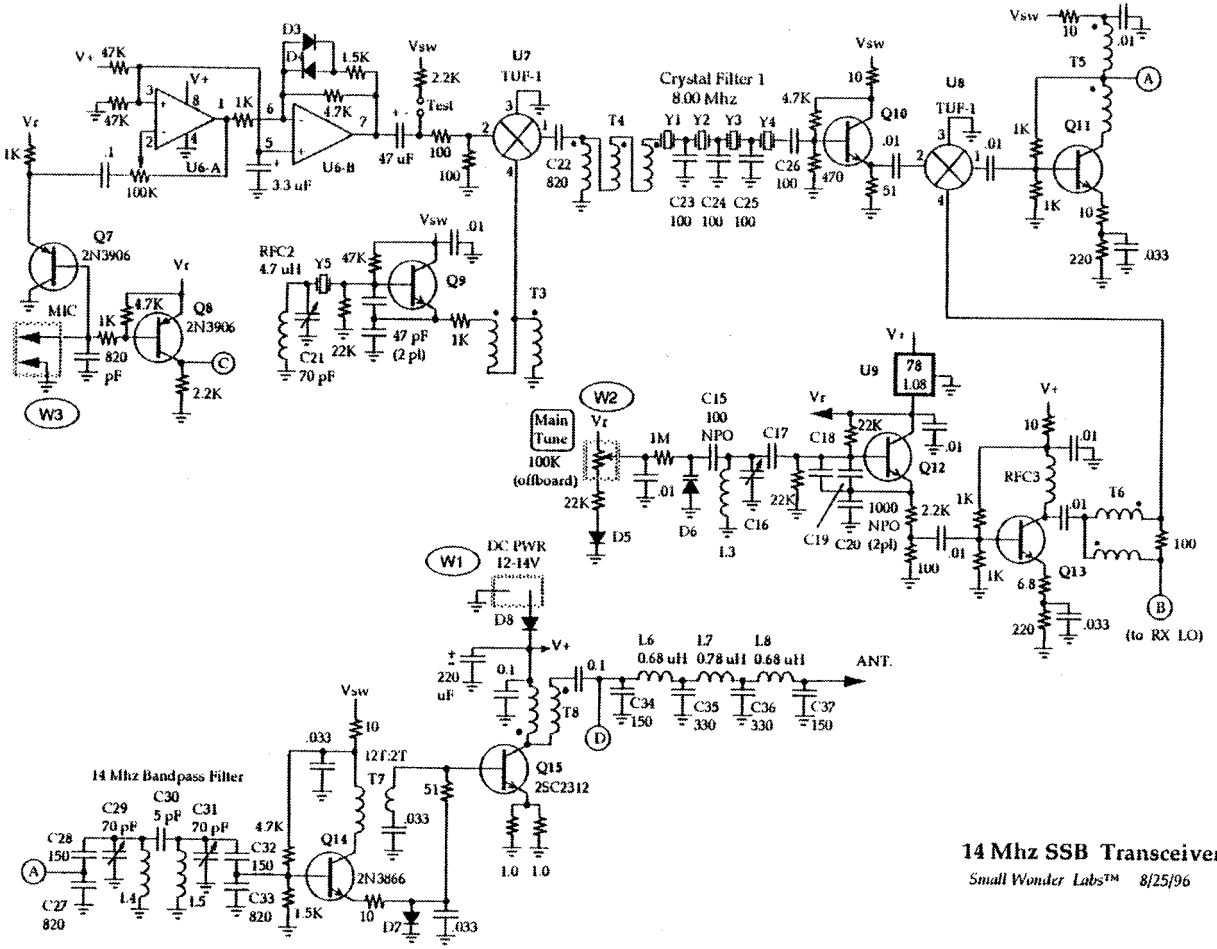
Alignment is a pretty straightforward process. Receiver response is peaked with trimmers C3 and C4 and IF transformer T2. For the transmit mode, install a dummy load at the antenna connector. The 'test' connection near U1 is *jumpered* to inject a steady carrier and the MIC connection needs to be shorted to ground. Peak C21 for maximum carrier and then peak C29 and C31 for maximum output power. Note that C21 then needs to be readjusted for best transmitted audio intelligibility before you put it on the air. Don't forget to remove the test jumper-you won't impress people who have to listen through your carrier! AF level pot R1 is adjusted according to your preferred distance to the microphone, and is typically run nearly all the way up. AGC pot R2 is initially set to mid-scale then and adjusted for maximum audio output level. Happy homebrewing and see you on 75 meters!

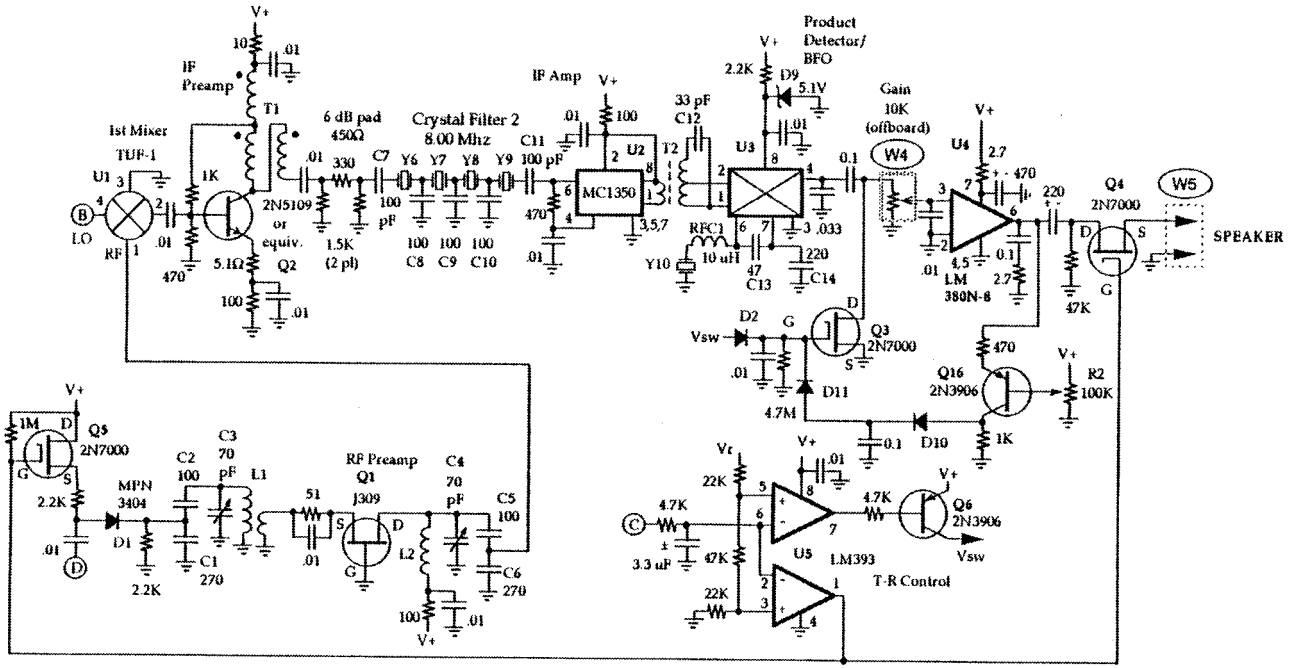
[Contact me for information in the kit version of this project. Both the board-only and full-up versions are available. If you're 'rolling your own' and need some of the specialty parts for this project, contact Pat Tendam (buckeye@alpha.wcoil.com) at Buckeye Electronics. He carries the balanced mixers and diodes, as well as many of the better-known small parts for this project.

Dave Benson - NN1G

The list below shows parts not described on the schematic.

C16- 2-27 pF trimmer (Digikey SG-3004)	C34-37- NPO (C0G monolithic) or silver mica
C17-0.0047 uF polystyrene	C18-1000 pF polystyrene
C19,20-1000 pF NPO (C0G monolithic) or silver mica	D3-D5, D10, D11-1N4148
D6- MV1662	D7- 1N4001
D8- 1N5818	L1- primary 17 turns #26, sec. 6 turns on T-37-2
L2- 17 turns #26 on T-37-2	L3- 18 turns #26 on T-37-6
L4,5,6,8- 13 turns @26 on T-37-2	L7- 14 turns #26 on T-37-2
T1, 4-4 turns trifilar on FT37-43	T2- 10.7 MHz Interstage transformer-green (Mouser 42IF123)
T3, 5, 6- 4 turns bifilar on FT37-43 core	T7-primary 12 turns #26, sec. 2 turns on FT37-43
T8-6 turns bifilar on FT37-43 core	U3- NE602A
Q9-Q13- 2N2222A	


14 Mhz SSB Transceiver
Small Wonder Labs™ 8/25/96
Crystal Filter 1
8.00 Mhz
14 Mhz Bandpass Filter
DC PWR
12-14V
Main Tune
100K
(offboard)
MIC
ANT.
(to RX LO)



14 Mhz SSB Transceiver

Small Wonder Labs™ 9/2/96

A Phone Call To Mama

"Hi Mama, it's me Joel....

"What do you mean 'Joel who?' It's me, Joel. I want to tell you about my QRP activity. No Mama, it's not illegal... immoral or anything like that.... What do you mean, 'Then it can't be fun.'?

"QRP is using 5 watts or less to make ham contacts....

"No Mama, I'm not nuts....

"Yes Mama, that's about as much power as the night light in the baby's room....

"You see, I bought this new $700 radio for QRP and...yes Mama, that's $140 per watt..., but Mama—*what cha' mean I was always the dumb one!*

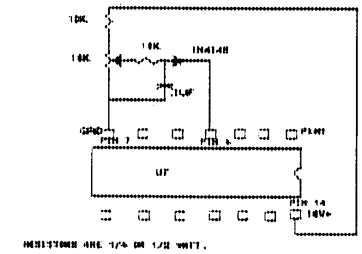
"What's your name woman?...You ain't my Mama...!

"That makes you happy...? Good...'cause that makes me happy too...."

Bye now. Mama's loving son.

Joel Denison - WA5CVM
jdenison@aisp.net

RF Gain Control For INDEX Labs QRP



RESISTORS ARE 1/4 OR 1/2 WATT.
POT IS 1/2 WATT LINEAR TAPER
UNF IS BASE TYPE

LOOK AT PAGE 10 IN QRP+ MANUAL FOR LOCATION OF U7.
IT'S SMALL ABOUT 2 INCHES TO THE LEFT OF THE
DIAGRAM LABLE. IT ALSO APPEARS IN OTHER PLACES WITH
OTHER PIN DESIGNATIONS.

FILE IS MAIN1.SCH

REPRODUCED FROM A DIAGRAM SENT TO ME BY BRUCE PRAMLEN
OF INDEX LABS.
DE K1LGQ
ENNIE

The New England QRP Club

The Excitement is Building!

Comments from the Other Side Of The Desk

Dennis Marandos - Editor 72 Newsletter

A few of you know what work goes into making an issue of any newsletter, but I want to reinforce what you always thought. The newsletter you're reading now was composed by different members on the NE QRP Club and edited by me for all to read. The process is very sample. The e-mail route is the fastest, the diskette is always a sure bet and of course snail-mail is always best.

After your editor receives your material, it is then placed into a format which is what you're reading now, that is...margins, center line, cnsp fonts and picture location. It might look as if everything just fell onto a page, but there is a great deal of cut and paste to make sure end page margins fit and that all the material is located on the right pages. Sounds easy...? Sometimes it's not.

A newsletter with 24 to 36 pages requires a lot of editing and proofreading and more proofreading, but you know—no matter how much you read sometimes a little error gets by. Ask any editor and they'll tell you where all the mistakes are located.

A newsletter needs to print in multiples of four, that is—four pages, or sixteen, or twenty-four, etc. This is so the printer won't have a blank page to send out. The format is very important and one which plays a BIG role in what will be the subject matter. The size for this newsletter is a standard 8½X11 inches which allows for bigger schematics and pictures of some size. About two decades ago, the printing industry abandoned the small booklet-type newsletter for the larger format to include today's newest styles and picture layout. We agree and feel it has a greater advantage over the smaller brochure-type booklets.

On another idea, every editor simple loves to have a lot of material for their publication, or to say it differently...not having enough material to print is like a bare cupboard in your kitchen. Once a year, **you should make it a point to send at least ONE item, story, picture, or technical article to your local newsletter.** Yes, there are several who belong to over a half dozen clubs, but the one closest to you, in spirit and mind, should be your home base. It's like the local baseball team whose patrons are out of state—not much attendance on the home front.

Every month, throughout the year, your local club will sponsor an on-the-air contest, a Saturday meeting, an ice cream social, a builder's night, etc. for the convenience of bringing fine people together to share their favorite hobby. Get involved and go to these events, participate on the air and meet who your friends are. Some of the finest people on the air are in your club. Get to see who they are.

The cooler months are approaching and we're heading inside from the cold. Now is the time to make plans to meet the members and begin plans for a long winter of getting together. Let the RF keep us warm. See you on the air.

Dennis Marandos - K1LGQ, Editor 72

The DDVFO

Steven Weber - KD1JV
Box 140, Gorham, NH 03581

The stability of your rig is more important today then it ever was. (Doesn't hurt in your personal life either, but that's another issue, one I don't think we want to get into!) With more and more Hams using DSP audio filters, you need a very stable transmitter to stay within the DSP filters' passband. If you want to use a DSP filter, your receiver must also be very stable.

Here's an example. Not long ago, I called CQ on 4.040 MHz. I got an answer from another QRP station, decent signal, about a 500-600 mile hop. I sent my info and turned it over for his report. I Didn't hear a thing. Oh well, the band shifted and I lost him. It happens all the time, right? I started to tune around, and there's that station turning it back to me, a good 400 Hz down from my frequency! I looked at my filter and sure enough, I had it set to the narrow setting, so I didn't hear him when he came back. Not a peep. I ended up tracking him 2.5 kHz down the band to finish the QSO. This is an extreme case, but he was using a popular QRP transceiver kit, so it may not be all that uncommon.

How do you ensure that this sort of thing doesn't happen to you? Go digital! Thanks to the latest in high speed digital electronics, we now have a viable alternative to tuning capacitors or complicated, troublesome Phase Lock Loops, something called DDS.

What is DDS?

DDS or Direct Digital (frequency) Synthesis is a means of directly reproducing a sine wave using digital techniques. Once relegated to low frequency operation (your touch tone phone uses DDS to make the tones) and expensive military or commercial radios, DDS is now available to the masses, thanks to a relatively new chip made by Analog Devices called the AD7008.

How does DDS work?

Here's the technical details. A block diagram is shown in FIG 1. A 32 bit phase word corresponding to the desired frequency is first written into the chip. This word is used by a phase accumulator to produce a linear phase ramp which has a period proportional to the phase word and a reference clock. The phase ramp is sent to a sine wave look up table, which outputs a 10 bit data word corresponding to the instantaneous amplitude of a sine wave at that particular point of the phase ramp. The sine data word is then sent to a Digital to Analog Converter (DAC), which will output the proper analog amplitude at that point of the phase. In the case of the AD7008, any frequency between DC and 25 MHz may be reproduced. The sine wave is actually made up of small voltage steps.

There are, however, a couple of drawbacks to this technique. These drawbacks are undesired frequency spurs that are an inherent side effect of the DDS processes. One set of spurs is called alias images. These spurs are a product (±) of the base frequency being generated and the reference clock frequency and all the harmonics there of. These spurs are effectively removed by a low pass filter on the output of the DAC. The closer to the request frequency of ½ the reference clock the DDS signal gets, the better the low pass filter required to keep the low order product (F_{ref}-F_{fun}) from the output.

The second source of spurs is "glitch energy." This is energy stored in the DAC latches that is transferred to the analog output when the latches change state. These spurs are particularly troublesome as they fall within the pass band of the low pass filter and can occur at any frequency, above or below the desired signal. Generally speaking, the amplitude and number of spurs increases with the frequency being generated by the DDS chip. Spurious Free Dynamic Range (SFDR) is a measurement of how good a DAC is in generating a signal. The better the SFDR, the better the DAC. In the case of the AD7008, the SFDR is -50 dBc or better, depending on the frequency span you look at. Although this is not real good, it is much, much better than earlier DDS designs and it is adequate for QRP transmitters to amplify directly and stay within FCC spectral purity regulations.

There is also one other little detail. Operating at a clock speed of 50 MHz, the AD7008 draws a little over a half watt of power! Might be a bit much for your battery operated rig.

How do you use one of these fantastic DDS chips?

You need a little computer. You may have seen earlier DDS designs that required a full fledged PC or thumbwheel switches for use, but clearly, this is not all that practical a solution. What is needed is a dedicated "imbedded" microprocessor. That is why I designed the DDVFO. While I was at it, I included features that are handy to have in a radio and designed it so it could replace just about any VFO you might have. Since so many Hams like to turn knobs rather than push buttons to tune a radio—I'm one—the VFO is knob tuned. The VFO can be tuned in select tuning steps of 1 Hz to 100 kHz. The tuning rate (steps) are indicated by LEDs.

Features of the DDVFO

First, the DDVFO does not include a frequency display. This is done for a couple of reasons. One, it helps keep the costs down. Two, it makes the VFO smaller. (The VFO board is just 2.5" x 4") Three, in many applications, a display is not needed and would only be redundant. Finally, most, if not all, of you already have a frequency counter that can be used to set up the VFO.

Since the DDVFO can cover a frequency range of DC to 22 MHz, just by adding a frequency counter makes a great signal generator for your R&D bench. You can even add a variable resistor and have a vari-

able output level. I suspect that a lot of these VFOs will be made just for this application. There are two signal output jacks (PC mounted–RCA jacks) on the DDVFO board: one is a direct connection to the low pass filter, the other is buffered and is normally used to drive a counter. The output signal level is nominally 1 volt peak-to-peak and just by adding a MMIC amplifier would give you a decent QRP transmitter just by itself!

The DDVFO includes RIT and a memo memory features which are very handy when using the VFO to run a radio. A fixed frequency offset can be programmed to be either added or subtracted from the base operating (transmit) frequency. This facilitates using the VFO to run a transceiver with either a superheterodyne or direct conversion (DC) type receiver. A transmit/receive (T/R) input is, of course, required to use RIT and the receiver offset.

As noted earlier, the DDVFO can be used to replace the VFO in almost any type of rig. If the rig already has a frequency-counter type display, such as my Ten-Tec Scout, you are all set. If you wire up a couple of jacks and have one output to the VFO built into the rig, and another to input the signal from the DDVFO, you can set up a switch and have dual VFOs. With a little more work, you can use one VFO for transmit and the other for receive. If your rig doesn't have a counter type display, you can add an adapter, such as the one sold by S&S Engineering.

Furthermore, you may forgo a display all together. You can program the tuning limits into the DDVFO, which is what you would do when replacing an existing VFO, or adding it to a rig that is crystal controlled. An LED flashes when you get to either end of the tuning limits, so you know when to tune the other way. Also, you can opt to set the VFO to tune a given portion of a Ham band, say 7.025 to 7.075 MHz. You may not know exactly where in the range you are operating, but you do know for a fact that it is within the correct limits.

In order for the uP to remember its user programming, it requires a memory back up. This is accomplished with a 0.1 farad "super cap" and/or batteries. The super cap will retain memory for a week or so. For long term back up, a couple of AAA batteries or a lithium "button" cell can be connected directly to the board.

A small ¼ size DIP 50 MHz crystal oscillator is used as a reference clock. This gives a typical warm up drift of about 5 Hz per MHz. Therefore, at 1 MHz you may see a 5 Hz drift, while at 10 MHz it would be 50 Hz. After warm up, there will be very little, if any, additional drift.

Okay, I'm sold, how do I build one of these things?

Because this project requires a custom programmed computer chip, and it is difficult to find the AD7008 in single quantities, I am offering a kit. The kit includes the printed circuit board, all the board mounted parts, LEDs, rotary encoder and, of course, an instruction booklet. It does not include a box or switches. (You need a toggle and a push button) The kit costs $110.00 plus $5.00 for shipping. (Yes, I know this is a lot of money, but the AD7008 alone costs almost 40 bucks and the encoder is another 20.) But, I'm sure you will find this project well worth the expense. [KD1JV, Box 140, Gorham, NH 03581] E-mail questions and comments welcome - KD1JV@JUNO.com

By the way, I do have another version available with an LCD display and more features for $150.00.

Steven Weber - KD1JV

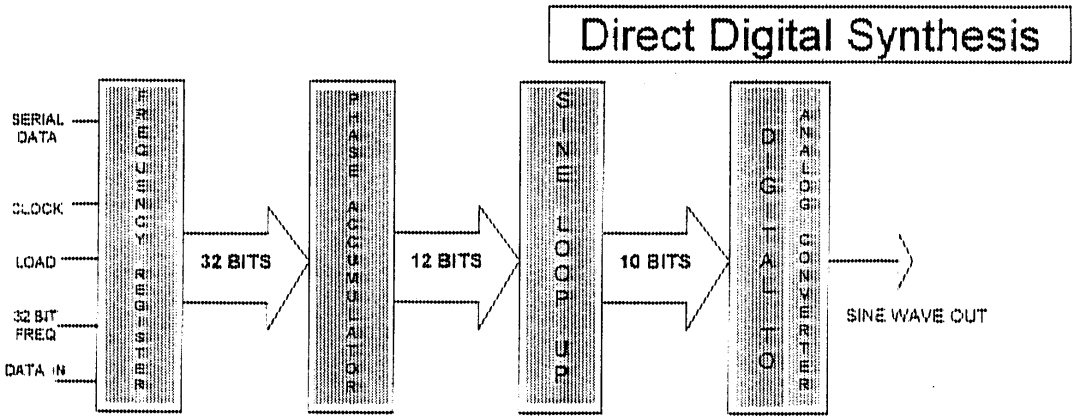
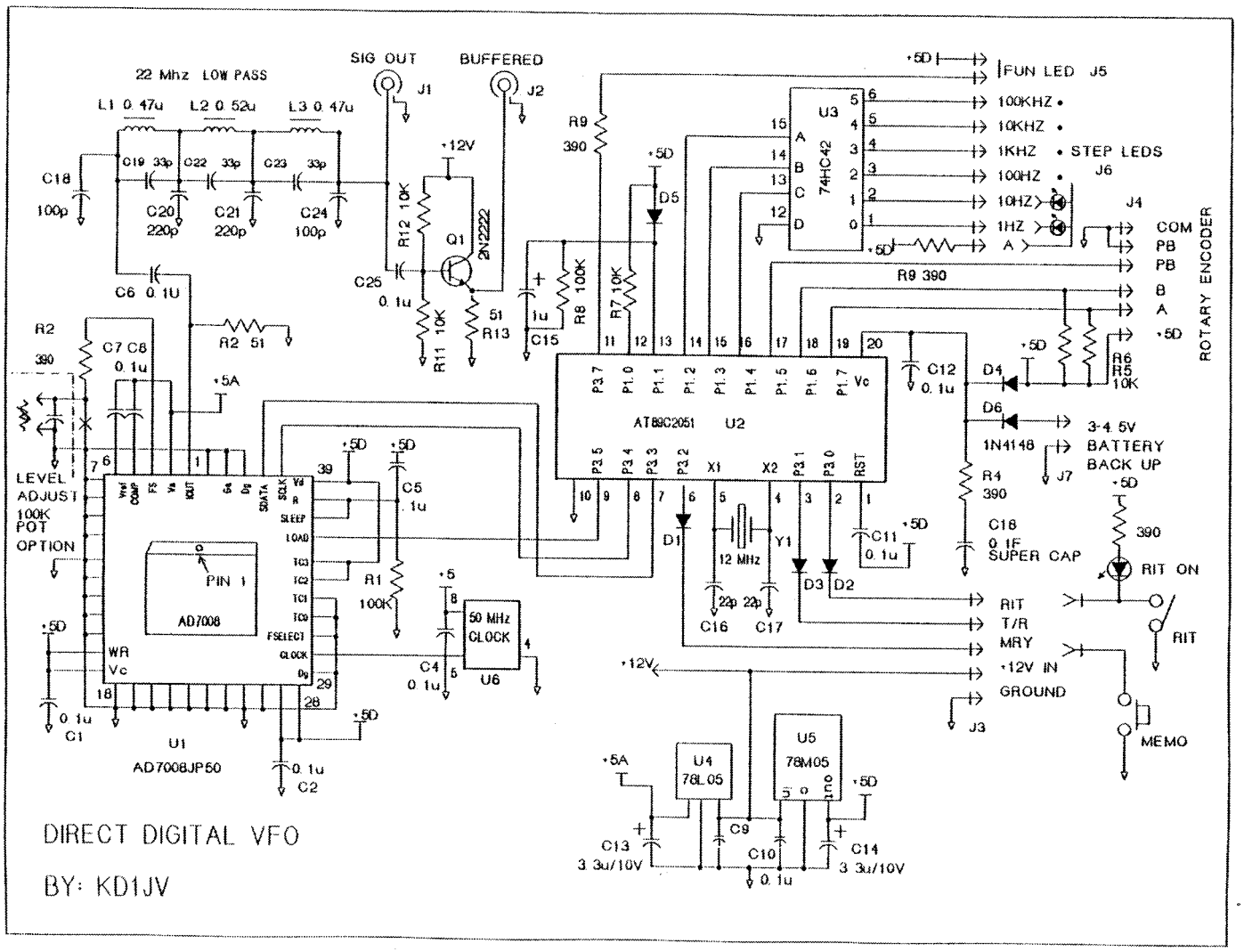
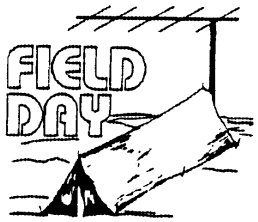


Figure #1 DDVFO


22 Mhz LOW PASS
L1 0.47u
L2 0.52u
L3 0.47u
SIG OUT
BUFFERED
J1
J2
+12V
Q1
2N2222
C18
100p
C19 33p
C22 33p
C23 33p
C20 220p
C21 220p
C24 100p
C25 0.1u
R12 10K
R11 10K
R13 51
C6 0.1U
R2 51
R2 390
C7 C8 0.1u
+5A
LEVEL ADJUST 100K POT OPTION
PIN 1
AD7008
U1
AD7008JP50
WR
Vc
C1 0.1u
C2 0.1u
C5 .1u
R1 100K
C4 0.1u
50 MHz CLOCK
U6
C15 1u
R8 100K
R7 10K
R9 390
D5
U3
74HC42
+5D
FUN LED J5
100KHZ
10KHZ
1KHZ
100HZ
10HZ
1HZ
A
STEP LEDS
J6
J4
COM
PB
PB
B
A
+5D
ROTARY ENCODER
R9 390
R6 R5 10K
D4
C12 0.1u
AT89C2051 U2
P3.7 P1.0 P1.1 P1.2 P1.3 P1.4 P1.5 P1.6 P1.7 Vc
P3.5 P3.4 P3.3 P3.2 X1 X2 P3.1 P3.0 RST
D6
1N4148
3-4.5V BATTERY BACK UP
J7
R4 390
C18 0.1F SUPER CAP
C11 0.1u
12 MHz
Y1
C16 22p
C17 22p
D1
D3
D2
390
RIT ON
RIT
RIT T/R
MRY
+12V IN
GROUND
J3
MEMO
+12V
U4 78L05
U5 78M05
C13 3.3u/10V
C9
C10 0.1u
C14 3.3u/10V
DIRECT DIGITAL VFO
BY: KD1JV



QRP-Battery FD in 1996

Floyd Soo - KF8AT

President Utica Shelby
Emergency Comm. Assn., Inc

The Utica Shelby Emergency Communications Assn. (USECA) has been known for putting on the largest Field Days in North America when it comes to visitors to our site. At times, we have had close to 400 people sign-in on our guest register. We are also well known for our hospitality and the fact that nobody leaves our FD site hungry! When it comes to food, NOBODY EVEN COMES CLOSE! We welcome all with open arms, and almost all of the visitors bring a dish-to-pass. We have supplied the roast pigs in the past and the last 2 years, we have supplied several hundred sirloin steaks and large home-brew charcoal grills so everyone can grill their steaks as they like. The side dishes, desserts, snacks, etc. are plentiful and last all weekend!

The USECA has been knocking on the door of placing in the Top 10 overall in North America for several years running without really trying. In 1994, the club made a concerted effort to get into the Top 10, which we accomplished by placing 8th. Just to prove to ourselves that it wasn't a fluke, we did exactly the same thing last year, placing 8th overall again! We were talking at the end of last year's FD about doing something a little different, and QRP came up as one of the suggestions.

It took some convincing at first, there were many skeptics, but after a while, most all of the club decided that it was worth a try. We paid attention to the same details that we did the last couple of years and the suggestions from some of you! Most were in agreement that high performance antennas, low loss feedlines, plenty of food and drink, and sufficient *ops* to make it through the night without any down time for key stations; were the main points to pay attention to. That's just what we did, and it may have paid off!

Normally, set up begins late Friday afternoon. We then have a Bar-B-Q and then the all ham band **QRM** plays classic rock and roll into the wee hours of the night.

Saturday morning was glorious! Both Saturday and Sunday were PERFECT for FD! Temperatures were in the 70s with a little breeze to keep the bugs at bay and keep the area cool. Set-up continued on Saturday, with breakfast and lunch being served at the appropriate times of day. At 2 PM, the contest started. At 5PM the great *steak-in* began! What a feast! We weren't proud and just pigged out! The contest continued into the evening with most stations staying on the air all through the night, especially the big point *getters* like 20, 40 and 80 CW and phone.

Sunday dawn was beautiful! We were visited by a hot air balloon at antenna top level just after sunrise! Breakfast was great as usual, and the contest continued in earnest. Sunday was another gorgeous day! After lunch was served (steaks, hamburgers and hot dogs along with all the fixings!), the contest continued until 2 PM. Tear down went on without a hitch, and all of a sudden, it was over again for another year! Virtually everyone that participated learned a lesson or three! What a fabulous learning experience this FD was! Everyone was so excited about what happened that weekend, that our repeater has been buzzing with QRP FD activity since then!

Some of the lessons learned: Running QRP power levels placed the phone *ops* at a much greater disadvantage than the CW *ops*. Going from 18 or 19 generators to 1 this year made it so quiet, that people are calling for another QRP FD for that reason alone! It IS possible to hold a frequency with 5 watts! (for a short while, anyway) One good deep cycle battery was sufficient to run most state of the art rigs at QRP power levels for 24 hours. We worked anybody we could hear, even though it may have taken more calls than we were used to. The lack of noise and interference was great! FD was still fun, even though we didn't make as many contacts as the last couple of years.

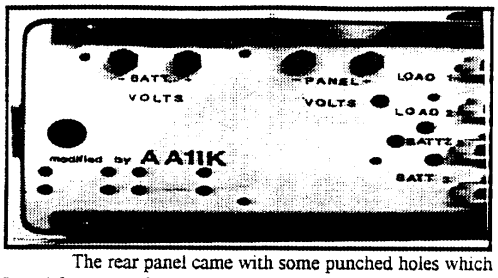
Some initial numbers and information at this time because there are many of you who are curious. The USECA Club ended up running 16A, QRP-battery. Our original plans were to run 17A, but a death in the family of one of our station chairpersons precluded him from participating. Sixteen-A it was! All but one phone station did not achieve their point totals from last year. I believe that all of the CW stations equaled, and many bettered, last year's scores. Our final point total according to the ARRL is 15,530! **WOW**! That's a good 2,000 more points than we had the last two years! Unfortunately, they were unable to tell me just where we placed in the standings. Hopefully, this means that we will be in contention for top 10 or better! Most interesting antenna was the vertical 160 meter delta loop that was supported by surplus weather balloons! The upper 2 corners of the delta were balloon supported and the feed point was the bottom corner of the delta. It stayed up all night and worked pretty well! The 160 meter CW station also had a 300 foot, end-fired wire supported by a kit all day Saturday! The 80 CW station boasted a PAIR, count 'em, TWO, ¼ wave verticals that were phased. They also had a dipole too. The 40 meter phone station used five sloping dipoles equally spaced around a 70 foot support. This antenna was easy to steer using a relay box and ¼ wave feeders. The 40 meter CW station used a caged dipole supported at one end by a tree, and at the other end by a 43 foot vertical. The bottom 33 feet was made up of 4-inch aluminum irrigation tubing and was loaded as a vertical. These two antennas worked great! There were also the usual assortment of three element Yagis, dipoles and verticals.

This gives us a final point tally of 15,530 Points! I can say this—we have always run generators before; the lack of noise, EMI/RFI and physical noise was fabulous! Our club is tempted to do this all over again for this reason alone! In our minds, the silence (in the field) was golden!

Floyd Soo - KF8AT

The NEW ENGLAND QRP CLUB

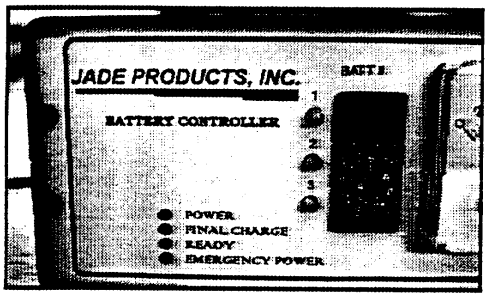
THE EXCITEMENT IS BUILDING



The rear panel came with some punched holes which I used for some of the modification. The AC power cord fits in a prepunched hole but the other cable holes had to be drilled or cut. By the time I cut the last slot for the power plugs, I managed to cut the holes correctly and they didn't need tooth pick shims.

There is not a lot of room left over with a 7.0 AH battery inside the enclosure and placing the plugs, voltage test pins and fuses was planned carefully. In order to fit the battery into the box, the meter pins were trimmed, a tight fit, but it worked.

Each battery is individually fused and switched. All or any combination of the three batteries in the bank can called upon to deliver power. Bear in mind here that a battery is a group of individual cells arranged in such a way as to produce a desired voltage. A battery of guns in a fort, if you will, is a good analogy. So, a ***Battery*** is a group of individual gel cell enclosures producing 12 volts each. I have one inside the controller, and three others outboard. Two of these are hooked up in parallel to form one unit that is connected as a single unit to the charger. This makes a total of four gel cell ***Batteries*** that form my battery bank.

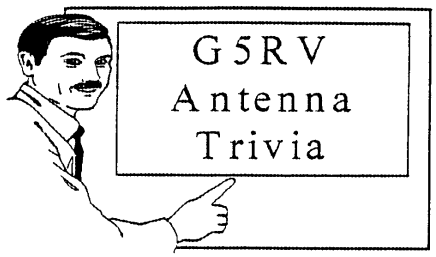


This was a fun project and a practical one too. I use the controller by itself for powering VHF radios as well as HF. This portable power means I can use packet, RTTY, CW, and SSB just about anywhere. This is a great Field Day setup.

If you want to try this modification and need more information, write to me E-mail, gregoire@endor.com or packet aa1ik@w1wok.fn+3.nh.usa or a phone call to 603/523-9003.

72/73

Ernie Gregoire - AA1IK



Al Bates - W1XH

Chelmsford, MA

If you have tried them all, but keep scratching your head for one more—the following notes will give you an insight to an antenna which has gained an abundance of popularity. Here's some trivia about the G5RV antenna system and antennas in general.

1. **G5RV Dimension**: The antenna is designed for 14.230 MHz in the 20 meter PHONE band. If you plan to operate mostly CW, you might use 103¼ feet which is for 14.057 MHz. The change won't have any effect at all.

2. **G5RV Length** - Critical or Not? That would be "not." Changing the dipole dimension (102 feet) by plus or minus ten percent will not have any effect on the signal. A full size 80 meter (135 feet) dipole fed with ladder line will work better than a G5RV antenna system. Again, you won't be able to tell the difference.

3. **Half-Size and Quarter-Size G5RV**. The half-size version is designed for 28.460 MHz which is okay. The quarter-size version is designed for 56.920 MHz (TV Channel 2) which is just plain silly. The double size version (204 feet long) is designed for 7.114 MHz and will be hard to load on 20 meters. There are better alternatives. *(See paragraph 10.)*

4. **G5RV All Band Antenna?** No, it is not. With an adequate transmission line tuner*, it will work on any amateur band. Of course, that0's true of any antenna.

5. **G5RV Antenna Won't Work on 30 Meters.** It may be hard to load, but it will work. Quite well, too, thank you. It depends on your transmission line tuner*.

6. **The Length of the Coax is Critical.** No, it is not. You are just moving the transmission line tuner*. You are also kidding yourself. It would be better if you could do without the coax.

7. **G5RV for Other Bands.** The standard model is designed for 20 meters. It can be scaled up or down for other bands depending on the amount of space and your operating preferences. Dimensions? Check your textbook on antennas. You do have one of them, don't you?

8. **Oversize G5RV Antenna Systems**: The standard G5RV is a 3/2 wave dipole. Performance will improve if you increase to 5/2 wave, 7/2 wave, or 9/2 wave. Again, check your antenna textbook for the correct formula to use.

9. **Balun. Don't use one.** On bands other than 20 meters, some baluns will fold and die. The impedance is weird. A coiled coax choke might help, but is hardly worth the effort.

10. **General Purpose Alternative to G5RV Antenna System.** Put up as much wire and as high in the air as you can. It does not have to be straight. Feed it with open wire or ladder line. This is not an original idea.

11. **General Statement About Antennas**: On transmit, an antenna will radiate all the power you can feed to it. Size has nothing to do with it. The trick is getting as much power as possible to the antenna.

12. **General Statement About Antennas** (Part II): On receive, the more wire you have, the more signal it will intercept. The trick is getting as many of these microvolts to your receiver.

13. Standing Wave Ratio (SWR): When you find out what it really is, you will learn to stop worrying about it.

Al Bates - W1XH

footnote: A "Transmission Line Tuner" is not an "Antenna Tuner". Nobody tunes the antenna. Everyone tunes the transmission line. An "Antenna Tuner" must be mounted at the antenna. This will give better results, but is inconvenient.

The Cajun Who-dat Antenna

JOEL WA5CVM

Greetings once again from the state of Maine. I hope all is well and everyone is getting ready for the winter DX. The cool air this morning reminded me of home. (south Louisiana, Cajun Country.) I moved to Maine in the summer of 93, and I had an antenna in Louisiana that was really something.

Every evening I would talk with the guys at the South Pole, and chat with the guys in South America. This was in the late 60s and I was using a WRL DUO-BANDER. This was an eighty and forty meter SSB rig. I think it ran 60 or 120 watts output. The rig was easily converted for CW use, but that's another story.

I was using the rig one night and wondered if I could make an effective antenna with the parts that were around the house. I was using a dipole and didn't want a quarter wave vertical, yet most of my room for antennas was straight up! For whatever reason, I decided on a half-wave vertical pole for forty meters. Cushcraft's R-7 was non-existent in those days. I did some calculating and figured that I needed about 66 feet of pole with rope guys and my wife's permission to put this thing up.

I talked, pleaded and agreed to various things to get the wife's permission. The kids thought it was a great idea but I really shouldn't have been all that concerned because the wife divorced me ten years later. Now, that's another antenna story!

I found a 50 feet telescoping TV mast, and they were quite common those days, a king-size coke bottle, some rope, an eight foot ground rod, and one of my fishing poles. I was ready! On top of the 50 foot Telescoping pole I taped a cane pole and made the over all height a bit over sixty feet. Realizing this was short for what I needed, I connected a wire to the TV mast and taped it to the cane pole and made a few turns of wire around the pole and ran the wire to the tip of the cane pole, which was secured with electrical tape, and left the wire sticking another 6 inches from the pole. I was determined to get as much height as I could.

Having measured the pole, I collapsed the sections of pipe down to twelve feet plus the 15 foott cane pole. I then inserted a ground rod. This is usually not too much of a task if you use water to soak the ground as you insert the ground wire. Sure enough, the eight foot of copper ground rod went into the ground just fine. I ran four radials for forty meters and four for eighty meters and then tied the eighty meter ground wires to a
chain link fence that surrounded the back yard.

Next on the list was to find four anchors for the rope guys. I found four metal fence poles that were anchored in cement and used them as my foundation. At this point I needed some help so I had a few friends over to help me get the vertical up. I wanted a solid base for the vertical so I used a king sized coke bottle for the insulator on the bottom. I dug a four inch hole for the coke bottle to rest in and drove four pieces of pipe into the ground about three from the coke bottle. I then ran the first guys to their anchor and raised the TV mast on top of the coke bottle. I secured these guys. I did not want that first ten feet of mast to move so I dropped and secured the bottom of the mast, as it sat on top of the king sized coke bottle with the rope from the guys just three feet away.

To test the sturdiness of this setup, I climbed up the ten foot mast and shook around a bit. Nothing moved so I pronounced it secure. I then secured four guy ropes to the mast at each ten foot interval. Using a ladder I got in position at the first set of guys, about 10 ft. Off the ground, and passed the guy ropes to my helpers. They kept tension on the guys as I pulled up each section of TV mast. Once this was done, I climbed down the ladder and secured each guy wire to the fence posts, starting with the lowest one first.

There it was, my half wave vertical for forty meters. I was proud and thought it was a thing of beauty. The wife just looked and told the kids to stay out of the back yard!

Can you picture this young Cajun papa, on a mild fall day, sitting with friends and admiring the antenna of his dreams? Here he is with a quarter-wave vertical on eighty and half wave on forty, a brand new Duo-Bander and a wife that is now offering affliction instead of affection. I miss that antenna....

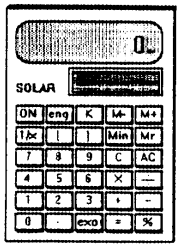
I used a relay to change the coax from a parallel tuned circuit, link coupled, to the antenna and a direct connection to the antenna. Needless to say the match was just fine with no reflected power on forty and not much on eighty. From 3.5 MHz to close to 3.9 MHz, as I recall.

In action, the antenna gave me excellent ground wave coverage on eighty and forty meters and was just fantastic to South America and the Antarctic. I have been waiting for the chance to build this antenna again and if and when I get another 50 foot Telescoping pole, I will do it ASAP.

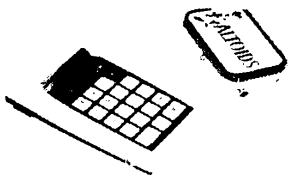
After a week of operating, I came home at noon and found the antenna on the ground. I was upset to see that, but I was glad to see that it fell toward a corner of the yard and did not hurt anything. Then I found out why! Someone had cut a set of guy ropes at one of the guy anchors! This was a warning of the bitter winter ahead, as the temperature got to 19 degrees Fahrenheit that winter.

As for the name of the "who-dat" antenna, I dubbed it that because with little knowledge of DX, I kept wondering "who-dat" and "where at" I just talked to.

Joel Denison WA5CVM

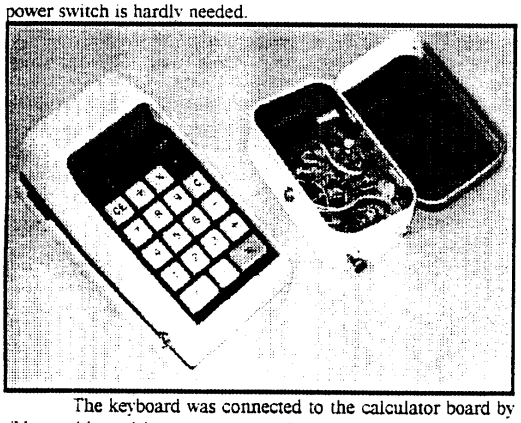


Bob Cutter KIØG



I am always trying to find ways to cut down on the stuff to take camping and more importantly eliminate things that I seem to leave behind. I have become addicted to electronic keyers even for casual operation and have likewise found memory keyers to be a great help, even for informal use. Crouched inside a wet tent does not lend itself to good hand sending and you can prop yourself up on an elbow for just so long.

I have put together what I feel is the best combination of keyer, power supply and paddle. The heart of the unit is an old TI hand calculator that I picked up at a garage sale for a buck. This is the old style that used 4 AA nicads as a power supply with a nice large keyboard. I rewired the battery case to hold 3 AA cells to power the CMOSII keyer board, kept the existing on/off switch although the power drain is so low a power switch is hardly needed.



The keyboard was connected to the calculator board by ribbon cable and it was an easy task to identify the leads for 6 pads after I had removed the calculator board. I wired pads 1, 2, 3 and 4 as the message keys for the CMOSII and wired pads 8 and 9 as a paddle for the keyer. With a little practice I can send code with two fingers while holding the whole calculator case with the thumb and rest of the hand—just the thing for sleeping bag Q's.

The rest of the project was a stereo plug for an external paddle, if I want to use one, a mono plug for the keyer output and another mono plug to tap into the keyers sidetone for programming or to use on my 40-9'er without sidetone.

I now have a compact package that is self contained and very operational.

72/73 Bob Cutter - KIØG
bcutter@teal.csn.net

QRP RX Update

Steve Webber KD1JV

The circuit for the QRP Rx receiver in the June issue of 72 was kind of rushed to print, and ol' Murphy showed his time honored hand. The QSK switch needs a couple of parts to be added to make it work properly. These are shown on the diagram. Change D1 and D2 to 1N4148 types. Otherwise, the 1N4007s act as resistors at RF. (But, don't change D3 and D4) A 4.7k resistor needed to be added to the D1, D2 junction to ground in order make the voltage-doubler work. A diode needed to be added across the RFC so that the DC bias isn't blocked by the RFC during transmit and can bias D3 and D4. Finally, the gate resistor on Q1 needs to be changed to 51 Ω in order to prevent intermod.

I neglected to show an audio mute circuit, which is real nice to have, so a simple transistor switch, powered by the rectified RF is shown in the diagram. Connect the collector of the transistor to the wiper of the volume control. You may have to adjust the value of the 100k resistor, depending on the power level you operate.

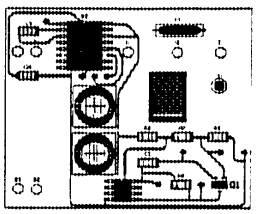
After further evaluation, I have concluded that the MAX 295 switched capacitor filter is not worth its expense. Although it does work as advertised, I have been unable to prevent RFI generated by its switching clock from leaking into the IF and RF sections of the receiver. This RFI causes the noise floor to rise to unacceptable levels and desensitizes the receiver. The circuit and board are currently being modified to use a more traditional Op-amp based 3 kHz low pass and 800 Hz centered band pass filter.

If you wish to use the MAX 295, I suggest that it be built into its own shielded box, with extensive RF by-passing on the audio in, out and power supply leads.

The receiver still works very well without the SCF filter, but a DSP on the output sure helps also!

Sorry for any problems or confusion these errors may have caused you.

Steve Webber - KD1JV
Box 140, Gorham, NH 03581



GOING DIGITAL QRP STYLE

Bob Gobrick
VO1DRB/WA6ERB
70466.1405@compuserve.com

Sooner or later you will be building digital circuitry into your QRP transceiver designs—it's just a matter of time. Have you prepared yourself to meet the challenge of the new "digital" construction era? Using "ugly" construction techniques to wire in a 28 pin "dead bug" integrated circuit will just not cut it. If you're wondering what this is all about then you better read on—the move to digital design in QRP rigs is accelerating faster than we imagined and the driving mechanism is cost—analog component costs are going up and digital component costs are coming down.

Buying decent quality analog parts is becoming more difficult for the hobbyist. As an example, it is near impossible to find a reasonably priced variable capacitor for VFO circuits. Check with any QRP transceiver kit manufacturer who uses variable capacitors and listen to their tale of woe. Two recently purchased top end kits from two different vendors had poor quality variable capacitors and the kit manufacturers will apologetically tell you so. Many vendors have had no choice but to eliminate variable capacitors from their designs and switch to VARICAP (variable capacitance diode) tuning or the ultimate form of VFO tuning—Direct Digital Synthesis (DDS).

VARICAP tuning designs appear to be the latest cost-effective means for building VFOs. VARICAP temperature stabilization techniques have improved over the years as demonstrated in designs by Gary Breed K9AY, Wayne Burdick N6KR with the NorCal 40A and Dave Benson NN1G with the Small Wonder Lab series of rigs. Additionally, the newly designed NN1G Green Mountain transceiver series uses a heterodyne local oscillator stage to increase the VARICAP tuning range to 100 kHz. A similar mixing scheme is used in the Oak Hills Research OHR-100 series of 5 watt transceivers.

Although VARICAP tuning may be cost effective there is a downside and that is VARICAP diodes are not perfectly linear in their voltage/capacitance change. Mass producing a front panel calibrated dial becomes a problem. As many builders know the typical procedure used to calibrate a dial is to set your VFO to the QRP calling frequencies and then pencil-mark your dial for the end points. Help is on the way though for the QRP builder and it is coming from the "digital" folks.

The recent *explosion* of inexpensive microprocessor integrated circuit chips such as the Microchip™ PIC and some clever software have brought about high performance digital design applications at a reasonably low price. The first wave of PIC type applications were with keyers and memory keyers. The Idiom Press Super CMOS II and III memory keyers, Radio Adventures Company "CodeBoy" keyer and keyer chips, the Embedded Research AK-1 memory keyer, Wilderness Radio KC-1 keyer/audio frequency counter, and the Kent "touch" key/keyer are but a few recent examples of really nice keyer applications based on some economical chips. As an aside there is one component of cost that the builder needs to contend with—software is not free and the trend is for the buyer to pay for the price of the chip AND the software programmed into that chip. This will open up a whole new market of QRP products that will be tied back to the designers software efforts.

The next wave of PIC applications that will move QRP builders into the digital world are frequency counters and digital dials. Many VARICAP diode VFO applications use precision or 10 turn resistor potentiometers for the frequency control reference voltage. Excluding mechanical means, there is no easy way to know what frequency the VARICAP is tuned to and this is where the digital dial becomes a useful item. Although frequency counters have been around for a long time it was the PIC chip and software that have driven counter prices so low that it is hard to ignore them. The new Microchip™ PIC designs and read-out displays, draw very low power and generate minimal RFI. Two great examples of what's to come in the way of inexpensive digital frequency displays kits can be demonstrated by the Radio Adventure Company "DigitalDial" kit and the Wilderness Radio KC-2 keyer/counter/meter kit.

Radio Adventures Company DigitalDial

Of the new wave of counters on the market, the one that catches your eye is the RAC DigitalDial. Packaged in a 1.88" X 4.5" X 3.75" neatly painted and silk-screened aluminum cabinet is a six digit LED display, low power CMOS design with flexibility to use the unit as a shop frequency counter as well as a digital dial. It is hard to believe that this kit is well under $100. It wasn't all that long ago that it cost that much just for the counter and display chip set.

My DigitalDial was built as a mate to an Oak Hills Research OHR-400 quad band QRP transceiver. Even though the OHR-400 has a decently calibrated variable capacitor driven readout, there is nothing like the added touch of a digital readout to see where you are on the band. The DigitalDial is an ideal unit for use with any multi-band rig since you are able to program a number of IF offsets with or without reverse VFO tracking. Other standard "extras" are blanking of the 100 Hz digit, automatic display enable (after blanking) when the frequency is changed, anti-jitter code on the last digit and coverage up to 50 MHz. The unit really adds some pizzazz to your station. I think Oak Hills Research must have liked how the DigitalDial worked with their units since Dick Witzke KE8KC at OHR offers a new DD-1 digital dial kit based on the RAC chipset and design.

The Wilderness Radio KC-2

The darling digital design for the 1996 QRP season has to be Wayne Burdick's N6KR KC-2 keyer/counter/meter/kitchen sink kit. The packaging alone is a candidate for the Museum of Modern Art industrial QRP design award. Wayne eloquently sandwiches the LCD display chip on top of the LCD driver chip to come up with a self-contained module 2.9" X 1.1" X .8". The unit is so beautiful, you almost want to replace your transceiver's front panel with clear Plexiglas so you can see this hidden masterpiece. And to top it off, the unit not only has a memory keyer and digital frequency display but also an S-meter, relative output power meter and some auxiliary control circuitry to turn on that 1000 watt ON THE AIR neon sign that you received as a birthday gift. All this with a power drain of less than 7 milliAMPSs making the KC-2 field-ready.

The KC-2 was originally designed for the Wilderness Radio Sierra and NorCal Cascade transceivers but it's so flexible

that it's a good bet we'll see the unit retrofit in many, many rigs. We may even see a KC-2 with a NorCal 40-9er rig attachment. Construction was again a matter of taking your time and using a small tipped soldering iron for those small tight soldering joints. The KC-2 consists of two small printed circuit boards mounted back-to-back so the unit is self-contained.

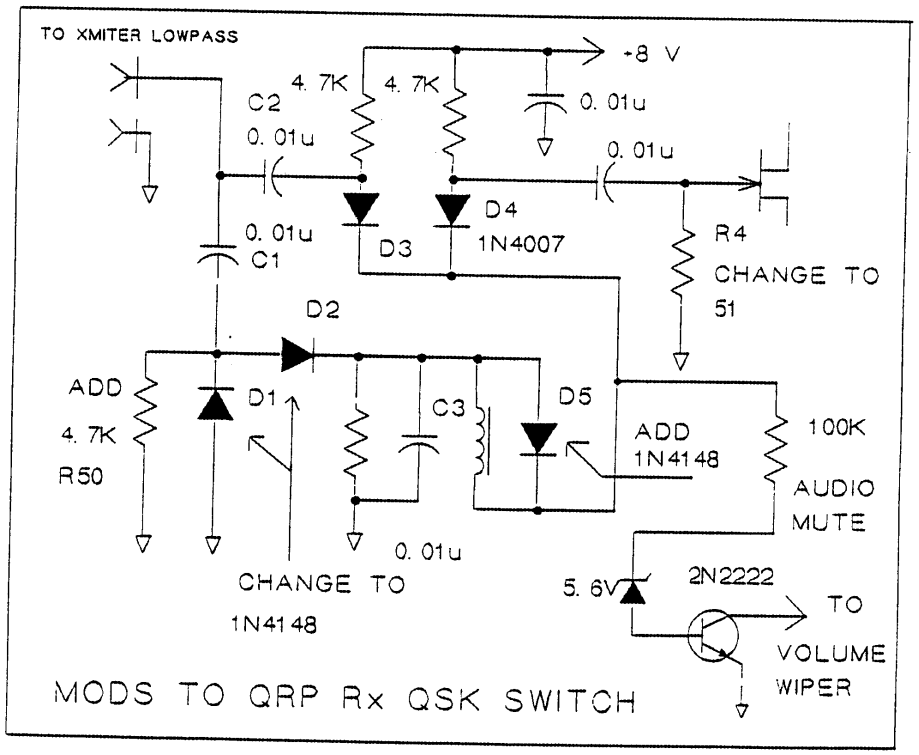
Future Shock-QRP style

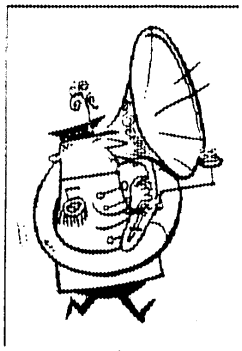
The two units highlighted are only the tip of the iceberg of what's to come in the digital QRP world. The QRP community are now beginning to see the first wave of inexpensive Direct Digital Synthesis (DDS) VFOs. S&S Engineering has a very attractive digital DVFO kit (DDS VFO plus digital dial) that is also being used in their TAC-1 QRP transceiver. Past articles by New England QRPers such as Howie Cahn WB2CPU with his DDS frequency controlled NE Forty-40 transceiver (Winter 1995 Communications Quarterly), and Steve Webster KD1JV with his article on the DDVFO-23 Direct Digital VFO (June 1996 *73*) are a hint of things to come for the QRPer. So get that fine tipped soldering iron heated up and bring out the magnifying glass-we QRPers are moving on. Have some fun with those *dits and dahs* and also those *ones and zeros*.

72/73 - Bob VO1DRB/WA6ERB

Modification to QRP RX QSK Switch - Steve Webber - KD1JV

The following schematic is Steve's recent modification to the June printing of his sensational receiver.





72 Membership News

AL BATES - W1XH

Ice Cream Social: Dennis Marandos, K1LGQ, started a great new tradition. Seven QRPers met at Kimballs Ice Cream in Westford, MA, for show-and-tell and socializing. Present were John Forrest, WB1HBE, Bob Scheichel, N1RXV, Bob Baker, N1BKL, Al Bates, W1XH, Rhyne Killian, KA1CX, Chuck Ludinsky, N1RXT, and Dennis Marandos, K1LGQ. Dennis brought a couple of rigs and his portable plastic mast.

QRP By the Sea: Jim Fitton, W1FMR, opened his beach house to QRPers for a weekend in late July. Randy Rand, AA2U, Dennis Marandos, K1LGQ, Jack Frake, NG1G, and Dave Benson, NN1G, were all in attendance. Dave brought the new QRP rig for 20 Meters SSB rig that did well for itself. A QSO in Ireland was made by Dave and Jim with a 5 by 7 report.

New Member: Serge Hebert, VE2DEQ/W1, writes from Swanton, VT. He details his 30 plus years of ham radio with examples of how well extended Zepp antennas can work when installed high enough in the air. While Serge is a new member, he has been running QRP levels for several years. He would like some help with two questions. (1) Would like to buy or build if available a QRP transmitter for 5 bands operation like 80, 40, 30, 20, and 15 meters, that is VFO controlled on all bands, solid state or tube type but very small in size. (2) Appreciate information or details for an accurate 10 Watt max SWR wattmeter that is accurate. Contact him at Box 403, Lakewood Drive, Swanton, VT 05488.

Boxboro, MA ARRL convention and Rochester, NH "Hosstrades" tailgate swapfest events are both the same week end. Let me know who you run into there and what good bargains you find.

Jay Miller WA5WHN [wa5whn@juno.com (Jay D Miller)] from New Mexico visited the northeast the second week of September and stayed in the Worchester/Shrewsbury, MA area for five days. He says his VISA was endorsed for only five days, but we think he made a deal with the Devil. However, K1MFS, W1IS, N1ECK kept and eye on him so he wouldn't miss his plain at Logan. I am sure they'll be a follow-up on his trip.

Jay also said his visited in New England was uneventful, that is, he escaped from the PRM. (Peoples Republic of Massachusetts), better known as the home of the Ted Kennedy Driving & Aquatic School. Back at home, Jay took his gang (AB5OU, K8BI, NA5N, N5ZGT, KC5DT) out on Sept. 20th to Torreon (Tower), New Mexico, to set up for the QRP AFIELD where 20 & 40 meters CW would be their prime AO (area of operation).

While in Torreon, Jay brought with him a three element beam for 10/15/20 CW at 40 feet and a wire beams for 15/20 meters, plus a 40 meter dipole. The Index Labs QRP+, a Kanga XCVR on 20 meter and an ICOM IC-706 were his RF pumpers. Torreon, NM, by the way, is approximately 34 miles east, southeast of Albuquerque, and on the "other side" of the Manzano (east slope) Mountains. The area is pine tree country, very old towns, which dates back to the 1700's, Spanish settlement and land grant.

Tom WA1GUV reports that the RF-1 is a neat little gadget and will work as a frequency generator. It generates a nice, albeit wobbly, signal to be picked up by a receiver. He says he will cautiously replace his current RF measuring system. The RF-1 is half the size of the noise bridge, ¼ size of the Grid Dipper, and ¾ size of his freq. counter. Tom says he needs these things he carries around for antenna experimenting, plus 30 volts worth of batteries are needed for the job.

The previous antenna measuring system consisted of a modified HW-8 to include VSWR and an S-meter, a set of Ni-Cads, and the marvelous noise bridge. It required about 5 watts of power to make measurements. The RF-1 draws 35 mA at 9 volts and fits into a shirt pocket. So far, Tom has had excellent luck using it to adjust a long wire antenna tuner on 30 meters.

Tom says, "Lately I've been hearing VKs, ZLs, and JAs stations on 30 meters at 11:00 Zulu on my NN1G Thirty-40 rig. What a rig! I was chatting with a G3 the other morning and got QRM by 599 JH7. I think they (JAs) are coming in long path because East coast stations are getting first crack at them, instead of that W6 curtain that normally exists.

"In case you are interested, I did make 4 QSOs from VT, and none were pre-arranged. While trying to "improve" my antennas one Saturday afternoon, I managed to get the ropes all snarled up in the tallest tree, and went off to a friend's birthday party with my wires laying on the ground.

"Well, one glass of Chardonnay lead to another and by the time I got home I really didn't care where my wires were. I heard some plaintive CQs and answered them. Push button CW really is a boom to mankind. Anyway, my rate for 4 Qs wasn't that bad, but the SWR was off the charts, so I retired, not wanting to let the smoke out of my finals.

"I gave up on the rope mess and hung the wires as an inverted Vee on Sunday. Twenty meters has been solid Europeans ever since. Have the band conditions improved overnight or did I just get lucky?

Phil Rutledge - KB1GO has been pretty active acquiring new QRP gear. He has the MFJ 9030 and now has the 9040 to accompany his collection, plus the NorCal 40A. Phil has been working the European DX stations from Amherst, NH and plans to add *more* antennas before the frost hits the area, not to mention the planned tri-band beam in the wings before snow fall.

That's All Folks: Thanks to those of you who contributed to the column this month. Why haven't the rest of you written of your latest exploits and accomplishments? We all want to hear what you are doing and building. Please, please, please write and tell me what's new. Things are changing so please use snail-mail to Al Bates - W1XH, 2 Coach Road, Chelmsford, MA 01824.

Al Bates - W1XH

Another Great Antenna

Dave Benson - NN1G
Newington, CT

I just found yet another great source for antenna materials at the local Home Depot. For the magnificent sum of $3.49, they offer clothesline proper-uppers. This item is found in near the hardware section—around clotheslines/pulleys, at least in our outlet, and is made from 5/8" thin wall aluminum. After removing the *doohickey* on the end, you're left with about 6 feet 8 inches of useful length. (There's something vaguely medical about that turn of phrase, but I just can't place it!)

I used this material to put together a 20-meter ground plane, using ¾ inch OD tubing for the bottom section. The ¾ inch tubing may also be used to join sections of the 5/8 inch tubing end-to-end, although the ¾ inch tubing Home Depot offers is not the preferred .058 inch-wall material. I used a 12 inch length of the larger material to join the sections, in concert with a few sheet metal screws and some de-oxidizing compound at the metal junctions. This material goes under the trade name of **Ox-gard** at the Depot (in the Electrical department) and also may be found under the trade name **De-Oxit** and undoubtedly other stores elsewhere.

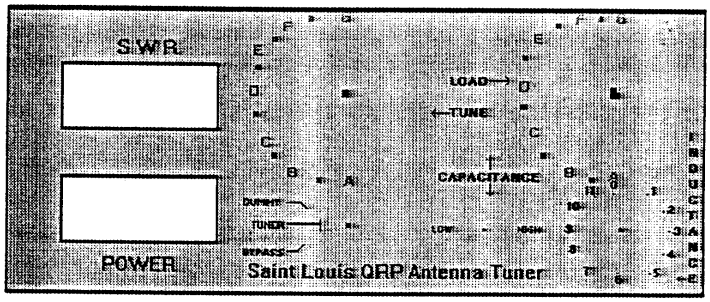
The tubing looks like it might be useful for ultra-light back-packing masts, weighing only 6 ounces for a length. [Call me an incurable optimist, but I'm planning to put together a 10 meter or even 6 meter Yagi using this material.] To paraphrase an old depression-era slogan "Prosperity—and sunspots—are just around the corner."

72 - Dave Benson - NN1G

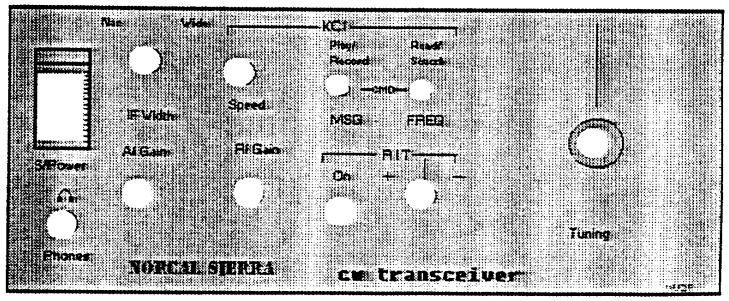
Face Plate Needs NO Up-lifting

If you're one of the several hundred who built the St. Louis Tuner, offered by NorCal QRP organization for the Colorado QRP Club, the following face-plates might be of interest to you. It is as close to dimension as possible, but you might have to tweak the corners to fit your tuner. Try a sheet of acetate in a photo copier (*i.e.* a transparency) to make your copy.

Sierra dimensions @ 122% output to Canon BJC 600e—adjust as needed for different printers.



The NorCal Sierra face plate



New England QRP Club Wants A FEW GOOD MEN!

KITTING PARTY: Looking for a few good men, and women, to kit STEVE WEBER - KD1JV RECEIVER printed in June's issue of *72*. At least five volunteers to kit the parts needed for future sales to club membership. Contact **Jim Fitton - W1FMR, P.O. Box 2226, Salem, NH 03079, Tel.:603/898-6188; E-mail MVJF@MVUBR.LUCENT.COM.** There is NO financial obligation on your part but to simply count pieces for a spectacular kit for all to enjoy. We need your help in making our club come alive, so please offer your assistance and call Jim today.

The PVC Gusher II

~

Joe Everhart
N2CX

This article explains how to make a simple handy, single-band portable antenna for 40 through 10 meters. And, in addition, how to easily expand its capability for multi-band use.

The PVC Gusher II is a lightweight dipole antenna intended for portable QRP hamming. It is designed and intended for QRP AFIELD, QRP To The Field and the other short-duration temporary activities that are becoming increasingly popular. The Gusher II subscribes to the Spartan philosophy of reducing an antenna to the minimum requirements necessary to do its intended job. Weighing less than 1.5 pounds, the Gusher is light enough to consider for backpack use and is rugged enough to give long service.

How it Came to Be

Using a dipole configuration gives repeatable effective antenna performance. Dipoles are very common radio amateur antennas because they are highly efficient and easy to build. Unlike random wires, they need no tuner for single band use. And they need no ground system to keep operating losses low. With a dipole antenna, all you have to do is raise it up in the air, connect the feedline to your rig, and you're ready to go.

The dipoles used at the home stations had heavy gauge (even hard-drawn) copper wire, low-loss heavy feedlines and insulators that looked like they came from a B-grade horror flick. But, for a temporary portable QRP dipole, all that was overkill.

Using a dipole in an inverted Vee configuration makes antennas simple. First of all, only a single high tree or other support is needed as opposed to needing two for a conventional dipole. When you are in a campground or field-day site, a single high tree gives you more freedom about where you can install your antenna. Not only the location, but since most of the weight is supported at the center of the span, the wires don't have to be heavy gauge copper. And with QRP, insulators don't have to withstand high voltages so heavy, large ribbed ceramic or glass monsters are unnecessary.

Like many hams, I've built lots of dipoles for both home and field use. I've used "store-bought" center insulators, made my own from sheets of plastic and used an end insulator with the coax tied or taped onto it for strength. For end supported dipoles you need this. And I've run the gamut for end insulators from ceramic and glass "egg" jobs to six-inch, $5 each, commercial plastic multi-kV jobs. Lately, though, I've simply used a three inch piece of inexpensive PVC pipe and drilled a couple of holes into it. With low power you don't need much dielectric insulation.

There was mention last year (1995) on the Internet QRP mail list of a very simple QRP antenna, the BIC ™ Flamethrower. Devised by Fred Turpin - K6MDJ of the illustrious Zuni Looper group, the antenna consisted of some lightweight speaker wire and thin coaxial cable with a sawed-apart disposable lighter body as insulators.

PVC Gusher Classic

Not to be outdone by such a flash-in-the-pan effort, I used plastic plumbing parts to make an antenna that fairly gushes with strong signals. I dubbed it the PVC Gusher. The original, the Gusher Classic uses the same type of construction as the left-coast progenitor, but with PVC plumbing parts substituted for the sawed-apart lighter. It has so far seen print only in the manual for the NEQRP Twenty-30 mast kit.

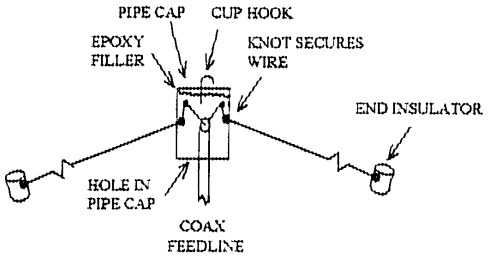


Figure 1 Gusher Classic Center Insulator

Figure 1 shows the details. Each ¼ wave leg of the dipole is made of 20 or 22 gauge insulated stranded wire. The center insulator is a PVC pipe end cap and the end insulators are ½ inch long pieces of ½ inch id. (inside diameter) PVC pipe. The wires are simply passed through small holes drilled into the insulators and knotted to secure them. The feedline, a length of small-diameter 50 ohm coax, such as RG-174 or RG-122, is passed through a hole in the end of the pipe cap and soldered to the dipole wires. The pipe cap center insulator is filled with epoxy to weatherproof it and secure the coax. A cup hook screwed into the epoxy for the support line.

PVC Gusher II

As handy as the original Gusher was, it still had a few shortcomings. Assembling the center insulator assembly took some skill to get everything together properly. And with soldered connections inside a sealed center insulator, the antenna was useless if one of the wires happened to break at the insulator. (Murphy's Law says this will happen!) Also, with the feedline and two legs coming together to the center, the antenna can be a little difficult to wrap up for storage. Finally, dipole element lengths couldn't be changed to use the antenna on another band.

The Gusher II circumvents the connection shortcomings by using some simple hardware. As you can see if Figure 2, a ½ or ¾ inch pipe cap forms the center insulator, but the connection methods are more sophisticated. The coaxial cable this time goes through the open end of the cap and is attached to bolts through the side of the cap with ring lugs. Perhaps I'm retentive, but I crimp AND solder both lugs. The bolts are held in place by hex nuts snug down well on the outside, connections. Wing nuts on the bolts secure the wires and make need no tools for installation or removal.

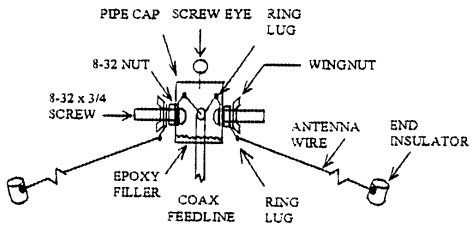


Figure 2 Gusher II Center Insulator semi-exploded view

Insulators at the other end of the dipole are the same as with the Classic. They are ½ inch lengths of ½ inch PVC pipe holes drilled into them just large enough to pass the wire through. The wire is knotted to secure it. A screw-eye placed into the top of the pipe cap provides an attachment point for the inverted Vee center support line

Since the wires don't have to support the feedline weight, 20 or 22 gauge wire has adequate strength and attaching them with ring lugs is fine. Since the dipole legs are easily removed, storage is simplified. You can disconnect the legs and wrap them separately from the coax so you don't end up with a tangled mess. Not only that, but you can easily disconnect one set of dipole elements and replace them with another set for different frequency bands.

Single band Dipole

The simplest configuration is the single band inverted Vee dipole. The center of the antenna should be at a height of 20 feet or more and the ends at least 7 feet or so above ground. Each leg is a quarter wavelength long as calculated from the familiar formula L (ft)=234/f(MHz). Insulation on the wires will make the dipole electrically longer by several percent, so the antenna should be cut to this length and trimmed for lowest SWR. As mentioned above, a Gusher II can be used on different frequency bands by cutting sets of elements for each band desired.

Multi-band Fan Dipole

Dipole antennas have a low feed point impedance at their resonant frequencies and a much higher impedance elsewhere. So you can use two or more (cut for different frequencies) in parallel and feed them with a single feedline. This works because the high impedance of the "off-frequency" elements decouples them from the feedline. The "extra" elements are merely attached to the center insulator bolts along with the original elements. There is some interaction between the elements if they are spaced too closely. It's best to tie the ends off to separate supports to separate them as much as possible. See Figure 3.

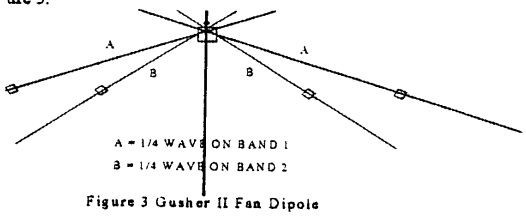


Figure 3 Gusher II Fan Dipole

Multi-band leapfrog dipole

Another way to make a multiband antenna is to break each leg up into sections with insulators as in Figure 4. The inner sections are cut to a quarter wavelength on the highest band; then next sections add the appropriate length for the next highest band, etc. To operate on the highest band, the inner insulators are not jumped. Alligator clip leads are used to bridge insulators for each successive band as desired. The antenna must be lowered to change jumpers, but this isn't too tough with an inverted Vee!

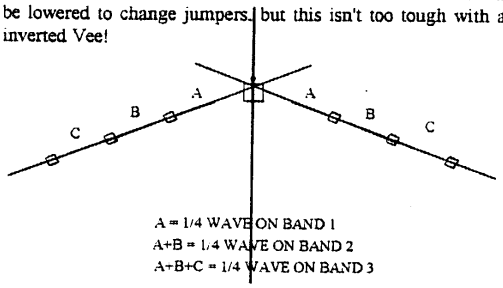


Figure 4 Multi-band "Leapfrog Dipole

The Gusher II is an easy-to-build and very handy for throwing into a backpack or duffel bag for portable operation. However, if you want most of the work done for you, a kit is available from N2CX. The kit includes the pre-assembled center insulator and attached 30 foot feedline with a BNC connector. Also included are two 50 foot pieces of wire, end insulators and alligator clips to make several different multi-band designs. And *best of all* is the ten page manual which tells you how to make a single band dipole in 15 minutes with illustrated instructions for fan and leapfrog dipole antennas. The G-II kit is $20 postpaid.

Also available is the companion Twenty-30 Portable PVC mast semi-kit. It comes complete with a 20-plus page manual and all hardware. You buy the PVC pipe locally. The mast kit is $15 postpaid.

You can also get both the Gusher II antenna and Portable mast as a combo for $33. Send a check for the proper amount to:

Joe Everhart - N2CX
214 New Jersey Roadd
Brooklawn, NJ 08030

New England QRP Club
The excitement is building!

No Excuses!

Nick Franco - KF2PH

I am relative new to this hobby for I received my Novice ticket in May 1991. Since the day I received my call in the mail, I have never stopped working CW on the HF bands. I made myself a promise to get on and work even one station each day so I could improve my CW skills and eventually upgrade. As I followed through with my plan, my code speed increased painlessly. I was ready for the 13 WPM test before I could finish preparing for the Technician written exam. This same approach yielded my passing the 20 WPM exam well in advance of being ready for the Extra written exam. In fact, it was because I had already passed the code tests that I really bit the bullet and crammed for the written exams in each upgrade. I seem to always hear about code being the barrier, but for me---the theory was a killer. I guess there's really no excuse for not improving CW skills.

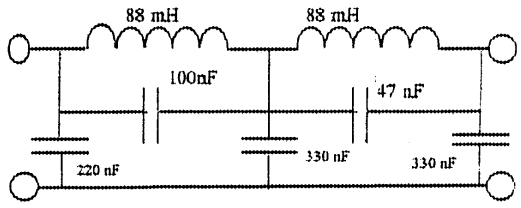
The above paragraph is only to establish an approach and show that *commitment* is required for us to improve in any area. Like the gag-line, "How do I get to Carnegie Hall...?" OKAY, so it worked for CW, but what about the electronics stuff? I always thought you needed a conical hat and magic wand to understand the theory and build something that actually worked. I've looked at schematics and made a few lame attempts at building a small item here and there, and I thought it must be by accident if the project really worked in the end. How would I even get started? I would need someone to hold my hand every step of the way; someone to talk with about my results, questions, problems, etc.

ENTER QRP-L! I know most of us have heard of this e-mail QRP club before, and I have been subscribed for over two years. This great group of Hams is constantly promoting building projects and getting on the air to use the critical projects and QRP skills. Sound familiar? Sounds like the NE-QRP club, doesn't it? The difference here is that the entire group is available instantly via computer e-mail on the Internet. There are members from several countries with a variety of backgrounds and experience levels. The designers of many of the popular QRP kits are available to answer questions and bail us *newbies* out along the way. For any question asked, there could be hundreds of responses to choose from or get a consensus from to resolve any possible problem. But, wait a minute here, now I don't have an excuse for why I can't build a transceiver or tuner or test equipment or keyer or, or.... Now I can participate in all the NE-QRP activities like the ColorBurst Sprints and QRP AFIELD?

Well, if you have a computer and modem you can get onto the Internet and participate or just monitor all the mistakes people like me ask about on this e-mail reflector. You can even send for a program called Juno, which is a mailer program. The company offers FREE e-mail services for you. You load the mailer program into your computer and from there JUNO dials an 800 number where you complete a dialog script and your account is established---free. You can even use your call sign as your e-mail address and then subscribe to the qrp-l list. You pick a local phone number as your dial in point so it only costs you a local phone call. If no local phone number is listed you choose "none" and Juno will automatically dial the 800 number so it doesn't cost you for the phone call either. To obtain a copy of Juno, just send an e-mail message to signup@juno.com and include your postal mailing address in the body of the message. Eventually you will receive the diskette in the mail. It's free, FREE. They make their money by selling advertising services to companies who want to advertise via the Internet. The mailer has a banner display area for these advertisements to show up on your screen. My new Juno e-mail address is kf2ph@juno.com. My normal work e-mail address is still valid. To subscribe to the QRP-L mail list, simply send e-mail to listserv@lehigh.edu and in the first line of your message type: subscribe qrp-l <yourcallsign>. Remember that's QRP-L in lower case. Some people accidentally type a one instead of L in the subscribe line. Now there's no excuse to getting on the Internet and obtaining a personal e-mail account either. Who would have though that a computer would be a piece of troubleshooting equipment? ☺

72, Nick Franco - KF2PH
NE-QRP # 349
UPTON, NY
kf2ph@bnl.gov

LOW PASS AUDIO FILTER
ELLIPTICAL AUDIO FILTER WHICH REDUCES HIGH HISSING SOUNDS



QRP Beacon Back On The Air

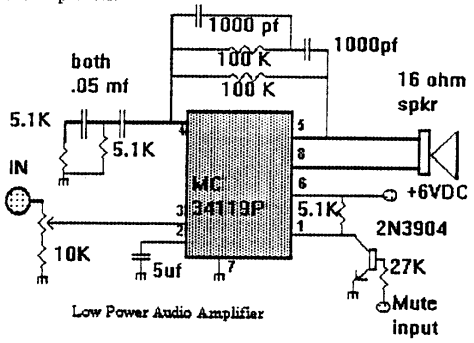
After returning this year to the land of reality from a 3 year assignment on the Rock of Oahu, I have finally put my QRP beacon back on-line. The frequency is 50.073 MHz. The rig is an ICOM IC-575A. The antenna is a *SquareLO* that is temporarily mounted in the attic. Power out is 5 watts. QTH is FM18gr in Manassas, VA. If the weather cooperates, an outdoor antenna installation would be planned after September 14 or 15, 1996.

de W7KMA QRP-L #585
tmoore@pentagon-dtsw.army.mil

A Battery Audio Amplifier for QRP Receivers

Stan Wilson - AKØB

The boom in electronic telephone engineering has resulted in some excellent parts for use by the ham radio engineer in his next low power and/or portable QRP transceiver or receiver project. Motorola developed the MC34119P for use in speakerphones. It will operate with battery power levels of 2.0 v DC minimum. It has a mute or chip disable input (great for transmitting). The amp requires few external components and its frequency response is easily shaped allowing it to filter out much of the high frequency hiss common in most single chip audio amplifiers.



Low Power Audio Amplifier

In a recent commercial design project I had used the old, common and proven LM380 (the LM386 was also evaluated). The audio amplifier was driven by a casebook design audio filter with 20 db roll-off at 400 Hz and 3.2 kHz. The speaker was a better quality 8 ohm unit and/or a headset. When operated at a very low power level, the LM380 driving the speaker at higher audio levels, the high frequency hiss or white noise background was quite noticeable during periods of no sound or input. All standard methods of limiting the frequency response at the higher frequencies would not produce a suitable product.

In my search for a replacement, I happen upon the MC34119P. The chips are not easy to locate, long lead time, so for that project next fall or winter, place your order with the local semiconductor supplier today. It was found that the best audio level for comfortable listening was obtained with a 16 ohm speaker, which is often listed for sale by the various electronic surplus houses. The audio chip is excellent for driving a pair of 8 or 16 ohm headsets. You will note that a *snubber* is not required to stabilize the chip. However, twist the speaker leads together and keep them short. The circuit shown will start to roll off at about 4.5 kHz on the high frequency side and about 800 Hz on the low frequency side. The audio distortion will be quite low (less than one percent) when operated with a 6 v DC power supply source and a 16 ohm speaker at power output levels under 200 mW. It is recommended a 16 or 32 ohm speaker be used when the chip is powered with a 9 volt battery.

A logic "Ø" (<Ø.8 v DC) at pin 1 sets operation. A logic "1" (>1.Ø v DC) will mute the chip. The chip should be usuable in a QSK keying circuit since the turn-off and turn-on times via pin 1 is less than 15 msec. current drain is less than 100 microamps in the mute mode, and about 3 ma when ON and NO input signal design.

For that next project, up-grade your design with the latest the telecommunications industry has to offer and use a MC34119P for that audio stage.

Stan Wilson - AKØB

THE EXCITEMENT IS BUILDING

It is with extreme pride that we introduce New England's newest member to where the excitement is building.

⇨MEMBERSHIP - FALL 1996⇦

NE480 Randy Moore - KS4L,
NE481 Greg,R. Breeden - KM4VZ
NE482 Brad,B. Mckirryher - N1VWD
NE483 Andre,J. Boele - KC4UER
NE484 Donna,E. Fruh - KE6TZY
NE485 Frank,K. McCrackin -WB6LMA
NE486 Douglas L. Datwyler - WR7O
NE487 Dean Marzocca - N2TNN
NE488 George Point - K2BEV
NE489 Phillip Rutledge - KB1GO
NE490 Steven Weber - KD1JV

SEE IF YOU CAN REMEMBER THESE NEWS CALL FROM THE OLD TIMERS WHO CHANGED THEIR OLD CALLS.

NAME	OLD CALL	NEW CALL	Internet address
W. Keith Hibbert	KE2DI (1985 - 1996)	WB2VUO	wb2vuo@juno.com
Keith Despain	AB5QE	K7RBJ	despain@crls.com (Keith Despain)
Alan Pike	NT1V	W4MQC	alan.pike@mso.mts.digital.com
Mike Dooley	KE4PC	N5BGZ	msdooley@rdxsunhost.aud.alcatel.com (Michael S. Dooley)
Dave Runk	W1DHD	AA3EJ	RUNKD <RUNK@accuwx.com>
Jetf Greer	KF4GKH	WD4ETO	Jeffrey Greer KF4GKH@worldnet.att.net
Jim Kortge	NU8N	K8IQY	jokortge@tir.com
John Evans	KB2OCE	N2QCE	n2qce@aol.com
Mill.Moore	WA1JGK	AA1PB	Mill.Moore@VALLEY.NET (Mill Moore)
Rich Mulvey	N2VDS	AA2YS	Rich Mulvey <mulvey r@ll.aa2vs.ampr.org>
Paul Stroud	AA4XX		aa4xx@ipass.net

Application For Membership and Renewal
The New England QRP Radio Club

For a NEW membership, send your application to *Bill McNally--AE1D* Membership chairman, and **RENEWALS** to *Bill Studley - AA1OC*, Renewal Chairman.

Last Name: _____ First Name: _____

Call Sign: _____ NE-QRP Number (renewal only) _____

Mailing Address: (Street, City & ZIP) _____

Phone number : (If not unlisted) _____ License Class: _____

Former Amateur call[s]: (Year first licensed)_____

Please write a couple of paragraphs about yourself (use another sheet of paper), and we'll pass it along to our Member's News Editor.

The membership is $10.00 and renewal is per year. Outside USA please add $5.00. The club year begins in January, and renewals are from September to December for the following year. Please make your check or money order payable to : **QRP Club of New England.**

Mail your *new* membership application to:

Mr. William McNally - AE1D
New Membership Chairman
7 Blueberry Road
Windham, NH 03087

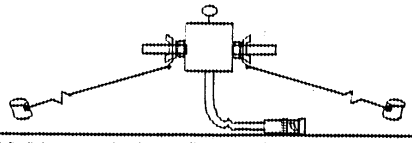
Mail your *renewal* to (Please put your NE-QRP number on your correspondence.)

Mr. Bill Studley - AA1OC
NE-QRP Renewal Chairman
133 Baboosic Lake Road
Merrimack, NH 03054

PVC GUSHER II PORTABLE QRP ANTENNA

NEQRP 20-30 Portable Mast semi-kit

- 20 feet installed, breaks down to 5 feet for transport
- We supply the hardware and 20 plus pages of instructions
- You supply the PVC pipe (about $10.00)
- Manual has illustrated directions and application ideas



Gusher-II Portable QRP Antenna Kit

- One pound portable/backpacking dipole
- foot low loss lightweight feedline with BNC
- plus page illustrated manual
- Single or multi-band use
- On the air in 15 minutes out of the box

20-30 mast $15.00 Gusher II antenna $20.00
Combo $33.00
inf. n2cx@voicenet.com
Joe Everhart - N2CX
214 New Jersey Rd. Brooklawn, NJ 08030

The Gusher II kit and manual were designed and produced by Joe Everhart - N2CX. Requests for missing parts, questions about assembly and usage of the antenna kit should be addressed to:
e-mail: n2cx@voicenet.com
snail mail:

Joe Everhart
214 New Jersey Road
Brooklawn, NJ 08030