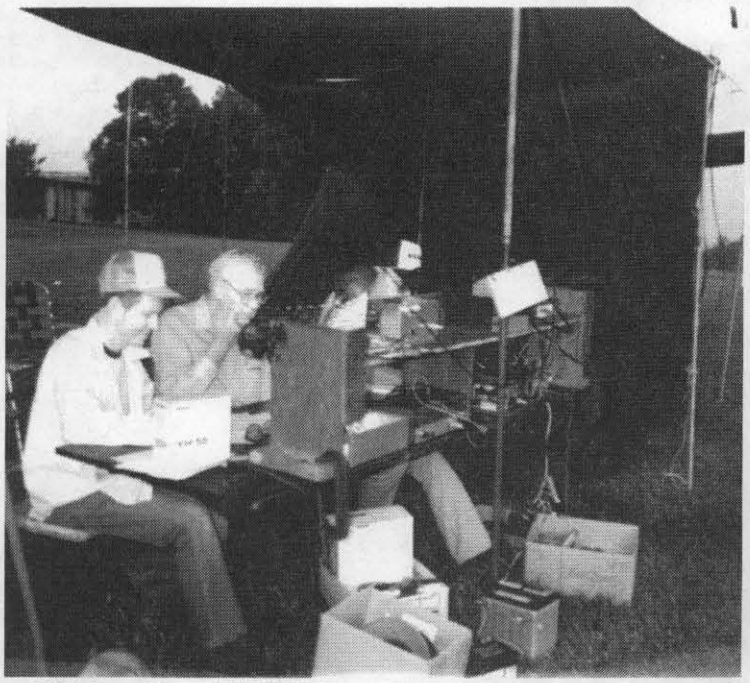
QRP Quarterly

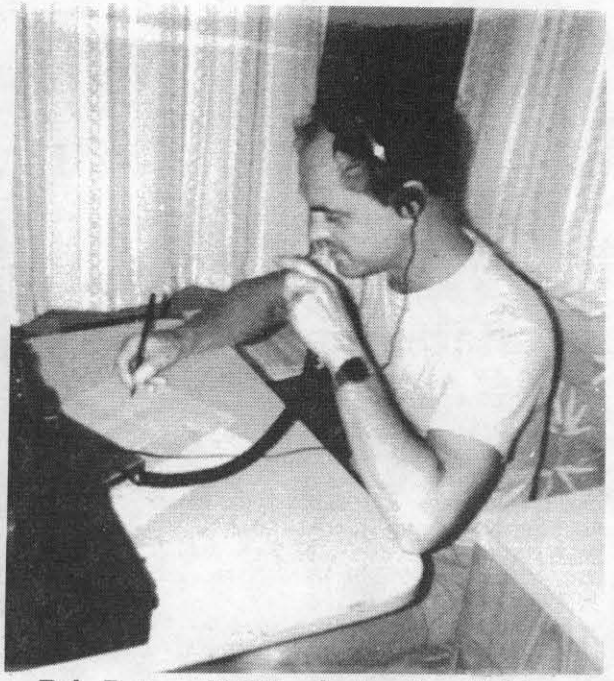
Journal of the QRP Amateur Radio Club, International

April 1987 Volume XXV Number 2

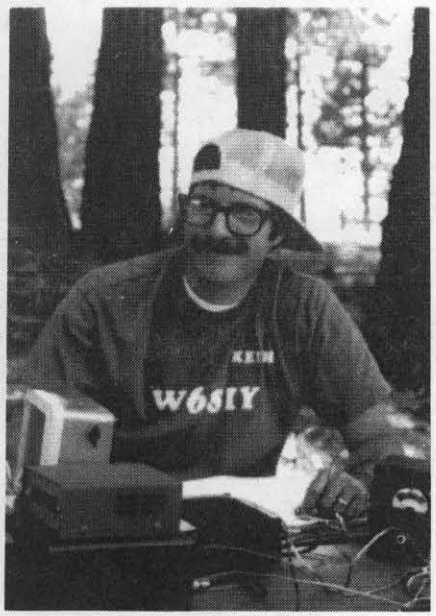
Our Twenty-Fifth Year



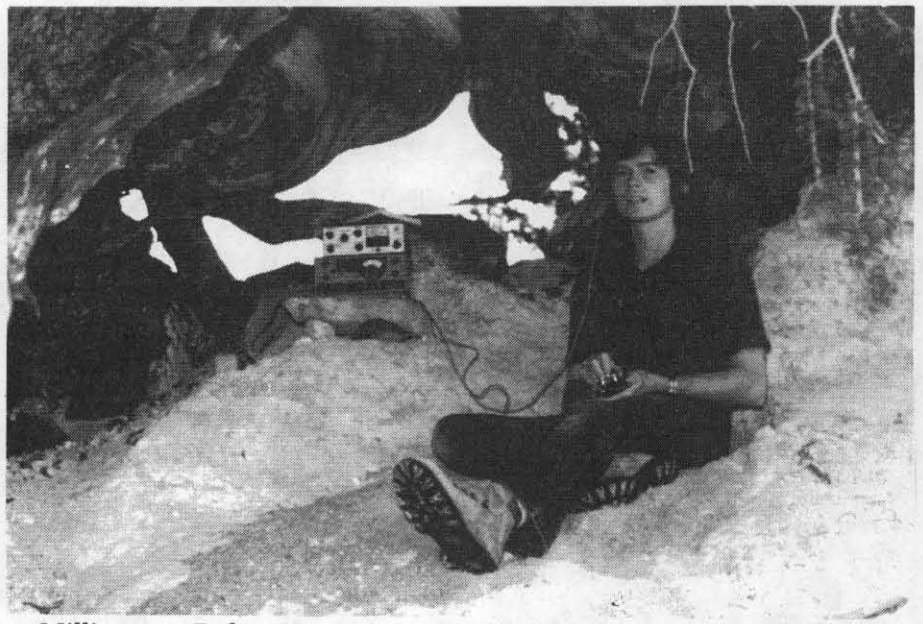
Bill Stocking, W0VM (center), operates 20 meters with the Principia College QRP Field Day team



Bob Patten, N4BP, playing 5-watt big gun and filling the logbook.



Zuni Looper Keith Clark, W6SIY, dupes on 40 meters.



Milliwatter Rulon VanDyke, KA7BCD, uses a weathered tree as a natural mountain top shelter.

QRP ARCI News

Membership

The initial QRP ARCI membership fee of $11 ($13 for DX) covers lifetime membership plus the first four issues of *The Quarterly*. The membership and renewal form is on the mailing cover.

Subscription Renewal

Subscription renewal is $10 ($12 for DX) for four issues. The renewal date appears on the mailing label following the QRP membership number, i.e. 4174-3/87, means that member number 4174's subscription will expire with the 3rd (July) *Quarterly* in 1987. Renewals and new member applications must be received by the 1st of the month prior to the next publication to receive that issue, otherwise service will not begin until publication of the following issue.

Information for Writers

The Quarterly welcomes articles on all aspects of low power communications-equipment construction and modification, antenna experimentation, and operating practice, as well as reports of experiences, presentations on QRP for local clubs, announcements and letters.

Photos of your station, and projects are especially desired. Black and white photos are preferred where possible.

Send contributions to the consulting editors or to the general editor via modem or by mail typed double-spaced. Editors will select and edit material to space limitations.

Editorial dates are Jan. 25, Apr. 25, Aug. 1 and Nov. 1. Remember your editors are volunteers like yourself who must squeeze this work into busy family and work lives and still get on the air from time to time.

Please include name, call, address and telephone number on all correspondence and material. Enclose S.A.S.E. if you wish material to be returned or when requesting reply from officers or authors.

Technical Articles Wanted

Send technical articles to the general editor via modem or by mail typed double-spaced. To save editing and retyping, please use the abbreviations on the mailing cover of January '86 *Quarterly*. Include a complete list of parts and values. To reduce errors draw circuit diagrams well enough that they can be reproduced as is. Double check them before mailing. Include photos. Editorial volunteers can't test projects.

President's Message

As I write this, it is New Years Day, 1987, and I think how fast my first year in office has gone. Certainly we have had some difficult times, but all in all the Club is in pretty good shape.

Now is the time to think about new officers for the Club. The usual procedure is for nominations to be printed in the July issue and election results to be printed in the October issue. If you are interested in serving the ARCI QRP Office, please let your feelings be known by writing to me before the 15th of May. I'm sure there are many who would like to contribute, and there is plenty of opportunity for all who have a desire to help. Let's make the future of the ARCI bright by having interested members run for office and volunteer for assignments.

This *Quarterly* should arrive just before the Dayton hamfest. As usual, Dayton will be the center focus of the club's get together activities. I'm looking forward to meeting many of you there.

Again this year, we will need a lot of help with our booth and QRP Hospitality Suite. Each year the number of members attending has doubled. If this is any indication we should see the largest group of QRPers ever assembled. See you there. (And if you can't come, listen for our "18" stations evenings and early mornings before 7:30 a.m. Dayton time).

My pet project in 1987 is to finish the club's history and get it published. I have the old history up to about 1975. I am missing issues of the *Quarterly* from 1975 through 1981. If any member has these back issues that I could copy, I would return them promptly and send you an updated history free of charge for your help. 73,

Les Shattuck, WB2IPX

Nominations for Officer Postions are Open

The term of office of the club's three highest elected positions and three of the Board of Directors expire on December 31, 1987. Any member of QRP ARCI may place his/her name in nomination by sending the Secretary/Treasurer a brief biographical sketch by August 1, 1987. The sketch should include a definitive statement of the candidate's goals and interests in QRP. A ballot for these positions will be published in the October QRP *Quarterly*.

The officers whose terms will expire are President Leslie J. Shattuck, WB1IPX; Vice-President James M. Fitton, W1FMR; and Secretary/Treasurer Robert R. Brown, NM7M.

Board members whose terms will expire are John T. Collins, KN1H; James M. Fitton, W1FMR; and Robert W. Reynolds, K5VOL.

The Secretary/Treasurer's address is listed on page 3 of the *Quarterly*. All biographical sketches must be received by August 1, 1987 for your name to appear on the ballot.

Call for Receiver Design Articles

Increased enthusiasm for home built stations has brought many to ask for better receiver designs that are within the reach of a QRP budget and ordinary test equipment and building skills.

The simplicity, sensitivity and dynamic range of the direct conversion receiver have made it the usual resort of the homebrewer. But its disadvantage in terms of selectivity is particularly annoying for other than casual operation. With many QRPers and clubs now talking of a Homebrew Field Day in 1988 and with the QRP ARCI offering bonus points for homebrew stations beginning with the Homebrew Sprint on July 11th, receiver design becomes the most important technical challenge we face.

One experiementer is testing means for eliminating the DC receiver's signal images through special circuitry at the audio stage. Others are developing improved cyrstal filter designs for superhetrodyne receivers. Five to ten dollar filters with 50 to 80 dB of sideband rejection are on the workbench. We invite all who are working on these or other receiver design questions to report your progress.

The *Quarterly* has reserved space for these reports in every issue, and will give receiver projects publication priority over all other material.

Editorial deadlines for the *Quarterly* are:

Issue	Limit Date		
July '87	April 25	Oct '87	Aug 1
Jan '88	Nov 1	Apr '88	Jan 25

Editor's Word

Special thanks to all who contributed to this issue, providing meaty ideas to think and act on over the next three months!

Of particular note are the contributions of John Collins, KN1H, and Keith Clark, W6SIY, who used careful procedures and test equipment to answer questions on key aspects of QRP operation.

Our traditional feature on QRP Field Day is timed to inspire us all to improve our preparation and performance in the biggest of all QRP events. Contributors report how K0NA, became the top five watt club in the nation and how the K9NG group has stayed the top milliwatt club. We also hear from Bob Patten, N4BP, whose QRP operating process has become a QRP Field Day legend.

QRP'ers are particularly honored that in his last hours before becoming a silent key, Bill Stocking, W0VM, pressed to completion the report of his QRP Field Day learnings. We express gratitude to his family for typing the manuscript and assembling the photos and drawings which Bill wanted to pass on to the QRP community. May we be the better for what he has done.

Again and again, top Field Day performers show how consistently analysis of experience, planning and detailed preparation lead to improved results. Thanks to all who shared their experience, methods and plans. And hats off to them for their skill in *doing more with less!* 73,

Jim, KK7C

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.

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Experimenter's Corner

QRP Power Control on a QRO Rig

by Keith Clark, W6SIY [1]

The most fundamental measurement associated with QRP operation is output power. It figures into contest scores, awards, and even the basic question of whether we are really operating at QRO, QRP, or Milliwatt levels. QRO rigs capable of 100 watts output are used at QRP levels by many of our members, including myself. How can we be sure we are controlling output power to the desired level? How does the Automatic Level Control (ALC) work? What about antennas with a high SWR? Is it possible they could somehow draw more power from the transceiver than we thought it was set up for?

These questions have troubled me from time to time in my QRP operating, so I've conducted some experiments with my TenTec Delta 580 to answer them. While most of you won't be particularly interested in the Delta, the same measurements could be done on other rigs. So read on—maybe some others can report on how their rigs behave under varying loads.

This has been my first experience learning about SWR, directional couplers, noise bridges, ALC and RF power measurement -quite a wide range of topics, but important ones to QRP operators. Happily, the final result of this effort was the knowledge that my method of QRP power set-up and control does work correctly, and that the Delta's ALC can limit power output over a wide range of frequencies and antenna loads without re-adjustment.

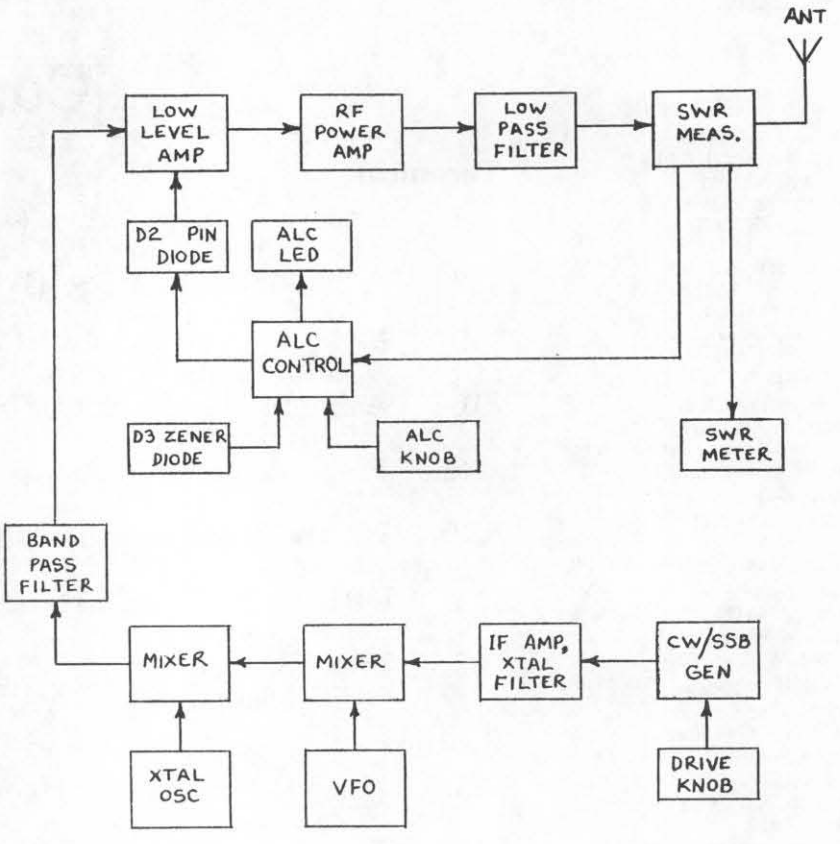


Figure 1. TenTec Delta transmit block diagram.

TenTec Delta Description

First, lets look at a partial block diagram of the Delta's transmit circuitry, see figure 1. The acutual schematics are quite complex, and I would be months trying to understand how everything works in the various blocks. However, based on the somewhat brief write-ups in the owner's manual, I will try to describe my impression of the major functions.

The front panel transmitter controls are "DRIVE" and "ALC" knobs and an ALC Light Emitting Diode (LED). Signal generation for CW or SSB is at 6.3 Mhz, with the level adjusted by increasing the DRIVE control knob until the LED lights on key-down CW, or on SSB voice peaks. The signal then goes through the usual IF amplifier and crystal filter to the mixers which shift the 6.3 MHz signal into the desired amateur band. Bandpass filters remove unwanted mixer products. The signal then goes to the Low Level Amplifier which has two stages and a maximum output of about ½ watt. It is here that the ALC control knob and feedback control signal do their jobs to establish the transmit level. The output of this block is fed to the broadband RF Power Amplifier which provides up to 90 watts output. On its way to the antenna, the signal goes through a Low Pass Filter and SWR measurement circuitry. Gain control in the Low Level Amplifier is performed by a PIN diode (D2) attenuator at the input. The PIN diode control signal is based on three things:

1. A reference Zener diode (D3) voltage, 5.6V.
2. A signal fed back from the SWR measurement circuitry.
3. The setting of the "ALC" knob on the front panel.

For normal QRO operation of the Delta, the ALC knob is set to the desired power level (25-90 watts output) and the "DRIVE" control is advanced until the LED lights, key-down. There is no dedicated circuitry for power reduction at high SWR loads. The primary protection is provided by an over-current circuit breaker in the 12 volt power supply. Additional protection is from the operator's observation of the SWR meter. The owner's manual recommends reducing power (by the ALC knob setting) until the SWR meter reads 3 or less. When this is done, the SWR meter is no longer calibrated as it was for the full 90 watt output setting. Of course, this would only be required for antenna loads presenting 3:1 or higher SWR to the transmitter. The RF Power Amplifier is claimed to be quite rugged, but caution is still recommended in driving high SWR, or highly reactive loads.

My antennas are an HQ-1 Mini-quad at 24 feet, and a 40/20 meter diopole at 18 feet. The dipole has separate wire elements for the two bands. Element lengths were adjusted for satisfactory SWR readings across both bands, using the SWR meter on the Delta. The worst case SWR reading of 4 occurs at 14.0 MHz where some QRO power reduction is needed to get the reading down to 3. The Mini-quad is well known for its narrow bandwidth, so QRO power reduction is also needed for it at the band edges of 20, 15 and 10 meters. I've made no effort to trim the tuning spokes, as it was pretty well centered for combined CW and SSB use. I've experienced no problems with transmitter reliability or spurious signals in several years active use of the Delta with these antennas, without a transmatch.

QRP operation with the Delta

Now, how about QRP operation? That's what you've all been waiting for! For levels below about 25 watts output, the factory manual suggests setting the ALC knob all the way down, then reducing the drive knob below the point where the LED lights. A formula is given for determining INPUT power to the transmitter based on power supply current readings. This method of setting QRP power levels has several disadvantages:

1. There is no LED indication of output power, and uncertain ALC feedback level control of it.
2. The transmitter is VERY inefficient at

levels under 5 watts, so input power is a poor indication of expected output power. You might expect 50 percent efficiency and set up for 10 watts input, only to find output was just 130 milliwatts. This happened to me in one QRP contest, before I built a dummy load/wattmeter!

3. SSB operation cannot be controlled to QRP levels due to lack of ALC operation.

4. Adjustment of the drive control is VERY critical, and changes on different bands.

I wrote QRP contester Chris Brakhage, WB5FKC, to find out how he controls QRP power level on his Delta. His solution was an easily installed modification to the ALC control circuitry on the Low Level Amplifier board. The D3 zener reference diode is paralleled with a lower voltage (about 2.5 V) zener in series with a switch. This reduces the ALC reference level so that the ALC knob adjusts through the desired QRP range of output power. With this modification made operation of the DRIVE and ALC knobs and the ALC LED are exactly as described in the QRO adjustment procedure. This solves all the previously listed disadvantages. I didn't have a low voltage zener, so I used 4 silicon diodes in series. There is a minor power level shift during the fist half-hour warm-up due to the silicon diodes temperature sensitivity. The series switch was mounted on the back of the transceiver so I can easily switch back and forth between QRP and QRO power levels. At QRP levels, the SWR meter always reads well below 3 (not calibrated), so there is no need to reduce the power setting at the band edges. In fact, once set up on a dummy load/wattmeter, I can switch to either antenna, and various bands without any readjustment of the ALC or DRIVE knobs – instant QSY! This is the control method I have used for QRP contests and my successful achievement of a QRP DXCC.

Due to my low antennas and casual approach to contests, I have not been any serious threat to the Big Guns in the QRP ARCI contests. Thus, there was no serious concern if my power level was not precisely controlled. However, my DX'ing efforts were another story. I wanted to be absolutely sure that my QRP DXCC contacts were really being accomplished with under 5 watts output! My main concern was that the ALC control signal fed back from the SWR measurement circuit to the Low Level Amplifier might act as an RF voltage control instead of an RF power control.

SUPPOSE IT WERE A VOLTAGE CONTROL. – If I set the Delta up for 4 watts output to a 50 ohm dummy load (14.1 VRMS measured with a FET VOM and RF probe), then switched to an antenna/feedline which happened to have a feedpoint impedance of 20 ohms resistive, the same 14.1 VRMS would result in 10 watts output, clearly beyond QRP level! This is not an urealistic load, as it represnts an SWR of only 2.5:1. This kind of control would definitely *not* be acceptable for maintaining QRP output levels with my antennas.

Measurement of ALC Behavior

So, early in my QRP DX'ing efforts I conducted a simple experiment to see how the ALC operated. I set up the Delta for about 4 watts output to a 50 ohm dummy load, then tried different load resistances without changing the Delta's adjustments. Series and parallel combinations of 50 and 100 ohm, 2 watt, resistors were used for this experiment. They were carbon resistors; wire-wound ones could throw off the results with added inductance. The measurements are shown in table 1.

Resistive Load	SWR	VRMS	Measured Power output	Expected Power output
50 ohms	1:1	15.0	4.5 W	4.5 W
25	2:1	10.4	4.3	4.0
100	2:1	20.1	4.0	4.0
200	4:1	23.7	2.8	2.9

TABLE 1. Delta QRP output to a dummy load, no change in DRIVE or ALC knob settings.

Table 1 shows that RF voltage is *not* being kept constant, but that output power does stay relatively constant at varying SWR levels. Also, the tendency is for output power to drop off at high SWR levels. Because of the general arrangement of the SWR measurement circuitry, and the results of this experiment, I am inclined to believe that the actual ALC controlled level is *INCIDENT* power to the line and antenna, while the SWR meter really measures *REFLECTED POWER*, with a dial calibrated in SWR. Since Output power = Incident power – Reflected power, this would explain the fall-off in output power at high SWR's. It is being subtracted as reflected power. This can be analytically predicted using the following equations:

$$\text{Reflection Coefficient, } p = \frac{\text{SWR} - 1}{\text{SWR} + 1} = \frac{\text{Refl Volt}}{\text{Incident V}} = \frac{\text{Refl Current}}{\text{Incident Cur}}$$

$$\frac{\text{Reflected Power}}{\text{Incident Power}} = \frac{(\text{R.V})\ (\text{R.I})}{(\text{I.V})\ (\text{I.I})} = p^2,$$

where R.V. = Refl Volt
R.I. = Refl Current
I.V. = Incident V
I.I. = Incident Current

Output power = Incident power – Reflected power
Output power = Incident power $(1 - p^2)$

The calculated values of ouput power are listed in the last column of table 1 as "Expected Power Output." This is to test my assumption that the ALC really controls INCIDENT power. The analytical results show reasonable agreement with the measured one! I should point out that all my measurements are being made with a homebrew RF probe and FET VOM. While they are not laboratory quality, they have been calibrated and accuracy should be adequate for the type of comparisons I'm doing here. The results were good news for my QRP DX'ing efforts because I could set up output power on a simple dummy load, then go to any frequency, using the appropriate antenna, knowing that my output power would either be held constant, or would fall off somewhat with SWR.

I have since made additional output power measurements with reactive loads connected in series or parallel to the resistive dummy loads. A single capacitor or inductor was used, and the frequency varied to get different reactance values. The results are shown in table 2.

The table 2 data were developed as follows: The Delta was set up for 4.5 watts output to a 50 ohm resistive load as used for table 1 data. Delta control knobs were then left unchanged during all measurements. Frequency of operation and the schematic of the reactive load are shown in the first two columns. Impedance was calculated for all loads and listed in complex form. Negative "j" values are capacitive and positive ones are inductive. For series loads, the reactance is calculated, multiplied by + or – "j," then added directly to the resistance. For parallel loads, it is necessary to transform the parallel impedance values to an equivalent series impedance. This can be done by complex arithmetic manipulation of impedance and admittance values, or by the following algebraic equations:

$$R_S = \frac{R_p X_p^2}{R_p^2 + X_p^2} \qquad X_S = \frac{X_p R_p^2}{R_p^2 + X_p^2}$$

where R_s = series resistance
X_s = series reactance
R_p = parallel resistance
X_p = parallel reactance

The complex impedance is then located on a Smith chart to determine SWR. Finally, SWR was used in the previously discussed equations to find "expected power output" based on ideal ALC control of incident power to 4.5 watts. RMS voltage was measured directly across the resistive part of the load so that actual power could be calculated as: $P = (V_{rms})2/R$.

The results are quite similar to those shown in table 1. For load resistance values of 50 to 100 ohms, the measured power output closely matched the "expected" values. However, at loads with about 20 to 25 ohms resistive component, the measured values were 7 to 20 percent ABOVE predicted values, exceeding the original power setting by up to 7 per cent. The worst case occurred with a 25 ohm resistance in parallel with a 1.7 microhenry coil, measured at 21 mhz. I'm not sure whether the higher than expected power levels are a real effect or some type of measurement error. However, the effect is small enough that the ALC feedback can still be considered to control incident power. For my DX'ing efforts, I've always set up for output power of 4 watts to give some margin for variations like this.

Another check I have done along with these dummy load tests is to measure my actual antenna/feedline impedance as seen at the transmitter end of the coax. This is a relatively simple measurement made with a

FREQ MHZ	LOAD	Equiv. series Impedance	SWR	VRMS across Resistor	Watts actual Power	Watts Expected Power
3.5	25Ω	25-j2	2.0	10.4	4.3	4.0
14	150 pF	23-j7	2.3	10.4	4.3	3.8
14	50 150	35-j23	1.9	14.4	4.1	4.1
14	100Ω 150 pF	37-j48	3.0	17.9	3.2	3.4
14	25Ω 150pF	25-j76	7.0	7.5	2.3	2.0
14	50 150	50-j76	4.0	12.1	2.9	2.9
14	50Ω 1.7μH	50+j150	11.	8.0	1.3	1.4
7		50+j75	4.1	11.6	2.7	2.8
3.5	25Ω	17+j12	3.2	9.4	3.5	3.3
7		23+j8	2.2	10.4	4.3	3.9
14		24+j4	2.1	10.8	4.7	4.0
21	1.7μH	25+j3	2.0	10.9	4.8	4.0
3.5	50Ω	18+j24	3.5	12.7	3.2	3.1
7		35+j23	1.9	14.5	4.2	4.1
14		45+j15	1.4	15.0	4.5	4.4
21	1.7 μH	48+j11	1.3	15.0	4.5	4.4
3.5	100Ω	12+j33	6.0	15.6	2.4	2.3
7		36+j48	3.1	19.1	3.6	3.3
14		69+j46	2.3	19.6	3.8	3.8
21	1.7μH	84+j37	2.2	19.6	3.8	3.9

Table 2. Delta QRP output to reactive loads, no change in DRIVE or ALC knob settings from those used in table 1.

noise bridge, using the transceiver as a null detector. Knowing the antenna/feedline resistance and reactance, I could duplicate them with a dummy load resistor and capacitor or inductor. Power output to the resistor, measured with an RF voltage probe, would be the same as output power delivered to the antenna/feedline.

Finally, I decided to test the Delta's power output when using the owners manual suggested QRP adjustment technique described earlier. The ALC knob was set all the way down, with my added switch in the QRO position, and the drive control was gradually brought up to the 4.5 watt level on a 50 ohm load. I expected power levels to change dramatically with load resistance, but they didn't. In fact, the results were nearly identical to those shown on table 1. So the ALC circuit is still having some effect, even if the LED light isn't "on." This was certainly a surprise to me! I did notice that if the power level was set up correctly this way on one band, it would be far different when switching to another band. Also, I determined with dummy load measurements that on SSB the output power varied greatly depending on how close the microphone was held. Since there is no output level control for SSB the suggested adjustment procedure is unacceptable for SSB QRP operating.

SSB Power Control

The owners manual for the Delta is not very informative about SSB output power. No mention is made of PEP level on which our QRP power settings are based. This was another case where some simple measurements were quite useful.

My findings were that the Delta's ALC, when operating with the LED coming on, controls SSB PEP power output to the same level as CW output. If the ALC knob is set for 5 watts CW output switching to SSB will give 5 watts PEP SSB output, if the ALC knob is left in the same position. The drive knob may have to be re-adjusted depending on speaking volume and micrpohone gain. Remember that 10 watts PEP SSB is the usual QRP limit!

The test procedure for these measurements was quite simple. They previously used 4.5 watt CW output was fed to my dummy load/wattmeter, then the ALC knob was left in place when switching to SSB. My wattmeter is a rather unusual design from a magazine article a few years back. Part of the dummy load resistance is a pair of #47 bulbs. These shine in a photocell (obtained from an old Kodak Instamatic camera) which drives a microammeter. This design responds to average power output, not peak power like a conventional RF voltmeter-based on an RF probe does. I attached my FETVOM RF probe accross the dummy load to measure RF "RMS Voltage" based on signal peaks.

Finally, my Dumont 208 scope vertical deflection plates were also wired to the dummy load. The Dumont is a very old tube-type scope with audio frequency response through the amplifiers. However, it responds from DC to 100 Mhz if driven directly at the deflection plate.

First, the CW signal shows up as 15 VRMS (4.5 watts output for 50 ohms) on the RF probe, and also as 4.5 watts output on the wattmeter. The Dumont trace for the CW signal is a continuous band 1.2 inches high. Rise and fall patterns of the CW waveform could be observed while keying the transmitter, just like the QST and "Handbook" pictures you see.

Next, the transmitter was switched to SSB without changing the ALC knob setting. Various noises and words were transmitted into the dummy load. No matter how loud they were, the RF probe never indicated over 15 VRMS (peak power level), and the scope trace never exceeded the 1.2 inch height. On voice peaks, when the ALC LED was coming on, the SSB peaks were identical to the CW level. This demonstrated that SSB PEP power output was being controlled to the same level as CW output, by the Delta's ALC.

While these sounds were all showing the same 4.5 watts PEP, the average responding wattmeter varied from about 1.5 to 4.5 watts depending on the character of the sound input. These measurements illustrate the problem of relating SSB average power to PEP power; there is no exact relationship due to voice variations, speech processing, etc.

Accurate SSB transmitter measurements are made with a two-one test. If the amplitudes of two audio input tones are equal, they will ideally result in two RF frequency outputs, each with a power one-fourth of the PEP power. Combined, the two signals yield a power one-half of the PEP level. This looked like a rather complex test set-up, but I found a short cut.

Touch tone telephones operate on pairs of tones whose frequencies depend on which button is pushed. I held the telephone earpiece up to the Delta's microphone and tried

See page 8 . . .

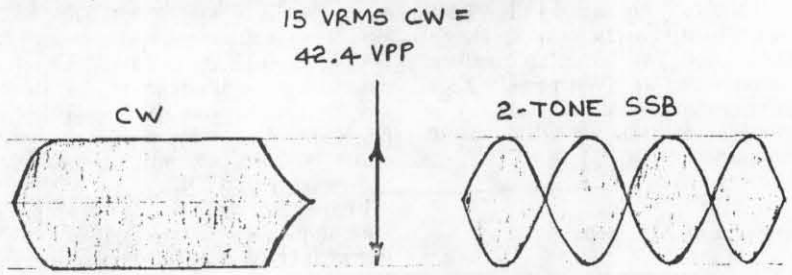


Figure 2. Delta output waveforms with the same ALC knob setting on CW (4.5 watts) and SSB (4.5 watts PEP).

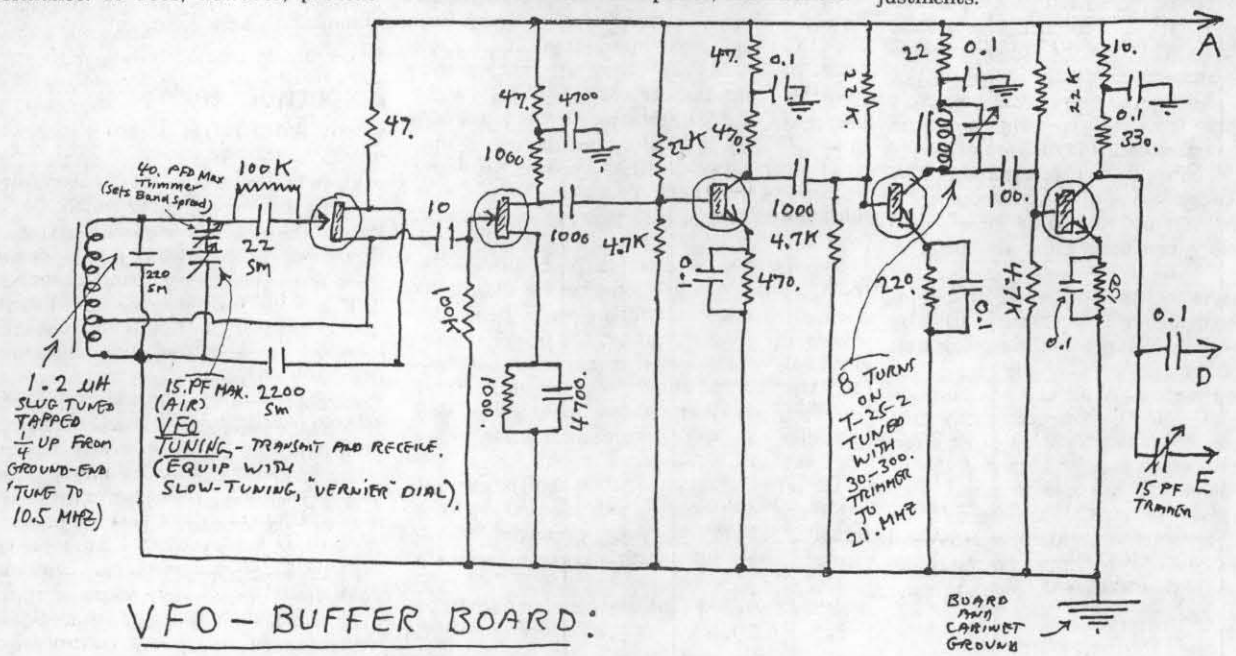
A One-Watt 15 Meter CW Transceiver Packed to Go

by C.R. Rockey, W9SCH [1]

This unit was built for the writer's own use, employing components on-hand in Rockey's junk box. It is not intended to be duplicated in detail but rather to show what is possible and perhaps to stimulate some ideas within the reader's mind. There is nothing particularly unique within it and no great attempt has been made to achieve the ultimate in performance. It does, however, provide much pleasure to the writer and its signal has elected a number of favorable comments on the air.

The transceiver is built within a 12"x 6"x 5" metal fishing tackle box, the writer having neither the need or desire for further compactness. The transmitter boards (VFO-buffer and drive/final amplifier) are mounted upon the bottom of the box, the receiver portion upon the underside of the lid. While not necessarily exquisite, this is a sturdy and practical arrangement.

The transmitter VFO-buffer assembly is primarily mounted upon a 3½"x7," single-sidedboard, allowing plenty of room for necessary component changes and adjustments.



VFO-BUFFER BOARD:

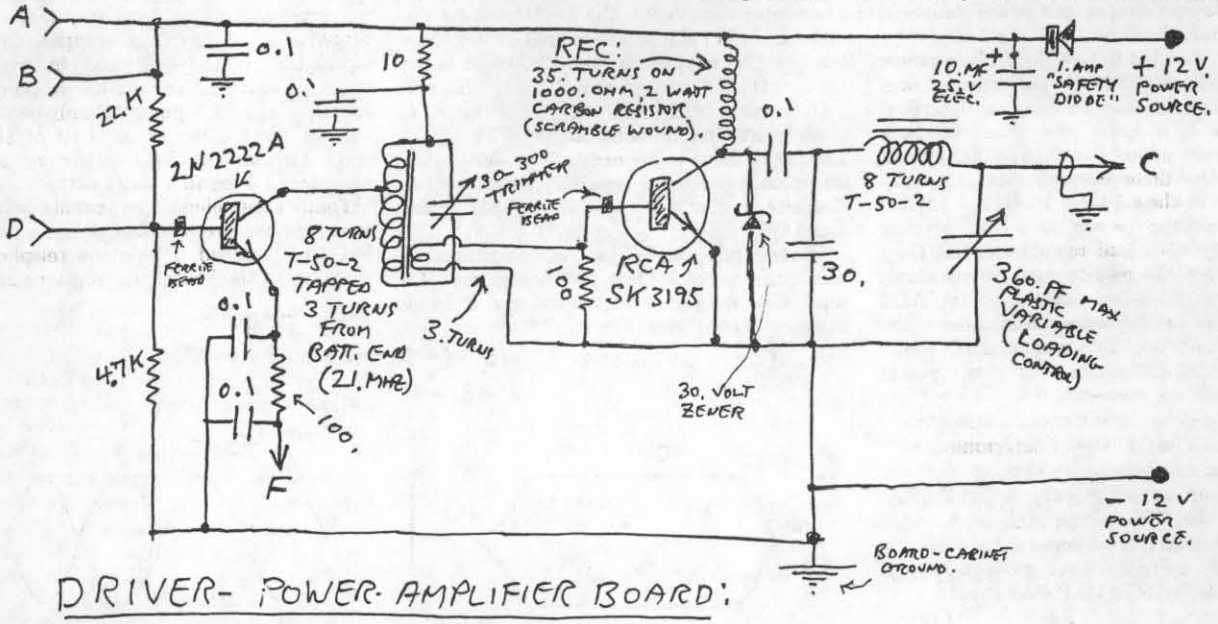
FETS: MPF-102 PREFERRED.
TRANSISTORS: 2N 2222 A PREFERRED.
RESISTORS: ¼ WATT CARBON.
CAPACITORS: DISK CERAMIC, UNLESS OTHERWISE STATED.

(LETTERS REFER TO INTERCONNECTIONS BETWEEN BOARDS, ETC.)

It has been my experience that greater frequency-stability is obtained when the VFO is operated at one-half of the output frequency or, in this case, at 10.5 Mhz (approximately).

I have found this imperative if chirp and frequency-pulling are to be avoided. Aside from these precautions, the simplest and most straightforward methods are used. The simple, Hartley-type FET oscillator provides plenty of output with satisfactory frequency stability.

An untuned FET plus a following bipolar-transistor untuned buffer stage provides satisfactory isolation. Plus sufficient drive



DRIVER-POWER AMPLIFIER BOARD:

ALL RESISTORS: ½ WATT
ALL CAPACITORS: DISK CERAMIC UNLESS OTHERWISE STATED.

for the frequency-double stage. But such a stage often provides limited power gain, so we follow it with another untuned buffer. Adjust the trimmer in series with the VFO tuning capacitor to just cover the 15 m. CW band.

The driver - power amplifier primarily occupies a 3"x4½" board. Since these were the writer's first attempt at circuit board layout and etching, no attempt at high component-density was made.

The driver stage is a straight forward class-A RF power amplifier using a parallel-tuned tank circuit link-coupled to the final amplifier base. The final amplifier operates class B-C and is coupled to the output through a pi-network. The output capacitor of the pi is made variable to permit optimum coupling to *resistive* loads of from about 40 to about 100 ohms. The output runs from 3/4 to 1½ watts depending upon the mood that it is in. We have found this to be sufficient to provide many contacts when the band is open.

The receiver makes use of the little circuit boards once made for the amateur market by TenTec (type MX-1 product detector unit and AA-1 high gain audio amplifier) which I found at a Hamfest. While this combination provides an effective direct conversion receiver, any other combination of an effective product detector and a high-gain (about 100 db) audio amplifier would do as well. Two interesting receiver circuits appeared in the July - Oct. '86 *Quarterly*. Also see Hayward and DeMaw *Solid State Design for the Radio Amateur* or DeMaw's *QRP Notebook* for suggested circuits.

The transistors shown are those which we recommend for new construction, although several mavericks of unknown origin tually used, component values being juggled to suit their properties.

The VFO-buffer board was assembled and de-bugged first. Then the driver-power amplifier was installed and made to work. Unlike many writers of high-toned scientific papers, I do not claim to have merely "solved the pertinent equations and assembled the apparatus for immediate perfect performance." We had our share of problems, the solution of which proved to most educative.

Perhaps the most interesting observation was the noticeably lessened output obtainable from most transistors at 15 meters compared to that available on the lower frequencies. If all of your transmitting-transistor experience has been on 40 or 80 meters, watch out! You may have a not altogether pleasant surprise in store on 15 meters.

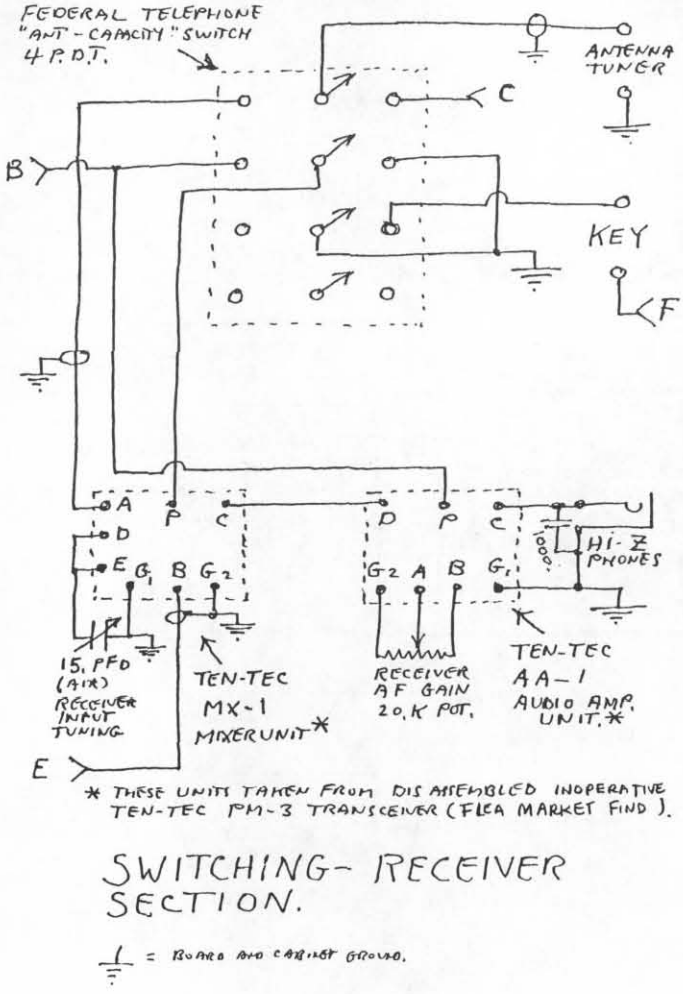
Having had interaction problems in the past, I used several stages between the VFO and the power amplifier, each being individually de-coupled from the power source. Perhaps sophisticated engineering and better transistors could have reduced their number, but I am please with the overall stability and freedom from interaction which we have here obtained.

Despite limited on-air time and the current spotty conditions, I am pleased by the results which one watt produces on 15 meters. Even more surprised and amazed are many QRO-operators.

I have worked - some answering CQ's! I've worked no DX yet. Solid QSO with both coasts of the US and Canada, along with Cuba, Florida and Texas is the score so far, all worked using the trusty 80 m centered Zepp at 25 feet.

When Ol' Sol acquires a few more "freckles" we expect a crack at our share of one-watt DX.

If any potential homebrewer wants more information or clarification, do no hesitate to write.



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Experimenter's
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push buttons until I got a classic two-tone trace on the scope, using button "1." When the two tone levels are balanced, the scope waveform envelope looks like a positive sine wave lined up with a negative one. See figure 2. This came out very nice, just like the picture in the ARRL Handbook. Note that the scope peaks on SSB were the same height as the CW level, at the same ALC knob setting. With this two-tone audio, the RF probe read 15 VRMS, indicating 4.5 watts peak output (PEP) and the wattmeter read very close to the expected 2.25 watts average output. These measurements were quite interesting and helped me to better understand the Handbook discussion on SSB power levels.

I have been happy with the results and the method of power output control now being used. The output does fall off somewhat with SWR, but the ability to change frequencies or bands instantly without retuning has been very helpful in my QRP DX'ing efforts. If others wish to make measurements like this, I would suggest care to avoid loading conditions which could damage the RF power output stages. The Delta has quite a rugged design, and my QRP testing power is only 5 percent of the normal rated output. Other transmitters may be less tolerant of high SWR loads, so pay attention to the manufacturers recommendations, and watch power supply current use.

Some of you have undoubtedly been wondering through all this why I don't just use a Breune type in-line RF power meter to read incident and reflected power. The reason is that I haven't built one yet! That is the ideal instrument for monitoring output power and SWR. It would be particularly useful for checking homebrew QRP rigs, or others which do not feature an ALC circuit. However, as I have shown, simple measurements with a dummy load and RF probe/FETVOM are quite adequate for investigating transmitter output characteristics. Besides, it has been a great learning experience. Going through the measurements and calculations helps develop a better understanding of circuit behavior. Measurements with the simple test equipment can also serve as a cross check of those made with more elaborate instruments.

My reference sources for this effort were: *ARRL Radio Amateurs Handbook; ARRL Antenna Book;* Ade Weiss, *The Joy of QRP; TenTec Delta Owners Manual.*

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Make Your Argo into a Contest Rig

by Fred Bonavita, W5QJM

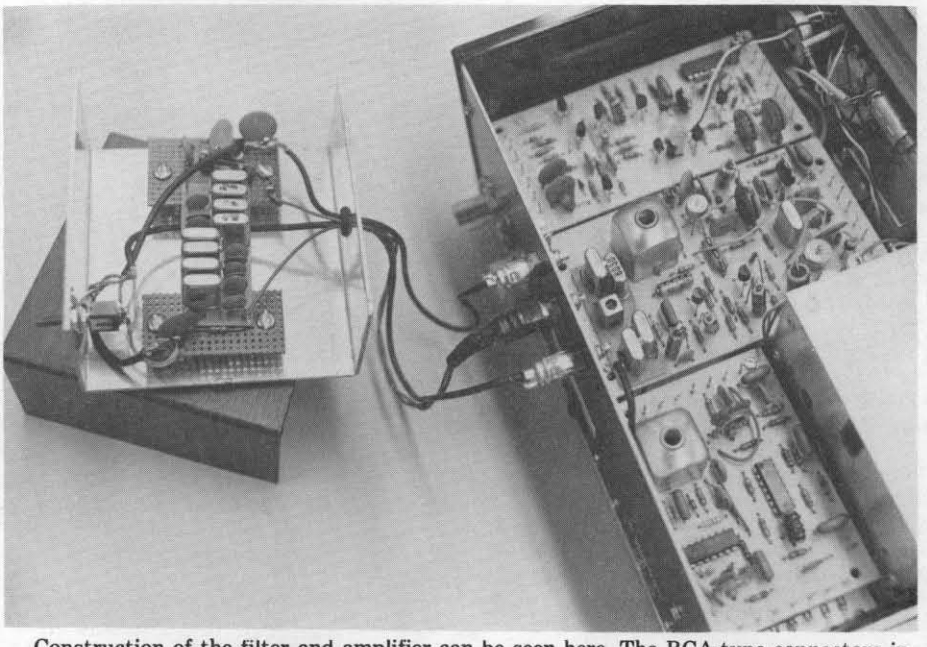
Despite the fact Ten-Tec stopped making them several years ago, the Argonaut 515 transceiver remains a much sought after rig among QRP enthusiasts.

Whenever a 515 surfaces at a swapfest or in the for-sale columns of an Amateur Radio publication, it's usually snapped up quickly. There are not that many 515's floating around, since Ten-Tec manufactured only about 800 before suspending production because of costs. By comparsion, almost 5,000 Argonaut 509's were produced before it was dropped in favor of the 515.

Among the pluses for the 515 is the fact Ten-Tec used the receiver front end from its popular Model 540 (formerly the Triton IV) transceiver and boosted the power output of the transmitter by about a halfwatt.

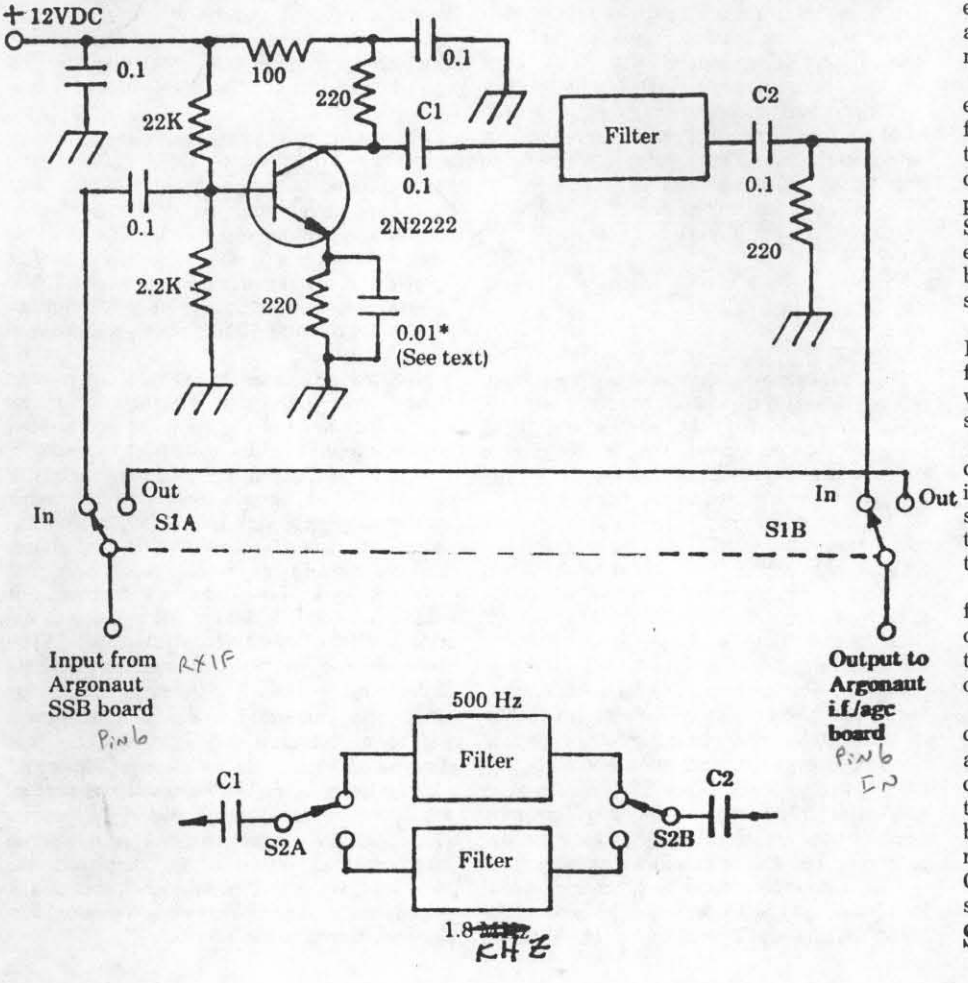
The 515, however, suffers from a somewhat marginal filtering system, especially for CW. As produced, the 515 was equipped with a four-pole, 2.7 KHz crystal filter. While this was fine for sideband, CW operators had to rely on an outboard active audio filter for improved selectivity. Ten-Tec offered the Model 208-A filter with a tunable notch as an accessory which plugged in the receiver chain between the i.f. and audio boards.

Even with the 208-A or similar filter, the 515's performance is still not what it should be in contest or similarly crowded conditions. Steven E. Mann, N4EY, offered one solution – adding an outboard crystal filter. Although his article in the September 1981 issue of *QST* dealt with the 540 transceiver, he suggested the modification would work for the 515 and possibly the 509 Argonauts. While I have not tried this for the 509, it works for the 515.



Construction of the filter and amplifier can be seen here. The RCA-type connectors in this photo later were replaced with BNC connectors.

This modification involves inserting the crystal filter in the receiver chain between the single sideband board and the i.f/agc board of the 515. To compensate for the insertion loss of the new filter(s), a small amplifier based on Steven's design is included. The whole thing goes together quickly and inexpensively and enhances performances far beyond the costs.



As recommended, I used the Ten-Tec 217 eight-pole, 500 Hz crystal filter, which sells for about $60 as an accessory for the Argosy transceiver. If even narrower filtering is designed for CW, there's the Model 219 six-pole, 250 Hz crystal filter, while improved SSB filtering may be had with the Model 218 eight-pole, 1.8 KHz crystal filter. These can be used singly or in a switched fashion (see schematic).

My version went together in about an hour. I used small pieces of perf board to hold the filter and accompanying amplifier, which I wired in "ugly-fashion." I used quarter-inch stand-offs to support the whole assembly.

Modification of the 515 is simple and direct. Remove the 515 SSB board, the i.f./agc board and their insulating strips and set them aside. Locate the seven-pin sockets these boards plug into at the back of the transceiver.

Unsolder the wire (it was blue in my 515) from pin 6 of the i.f./agc socket, flip the rig over and unsolder the other end from pin 6 of the SSB board socket directly beneath the other one. Discard the wire.

Prepare two pieces of miniature 50-ohm coax (RG-174/U) - one about two inches long and the other four inches. Solder the center conductor of the four-inch strip to pin 6 and the braid to a ground at pin 7 of the SSB board, and insert the other end through the rubber grommet into the top of the rig. Check your wiring. Replace the insulating strip and SSB board and fasten in place.

See page 11 . . .

A Balun May be Eating Your Lunch

by John Collins, KN1H [1]

This project started the day after I got home from Dayton 86 where, at the QRP Antenna Forum, Brice Anderson, W9PNE, claimed that a ferrite cored balun or coil would reduce your power by 2dB or more. Others opined that ferrite-loaded baluns tend to be lossy and are to be avoided. That thought nagged at me for the rest of the Hamvention and followed me all the way home. Since moving to a new QTH six months earlier, I had erected a dipole 140 feet long and 50 feet high fed with open wire line, which in turn was fed thorugh a balun (ferrite loaded) with an L network (also ferrite loaded). This antenna worked infinitely better than anything I'd ever been able to put up on our former city lot. Could it possibly be made to work even better? And how could I tell if it was? Some test equipment was needed.

First I needed a field-strength indicator of some kind. Looking through the literature and handbooks turned up several designs for the field-strength meters with various drawbacks – lack of sensitivity, or battery power, or tuning requirements. My solution, ironically enough, was to build the circuit in fig. 1 using a ferrite core. When used with a 4' piece of wire for a pick-up antenna, it gives at least half-scale deflection on the meter on all bands, 160-10M, with a couple of watts to the antenna. Now I had a way of looking at the RF after it left the shack. To accurately measure power inside the shack I had a RF voltmeter, a 0-250 RF millammeter and my calibrated QRP dummy-load-wattmeter.

Before I describe the measurements I took and their results, let me issue a warning to anyone who wishes to wring out his antenna system: question every measurement! It's very easy to find yourself comparing apples with oranges, and easier yet to believe that your test equipment is telling the truth. It may not be. Or you may make measurements based on an assumption that isn't true. If this sounds like experience talking, it is. I made one series of field strength measurements comparing two baluns which showed one having 20dB loss over the other. To make switching between the two easier I had equipped each with its own connector cable - one had an open shield as it turned out, and gave pretty impressive field strength readings even into a dummy load. The moral: keep the variables down to just the items being compared, there's enough confusion without adding more.

Another, happier, problem cropped up when, about half way through these experiments, I was fortunate enough to be able to borrow a 50 Mhz Hitachi oscilloscope. Right away something was wrong. With one watt into my calibrated dummy load the scope indicated 14.2 V p-p where I was expecting about 20 V p-p. It seems that the 'scope is right, but so is the RF voltmeter used to calibrate the wattmeter. The problem is that the RF voltmeter is a **peak** indicating meter and I had calibrated the wattmeter using the formula $P = E_2/R$,E being the **RMS** voltage. I recalibrated the meter according to the formula $E(peak)_2/2R = P$ and at last have an accurate wattmeter. However, for the past two years I'd been operating at less than ½ watt output while thinking I had a blistering 950mw. It just proves that QRP operation really is possible. I worked about 40 stations in the fall contest while running what I thought was 500mw to save my batteries. Actually it was only 250mw!

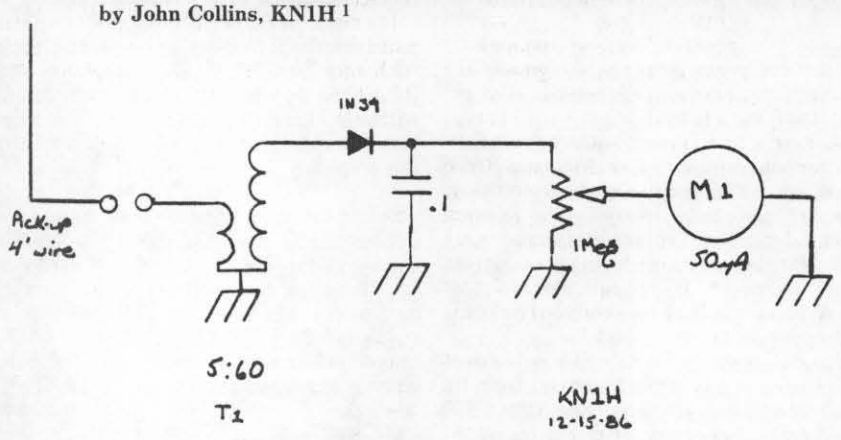


Fig. 1 Field Strength Meter. T1 : 60T secondary, 5T primary, Primary and Secondary Twisted Tightly Together before winding on Ferrite core. Core Type not critical.

But I digress. Once the various measuring problems were straightened out, the experiments went smoothly with some very enlightening results.

To measure the loss through the L-network antenna tuner, I calibrated the transmitter power at one watt and then measured the RF voltage and RF current at the output of the tuner on all bands using a 100 ohm resistor as a load. Four different inductors were used in the tuner for comparison purposes: one wound on a ferrite core, one on a powdered iron core, one air-wound of #20 wire, 1" diameter; and one air-wound of #10 wire, 3" diameter. The results are as follows:

CORE	LOSS
Ferrite	6.5 dB
Powdered Iron	3.5
Air (small)	2.7
Air (large)	.5

Field strength measurements corresponded very closely with the power measurements which would confirm that only about 1/4 of my transmitter power was even getting through the tuner! Loss figures vary only slightly from band-to-band, being about .2 dB higher on 10m and .2 dB lower on 160m. The large air-wound inductor showed no measureable loss on 80m, but had .5 - .7 dB loss on all other bands, including 160m. Clearly, the ferrite core in my L-network is little better than an attenuator. Further evidence of this loss is the broad SWR dip at resonance obtained with the ferrite core compared with the very sharp narrow dip obtained with the large air-wound inductor. Actual bandwidth measurements were not made, but suffice it to say that if your SWR minimum is very wide, especially on the low fequency bands, your antenna system may be approaching the status of a leaky dummy load.

With a new L-network in place and a 6dB 'gain' under my belt it was time to take on the balun. While the operation of an 'antenna tuner' such as the L-network is fairly easy to imagine and understand, the balun is more difficult to grasp. Basically it's a device for converting a BALanced condition to an UNbalanced one, or vice verse, and some configurations also feature a 4:1 or 9:1 impedance transformation. When feeding open-wire line from an unbalanced tuner, theory says a balun is necessry to keep the open-wire line from radiating due to imbalance. But a couple of questions come to mind: what's wrong with a little feed-line radiation from an HF dipole? And what does the RF see when it gets to this large hunk of inductive reactance.?

The answer to the first question depends on whether you want the textbook pattern from your antenna or not. Unless the dipole is at least ½ wavelength above a perfectly conducting ground you aren't going to get it anyway. For most amateurs, an antenna that splatters RF everywhere is quite useful, but in any case the pattern is very difficult to predict for a dipole 50 feet above who-knows-what for ground.

Measuring the loss through a balun proved to be trickier than I first imagined, and in the end it was beyond the scope of my limited test equipment to do it with any accuracy. Directly measuring the power transfer capabilities of various baluns didn't work well because inserting the test equipment into the circuit upset the balance, giving misleading and unrepeatable results.

To get some idea of the relative merits of each balun, the field-strength meter was used. Each balun was placed in the line and the transmitter power was adjusted for the same deflection on the field-strength meter for each measurement. The transmitter power was then measured and recorded. This was done on all bands with 5 different baluns and with no balun at all. The baluns tested were all 4:1, phase reversal types wound on various cores including: a ferrite toroid, a powdered iron toroid, air-wound on a 1" diamter form, air-wound on a 2½" diameter form, and a commercially made balun wound on a ½" ferrite rod. Here are the results:

Core	80M	40M	20M
Powdered Iron	4.2W	1.4W	1.6W
Ferrite	1.2W	600mw	225mw
Commercial	1.2W	800mw	270mw
Small Air	1.0W	1.0W	325mw
Large Air	1.2W	700mw	90mw
None	225mw	125mw	20mw

The differences in power readings between bands is due to the field strength meter being more sensitive at higher frequencies (the 4' piece of wire becomes a more efficient receiving antenna). The extremely low readings associated with no balun at all may indicate that the feedline was radiating and may not be directly comparable to those taken with a balun. Or are they?

Balance was checked by placing the field strength meter off to one side of the dipole with ther pick-up antenna horizontal and parallel to the dipole. The balun connections to the feedline were then reversed and measurements taken to determine if there was any difference. Any imbalance in the baluns should show up as a different field strength reading for the same input power. Here are the results:

Core	80M	40M	20M
Powdered Iron	2 dB	1 dB	.8dB
Ferrite	1	1.2	1.4
Commercial	.7	.9	1.0
Small Air	1.2	1.6	.6
Large Air	2	1.2	0
None	10.4	2.0	2.4

The readings taken with no balun were accomplished by reversing the connection between the balanced feedline and the unbalanced tuner output. They indicate a large imbalance on 80M or 10.4dB, but on the higher frequencies the imbalance is only slightly worse than with any of the baluns. (It's interesting to note that the commercially made balun exhibited better balance than any of my homemade ones, but it really didn't perform any better.)

What does all this mean? It doesn't mean much unless it makes a difference on the air. With the exception of the balun wound on the Powdered Iron core, which performed dismally, all of the baluns were fairly close in terms of balance and field strength, so I elected to use the large air-wound balun for some on the air checks. In most cases, signal reports have been better with no balun at all. In QSO with W3TS on 80M SSB, Mike saw a 2'S' Unit increase in my signal when the balun was removed. The evidence seems to point toward some, as yet unmeasured but significant, loss through all the baluns. The investigation continues, but meanwhile I'll be on the air balunless.

If there are any morals to this story, they might be: Don't let anything unecessary come between your transmitter and antenna, and: For the best QRP use kilowatt components.

I'd be happy to hear from anyone who has successfully measured the loss through a balun, or who has performed similar experiments to compare notes. Send your information to me for inclusion in the *Quarterly*.

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Argo . . .
Cont. from page 9

Turn the 515 over and connect one end of the two-inch coax to the socket of the i.f./agc board in the same fashion - center to pin 6 and ground the braid. Check your wiring. This board and insulating strip may be replaced now or after the next steps.

It's necessary to drill some holes in the rear panel of the 515 above the i.f./agc socket. Although the accompanying photo shows RCA-type connectors, these were replaced with BNC types for signal lines. RCA connectors were used for the 12-volt line to power the amplifier, however.

Solder the coax from the SSB board to one BNC connector and the coax from the i.f./agc board to the other. Pick up 12 volts from the pilot lamp on/off switch on the underside of the chassis. If the crystal filter is pulled out of the circuit, jumper across the the two BNC connectors or wire a small jumper with BNC plugs at each end.

In my modification, the amplifier has no effect on the transmit functions and appears to boost the audio output somewhat. If the version you wire proves too "hot," try disconnecting the 0.01mFd capacitor in parallel with the 220-ohm resistor in the emitter lead. Or try a transistor with less punch.

As shown in the schematic, it's possible to use more than one filter in this arrangement. A DPDT toggle switch may be used if only one more filter is to be added, while a DP3T rotary may be used if all three filters are desired.

The combination of the 515's internal crystal filter, the 208-A outboard active audio filter and this 500 Hz crystal filter vastly improved selectivity in my 515 at a reasonable cost.

Urgent Call for Dayton QRP-fest Volunteers

Thus far, Jim Fitton, W1FMR has taken charge of reserving the block of QRP hotel rooms and organizing conference and hospitality facilities. Les Shattuck, WB2IPX is in charge of the forum and the club organizational meetings. Dave Cornell, WB2VXI, has accepted the charge of preparing a QRP transmitter or transceiver kit for sale at our booth.

We urgently need someone to obtain a commercial booth and two flea market spaces for the club. This volunteer would need to organize a team to decorate and staff the booth also. Call Les (703)481-0769 or Jim (617)374-3594. Time is of essence for this project.

Do you Homebrew?

Many of us are interested in rigs and accessories that we can build for ourselves or use as projects for newcomers to the world of low power. *The Quarterly* wants both long and short articles on homebrew construction, design and technique.

Errata

In the January issue of the *Quarterly* the publisher inadvertantly left out the symbols on a chart in Bob Brown's NM7M, "Solar Activity: Gearing up for Cycle 22. We regret the inconvenience and the chart is reproduced correctly below.

Quiet = A <= 7, usually no K-indices >2.
Unsettled 7 < A <= 15, usually no K-indices > 3.
Active = 15 < A <= 30, a few K-indices of 4.
Minor Storm = 30 < A <= 50, K-indices mostly 4 and 5.
Major Storm = A > 50, some K-indices 6 or greater.

S = Subflare, involving a solar area of <= 2.0 sq. degrees.
1 = Importance 1, involving 2.1 < = area < = 5.1. sq. degrees.
2 = Importance 2, involving 5.2 < = area <= 12.4 sq. degrees.
3 = Importance 3, involving 12.5< = area < = 24.7 sq. degrees.
4 = Importance 4, involving > = 24.8 sq. degrees.

Class	Flux (w/sq mtr)
C	Peak < 1/100,000
M	1/100,000 < Peak < 1/10,000
X	Peak > 1/10,000 for descriptive

Propagation & DX

conducted by Bob Brown, NM7M
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The arrival of a new solar cycle is certainly news in many circles and the events that go with it catch the attention of those who ply QRP on the bands. So the jounalistic imperative "what, when, why, where and how?" should be ringing in our ears as we write about it. But, having done some of that in previous articles, let's do a bit more and change "how" into "how often?" or "how long?" That should be helpful in sorting out what we'll be in for as we go from solar minimum to solar maximum. That change, usually expressed in sunspot counts, takes 3-4 years so the pace of events could pick up considerably in the near future. After that, we can ride the crest of the solar cycle down to conditions like the recent doldrums. But let's not dwell on that; rather, on with the story.

As mentioned last time, we'll be changing to a situation where band conditions are controlled by effects which arise from flares on the sun. In that connection, we should distinguish between effects which follow promptly or even simultaneouly with a flare from those which are delayed in time. The first category involves electromagnetic radiation and ranges from emissions at short wavelengths in the x-ray and UV range, through the visible portion of the spectrum and on to radio waves in the wavelength range from 3 cm to 10 meters. All these waves travel with the speed of light and reach the earth 500 seconds after starting on the sun! As mentioned earlier, some of these flares can produce energetic x-rays which penetrate below the 100 km level and give rise to absorption of hf waves in the D-region for up to 30 minutes. OK, that's "how long"; the "how often?" part for these sudden ionospheric disturbances (SID's) ranges from about 2 per year at solar minimum to 1-2 per week at solar maximum. So you can see we'll be in for some surprises in the time ahead.

The visible portion of the spectrum that comes from a flare is really something that the solar astronomers deal with, not those of us who are concerned about hf propagation. So they monitor the regions around sunspots using spectroheliosccopes. Now that's a mouthful but it really means that they're looking at a limited part of the solar spectrum, not the broad band of "white light" that we think of when getting a peek at the sun. The usual choice is what is called "H-alpha," the first line in the Balmer series of atomic hydrogen at 6563 Angstroms. Anyway, they watch for sudden brightenings in that light around sunspots, the signal that a solar flare is taking place. Not only does the light in the H-alpha brighten, but it comes from an expanding region when a flare is in progress. So it's a matter of noting the start, peak and end of light in H-alpha and that gives us "Time Zero" for the effects which follow.

When it comes to radio waves from a flare, they reach us as bursts of noise and are spread in time as well as in frequency. The first bursts are in the microwave and decimetric parts of the spectrum. Just "how long?" the bursts last or how far down they extend in the spectrum is a matter which varies from flare to flare. Most of the time we're quite oblivious of the solar noise as it takes a large flare to bring the spectrum down to the 10-20 meter range where we normally operate. But when it does dip down to those frequencies, we'll hear "whoosing" sounds that rise and fall in intensity. So the "how often?" for solar noise bursts is about the same as that for the SID's, getting our attention when rather large flares take place, say class 2B or greater.

So, all in all, the prompt effects that come from electromagnetic radiation accompanying large flares and which affect HF propagation are rather rare and infrequent. That is not to say they won't be striking when they do occur. The last one I encountered was back in April of '84; it happened around midday and the SID reduced 20 meters to total silence for about 20 minutes! That's something one does not readily forget.

Having said all that, we go on to the delayed effects resulting from flares: they can be frequent, intense and of considerable duration. So let's get to them, taking the most common ones first. For QRP'ers, they are ionospheric storms, involving a serious disruption of hf propagation on the bands. These ionospheric effects go hand-in-hand with geomagnetic storms and while they're triggered by the arrival of material spewed out from the sun at the time of a flare, their origin is to be found in processes close to earth. That solar material consists of low-energy protons and electrons, often referred to as solar plasma or magnetic storm particles, and it travels rather slowly so the storms have delay times ranging from 20 to 40 hours after a flare.

These storm conditions are triggered by the impact of solar plasma on the outer reaches of the geomagnetic field. But that means the plasma has to be heading in our direction in the first place. Thus, flares near the central meridian of the sun may trigger magnetic and ionospheric storms but those facing away from us may not. To add any more details to this discussion, we have to use the fact that the sun spins on its axis, having a rotation period of about 27 days. So if there's a region where sunspot activity is developing, we first see it when it comes around the east limb of the sun; then it rotates toward the central meridian, and finally rotates off the solar disk by going over the west limb. Thus, the coming and going of a spot group could take as long as 14 days.

Actually, as practicing QRP'ers, we're already familiar with the idea of solar rotation, having experienced all those recurrent magnetic storms in the declining days of solar cycle 21. Thus, there were streams of material leaving regions rooted on the rotating sun and being spewed out into interplanetary space. Their geometry is well-described by the analogy of water coming out from a lawn sprinkler; thus, the solar plasma coming from those regions followed a spiral path, trailing out from the sun. But those solar streams could overtake our earth in its orbital motion and every time we took a bath, as it were, we would experience some sort or magnetic and/or inospheric distrubance. If the region on the sun were long-lived, we'd even have recurrences in those distrubed conditions every 27 days or so, showing up in poor band conditions as well as spikes on our plots of the A-index.

The difference between those recurrent events and the sporadic ones from solar flares can be put simply: instead of fairly steady streams of plasma from the sun, flares send the material out in puffs or even blasts. The lawn sprinkler analogy still holds and if one of those blasts spreads out and encouters the geomagnetic field, we can have a storm; on the other hand, if the curve of the stream is away from us, it'll pass by harmlessly and we're spared a disruption in our QRP'ing.

There's one thing I should add here and it will be of importance when we come to the possible delayed effect from solar flares the arrival of solar cosmic rays at the earth. The universe, being what it is, does not tolerate charged material wandering about on its own; put another way, charged particles are always associated with magnetic fields and where you find one, you'll find the other. Thus, whether we have a steady solar stream, a puff of solar wind or even just a quiet region of interplantary space, there'll be some sort of magentic regime to be reckoned with and that'll be important a bit later when we consider solar cosmic rays traveling outward from the sun. Okay? Keep it in mind!

Having said all that, we can talk about the "how often?" aspect of ionospheric and magnetic storms. So using our recent experience with the end of cycle 21, say in 1986, we find that significant disturbances which really ruin propagation occur about 4-6 times per year. Of those events, maybe two were associated with flares, the rest from the persistence of active regions on the sun. Now that was for solar minimum; if we go to solar maximum, then flare activity becomes the main source of these disturbances and experience shows we could expect one every week or two, depending on whether the solar cycle is an outstanding one like the one which peaked in '58 or just a garden-variety cycle like cycle 21.

As you know, one of the temptations in dealing with hf propagation is predicting what will happen for a given set of conditions. Okay, with what has been said earlier, we could go out on a limb and do just that. But, we'd need to be able to pick out active regions coming around the east limb of the sun, follow the growth or decay in their size as well as location on the solar disk in the course of time. Now if all of that was at our disposal, we could spot trouble easily; that would be a sunspot group which is showing some flare activity as it grew in size and rotated toward or even past the central meridian of the sun. That sort of a region would be a good candidate for significant flare activity and with a backlog of experience behind us, we might just be able to forecast what would happen to the bands in general

and our QRP'ing, in particular.

But one cannot just stay with "how often?" when dealing with events of such importance to us; we need to speak a bit about the "why" aspect and maybe even "how long?" as well. In that regard, it is no secret that poor hf propagation conditions result from the loss of electrons in the F-layer and the lowering of the reflection height. All of that has been established decades ago using ionosondes. But one of the interesting things is that the ionospheric changes go hand-in-hand with magnetic activity. And there's one more story we should add to our tale. The difference between magnetic and/or ionospheric storms which start "with a bang" or "a whimper," to steal from the poet T.S. Eliot. The first category, termed SC's are said to show a "Sudden Commencement" in magnetic storminess and begin all over the earth within a minute or so with a sudden change in the horizontal intensity of the earth's field. The other category might be called GC's or "Gradual Commencement" storms and, as the term implies, have a gradual onset measured in hours.

And that brings us finally to the "how long?" aspect of these events. While it really depends on the magnitude of the disturbance at the onset, a typical period of ionospheric or magnetic storminess could last for days. So, unless you have set up a modest solar/geophysical observatory of your own, all you can do is listen to WWV and the bands. WWV can spell out in their own special jargon some outlines of a given event but in the last analysis, you're the one who will have to make the judgement, by what you hear and when you hear it, whether band conditons have recovered or not. That's where first-hand experience pays off and is one of those things that will never be replaced by a computer program.

Having said all that about magnetic storms, solar rotation and magnetic fields coupled to particles, let's come now to another type of disturbance, the solar cosmic ray event, that results from some flares. There, for reasons best left to astrophysicists, protons and other particles near a sunspot can be accelerated to speeds or energies which are considerably greater than the magnetic storm particles mentioned earlier. Thus, instead of taking 20-40 hours to reach the earth, they can make the trip in that many minutes or even less. Thus, these particles are moving with speeds approaching the velocity of light and when they encounter the geomagnetic field, they are deflected in their paths in a manner which depends on their speed and angle of approach to the field.

Those particles which come to us over the polar regions have an easy time of it as their velocities are almost parallel to the geomagnetic field and they travel downward, almost undeflected. On the other hand, particles heading toward lower latitudes are deflected more as their velocities are more perpendicular to the field. As a result, the polar regions are heavily bombarded but we find fewer particles as one goes toward the geomagnetic equator.

On occasion, these particles have enough energy to penetrate to the D-region and increase the level of ionization there by a large factor. This gives rise to intense radiowave absorption in the polar regions and effectively disrupts communication paths to and from those regions. They used to be called "polar black-outs" before they were understood but now the term "polar cap absorption event" is used. I can say from first-hand experience that they are truly awesome, having encountered three of them in the first ten days of July in '59 while up in Alaska. You could turn the tuning knob of a hf receiver and hear absolutely nothing! Even the friendly sound of WWV was gone and we had to get our time signals via land-line from Boulder. Of course, we had no idea how much delay there was with those time-ticks coming along phone lines. For my work, that wasn't important but other scientific efforts needed time correct to a least a milli-second; obviously, that was out of the question at least for the duration of the PCA event.

Enough of the anecdotes; let's get to the "how often?" and "how long?" part of the solar proton events. As for the first, I have to say they are rare compared to the other events which disturb our ionosphere, maybe once or twice a year during times of low solar activity and once a month when solar activity is at its peak in a cycle. The "how long?" part depends on where the solar region responsible for the event was located when the flare took place. Thus, if it was toward the west limb of the sun, it could be prompt in its effects but rather brief in duration, perhaps a day or so. On the other hand, with an extensive magnetic regime between the sun and the earth, it could come on slowly because of the diffusion of the particles and last several days for the same reason.

Usually, a PCA event is not as devastating to mid-latitude hf propagation as the ionospheric storm which might go with the accompanying magnetic storm. In any event, the particle fluxes in solar proton events are picked up by NOAA satellites even before any ionospheric effects become apparent. Thus, they provide an early warning of things to come. Since these events have an adverse effect on the Omega Navigation system, they are reported promptly to mariners on WWV. So if you suspect a PCA event, turn at once to WWV and listen to their Omega Status Report at 16 minutes after each hour; that'll tell you whether you're right or wrong.

The last item to consider in talking about ionospheric disturbances is auroral absorption. As the term implies, it involves the absorption of signals as they pass through the ionization in auroral displays. These events are caused by electrons accelerated within the geomagnetic field and are sporadic in time, lasting a few hours a day during a magnetic storm. In contrast to polar cap absorption events which essentially blanket the polar cap, auroral absorption events are limited to a narrow ring a few degrees wide around the auroral zone (about 65 degrees magnetic latitude). Most often you notice auroral effects when hearing a polar station, like a VE8. The best you can say is they are usually not terribly important, at least for hf propagation, but VHF'ers love them as they make for great DX'ing.

To conclude, this has been a heavy dose but I think it was called for considering where we are relative to Cycle 22. These will be exciting times ahead and you might as well know what you're going to be in for. If I may express my hope, it's for high solar fluxes between the magnetic storms. And the thing we'll have to learn from all this is to relax while the storms rage. In any event, DX'ing will improve; that's for sure!

Hit the Jackpot on 10 Meters

by Gus Taylor, G8PG

I am a guy who likes to beat the System. The System says, rightly so, that at the present stage of the sunspot cycle trying to work 28 Mhz via the F-layer is largely for the birds. How come, then, that between late April and the end of September, 1986, my three watts of CW and simple antennas produced over 250 QSO's with 33 countries on 28 MHz. The answer is Sporadic E, or Es for short. Sporadic E is not in the System at the moment because as yet we have no accurate means of forecasting it. What we do know, however, is that in North America and Europe the maximum number of Es opening will occur between the beginning of May and the end of August, with a secondary peak in December/January.

An Es opening is caused by the formation of clouds of strong ionization at a height around 55 miles, just below the normal E-layer. These clouds are very efficeint reflectors of HF signals and a single cloud can provide a path between two points up to 1000 miles apart. If more than one cloud is produced, other paths will open up over similar distances, and these paths are characterized by very low attenuation so signals are usually strong even when QRP and simple antennas are used. Also, with luck, you can get a second reflection from a different cloud, giving a range of 2000 miles or more!

As already stated, a good source can produce a number of clouds. These move in a westerly or northwesterly direction at about 150 mph, while the source which produces them moves in an easterly direction. Because of these movements, as time goes on, more and more paths are likely to open up. For example, from my QTH in England, a common type of opening starts with signals from I and YU. After a while, signals from HA, OK and maybe SP become workable (source moving north), then OE, HB and DL (clouds moving NW). In a really big opening, several sources may be present, one providing the paths just mentioned, another providing paths to EA and F, and a third one providing paths to SM and LA.

As one cannot accurately forecast Es openings, how does one find them? I use two methods. One is to monitor the band every hour or so. This is fairly good provided someone is on the air at the remote end. To back up this approach, I also monitor 21 MHz. If the latter shows short skips of 500/600 miles or less, then there is a high probability of 28 MHz being open or about to open. You can use a similar method to monitor 50 MHz openings. Thus, if skip is 500-600 miles or less on 28 MHz then 50 MHz may be open, and if it is down to 300 miles, then 50 MHz should be really boiling. But this will not happen too often. As a rule of thumb, for every 10 Es openings on 28 MHz there will only be one on 50 MHz.

If you have anything to add to the above, let's hear about it in the *Quarterly*. And let's try QRP'ing on 28 MHz in '87; it could be fun.

QRP DXing from a Desert Isle

by Bob Brown, NM7M[1]

With QRPer MaryLou Brown, NM7N, soon to head for a tropical DX location, keep posted on the QRP nets for QRG and schedule. Ed.

When talking about DX'ing with friends, it seems that an endless stream of stories comes forth. There are tales about fabled DX operators, their DXpeditions to exotic places and band conditions that just wouldn't quit. And there's always a discussion of antennas and their role in the pursuit of DX. And no matter what the topic, some of the stories involve trivia, pure and simple. With that in mind, let's take those two ideas DXpeditions and trivia, as our theme this time.

My natural inclination is to start with DXpeditons since up here in the Northwest, we QRP'ers depend heavily on such ventures in the Pacific to keep our spirits up. Indeed, for all those along the West Coast, the South Pacific is our "Fish Bowl" and given a little time, you can usually break through those pile-ups to QSO, albeit briefly, with a DX object. Thus, we brag about QSO's with places like Kermadec, Tonga, Tokelau, Cook Islands, just to mention a few recent ones. Rarer contacts are with places like Nauru, New Hebrides, Lord Howe and Pitcairn Islands. Just work QRP'ers on the West Coast and they'll gladly go through their own list of triumphs. But, I digress; back to business.

The thing that all these DXpeditions have in common is an island setting. And just by saying "island," my mind shifts back to memories of my days as a student. "That's a bit strange," you say; not so, just let me explain. That was back around YEAR ONE in academia, before students were allowed to take "open book" examinations. That's right; we had to have it all stuffed between our ears when the occasion demanded. Thus, we prided ourselves on our command of "Desert Island Physics." Still with me? Anyhow, that was a way of saying that one had a good command of the current course, enough to recreate a decent fraction of the semester's work if stranded on a desert island or, more likely, in an examination room. Now if we return to the topic of DXpeditions to the Pacific, obviously our islands are surrounded by sea water. Given that situation, we all have enough "Desert Island Physics" to know that's only one step removed from being located on a perfectly conducting ground plane.

So on to the trivia side of our discussion. That deals with the antenna patterns in the presence of perfect ground planes. There, the notion of images tells one immediately that a vertical on a desert island radiates pretty much like a vertical dipole, the difference being that half the dipole is buried in sand. In any event, that gives a pattern with a lobe right down at the water level, heading off for great DX-ing.

When it comes to a horizontally polarized antenna, be it a dipole, quad or Yagi, the number of effective radiators is doubled, as before, but in this case, our "DIP" tells us that the image radiators below our atoll are all 180 degrees out of phase with those up among the palm trees. That immediately rules out any prospect of a fat lobe in the pattern at a low angle; rather, it peaks in the 20-30 degree range and, moreover, the actual pattern depends on the height of the antenna.

Now before we actually try any QRP DX'ing from our atoll, we ought to think about what's possible and what isn't; that's so we won't be too disappointed, given the expense we'll go in getting to our island. So we grab our world globe and use more ham trivia, namely, most of our QRP contacts are limited to our own half of the world. That's another way of saying that it's tough, darn tough, for QRP'ers to work any DX that much beyond 10,000 km or one-quarter the way around the world from the QTH's. Mind you, I'm not saying it can't be done; you've done it on ocassion and so have I. It's just not "a piece of cake," that's all.

Okay, now if you look behind that bit of trivia, you'll find that we're really dealing with the fact that there's not much of our rf left after three hops, in and out of the D-region as well bouncing off the surfaces along the way. But if you come right down to it, maybe there wasn't much of our rf heading there in the first place. After all, some 3300 km/hop means that we're talking about a radiation angle of less than five degrees. So that brings us right back to the antenna pattern and what kind of signal we're putting out at low angles.

Now is takes a bit more than "DIP" to work out patterns for antennas over real grounds. Salt water is pretty nifty stuff but it takes its toll and the antenna pattern for any DXpedition antenna is not 100% of what you see in textbooks for a perfect ground. So if you stay with simple radiators, it's nip-and-tuck when it comes to which is better, a vertical or a dipole up there about a wavelength in height. But you aren't going to a desert island to settle the arguments about whether "dipoles are for the birds" or "verticals radiate equally poorly in all directions." Those thorny questions are better left for those of a more philosophical bent who stay behind and go to antenna sessions at hamfests. You're going for DX'ing and that means you won't leave home without at least a tri-bander in your carry-on luggage. Morever, you'll put it up high just to see what bands have to offer.

Now that's an interesting phrase, "what the bands have to offer." In a sense, you can make a rough estimate of that, by countries and UTC, before you even leave home and head off on your DXpedition. Just boot up that propagation program on your computer and see what it says. You do have to put in at least the sunspot number but after that, it's just a matter of fantasy, where you're going to and when you're going to be there. Just to show you what I mean, I know a QRP'er who'll be making a month-long trip to ZL-land next October and the plan includes a lay-over of about a week in 3D2-land. Okay, let's work out what to expect.

First, let's say the SSN is up to 25 by that time. Then the question is what'll be heard and when will it be coming in? A quick look at the globe tells us that 10,000 km of DX path from the Fiji Islands will include such calls as XE, W5-W0, VE6, VE7, UA0, JA, HL, BY, DU, VK, LZ and whatever else is in the South Pacific. What'll be tough is South America: that's where a good beam would pay off. But it's just too far to Europe and Africa for QRP so those have to be written off.

Now for the times of openings. Let's give the computer some typical QTH's and calculate the MUF's; then we use an operating frequency of 14 MHz to see how things shape up. So here's the results:

Before you get carried away and think that table says the bands will be wide open for hours at a time, let's stop and think just what MUF information really means. In a nutshell, a MUF calculaton only considers whether rf will be returned by the ionosphere, making it possible to contact point A from point B. For the QRP'er on a DXpedition, it tells when the QRO stations can be heard on that tiny atoll but that's not the same as when the QRP'ers mighty five watts can be heard at the other end.

So what's a QRP'er to do? Well again it takes more than "DIP" but one can work these things out. You have to get a Signal Loss Program going for you and feed in all the relevent data. Then with some patience (those programs are notoriously long and slow), you can get a realistic idea of what to expect; in particular, what fraction of the days of a month your QRP will make it from point A to point B and, moreover, arrive at a signal level that's detectable by the other guy's receiver. If you really do it right, you not only put in the transmitter power and antenna gain but also an educated guess of the DX'ers antenna at the other end.

Okay, getting the Signal Loss program on line, what do we get for those same paths? Here it is:

Path	DX (km)	Hops	MUF	14 MHZ
Fiji-San Francisco	9046 km	3 hops	18-05 UTC	06-17 LT
Fiji-Tokyo	7092 km	3 hops	21-11 UTC	09-23 LT
Fiji-Melbourne	3592 km	2 hops	22-10 UTC	10-22 LT
Fiji-Santiago	10954 km	4 hops	18-05 UTC	06-17 LT

Path	DX (km)	Hops	QRP Detectable	
Fiji-San Francisco	9045 km	3 hops	03-05 UTC	15-17 LT
Fiji-Tokyo	7092 km	3 hops	06-11 UTC	18-23 LT
Fiji-Melbourne	3592 km	2 hops	22-10 UTC	10-22 LT
Fiji-Santiago	10954 km	4 hops	04-05 UTC	16-17 LT

Okay, that's a bit different; so what happened? First, the program used the fact that our QRP'er only had five watts of power into a modest tri-bander. Then reflection losses were added to those from the signal spreading that we've mentioned before. With paths over sea water, those losses weren't very big. But the main thing is that the program took into account the D-region losses on the sun-lit parts of the path from point A to point B. Those were costly and nothing can be done about them. But to put a bright side to all this, if there's a good beam at the other end, our QRP-ers signal would be above noise level a bit longer. We'll have more to say about that another time but right now, it's clear that "MUF is Not Enough" when you talk about DX'ing. And whatever else, our QRP'er has to hope for quiet magnetic conditions; otherwise the DXpedition could be spent in the lounge, sipping tall, cool ones and watching the palms sway in the breeze. What a dreadful thought to close on.

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1986 QRP Field Day Honor Roll

by Ade Weiss, W0RSP

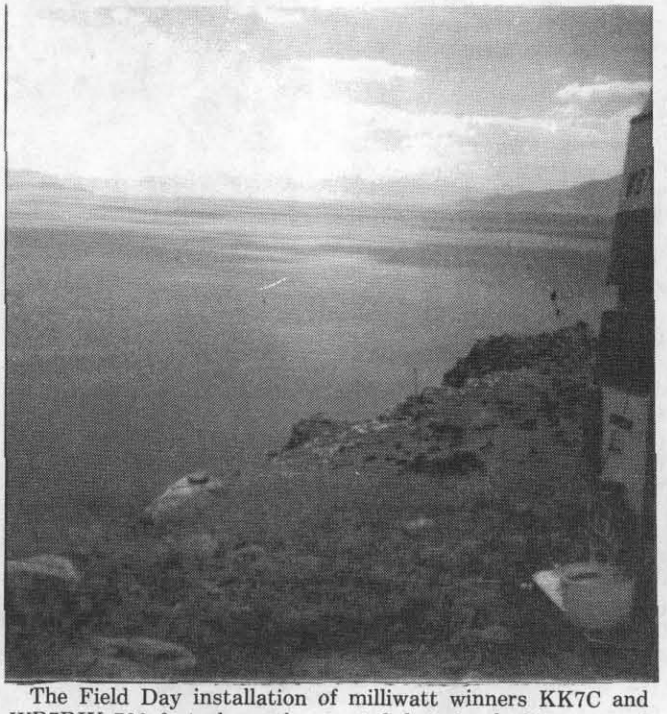
The surprise of the 1986 QRP Field Day competition was the precipitous drop in milliwatt entries! Milliwatting had been on the rise since we began offering milliwatt achievment certificates, but only five adventurous types went out for the prize in 1986! This may be due to the fact that diehard milliwatters from past years didn't find the time for FD, although a couple deflected to the high-power 5-watt class.

Bob Joiner, WB7BIV, from Roseburgh, Ore., drove 800 miles south to meet *Quarterly* editor, Jim Stevens, KK7C, at the shores of the Great Salt Lake. The two set up their station on an island 700 feet above the best ground plane in North America. Bob's camper was parked on the upper lip of a bowl shaped eastward slope and the 560 foot legs of their V-beam were anchored to the bumper and tied off on rock outcroppings 300 feet below. This setup produced marked direction/distance results. Milliwatter Mike, KO7V, took a high-risk approach for what he terms "a not-too-serious" FD excursion. Reason: "It really was done during my honeymoon; I figured this would get my new wife started out on the right track." As luck and love would have it, it seems successful since she liked it. However, Mike's scoring for the special event was stretching it a bit; "Plus 1000 pts. bonus for trying to work FD during my honeymoon? Or do I lose 1000 pts. for stupidity?" Second place milliwatter, Jack, WA7APW started his first FD outing at the one-watt level and "was kept busy enough, up to 15 QSO's per hour, so stayed at one-watt. What fun!"

The five-watt class was topped by WA9IRV/KB8N operating C.W. in Wisconsin with 500 QSO's, the fourth highest total since the inception of the FD program. Ron and Paul have run over 700 QSO's in a previous FD outing, so were a bit disappointed this year.

Some interesting match-ups took place between long time QRPers. KC5EV drove his pickup from Texas to the Dayton QRP bash, then continued on up into New England to do FD with KN1H on the top of Mt. Ascutney. "With absolutely no plan in mind," as John puts it, "we had nothing but trouble despite the killer antenna – three long wires with line-of-sight to everywhere and a G5RV." Seems they overshot the close-in stations.

Then again, OM/XYL Bob (NM7M) and Mary Lou (NM7N) split up for FD, Bob definitely had the easier time, operating from the home shack. Mary Lou with sidekick K9 dog, first set up Friday afternoon on Red Top Mtn. Wa., for a test-run; she was awakened at 0600 by a thunder storm, packed up and headed to Goldendale Observatory Hill (150 mi. away) only to discover that overnight parking was not permitted, then to Maryhill State Park for a day of good operating. Horrendous QRN forced a final move on Sunday morning to a road-side rest area on Hwy. 14, where Mary Lou finished FD! Meanwhile back at the ranch, Bob was rolling up the QSOs . . . no poetic justice, eh?



The Field Day installation of milliwatt winners KK7C and WB7BIV 700 feet above the great Salt Lake, looking toward Florida, down one of the 560 V-beam legs.

Paul, NY5T, (ex WD5BRR) catches the spirit of it all: "You know, this QRP FD contest stuff can be really addictive. There are few amateur radio activites quite as intriguing as the thought of jumping – and successfully I might add – right into the melee of a FD with a power output so low that one could literally put a finger in the antenna jack, key the transmitter and never feel a thing.

NR0J/W0KEA were back at 11,400 ft. on Aspen Mtn., but things just weren't the same as last year: "Used the same antenna as last year hung from the same trees and same rig on 40 but less than half the QSO's"

Dick, N5AE, missed getting into the field for the first time in a decade, but with undaunted spirit notes: "The bands were poor, but NOTHING spoils the fun of a QRP weekend!"

For the first time in year, a QRP signal was heard from South Dakota, courtesy of old-timer (69) Max WB0RXF and Dwain WA0ZPT running a 509 and G5RV.

The Club category experienced an increase in entries this year. The club plaque goes to W1ECH, the Zygo ARC of Middlefield, CT , a group formed just years ago and out on its second QRP FD. Six operators (W1ECH, WB1DQT, W1TKG, KA1MWR and others) operated a two transmitter setup with wire antennas in a field behind company property to post the second highest club total on record. Two graduates of the club's Novice class operated the Novice position for 43 QSO's. Congrats to these newcomers to the QRP competition.

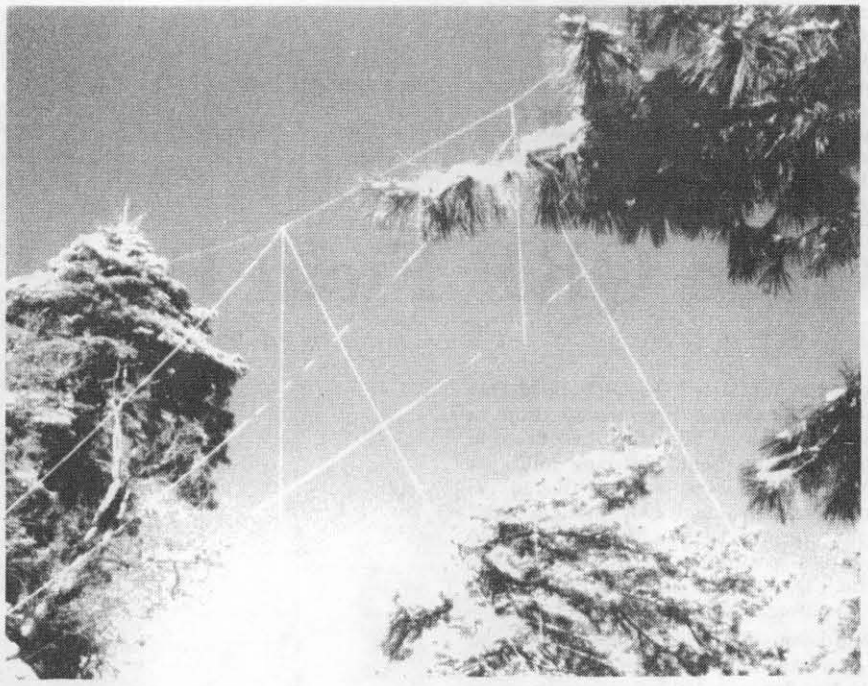
Several veteran groups were also in the field. The N8CGY group used a pair of G5RV's and a dipole and had good luck, but didn't manage to last much past midnight. Bill, W0VM, and the Principia College ARC used a pair of vertical 8JK beams placed 36 ft (in addition to the 136 centerfed Zepp) and was convinced of the value of a gain antenna, although results were down from last year.

Randy, KA9HAO, complained last year about going solo on FD and did something about it – he put together a QRP club from scratch, and I mean really from scratch, including recruiting likely prospects and helping KA7YIX, KA7YHC, KA7YHB KA7YGY and KA7YGZ get their tickets! "Our objective was to have fun, and we certainly did!"

And finally the outcome of the challenge match between the "Zuni-Loop Mountain Expeditionary Force" led by hot-air specialist K9VOL and signing K9NG. The HAH! Apparently made all the right mistakes this year but learned a valuable lesson, as Red (K9VOL) noted: "Since we were out to attempt to win again, and had challenged the Zuni-Looper, we managed to eliminate the fun of QRP FD." Even so, the HAH! did win and thereby earned the right to publicly shred a Zuni-Looper T-shirt at Dayton and drink a free case of beer gratis the vanquished Zuni-Loopers. It was a sad day for the Zuni-Loopers when Red called Fred, K6MDJ, to inquire about their results. Fred recounts the conversation: "Red was cocky but cautious as we probed each other with small talk. Suddenly he lunged for the throat blurting out, 'how many contacts did you guys get?' I paried and countered with '724, how about you?' There was a long pause. In an almost inaudiable QRK-1 voice, Red mumbled something like '533.' I knew in an instant we had been beaten as the HAH! ran in the one-watt power multiplier class. Red however was unaware of our 5-watt status and was suffering the pain of defeat. I withheld the truth as long as I could, knowing mine would come soon enough . . . at a point just short of telling a lie, I confessed the truth. Red's voice came up to 20 over S-9 and I felt the pain as Red twisted the cold steel . . ." As Fred later mulled over the situation, he concluded: "Alas, we did a fine job mates, but we allowed the arithmetic of the system to assist in our demise. Red said that dropping from 5 watt to 1 watt reduced their QSO only by 301, and he recommended dropping to that level next year. And so, gang, we'll all have to wait with baited breath to see if the logic of the mulitplier makes milliwatters out of Zuni-Loopers for FD 1987. With their 90 foot high antenna they could do a great job at the milli-watt level. There will be more on the line than T-shirts and beer this time – the HAH! will once again be eligible to win the Club Plaque!

As for the rest of the gang, we all can look forward to more of the unique excitement and challenge of QRP FD! In closing some interesting propagation info surfaced in reports of QRP'ers heard but not worked. KK7C heard W6SKQ, NM7N, and W7LNG, while W6SKQ heard KK7C, NM7M, NM7N, NJ7M and (argh!) K9NG. Note the KK7C-W6SKQ-NM7N triangle.

Scoring: Total QSO's x power multiplier (x 8 for one watt output, x 4 for five watts), x 1.5 battery/solar + 150 full portable (temporary antennas, no a.c. mains or home conveniences. Entry = ARRL Summary sheet showing breakdown of QSO's by band/mode, # of transmitter/operators, output power, batt/solar power, full portable to: W0RSP, 833 Duke St #83, Vermillion, SD 57069 by Aug. 30.



The pride of the Zuniloopers, this two element delta beam brought in 203 QSOs on 40 meters.

The Zuniloopers of 1986

See next page for more Field Day Honor Roll

1986 QRP Field Day Honor Roll

ONE WATT STATIONS (1 xmtr, 2 ops)

Station	CW	SSB	Total QSOS	Total
*KK7C/WB7BIV	236	0	236	2982
WB7APW	161	0	161	2082
KI0G	40	38	78	1086
KH6CP/1	54	0	54	798
KO7V	19	0	19	378

Keys to a Consistent QRP Field Day Effort

by Bill Stocking, W0VM

Bill Stocking, W0VM, became a silent key on January 11, 1987, just after he had finished this article for the Quarterly. Hilliard Goldman, KY0U, his long time Field Day partner proofed the copy, and his daughter, Maria Griswald prepared the manuscript. Bill's enthusiasm for portable QRP operation and his inventive mind will be dearly missed. Readers may also wish to review his earlier article in the June 1986 73 Magazine.

Honor Roll . . .

FIVE WATT STATIONS (1 xmtr, 2 ops)

*WA9IRV/KB8N	500	0	500	3150
NR0J/W0KEA	228	103	331	2136
WB0RXF/WA0ZPT	201	64	265	1740
NM7M	263	0	263	1578
NJ7M	236	0	236	1566
W0UY/K0WRY	228	0	228	1518
KN1H/KC5EV	96	123	219	1464
W0UY/K0WRY	228	0	228	1368
NM7N	167	0	167	1152
NY5T	163	0	163	1128
N3ANW	1	73	74	594
N4KEZ	31	20	51	456
W4DGH/N4NMD	0	63	63	378
NU4B	25	0	25	300
N5AE	43	4	47	282

CLUB STATIONS (multi-xmtr/ops)

K9NG	411	122	533	6546#
*W1ECH	467	437	904	5574
W6JTI	449	380	829	5124
W6SKQ	459	253	712	4422
W2LZ/W2TFL	526	16	542	3402
W3TS	408	101	509	3204
W0VM	375	0	375	2400
N7FU/N7CEE	326	0	326	2106
N9TW	212	92	304	1974
N8CGY/N8GNI/NM8L	213	50	263	1728
N2CYJ	150	96	246	1626
WB8IEK	150	50	200	1350
KA9HAO/7	38	41	79	1098#

* Award Winners # One-watt club stations

(Same station eligible for award once every three year)

QRP Field Day Club Standings

Top 20 Club Scores 1979-86

	Call	Year	QSO's	Score
1.	N4BP	'82	1170	7170
2.	K9NG*	'86	533	6546
3.	K9NG*	'85	503	6186
4.	W1ECH	'86	904	5574
5.	K8BX	'81	854	5274
6.	K9NG*	'84	418	5166
7.	W6JTI	'86	829	5124
8.	W3TS	'85	776	4806
9.	N6UU	'84	731	4536
10.	K8IF	'79	732	4488
11.	W6SKQ	'86	712	4422
12.	N2RI	'83	699	4344
13.	N5AF	'82	685	4260
14.	K8IF	'82	684	4254
15.	W2LZ	'85	667	4152
16.	KN9W	'83	643	4008
17.	W2LZ	'83	637	3972
18.	AC2U	'81	627	3912
19.	N2RI	'82	625	3900
20.	W3TS	'84	597	3732

*One-watt club entry

QRP Field Day Trophy Winners

Five Watt Class

1970	K4OCE	220	1470
1971	WA6ABP	137	1175
1972	W7DRA	55	562
1973	WA5WYO*	79	1098
1974	W0IYP	439	2748
1975	WB8OSM	220	1470
1976	K6TG	128	918
1977	N2AA	380	2790
1978	WA4IAR	442	2804
1979	WD5BKO	287	1872
1980	K1JX*	741	9042
1981	N4BP	999	6144
1982	N5EM	259	1704
1983	WA0VBW	435	2760
1984	N4BP	1046	6426
1985	W0KEA	486	3066
1986	WA9IRV	500	3150

*One-watt entries adjusted to X8 power multiplier

Milliwatt Class

1981	K5WNH/0	239	3018
1982	----	---	---
1983	N0BYC	241	3042
1984	W8ILC	425	5250
1985	KN1H	373	4626
1986	KK7C	236	2982

Why QRP?

The main purpose of Field Day is to demonstrate the abilities of amateur radio operators to set up an emergency type amateur radio station and communicate with other such stations. The contest aspects of Field Day add interest and incentive. The "name of the game" is to make contacts.

In 1979, using AC from a generator and with a rig running 90 watts, our club had made 408 CW contacts and a total score of 1,832 points. In 1980, someone "adjusted" the generator and burned out the power transformer of our Kenwood TS-520S transciever shuting down the station for the remainder of Field Day.

During the contest, however, N0ANV, Lee had driven up the road about 150 yards from our station, set up a card table, threw an antenna wire up in a tree, hooked his Heathkit HW-8 up to his car battery; and made many contacts. Many of us walked up the road from our defunct operation to visit N0ANV. We liked what we saw.

After Field Day, we met to discuss how Field Day could be improved in 1981. KY0U, Hilliard said, "I have a radical suggestion. Let's eliminate the nasty noise and work of running a generator and use my HW-8 and batteries next year." We took the suggestion. The 1981 Principia College station used a battery powered HW-8 putting out only one watt of rf to make 235 contacts and earn 2,650 points in 24 hours. This was the best score our club had ever made.

Going QRP not only elimated the "nasty noise" and tiresome maintenance of the generator, it dramatically raised the score of the Club, because QRP stations on battery power are awarded 10 points as opposed to two points for each contact. From there on we have continued to improve.

In 1985, our Class 1A battery powered five watt station made 427 contacts for 4,670 points. Note that 427 contacts is 19 more actual contacts than were made with 90 watts rf in 1979 when propagation was at its peak! This improvement came because our use of QRP led us to organize, experiment and learn how to operate better. Here is what we have learned.

Planning is the Key to Field Day Success

The first step is to appoint a Field Day Coordinator. It is helpful to have an experienced operator in charge of field day planning and experimentation. A retired person who has time to devote to this work and is an avid "field dayer" is a good choice for the job. He should be a person who can accept suggestions, work well with others, and write in an intelligent manner.

The Field Day coordinator, in conjunction with others in the group, has many decisions to make. Among these are:

1. Obtaining a good site for the Field Day station.
2. Getting adequate shelter.
3. Making provisions for earning bonus points.
4. Obtaining batteries for power.
5. Gathering equipment.
6. Designing antennas, etc.

Start Early!

Planning for Field Day is a year round activity. The Field Day Coordinator requests suggestions from the group and then plans accordingly. Testing of antenna designs can usually start in April or soon thereafter.

The Field Day Coordinator does most of the "paper work." Among other things, he sends for the Field Day packet from the ARRL (225 Main Street, Newington, CT 06111) which includes summary and dupe sheets.

Our Field Day Coordinator prepared special log, dupe and summary sheets that are easier to use than the official ones. At least one dupe sheet is needed for each frequency band. He also sends out invitations for people to participate in Field Day or to visit the Field Day station.

The Field Day Coordinator is in charge of overseeing the testing of equipment and new antenna designs. Nothing should be used on Field Day that has not been *tried and proven.* One year, as the coordinator of a group in Michigan, I took Field Day equipment to a picnic for testing and used a kite supported antenna just for fun. While working in a Canadian station, the battery capacitor shorted. Fortunately this happened during testing and could be repaired before Field Day.

Field Day Site

The site should be on high land, not in a valley. It should have enough level land for the shelter and antennas. Toilet and washroom facilities should be near by. There should not be too many trees.

Shelter

The shelter should be strong so that the wind cannot blow it down. Tents, trailers, trucks, etc., can be used. An open canopy is good so that breezes can keep the station from getting too hot, but strong tents should be pitched close to it into which the station could be quickly moved if a storm should arrive. (A storm shut down the Principia College station in 1984).

Bonus Points

A club should make provisions for obtaining as many "bonus points" as possible. Assign specific people to be responsible for each type of bonus. For example we assigned Hilliard, KY0U, to copy the ARRL Field Day message from W1AW worth 100 bonus points.

One hundred bonus points for five "natural power" contacts can be obtained by discharging a battery and then recharging with a solar charger. In 1986, charging a small motorcycle battery took many days because the charging rate was only 120 milliamperes in full sun and there were many days with little or no sunlight, but we planned for it and started charging in May. The solar charged battery ran the transciever for eight hours.

The Field Day Coordinator either writes or has some member of the group write a Field Day article for the local newspaper which will provide 100 bonus points for publicity. It is helpful if the article is delivered in person to the editor of the newspaper. The article should be submitted in late May or early June in time to be published before Field Day. A copy of the article also should be kept on file. If the paper does not print the article, send in a copy of your submittal and you will get the bonus points anyway for trying.

Batteries

Two fully charged 12 volt automobile batteries will run a transceiver with five watts rf output for over 24 hours, but it is a good idea to have one or two extra batteries on hand.

Equipment

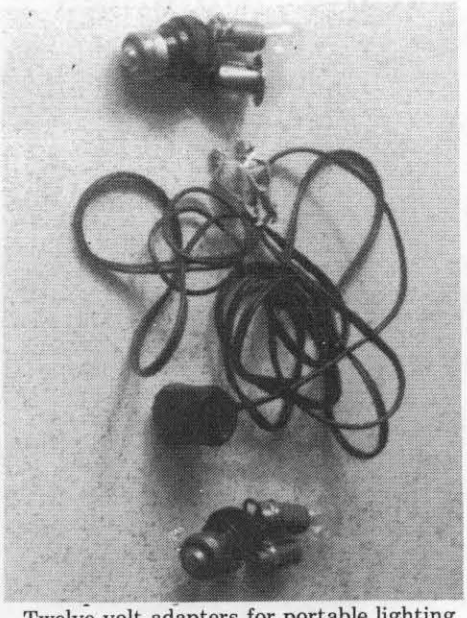
A superheterodyne tranceiver that has a built-in means of *indicating and controlling* rf output should be used unless you have a tranciever which *cannot* put out more than five watts of rf. For selectivity, the transceiver should have a 500 hertz or narrower IF filter plus an AF filter. (Direct conversion receivers such as the Heathkit HW8 tune in each station at two different places. There is enough QRM on Field Day without having this situation!). The transceiver should have full "break in" (QSK). A TenTec Argosy tranceiver operated in its low power mode is a good one for Field Day purposes. The meter is used in the position which shows rf output when the key is down and the operator adjusts the drive control to keep the rf output to *no more than five watts.* The output of the transceiver is connected thru a SWR meter to the switch which determines which antenna tuner and antenna system will be used. To avoid confusion, we use only two antenna systems. A double-pole-double throw toggle switch with the sides wired in parallel mounted on an alumunum box is used for changing antennas. The transceiver should be located at the left end of a large table that has a shelf over it on which to put the antenna tuner, SWR meter, antenna selec tor switch, and electronic keyers (if any). A small metal box with phone jacks in it should be plugged into the keying output. A computerized keyer can be programmed to send the exchange by pushing a button. This is a time saver and helps in making contacts. For convenience, the person or persons doing the logging and "duping" sit on the right hand side of the operator.

Each frequency band should have its own set of log sheets, and a clip board for each band should be provided. This prevents the log sheets from being blown away. There must be one "dupe sheet" for each band and each dupe sheet can be mounted on hard surfaced heavy cardboard.

Plenty of "one side good code practice paper" should be available for use by the operators. A good supply of soft lead pencils and a good pencil sharpener are needed.

A kerosene lantern or a gasoline lamp such as a Coleman lamp can be used for light at night. A goose-neck lamp can be fitted with an automobile tail-light bulb and a 12 volt battery used for power.

Principia College QRP Field Day team. Bill Stocking, W0VM, supervises from far right.
Photo 1



Twelve volt adapters for portable lighting system.
Photo 2

There should be an antenna tuner for each antenna and a switch by means of which the output from the SWR meter can be instantly switched from one antenna tuner to the other.

Testing at the Field Day Site

Set up the antennas on Friday evening. The remainder of the station should be set up early Saturday morning so that there will be at least an hour available for testing before the starting time of the contest. Testing has three purposes:

1. To make sure that everything is working well on each amateur band,
2. To determine and *record* antenna tuner settings for each band on each antenna, and
3. To listen to determine which bands are "open."

Antenna tuner settings for each frequency band should be recorded on a 3"x5" card mounted near each tuner so that bands can be quickly changed. If 15 meters should be open, start on that band and make as many contacts as possible before it closes down.

Other Key Points

1. Be prepared. This idea is as good for the Field Day as for the Boy Scouts. It helps to keep Murphy's Law from prevailing.
2. Make and use checklists to be sure that everything gets to the Field Day site. Check things off as they are loaded into the cars or trucks that will take them to the Field Day site. *Tools* are important. One year we forgot the sledge hammers and had a hard time driving pipes into the ground. A propane torch with a soldering iron tip is a necessity. Raincoats, jackets, food, softdrinks, toilet-paper, toothbrushes, soap, etc., belong on the checklist.
3. For the best score, assign your best operators to do most of the operating. Others are willing to log and dupe. If an operator is going "great guns" and wants to continue operating beyond his assigned time, we let him operate as long as he is willing to do so, and is making lots of contacts per hour. Be flexible.
4. Follow the suggestions found on pages 113-120 in the *Joy of QRP* by Adrian Weiss.
5. Applying the following ideas will increase the number of contacts:

a) Use a comfortable code speed that is not too fast. The sending should be accurate and clear. Remember that your QRP signals will not be as loud as most of the other signals on the band.

b) Answer CQs – rather than call CQs.

c)Conserve time. Use a minimum of words. Sending W0VM without sending the other station's call saves time in making a contact.

d) Sometimes quick "tailgating" after a station has completed an exchange results in a quickly made contact.

e) A keyer programmed to send the exchange when a button is pushed saves time and energy.

f) If a contact is not made after three calls, call another station.

g) Operate in less crowded parts of the band if you cannot make contacts in the crowded parts.

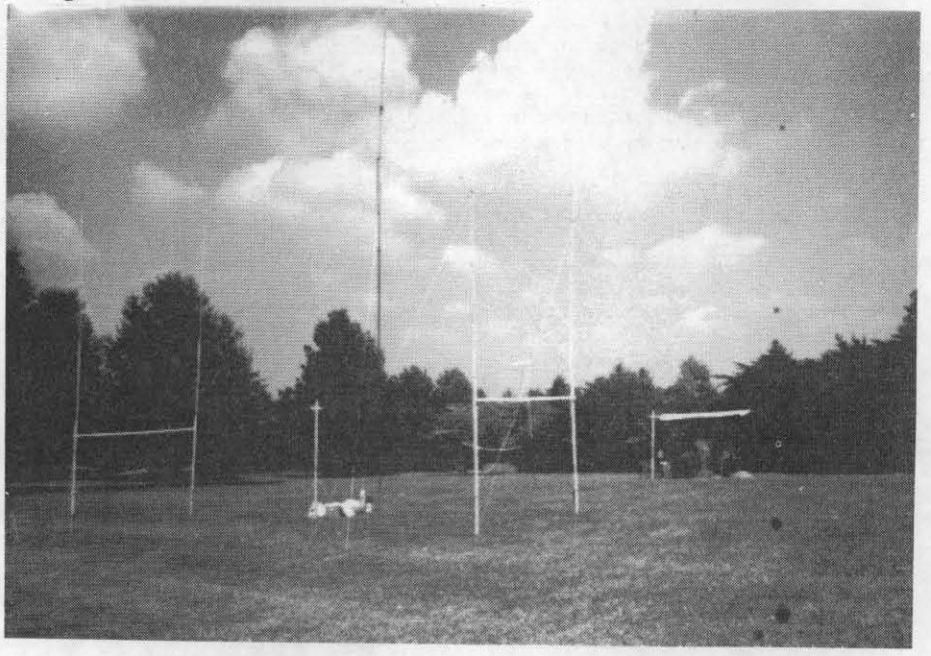
h) When a band seems "fished out," carefully select another band and change to it as quickly as possible.

i) Use local time to avoid confusion. Have a good clock (battery or wind up)

QRP Antenna System

The effectiveness of an amateur radio station depends upon the quality of its antenna system. With only five watts of rf to put into an antenna, the antenna must be a good radiator, preferrably *with gain* as compared to a dipole. This means that feedline losses must be reduced as much as possible by using tuned feeders with open wire line or end fed antennas without feedlines.

When W8BVU moved from Detroit, Michigan, to the St. Louis area in 1975, he brought his big tuned doublet or "center fed zepp" with him. The spreaders of its open wire line are made of three inch long pieces of cherry wood boiled in paraffin. The feedline, made of #14 enamelled wire is 66 feet long. The antenna wires are 66 each side of the center. The center is mounted up 40 feet and the ends of the antenna are up 20 feet. This antenna system provides *useful gain on all bands* except 80 meters. On 80 meters it is an effective tuned dipole. In 1983, the Principia College Amateur Radio Club made 394 contacts in 24 hours using only this antenna.



Centerfed Zepp, inverted vee stands between the two halves of W0VM's Football Field beam.

Photo 3

Experiments with a bottom fed low vertical W8JK end fire beam showed that it sends out in a wide azimuthal beam pattern with a null at right angles to the plane of the two vertical elements. This led to the design and testing of our "goalposts" antenna. Two 23-foot lengths of aluminum tubing were mounted 10 feet apart on 1" by 2" lumber. Wires from the bottom of each vertical went across the crossbar (also 1" by 2" lumber) to the center of the crossbar where they were connected to the open wire feedline that went into the antenna tuner. Our "goal posts antenna" named for its shape, was designed to send out signals that have angles of radiation fairly high for working stations in the U.S. and Canada. It was *not* designed for DX. The antenna was aimed east and west, but its wide angle beam set all up and down both the east and west coasts and into highly populated areas of Texas. The gain over a dipole was estimated to be at least three decibels on 20 meters and more than that on 15 and 10 meters. We built and tested it in my backyard before it was used on Field Day. It performed well.

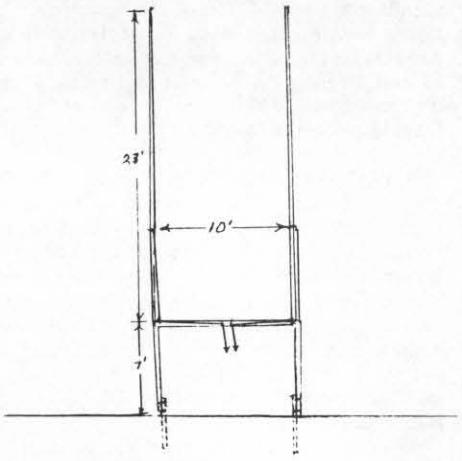
In 1986, Bob, N0EVQ, and I figured that if one goal posts antenna worked well, two of them spaced 36 feet apart and fed in phase should work even better. The double goalposts or football field antenna combined "endfire" and "broadside" gain. Tesing showed that the azimuthal pattern was not as wide as that of the single goalpost antenna, but the football field antenna made contacts east and west the way the 1985 Chicago Bears made touchdowns.

After the '86 FD, I visited a station with a 40 meter "loop skywire" antenna as described by Dave Fischer in the November 1985 issue of *QST*. Since performance was unusally good, the Principia College team will probably put up an 80 meter "Loop Skywire" to supplement our football field antenna, particularly for near field and north-south directions.

Stations like ours, located in the central part of the United States find bi-directional beams with wide azimuthal patterns very useful. We lose no time rotating our beam and contacts are equally useful both east and west. Our goalposts and the football field antennas meet these specifications wonderfully.

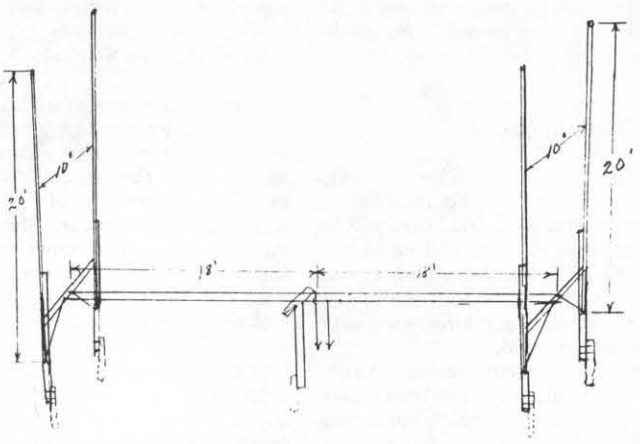
Constructing the Goalposts and Football Field Antennas

The goalposts antenna for 20, 15 and 10 meters is essentially a vertical W8JK end wire beam fed at the bottom with tuned feeders. The spacing between the two vertical elements is 10 feet which is 1½ feet wider than 1/8 wavelength for 20 meters. The reason for the greater width is to increase the radiation resistance of the beam and to make it more "broadbanded" and easier to tune to



Sideview of original V0VM bidirectional endfire goalposts antenna.

Drawing 1



End view of W0VM Football Field antenna. The antenna fires bidirectionally perpendicular to the plane of the drawing.

Drawing 2

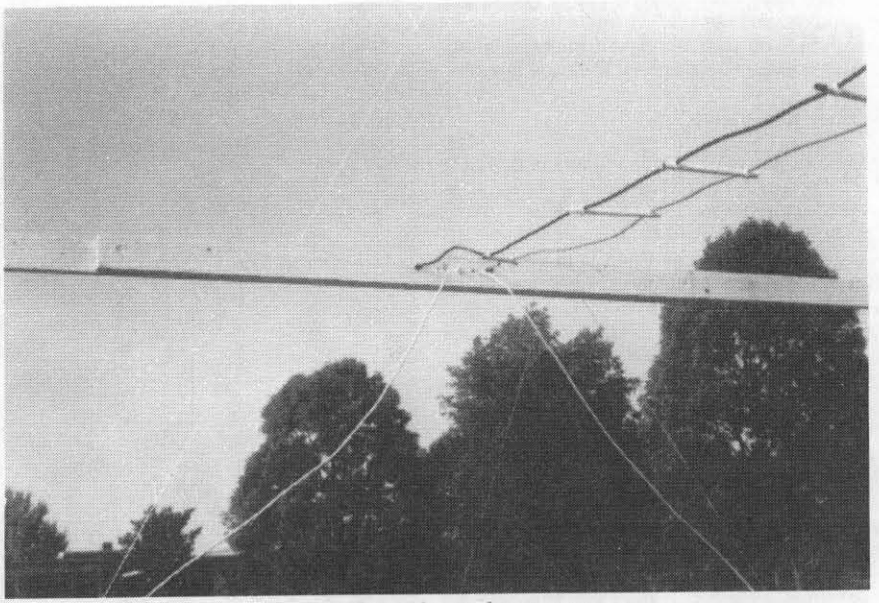
frequency with the antenna tuner in the station. To reduce losses, the vertical elements should have low ohmic resistance. Stiff aluminum alloy tubing was used in the goalposts antenna. Each vertical element was 23 feet tall with the bottom of the element seven feet above the ground (see drawing #1). Aluminum tubing was used because it was on hand.

Bronze or copper plumbing pipe has less resistance and is less expensive than aluminum alloy. That's what we used to make the second two goalposts for the football field antenna system. Since copper pipe is not as stiff or strong as aluminum alloy, it needed more support, so the bottoms of the vertical elements were mounted close to the ground at three feet. Copper wire comes in 10 foot lengths and two lengths were carefully soldered together using couplings to form the 20 foot tall vertical elements. Electrically, it would have been better to have made the verticals 28 feet tall, but added support would have been needed.

The vertical elements are held upright by many guy strings (strong heavy nylon string). The two goalpost antennas of the football field antenna system are connected together with a homemade open wire transmission line made of number 10 insulated house wiring "scrounged" from a used piece of Romex. The two wires, one red and one black were spaced four inches apart using spacers made from Bic pen barrels (see photo 4). Needless to say, Number 10 wire has low ohmic resistance, but the wire was so heavy that it had to be supported in the center where the feedline to the antenna tuner was connected (see photo 5).

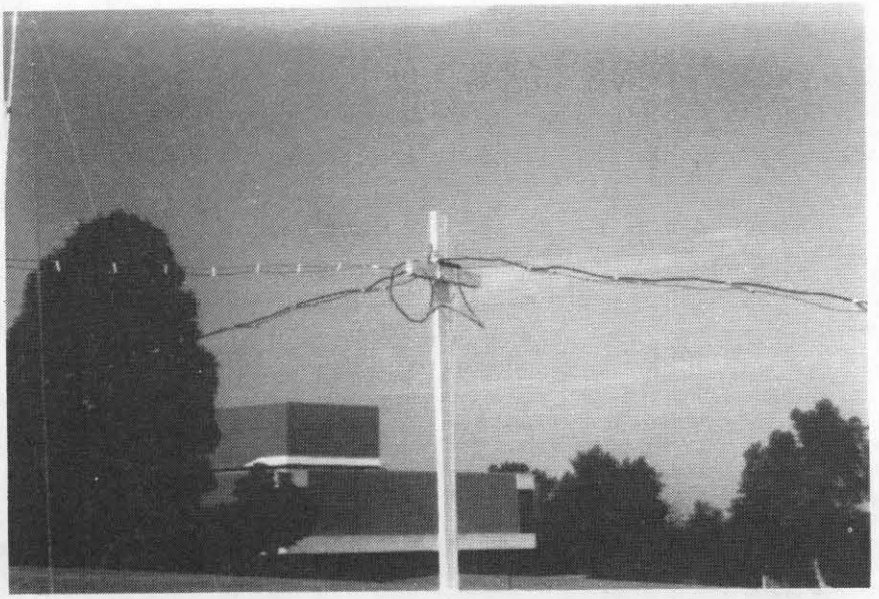
Having black and red wires made it easier to make proper connections. The two east verticals were connected to one another with one color, and the two west verticals were connected with the other color. The copper pipes were fastened to the 1x2 wooden supports by means of U bolts. Electricians tape around the copper pipe was used to prevent electrical contact with the pipe.

A coat or two of white paint added to the beauty of the goalposts antennas used in the football field antenna system.



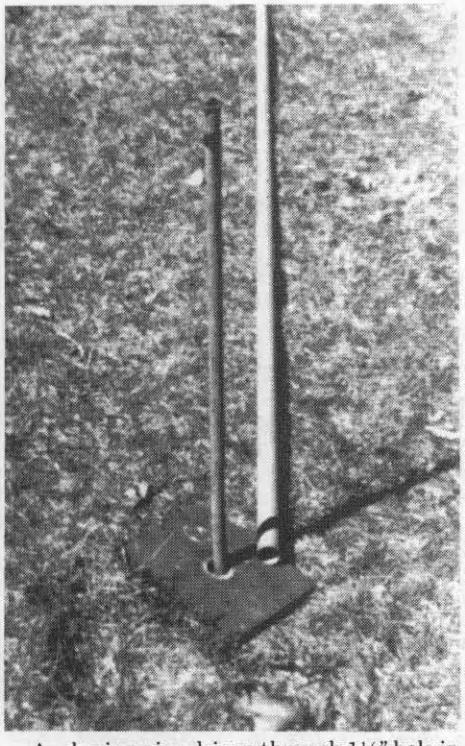
Feedline from the goalpost antenna

Photo 4



Football Field antenna feed point where feedlines from the two goalposts are joined.

Photo 5



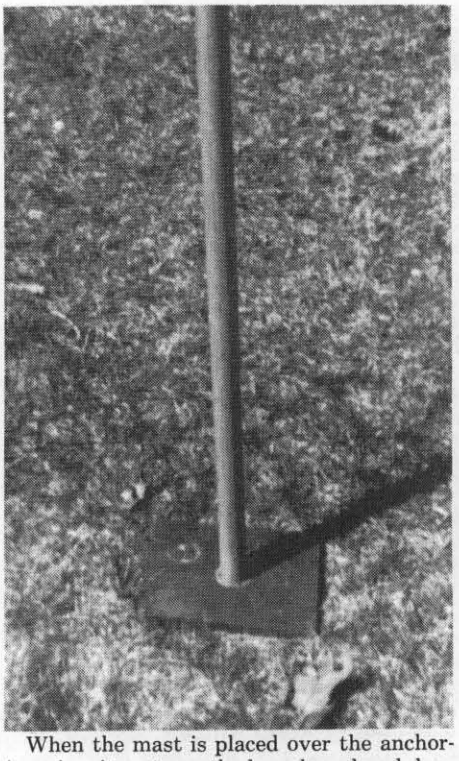
Anchoring pipe driven through 1½" hole in base board. Mast shown to the side.
Photo 6A

How to Put Up Tall Antenna Poles on a Beautiful Lawn Without Damaging the Grass.

Our Field Day Group has many four-foot lengths of 1" steel pipe to drive into the ground to hold the bottom of our antenna masts in place. Four other pieces of pipe are then used to anchor guy ropes for the mast. To prevent the bottom of a heavy steel support mast from sinking into the grass, a small board with a 1½" hole in it is placed on the ground and the center holding pipe is driven vertically into the ground through the hole in the board (see photo 6A). After the heavy antenna mast has been lifted over onto the center holding pole, it rests on the board and does not sink into the ground (see photo 6B). After Field Day, when the antennas are removed, the guy rope and center holding pipes for each antenna hardly show at all.

Steel antenna masts can be made taller by adding light-weight extensions at the top. Fiberglass pole vaulting poles are ideal for this purpose. Stiff bamboo poles also work well. It takes about four strong men to lift our steel antenna mast up and over onto the center holding pipe.

This system has made it possible for our club to use beautiful, well located spots for our operation without leaving a trace. As a result, we are always welcomed when we desire to return.



When the mast is placed over the anchoring pipe, it rests on the base board and does not mar the grass.
Photo 6B

Strategy for Milliwatt Field Day Success

by Robert (Red) Reynolds, K5VOL [1]

Perhaps the greatest on-the-air operating activity for most of the QRP fraternity is Field Day, and especially milliwatt Field Day. One QRP group, the Harper Air Hawks (HAH), has been involved in Field Day for seven years. Each year the net score has risen, culminating in the top club score in 1984, 1985 and 1986. Most of this success has resulted from learning through evaluating past errors and successes. The purpose of this article is to share this knowledge with others in the hopes of increasing both the number of QRP Field Dayers and the over-all competition. Let me tell what we have learned about sites, operators, antennas, equipment and especially strategy.

Choosing a Site

Sites for Field Day operations must be evaluated both with reference to the physical site itself and its geographical location with respect to the rest of the countries involved in Field Day.

The HAH physical site is not a picture perfect site. It is bordered on the north by a tangle of medium height trees and on the west by a line of low trees and bushes. However, the intersection of these tree lines is on a small hill providing height over most obstacles to the east and south. Over years of operating Field Day we have learned to make maximum use of the available area and supports for antennas. The two operating positions, are located at the top of the hill. Most of the top of the hill is clear, allowing unobstructed shots for the antennas in several directions. This site also has the virtue of being very QRN-quiet.

One requirement of a good physical site is operator comfort. We have had the use of an RV which we could locate about 50 yards away from the station and a nearby college security facility. The local law enforcement crew regularly visits us to be sure we are legal (in other words, they try to find the beer we have hidden) and to keep the Zuni-Loopers away. Several good restaurants are also close if we desire.

The geographical location is ideal for Field Day operators, centered in a dense 9-land area very big on Field Day. This provides a lot of contacts on all bands and with almost any antenna. To the east we have a clear shot at the W8's, W1's, W2's and W3's, all high-density call areas. Fixed gain antennas can be used to this direction. To the southeast are the W4's and to the south are the W5's. All these call areas are about half as far as the W6's, who represent the only really high-density call area to the west.

Choosing a Power Source

All power for the station is provided by batteries and solar panels. The absence of noisy gas gulping generators is one of the great pleasures of the QRP Field Day. At night small lights run by the batteries, dial lights and gas lanterns are used. We have learned to operate at night inside 'screened rooms' with the lanterns hung outside the enclosure. This prevents being taken over by all the local insects. We have found even a small car battery to be adequate to power an Argonaut or Argosy for a full 24 hours even with dial lamps and 12v log lamps used all night. Although generally we run with solar power exclusively during the day.

Our first solar powered Field Day was run by a demonstrator panel loaned to us by a local company. Normally this panel was kept in their lobby, and they were not sure if it still functioned. We ran an Argonaut directly off the panel without a battery buffer or even a voltage regulator. Currently we have available six or seven 35 watt panels for use at Field Day, along with charger/regulator controls. We can run our panel/battery system all 24 hours without having to switch power sources between daylight and darkness.

Antennas are Very Important

The selection of antennas for QRP Field Day is a rather complex subject. The type of antenna must be considered along with gain, direction of radiation, take-off angles, direction and distance of high-density activity, bands and, if multiple stations are used, interaction of the various antennas and transmitters. The Harper Air Hawks have seven year of experience with various antennas while running either one or two stations, but we are still learning and trying new ideas each year.

One of the most consistent performers for HAH has been a 300-foot long wire running east-west at an average height of 25 feet. This antenna has been extremely effective into the first, second, third and northern half of the fourth call districts on both 20 and 15 meters. Directivity and gain are both clearly apparent on these bands. On 40 meters, these same districts plus the 8th are also easy to work, although gain is not a major part of the system. On 80 meters we get a good omni-directional pattern that works well in the third, fifth, eighth, ninth and the near portions of the zero call district. We have found this antenna works best with a 65 foot

counterpoise directly under it. A test with a 300 foot counterpoise was tried but gave no improvement.

A second 300-foot long wire is run north-south to access the western half of the fourth area, the fifth area and the southeastern zero area on 40, 20 and 15 meters. This long wire is normally put up at an average height of 15 feet, the maximum we can obtain in the north-south line of bushes and low trees. A 65 foot counterpoise is used under the wire.

At the top of the hill, in the clear, we usually install a 20 foot tower with a triband yagi, turned by ropes attached to the boom and anchored with stakes. Having this one rotatable antenna has allowed us to take advantage of changes in propagation to various areas in the day and night. The yagi and dipole are the only antennas we have used at 10 meters.

In the 1986 FD we added two 40 meter button beams, one pointed to the east and one to the south, both about 15 feet high. Both button beams had baluns at their feedpoint so a coax could be used effectively. Both baluns were designed and tested for 40 meters. The south oriented beam was very effective but the east beam did not provide the performance we desired. Further experimentation will have to be conducted with this antenna.

Two vertical antennas have also been used. One is the vertical by Butternut mainly for short range coverage in the ninth area. The other has a balloon supported 100-foot wire used on 160 and 80 meters. Although the balloon supported vertical worked well, it seems to be very accident prone in the wind and at night when the air cools and some of its lift is lost.

Two things stand out about antennas when running one watt. First, all antennas must either be moveable for different areas of fire, or if fixed, they must be oriented toward high density areas. Second, gain antennas are an absolute necessity. One watt of rf will not stomp over anything.

Equipment

Transceivers used have been Argonauts (both 509's and 515's), and Argosy, and other commercial rigs throttled down. Since we began running at one watt, only the Argonauts have been used. In order to insure one watt levels, our power meters are calibrated in the local Motorola labs. With the Argonaurt transceivers, the RIT defeat switch should be pulled to prevent inadvertant off-frequency operation. Also for CW, external filters have proved very useful.

Since we use the long wires for much of the Field Day, good antenna tuners are necessary. These should be tuned on each band prior to the start and their settings logged for reference needed as a starting point when changing bands. Memory keyers are very helpful if they are available.

Test equipment and tools are useful for checking battery voltages, shorted and open coax, power lines and any other last minute checks prior to operating. Even though things seem OK before installation, that does not ensure that the rigors at the Field Day site will not cause problems. Problems must be rectified *before* the start-up time, not after the contest begins.

Operators

We have found that at least three operators are needed to man one station for 24 hours comfortably. Each operator should be able to run without assistance, that is make QSO's, log, and keep the dupe sheet. One operator must get several hours of sleep before midnight in order to run efficiently in the late hours of the night until morning. We usually leave it up to each individual as to what he wants to bring to eat and drink. This is supplemented by 'community' food and liquids.

We do not set times for an operator to be at a station. This works for us because everyone is always willing to fill any need as an operator or logger when one is needed. This non-schedule type of operation will not work for everyone, so plans must be made according to the type of operators at any individual Field Day site.

Over the years we have learned individual operator preferences and abilities. For example considering, four of our operators, one is the best on SSB, another best on 80 CW, one on 40 CW and one on 20 CW. We run each one on his speciality whenever possible.

Another idea that HAH adheres to is that anyone is welcome to run one of our stations. We have had some walk-ons operate each year. One evening, a QRP'er visited us along with his non-ham date and spent four hours as a logger.

Operating Strategy Makes the Final Difference

High Field Day scores are not the result of the Field Day that is being run, but the result of analyzing past Field Day results. Wise band usage times are also a result of past experience with a generous contingency plan allowing for vagaries of propagation and band openings.

Generally, 40 and 20 meters will provide a greater QSO per hour rate than the others. Eighty meters can be the most productive band at night. Fifteen and 10 meters must be run if they are open enough to support a good contact ratio for at least a short time. One sixty and two meters can also be productive, providing the local area has sufficient activity for short range contacts. It is well to provide for both CW and SSB modes for every band.

The two stations used by HAH are divided by band usage, one for 20/80 and one for 15/40, providing one band open in the day and one at night. The 40 and 20 meter bands are further divided into CW and SSB. This mode division prevents the 15/40 station being locked into one 'band' if it is out, since CW and SSB are considered separate bands. If 10 meters is open either station can work it while the other station is on either 20 or 40 at all times, either CW or SSB. Since 20 and 40 produce the greatest number of contacts, this has always worked for us.

The two stations must be located reasonably close to each other to make all antennas available to both. This usually is no problem with the longwires and any other tuned feeder antenna. One reason we went with baluns on the 40 meter button beams was to allow one station access to 40 with the buttons and 20/15/10 with the yagi and the other access to both longwires which are normally used on 80/40 and 15 only. The button beams were accessible to either station so that each station has either a rotatable antenna or several antennas oriented in different directions able to concentrate on high density areas at all times.

We normally start one station on 20 CW and use the other to work the highest available. Remember if 10 opens on the first day that it may not be available the second. One mistake to avoid is to start both on 20 and 40 when higher bands are open and end up Sunday with only 20 and 40 available. Both 'worked out' because of that we work 20 and 40 on Saturday only if 10 and 15 are down or we have already milked the higher bands for whatever they have. Working everything on 15 in the first two hours of the contest will pay off on 20/40 later on. We usually start on 80 well after dark when it gets loaded, and have found it very productive up to about 10 a.m. Sunday.

Once most of the available contacts in a band have been worked, a switch to a different mode will usually increase the QSO ratio again if the band is not dying out. Do not forget the novice bands, there are some sharp operators there. The big trick is to work the band producing the greatest contact ratio at all times, with the most effective antenna available.

For logging, select one time (local or GMT) and stick with it on all logs. All data on the log must be complete and readable, since any omitted or garbled entries must be thrown out. An accurate up-to-date dupe sheet must be kept at all times. Working a lot of duplicate contacts kills effectiveness. Not only do they not count, they waste valuable time.

The Pay-off

A look at the Harper Air Hawk's efforts for Field Day in 1985 and 1986 will illustrate the results of planning. In 1985 the QSO total was 503 and in 1986 it was 533. That tells only part of the story. The 1985 Field Day went along well except for a three hour off-the-air time forced by lightning. The results were studied and plans for 1986 were based on this analysis.

The 1986 Field Day was almost a disaster. Only two operators showed up to install the six antennas prior to start up time. When the contest started only three antennas were up. The two 40-meter button beams and the triband yagi. Both long wires and a vertical were installed after the rest of the operators arrived and were running the stations. Time was taken from operating to tune the longwires and record the tuner settings. The two operators who showed up at 6 a.m. to put antennas up were supposed to run 40 and 80 all night but now were unable to do so. That caused problems keeping both stations running all night.

Band conditions in 1986 were far worse than in 1985—no 10 meter openings and very poor conditions on 15 meters. The two meter packet station only found four stations to work (one was a totally unmanned computer-driven entry!) Finally one of our guest operators took 90 minutes to make one contact, his first ever on-the-air QSO.

Yet with all these problems we had a better score than in 1985. Part of the reason was planning for high density areas. Seventy two percent of our contacts came from the eastern areas; areas available by a longwire, a button beam and the yagi. Another 23% came from the southern area, available by the other longwire and the other button beam and the yagi. Only 5% came from the west by way of the east-west longwire and the yagi. 95% of our QSOs were worked on the close-in hi-density areas our antennas

were installed for, based on our analysis of the 1985 results. The final tally of contacts included a total of 48 states. Our antenna and strategic planning overcame the problems we ran into in 1986.

In truth the results in 1986 are a product of the previous six years of learning from Field Day. During this time many ideas, antenna systems and equipment have been tried, some good and some bad. It will be interesting as the higher bands come back to see how possibilities will change and how we can use conditions to our best advantage. We have not yet been able to tap into the Ohio high-density area on 20 meters—we simply skip over them. Maybe 1987 will be different. The ultimate has yet to be reached.

Looking over the 1986 Results

Although 77% of our contacts were made on CW, one watt of SSB worked out quite well. This was especially apparent on Sunday morning when we were able to make complete QSOs almost at will. Several visitors came out to the site that morning and were amazed that we were working one watt SSB with no apparent disadvantage relative to the more numerous 200 watt stations on 20 meters! One thing that surprised us was that we received a number of visitors from 200 watt clubs after they had worked our QRP effort. They just had to see if we really were running one watt!

QSO Results of Harper Air Hawks - 1986 Field Day

Area	80M	40M	20M	15M	Total
1	0	14	47	2	63
2	1	19	43	1	64
3	2	29	24	1	56
4	4	31	28	5	68
5	0	14	10	4	28
6	0	3	18	0	21
7	0	4	10	1	15
8	36	38	3	3	80
9	33	12	11	4	60
0	4	20	16	4	44
Total	80	174	210	25	489

Call Area by Order of Number of QSO's

Area	QSO's	Direction
8	80	E
4	68	E-SE
2	64	E
1	63	E
9	60	-
3	56	E
0	44	W-SW
5	28	S
6	21	W
7	15	W-SW

QSO's by Direction

Direction	QSO's
-	60(9th area)
E	207
SE	68
S	28
SW	59(W-SW)
W	21

Five Years of QRP Field Day

by Bob Patten, N4BP

```
          FUNCTION KEYS PROGRAMMING

F1:GOTO "C"@                    F4:GOTO "L"@

F2:GOTO "Q"@                    F5:GOTO "S"@

F3:GOTO "A"@                    F6:GOTO "H"@


                MAIN PROGRAM

 2:"H"ARUN :CLS :PAUSE "F1 CONT":PAUSE "F2 QSO":PAUSE "F3 QSO/HR"

 4:PAUSE "F4 LOAD":PAUSE "F5 SAVE":PAUSE "F6 HELP":END

 6:"N"CLEAR                :TIME=.01:N=118:T=0:B$="C":WAIT                0:DIM
A$(N)*7,B$(N)*7,C$(N)*7,D$(N)*7,E$(N)*7

 7:DIM F$(N)*7,G$(N)*7,H$(N)*7,I$(N)*7,J$(N)*7:END

 10:"C"CLS  :PRINT  B$;:C$="":INPUT  " CALL : ";C$:IF LEN C$=1AND C$>"@"AND
C$<"K"LET B$=C$:GOTO "C"

 12:FOR W=1TO LEN C$:X=ASC MID$ (C$,W,1):IF X>47AND X<58THEN 14

 13:NEXT W:CLS :PAUSE "NO # IN CALL":BEEP 10:GOTO "C"

 14:C$=B$+C$:ON 58-XGOTO 60,55,50,45,40,35,30,25,20,65

 16:CLS :PAUSE MID$ (C$,2,6);" QSO (Y/N)":IF INKEY$=""THEN 16

 17:IF INKEY$="Y"THEN ON 58-XGOSUB 62,57,52,47,42,37,32,27,22,67:T=T+1

 18:BEEP 1:C$="":GOTO "C"

 20:FOR S=0TO A:IF C$=A$(S)THEN 80

 21:NEXT S:GOTO 16

 22:A$(A)=C$:A=A+1:RETURN

 25:FOR S=0TO B:IF C$=B$(S)THEN 80

 26:NEXT S:GOTO 16

 27:B$(B)=C$:B=B+1:RETURN

 30:FOR S=0TO C:IF C$=C$(S)THEN 80
```

In mid December I received a request for an article in my efforts in Field Day using QRP. My immediate reaction was that this was an interesting challenge worthy of accepting; a challenge since I haven't done any writing in the last couple of years, and interesting since Field Day is the one activity in ham radio which gives me the most enjoyment. It would also be a worthwhile project in that the research might provide some clues on how to approach Field Day next June after taking a beating in our last QRP effort.

I've been participating in Field Day since the early 1960s. My first Field Day was with the Hampden County A.R.A. from a cow pasture in Middlefield, Mass., and I can still remember wandering from station to station in the middle of the night—BAREFOOT! Another early Field Day was a non-effort from Garden Key in the Dry Tortugas, a tiny island 60 miles west of Key West, in which the F.C.C. specified in our special events license, KF4DT, that we could not compete in Field Day. For three consecutive years, the contest was run mobile in a VW Squareback using two Sears Diehards and towing a 1.5Kw generator to charge them. The driver's seat was the operating position with a clipboard attached to the steering wheel. Further mobile F.D.s were done in the luxury of a 1973 Ford wagon including one from Mount Tamalpais just north of San Francisco. By 1975, I had what I considered the ultimate mobile/portable station within my budget, a 23 foot Jayco camping trailer with on-board generator. Several Field Day operations were done from this setup including one from Cape Cod during summer vacation in 1976 and all of the later QRP operations from the Florida Keys.

It wasn't until 1980 that I discovered QRP was the way to go. If you examine Field Day results in QST over recent years, you will observe that the higher scores in each class are invariably made by the low power stations. With the five times multiplier, this is probably the only contest in existence in

```
31:NEXT S:GOTO 16
32:C$(C)=C$:C=C+1:RETURN
35:FOR S=0TO D:IF C$=D$(S)THEN 80
36:NEXT S:GOTO 16
37:D$(D)=C$:D=D+1:RETURN
40:FOR S=0TO E:IF C$=E$(S)THEN 80
41:NEXT S:GOTO 16
42:E$(E)=C$:E=E+1:RETURN
45:FOR S=0TO F:IF C$=F$(S)THEN 80
46:NEXT S:GOTO 16
47:F$(F)=C$:F=F+1:RETURN
50:FOR S=0TO G:IF C$=G$(S)THEN 80
51:NEXT S:GOTO 16
52:G$(G)=C$:G=G+1:RETURN
55:FOR S=0TO H:IF C$=H$(S)THEN 80
56:NEXT S:GOTO 16
57:H$(H)=C$:H=H+1:RETURN
60:FOR S=0TO I:IF C$=I$(S)THEN 80
61:NEXT S:GOTO 16
62:I$(I)=C$:I=I+1:RETURN
65:FOR S=0TO J:IF C$=J$(S)THEN 80
66:NEXT S:GOTO 16
67:J$(J)=C$:J=J+1:RETURN
75:"S"PRINT "SAVING":PRINT #A,B,C,D,E,F,G,H,I,J
76:PRINT
#"";A$(*),B$(*),C$(*),D$(*),E$(*),F$(*),G$(*),H$(*),I$(*),J$(*):END
78:"L"PRINT "LOADING":INPUT #A,B,C,D,E,F,G,H,I,J
79:INPUT
#"";A$(*),B$(*),C$(*),D$(*),E$(*),F$(*),G$(*),H$(*),I$(*),J$(*):END
80:CLS :PRINT MID$ (C$,2,6);" DUPE":BEEP 10:GOTO "C"
90:"A"IF LEN STR$ (TIME -INT TIME )<6THEN "A"
100:T$="00"+STR$   TIME   :D$=LEFT$   (RIGHT$  (T$,9),2):H$=LEFT$  (RIGHT$
(T$,7),2):M$=LEFT$ (RIGHT$ (T$,4),2)
110:PAUSE USING "####.##";T/(24*VAL D$+VAL H$+(VAL M$)/60);" QSO/HR":END
120:"O"PAUSE USING "#####";T;" QSOS":END
```

VARIABLES

A-J	Count of calls in call areas 1-0
A$()-J$()	Arrays for calls in call areas 1-0
TIME	Elapsed time
T	Total QSO's (used for F2 and F3)
C$	Call input
B$	Current band
S	Search counter
N	Size of arrays (118*10 = 1180 calls)
W	Counter for finding number in call

Bob Patten, N4BP, tests a home brew 2-element yagi for Field Day. The vertical was better in all comparisons.

which QRP stations can compete alongside QRO stations AND hold the advantage. After making this brilliant observation, all further F.D. contests were run at the five watt level (except in 1986 when we decided to run a busy contest – we did make 1750 QSOs with our 100w and vertical – and to heck with the score).

There are quite a few sets of phonetics to use with N4BP including Baked Potato, Brass Pounder, Blood Pressure, Broken Pencil, etc., but it took the Ugly Mutha, N4UM to come up with Bashful Pevert during our first QRP Field Day together – hence the name of our "club," the Bashful Perverts. The location for each of our Field Day efforts together has been from the Fiesta Key KOA on Long Key, a small island whitewashed from the multitude of pelicans and sea gulls, hence the re-naming of our Field Day spot to Guano Reef.

As you look through the results in *QST* of Field Days over the years, you will see numerous examples of the results of "Murphy's Law" in the soapbox section. I am NOT a believer in Murphy's Law. With careful planning and backup systems, almost every potential problem can be eliminated. Another "law" which I DO firmly believe in is the K.I.S.S. principle (Keep It Simple Stupid) or, put in the form of Murphy's Law, "If nothing can go wrong, it won't." I'll admit it's not foolproof but I will point out some examples of this principle in the station description.

There are three basic ingredients in a successful Field Day operation; the operators, the antenna and its location, and the station

equipment. Tim (N4UM) and I have very different operation styles, but, I think, complement each other very well. Tim prefers to use the "search and pounce" technique while I like to play the "big gun" (yes, this DOES work with QRP). In contests other than Field Day in which Tim and I multi-op, I generate the volume and Tim gathers the multipliers. In Field Day, there are no section multipliers but our differing styles seem to generate about the same QSO rates; between us we cover the other "searchers and pouncers" and "big guns." Our operating schedule over the five years of QRP has been basically the same, two hours on, two hours off (except for hours off when Tim's son, WA4YWE has joined us). To faciliate uninterrupted sleep, the period from midnight to 8 a.m. on Sunday is split into two four-hour sessions.

The antenna and location were grouped as one ingredient. Since south Florida is basically flat, mountain topping with the associated beam is out of the question and a tower violates the K.I.S.S. principle. The alternative is a vertical over a near perfect ground. The near perfect ground is attained by selecting a small island with the Gulf of Mexico on one side and the Atlantic Ocean on the other. The antenna used was built 20 years ago from a 30 plus year old scrapped Hy-Gain tri-band beam. The traps were salvaged from one side of the driven element and more than enough telescoping aluminum was found in the rest of the beam to complete the vertical. By adding a Hustler 40 Meter resonator to the top, we had the 10, 15, 20, and 40 Meter bands covered.

The entire antenna is stored in a four foot long cloth bag; it can be removed from its bag and be fully operational on the roof of the Rec Vee in well under five minutes. On the 23 foot Jayco used during five years of QRP Field Days, it was mounted on the left front corner of the roof. Earlier tests had shown that this configuration showed considerable gain in the direction of the right rear corner. With the Jayco parked facing south, we had a strong, broad lobe to the NNW covering the states nicely. Besides Field Days in the Florida Keys, this antenna has done duty in the Bahamas, Cayman Islands, Dry Tortugus (FL), Cape Cod, Ontario, and California.

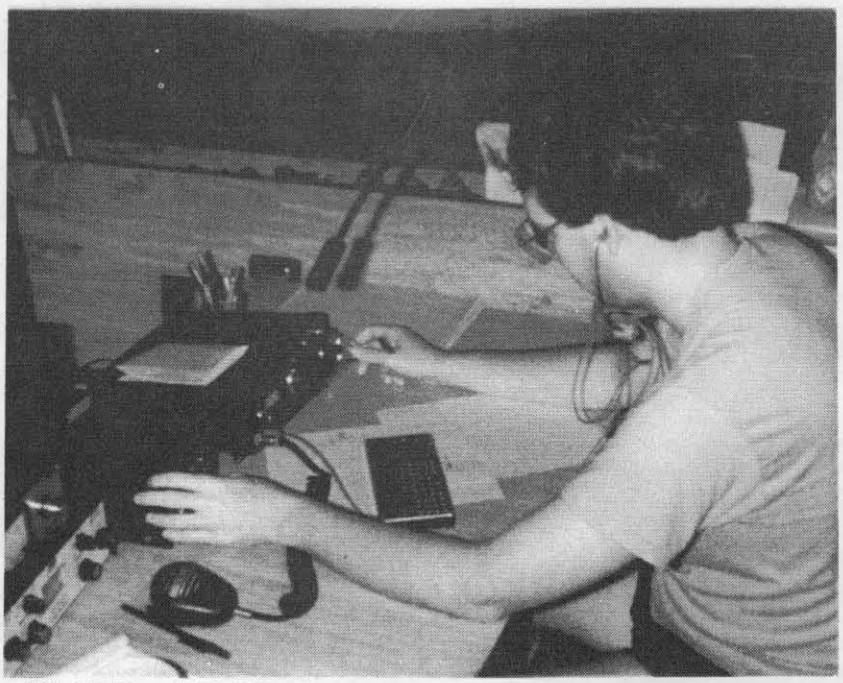
In our first "Bashful Perverts" Field Day, the rig used was the Argonaut 509. The first few contacts were made with the rig running directly from a 1.2 amp solar panel before switching to solar charged battery. The Argonaut uses switching diodes in the antenna circuit as part of its QSK scheme. After 26 hours of operating, a nearby thunderstorm induced enough current in the antenna to blow the diodes, effectively removing the antenna from the receiver. During the last hour we worked only those stations which would have normally been well over S9 but were barely detectable over the internal receiver noise. During the period from '82 through '85 we used the Kenwood TS-130V. This rig is a pleasure to operate with its 500 hz. filter, R.I.T., I.F. shift, and broadband tuning. The '130 has never given us a bit of trouble.

The power source used is a perfect example of the K.I.S.S. principle. The notorious gasoline generator is the culprit in most failed Field Day efforts; it either quits or decides that all the 110 volt gear really needs 200 plus volts to run efficiently. In either case, the result is down time during which no con-

```
X          ASCII value of character in call
N$         File name for load or save
T$         TIME converted to string
D$         Number of days elapsed
H$         Number of hours elapsed
M$         Number of minutes elapsed
```

The above program was authored by N4BP and may be considered Public Domain.

The N4BP, 5 watt championship station parked at Guano Reef (Fiesta Key, FL), looking at the Gulf of Mexico to the northeast.



WA4YWE at the Field Day N4BP operating position. Note: TS-13OV, MFJ tuner, CMOS keyer, PC-2 computer Duper.

tacts are made. Why not eliminate the risk of the failed power source, the noise, the exhaust, the gasoline expense, and danger? During our five year effort, the power source for our QRP rigs was a solar charged Gould 105 amper/hour deep cycle battery. The battery was charged from the 1.2 amp solar panel prior to and during Field Day. Even with no sun during the 27 hours of operation, figuring an average of two amperes to run the TS-130V (50 percent transmit cycle), we could theoretically operate for about 52 hours, almost twice the length of Field Day (we don't care if the sun don't shine! – Take your best shot, Murphy!).

The only other equipment required was a memory keyer; we used the "Super-CMOS" keyer from an old QST with an AEA "Contest Keyer" for backup. The Super-CMOS uses four built-in "AA" nicads and were solar charged.

To add more class to the operation and to keep the operators a little busier (the tendency is to nod off at 4 a.m.). we used the Radio Shack PC-2 to keep the dupe check. It is useful to keep a running dupe check during Field Day for several reasons. Obviously, when searching the bands for stations to work it is necessary to know if a station heard has been worked before. A great deal of time can be wasted by working the same stations repeatedly. It is helpful to keep a running total of stations worked and a QSO rate (functions easily combined with a computer dupe check program). Following the contest, the logs are more easily processed if not loaded with dupes.

The Radio Shack PC-2 used with the included program fits in beautifully with a QRP Field Day. The computer itself is QRP; the PC-2 runs on four "AA" cells a draws only 20 ma. The QSO rates while running QRP are slow enough to allow a dupe check to be easily kept. In fact, the extra activity of entering and checking calls can help prevent boredom when things get really slow!

A brief description of the program's functions follows:

On power-up Displays Menu:

F1 CONT Goes to call input routine
F2 QSOS Displays current QSO total
F3 QSO/HR Displays current QSO rate
F4 LOAD Loads file from tape into arrays
F5 SAVE Saves contents of arrays to tape
F6 HELP Displays this list

To make menu selection, push numbered Function Key. If in call input routine, you must push "Break" first.

At start of contest, push "DEF." then "N". This initializes all variables, dimensions the arrays, and zeros the elasped timer. DO NOT "RUN" OR "DEF N" AGAIN DURING CONTEST!

When in the call input routine, entering a single letter from A to J will select a band as follows:

A 10M CW F 10M SSB

B 15M CW G 15M SSB

C 20M CW (default) H 20M SSB

D 40M CW I 40M SSB

E 80M CW J 75M SSM

My research is done and I have drawn my conclusions. For each of four years, we turned in the highest single transmitter score in the country. In year five (1985), we came in sixth! Our band usage varied all over the lot. In 1984, we ran a much higher percentage of CW, yet our score was virtually the same as in 1982. The operators, location/antenna, and station equipment were all the same as in past years. So what happened? We brought my XYL!

Field Day Statistics

1980 Hollywood ARC 2A 20 Participants QRP

CW	PHONE	1086 QSO's
---	---	8265 Points
40M-30		55% CW
20M-374	20M-136	
15M-162	15M-195	FT-7 + Vertical
10M-20	10M-109	Argonaut + CL-33
	6M-41	
---	---	Thompson Park
Total 587	Total 481	

1981 Bashful Perverts 1B N4BP, N4UM QRP

CW	PHONE	999 QSO's
---	---	8355 Points
40M-73		57% CW
20M-263	20M-53	
15M-225	15M-105	Argonaut + Vert
10M-11	10M-208	
	2M-1	
---	---	Guano Reef
Total 572	Total 427	

1982 Bashful Perverts 1A N4BP, N4UM, WA4YWE QRP

CW	PHONE	1170 QSO's
---	---	9555 Points
40M-84		54% CW
20M-359	20M-53	
15M-184	15M-303	TS-130V + Vert
	10M-186	
	2M-1	
---	---	Guano Reef
Total 627	Total 543	

1983 Bashful Perverts 1A N4BP, N4UM, WA4YWE QRP

CW	PHONE	965 QSO's
---	---	7630 Points
40M-50		54% CW
20M-242	20M-136	
15M-199	15M-108	TS-130V + Vert
10M-30	10M-200	
---	---	Guano Reef
Total 521	Total 444	

1984 Bashful Perverts 1B N4BP N4UM QRP

CW	PHONE	1046 QSO's
---	---	9525 Points
40M-99		73% CW
20M-466	20M-125	
15M-194	15M-148	TS-130V + Vert
	10M-13	
	2M-1	
---	---	Guano Reef
Total 759	Total 287	

1985 Bashful Perverts 1A N4BP N4UM, WA4YWE QRP

CW	PHONE	673 QSO's
---	---	6675 Points
40M-185		89%CW
20M-220		
15M-181	15M-31	TS-130V + Vert
10M-16	10M-40	
---	---	Guano Reef
Total 602	Total 71	

1986 Bashful Perverts 1B N4BP N4UM QRO

CW	PHONE	1751 QSO's
---	---	5716 Points
40M-360	40M-40	49% CW
20M-427	20M-733	
15M-60	15M-69	TS-430S + Vert
10M-10	10M-52	4KW Generator
---	---	Guano Reef
Total 857	Total 894	

Anatomy of a Championship Field Day Effort

by Stephen C. Finch AI0W

When it comes to Field Day organizing and implementing a championship effort does not happen by accident. QRP provides the challenge, Field Day provides the format, but you put it together. Learn some of the ways K0NA, FD station of the Arapahoe Radio Club, Littleton, Colorado, has used to put together four successive top finishes in the two transmitter club competition, snagging 1919 QSOs in the 1986 FD.

At the January meeting, President Gary Breed, K9AY, called the Arapahoe Radio Club to order. Field Day seemed like many months away. But as the white of snow still covered the ground, planning for this annual event began. A volunteer to act as the Field Day Chairperson was requested and Bill Voeck, NE0K, volunteered. This is Bill's third year as chairperson. Nothing like experience to get planning off on the right foot! Several members volunteered for FD Committee slots, some 'old timers,' some 'new timers.' The club was off and running towards a 1987 Field Day First Place finish.

Does this describe your FD start? You say volunteers are hard to come by. I remember when Field Day struck terror in the hearts of members who thought they would be "volunteered" to serve, and that meant work. What is the difference between then and now? For the Arapahoe Radio Club, known to its members as the "ARC," it has been years of developing pride in its consistent high performance in Field Day. How did the ARC arrive at its consistent championship effort? It is not as difficult as you think. Just like a well run club or business, it is planning, evaluation and learning from what is successful (and not successful).

This is not a step by step cookbook to a championship effort for Field Day, but is a sharing of what the ARC has found successful. Your effort is bound to be different. Let us know what you found to be successful and share your results with all of us. Send your ideas to the *QRP Quarterly* and let everyone know.

Planning

The key to any successful outing is planning, and Field Day is no exception. The ARC uses five main leaders: FD Chairperson, Station #1 Manager, Station #2 Manager, Novice Coordinator and Antenna Coordinator. Each leader assembles his own group of helpers. Of course, the FD Chairperson is the main coordinator, but each leader is given latitude.

The FD Chairperson helps each leader accomplish his/her responsibilities. The FD Chairperson has the specific responsibility to see that all of the "Bonus" points are being planned for properly. Our FD Chairperson usually coordinates or delegates the responsiblity to make sure the food is handled. He/she is also responsible to arrange the post FD "party" to dupe the logs and prepare them for submission to the ARRL. Each month prior to FD, the Chairperson gives a progress report to the Club at the Club meeting.

The Station Managers' and the Novice Coordinator are responsible to assemble, test and coordinate their station before and during FD. Each Manager is given a check list which he/she uses to make sure all necessary radio equipment is available and who is responsible to bring it, ready for use, to FD. A couple of days before FD, the Managers will call the equipment volunteers to double check the availabilty. The two Managers will coordinate together to make sure at least one alternate transceiver is at the FD site 'just in case.' Since the ARC operation is "Battery," the Managers and Novice Coordinators are responsible to make sure they have two good, fully charged automobile batteries for their station. The Novice Coordinator usually has some meetings with the Novice operators to familiarize them with FD and to coach them on what to expect while operating. This is a good time for the Novice Coordinator to instill into the Novice/Technicians some real pride and desire to upgrade.

The Antenna Coordinator has a big job. He/she will work with the Managers and the Novice Coordinator to select the antennas each station will use. The Antenna Coordinator is someone who is knowlegeable in propagation, current band conditions and how those two factors affect the choice of antennas used. The ARC has settled into using a limited number of antennas, but each year something new is tried and its performance compared to that of existing favorites. Our antennas will be discussed later in this article. The Antenna Coordinator is also responsible to setup and carry out the antenna trailer checkout. This includes inspection of antennas, maintenance of the antenna trailer, testing of the coax for performance, assuring there are adequate numbers of ropes, stakes, connectors, wire and tools and finding a willing Club member with a trailer hitch on his car to pull the trailer to the FD site.

It is important for the leaders to meet at least once a month in January thru April just to make sure plans are going well. If this is your first FD or if you are revamping your FD effort, this is a must. A site must be selected which favors propagation in the best directions and has the room for all of the antennas. Antennas must be chosen and obtained, equipment must be selected and arranged for, station plan of operation must be established and, most importantly, operators must be found. Remember, CW is more effective when operating QRP and CW contacts score twice as much.

Equipment

No detailed discussion of various types of equipment will be given here. The ARC has tried several makes and models. From our experience, we prefer the Drake TR-7 and the TenTec Corsair (I or II). We have used several Yaesu models, several Kenwoods (we have not used the 830/930/940) and some Icoms. The Icom IC-751 was used with some success. The problems with the transceivers are generally poor reliability intermod, narrow dynamic range, marginal crystal filter performance and complicated operation. In several years of use, the Drake TR-7 has never had any problems and its ease of operation make it the current preferred choice. However, each year we try out another transceiver for comparison. One Club member has constructed simple crystal oscilators that can be used to measure minimum discernible signal and onset of third order distortion. This allows us to compare individual transceiver performance. We have found that published numbers seldom relate to "real world" performance.

One important item that must be checked out every year is the power output measuring device. We use Heathkit wattmetters. To calibrate for low power, run the output of your rig through the wattmetter into a dummy load. With an rf probe on a VTVM, measure the rf voltage across the dummy load. Set the wattmetter on the SWR setting (NOT the "Set Fill Scale" position). Increase power output until the VTVM reads 36.6 V_{rf} for 10 watts, 22.4 V_{rf} for 5 watts or 10.0 V_{rf} for 1 watt output. Adjust the SWR sensitivity control for the appropriate reading on the scale, i.e. 100 watts would not be set to be equal 10 watts if the VTVM probe is reading 36.6 volts. Do not put the selector on the wattmeter to read any wattage scale, leave it in the SWR "read" mode and read the scale just as if the wattmeter was in a "low power" readout mode. This method can be used for any wattmeter that is unable to read low power and has an SWR mode.

Antennas

In any QRP operation, antennas are the most non-operator critical consideration. The ARC has used many antennas from simple dipoles at varying heights to stacked multi-element beams to shunt loaded towers. Over the years we have settled on mono band beams for 20 and 15 meters, tribanders for the stations not having the mono bander and for 10 meters, Bobtail curtain for 40 meters and a shunt loaded tower for 80 meters. We generally have 6 meter capability available but except for 1985 FD, no significant openings have occurred on 6 meters. The beams are supported by old crank-up towers donated to the Club many years ago. The crank-up feature is not needed because we do not adjust antenna height. Initially, we adjusted the tower height to vary the skip distance of our signals. This does work, but being in Colorado, all of our major target areas are 1,000 to 1,5000 miles away, both east and west. A single height of 45 feet seems to be a good compromise.

The selection of antennas requires substantial planning and evaluation. Each year we review our logs to determine where our contracts were obtained. It is very interesting to see where your signal was the loudest and what antenna provided those contacts. It takes a couple of years of FD operation to settle on the best antennas. Remember, if you change the FD site, you begin all over with antenna history. Each site has unique ground conditions, topography, antenna support capabilities and has preferred operating directions. About the only constant factor is the distance to major target areas. Therefore, if at all possible, select a site that will be available for many years.

We have found several factors to be desirable in site selection.

1. Ease of access by all members.
2. Elevated above average terrain and sloping off toward the desired target areas.
3. Located on public property away from expected developments. This will increase probability of using the site for future FD operations.
4. Availability of supporting trees, etc., or enough room to erect guys for other types of supports.
5. Enough space to lay out ground radials.
6. Big enough to allow for parking of vehicles and setting up of tents.
7. A place that has some "mystic" about it. It adds to the fun and increases the interest by our Club and news media.

Operation

If your effort is a Club effort, keep it a Club effort. One sure way to lose the majority of Club support for FD is to bring in "Ringers" to operate. The ARC uses only Club members. We are a small Club of around 30 members or so. Size makes little difference. Our FD effort averages about 20-25 Club members. Some members never touch a key or speak a word into the mike, but they are there to help with erection of antennas, cooking, passing out coffee and cokes to the operators, manning the spotting receivers and many other necessary tasks.

The ARC sets up after the start of FD. We initially set up two simple tri-banders on 20 foot irrigation pipes. This allows us to be in operation within a few minutes of the start of the contest. It takes several hours to erect 45 foot crank-up towers with monobanders on top. However, the beginning of the contest the bands are so full of signals that both stations are kept very busy. By setting up after the start of the contest, we can operate the full 27 hours of the contest. We are able to make 20 to 40 contacts per station per hour during this ending time. The last three hours are also when we pass the "Message Origination" for bonus points and work two meters simplex using batteries charged by solar cells during the FD operation.

The actual operating team is a two-person team. The operator is responsible for selecting the contact, logging the contact and completing an accurate exchange. The second person is the "duper." He/she listens to the operation and checks the dupe sheets to verify if the contact is a new one. If the contact is a new contact, the duper adds the contact to the dupe sheets. The dupe sheets are made from large sheets of paper lined by call area and alphabetical suffixes. The paper is taped on stiff masonite boards. Dupe sheets not in use are kept at the Command Center.

The best teams have worked together long

enough so that the duper hears the contact at the same time as the operator and checks the dupe sheet before being asked. All the duper needs to say is "go for it" or "dupe." The duper then listens to the exchange to be a second opinion on the accuracy of the exchange, if needed. A good team can make 100 plus contacts per hour with no dupes or inaccurate logging. Many times a third person is added to the team to be a "go-fer." Pencils need sharpening, the teams gets thirsty or tired, nature calls happen, etc. The duper and go-fer are excellent training situations for upcoming operators.

The 2 a.m. to 6 a.m. shift is a good training shift for new operators. The action is not fast and time is available to recheck with a contact to verify a difficult exhange. Keep track of when inexperienced operators are operating. You will need to know this when evaluating your antenna vs contact record.

Communicating between the "FD Command Center" and the operating stations is best accomplished via two meters operating simplex. Each hour the "go-fer" counts up the number and type of contacts and reports them to the Command Center. Also, if any personnel replacements, supplies or the like are needed, this communications link is very efficient at letting the right people know. It also allows all of the FD participants to monitor the frequency and keep up to date on the activities of the stations.

As a Club we try to obtain a 60% CW contact ratio. When competing for top spot in the ARRL standing, it may seem best to try to have all CW contacts because of the higher score per contact. However, our experience is that you tend to work out a band and mode if you stay on that band/mode too long. We find that moving to SSB and letting the sun move, changing the propagation (skip distance), "reopens" a worked out CW band by making our QRP signal stronger into another part of the US. Besides, some of our best strings of contacts have come on SSB – example 100 contacts plus per hour for three consecutive hours on 15 meters in 1984.

We also try to use propagation information to determine when the best time to work into a targeted area will occur. For example, we cannot break through the Midwest "curtain of signals" from Colorado and reach the East Coast during the night on 40 or 80 meters. However, as the sun rises on Sunday, 20/15 meters propagation to the East Coast areas will improve as the skip shortens from the night time propagation. Signals for the Midwest will skip over us reducing our QRM and our signals are one hop to the East. Your operating plan will be different depending on your location. The fact remains, to maximize score, you need to work new stations when they are available.

DX bulletins usually report the solar flux information on a daily basis. Since the sun revolves on its axis once every 27 days, sunspots which face the earth one day will face the earth again in 27 days. Counting backwards from FD 27 days and looking at the fluxes for those days will give you some hint as to the probable conditions during FD. This is not 100% accurate, but is is the best predictor available. Also, at 18 minutes after each hour, WWV broadcasts up-to-date propagation information on the standard time frequencies (2.5, 5.0, 10.0, and 15.0 mhz). Listen in for the most current information.

Since the ARC is a 2A operation, we only have two transmitters operating (excluding the Novice station) at any one time. Yet, we are constantly checking with the other bands with spotting receivers for openings. With the sunspot cycle at its minimum, openings on 10, 15 and 6 sometimes start and close within 30 to 45 minutes. Besides finding an important opening, it gives a chance to evaluate a transceiver's receiving abilities under real FD type conditions. It will be a real eye opener to see just who's rig really stands up to their claims. (Problems with receivers are worse when you are operating QRO).

Novice Operation

DO NOT FORGET THE NOVICES!! WE did for one year and lost first place. More importantly, we did not give the upcoming operators in our Club an opportunity to operate. Bad mistake! We now have a Novice Coordinator. This is an experienced Club member who guides the Novice/Technicians in selecting equipment, antennas and helps them organize their operation. Of course, the Coordinator does not operate, but he helps a nervous Novice/Technician or two obtain an accurate exchange by pointing out the need for "confirmation" from a contact. Once the Novice/Technicians get over initial jitters, our Novice Coordinator lets the Novice station go on its own except for an occasional check back for any questions. Most of our new operators have at one time operated the Novice Station. It is the only real-time experience available. We make our Novice/Technician operators feel special, because they are. Their score can make the difference of many places higher in the standings and it can cement a very positive experience in their minds.

Bonus Points

There are eight opportunities to obtain bonus points. In the May issue of *QST Magazine,* the categories of possible bonus activities appear. Taken together, the bonus points can add 900 points to the score of a 2A entry. As a Club we attempt to take full advantage of all the possibilities, except for "Message Relay" which can take too much time to earn the bonus points. We do pass the required one "Message Origination" to the SEC for those bonus points.

We have a fully equipped satellite station at the site. It is manned by several Club members who enjoy satellite communications and are experienced in making satellite contacts. Coordination with satellite passes and operation of one of the two main stations must be made. One main station must go down for a minimum of 15 minutes and/or until a satellite contact is successfully made.

You could have several members at your operation copy the "W1AW Message." It is a good way to get many of the non-operators involved. Make it a contest with all successful copiers being listed in the next issue of your newsletter.

We find it easier to assign a member to take responsibility for each bonus point opportunity. Every club or group has members who specialize in their ham radio interests or have the right connections with the media. Use them and watch your point total climb.

Post Field Day Evaluation

Other than actual operation, this activity will add the most points to your future scores. Evaluation of antennas, operating equipment, organizational methods, propagation vs contact areas and operating methods should be looked at very carefully and critically. Never criticize an individual directly, evaluate only the results of ideas or actions. If the evaluation is done correctly and completely, year by year improvements in your score will be the result. The ARC moved from deep in the pack, to leading the pack by carefully evaluating performance in all aspects and implementing successful ideas into the next year's operation.

It is usually helpful to hold a meeting of the FD leaders very soon after FD so that the operation is fresh in their minds. Encourage each leader to keep a notebook during the FD operation and make notations of ideas as they occur. This is especially useful in the initial years of operation.

Summary

As you can see a championship Field Day effort does not just happen. It takes planning, willingness by Club members to help, good leadership and critical evaluation of performance. Do you want a championship effort? You can do it! And when you do, tell all of us how you did it.

Good luck at FD 1987 and best 73.

Software Exchange for QRPers

Newly elected QRP ARCI director and *Quarterly* consulting editor, Michael Bryce, WB8VGE, has volunteered to facilitate the exchange of software for QRPers who are using the IBM PC, Apple II +, IIe and IIc, Commodore C-64, and Radio Shack Color Computers. If there is sufficient interest a similar system for Macintosh software exchange will also be organized.

Unlike earlier software exchanges, Michael will furnish software on diskett (or tape if required) ready to load and run without rekeying. Only non copyrighted software that is in the public domain can be handled.

Future issues of the *Quarterly* will carry a list of available programs. Meanwhile, those of you who have something to share with other QRPers are invited to contact Michael to work out the details.

This Won't Be Murphy's Field Day

by Rulon VanDyke, KA7BCD

Murphy wasn't going to get the best of me, not this field day, It was going to be my first, and I was going to do it right.

Countdown

I began to prepare weeks in advance. First came the RIT and QSK mods (QST, July 1977) to my HW-8. Then I added WWV for precision and operating convenience. As a final touch, I peaked every stage and calibrated it to obtain maximum performance.

The power source was my next problem. I figured a worst case 50-50 TX-RX duty cycle. This meant an average hourly consumption of 90mA x 0.5h = 45 mAh for receiving and 430mA x 0.5h = 215 mAh for transmitting, giving a total hourly drain of 260 mAh. At that usage rate my 4Ah gel cell would give me almost double an 8 hour operation period with no QRM from a generator. Good! I wanted to copy all signals, not just the ones that came in above generator QRM.

Dawn on Friday found me trying to figure out the best method to support the new Tenna-Tape dipole. How are you ever supposed to stretch two tape measures between trees and keep the the right length without unrolling? I decided to string a catenary of 3/16" rope between the supports and hang the antenna along it.

As the morning turned into afternoon my brother Lynn and I mounted the motor bikes to scout out the intended field day site. I was going to show Lynn how a field day was supposed to run so that one day I could convince him to become a ham too.

We headed West toward the foothills through the young green fields of alfalfa and wheat, a warm breeze blowing in our faces. Our 10,500 ft. destination, on Thousand Lake Mountain, stood before us. Our destination was The Saddle, the highest point accessible by vehicle.

Our only deterrent would be a washed out road. Black clouds form fast in the summer, and a few moments of violent summer rain can destroy the unmaintained mountain trails, turning them into a morass of deep mud which no vehicle can traverse.

The rolling foothills gradually turned into steep slopes with lava rocks of all shapes and sizes rising beside the trail. As we neared the top, pine trees and sage brush gave way to quaking aspens. The trail was dry and hard-packed, but we noted as we climbed that the clay slopes could be treacherous when wet.

So far, the trail looked good enough for the jeep we would use the next day. Tomorrow we would be moving more slowly though, because the jeep was heavy and could tip and roll if we misjudged a slope. And it had four tires to get out of the way of the rocks and ruts, not just two.

As we rode into The Saddle, a new question dominated our thoughts. The view was unobstructed today, as it had been every time we had come, but that was part of a new problem: There were no big trees to block our view or to support our antenna. Small twisted runts, hardly more than bushes, were our only option. What in the world is there to hang our antenna from? Where will we place the rig? What about shelter?

Countdown checkoff time before the KA7BCD Field Day Expedition.

Scouring the area, we looked for a point that would give our dipole an East-West pattern. The best we could do was to use two knotty 10 foot cedars that would give us a NE/SW orientation. For shelter, we decided to set up in the shade of a dead tree midway between the other two trees on the Eastern slope. Having determined all this, we mounted the bikes and started back down the mountain.

Going up was much easier than going down. As I crested the hill and prepared for the descent, my bike started going faster and faster, even though I locked it in first gear! I hit my brakes and the bike skidded and fishtailed like Disneyland. Then the back tire struck a protruding rock. The bike stopped and I continued, airborne. The dirt was in my eyes, and rising up all around me. I was swimming in it and it hurt. But I was all here and still okay. The bike lay on it's side roaring. Remounting the Honda 350 on the steep slope was another story. It was not Disneyland this time. Thanks be that miracles happen. I was on my way again, but within 500 yards, I took a second dip in the dust. Tomorrow with the jeep we could make no false moves.

Back at the farm, we cleaned the jeep, checked the oil, and estimated the amount of gas we needed. The rig was given one last check. All the tools and materials were laid out on the ground and checked off against our list. Yep, everything was here and everything was in working condition. We loaded the mountain gear then I carefully packed the rig to endure the treacherous, lurching two hour climb up the mountain.

The tough people of this valley don't talk about it much, but they keep an eye on the sky, particularly if they feel the air begin to move in from the West. In these parts, storms can appear quickly, and on the mountain the intensity can seem a hundred times what we experience in the valley. I remembered looking out into the darkness on stormy nights watching the glowing silhouette of the mountain illuminated by an unrelenting barrage of lightning, while gentle rain fell on the barn in the valley. Worse still, I had seen jeeps mired to their hubcaps or turned over from sliding off the slick clay trail when caught in even a momentary shower.

During all our preparing, we had habitually glanced upward every few moments, looking for the telltale signs of weather. There was no sign of rain anywhere. What more could I ask for? I had prepared everything, and everything was perfect. Tomorrow will be *my* field day, not Murphy's!

Day Zero

As the low rays of the sun cleared the mountains to the East, I put the jeep into gear. Dust rose in billows behind us as it spread from the trail to the fences where it would cling until the next wind storm. I could see the red glow of the taillight on Lynn's motorbike as he led the procession, carrying the camera that would record our exploit.

The sky was clear and cloudless. The sun blazed down. It felt like a beach in Southern California. The sage brush stood straight and silent in the windless air. In all of creation there was only the sound of distant chickens roosting and cattle feeding. Dust rose in little puffs as we rolled through the foothills towards The Saddle.

The low rolling foothills turned into steeper ascents as the engines echoed through the canyons. As we crossed ravines and gullies, squirrels, jack rabbits and birds stopped to

The KA7BCD Field Day Expedition. From the trail up Thousand Lake Mountain, the alfalfa fields below resemble a chessboard for the gods.

peak at us through the bush and trees wondering why all the racket.

At times the gentle inclines turned into tense climbs as we could only see the trail end where the pastel sky began. And looking to the right, the mountain side disappeared and I imagined I was riding through the sky. I paused to look into the valley. Distant alfalfa fields from this perspective became symmetric green squares, resembling a chessboard for the gods to play on.

Again and again, the trail crossed steep clay side-hills that the slightest amount of rainfall would transform into a bottomless, slick, gooey substance. Any error on the wet clay would be magnified over 100 times and could easily send me sliding to oblivion.

Nearing the final crest of the hill, the trail led us through a dense thicket of Ponderosa pines. Across the road lay a 1½ ft diameter tree blocking our path. The thicket crowded in against the trail, providing no alternate course. For lesser men this would be the end of the road, but Murphy wasn't going to get the best of me, not this field day. Fearing this, we had packed the chain saw. In 20 minutes, I had severed the uprooted trunk and mustered the strenght to swing the rest of the tree out of our course. One mile later we stood on The Saddle. We had conquered the mountain, and we had conquered Murphy. This was the field day never to forget.

At the top, the weather was superb. From here we surveyed the content of all creation. We drank in the pure air, while the scent of the mountains, with its trees and flowers and valley below intensified our awarness of what we had accomplished. Nothing had been able to stop us.

Back to business. We carried the equipment up the operating site and Lynn took a few pictures. A table was made out of flat lava rocks. We moved to a spot underneath the old wrinkled tree. The rope was tied between the two trees. Now the Tenna Tape antenna was affixed to the rope and set for the 15 meter band. We set the rig up underneath the tree on the table. Do you get multipliers for natural shelter? The rugged old tree had died when the clay hill it grew on was eroded away by wind and rain, leaving the entire body of the tree and ¾ of the roots hanging in mid-air.

Everything had come together beautifully. Could I ask for more? By now it was 1830 UTC and I could hear hundreds of stations. I had never heard the band so crowded. Surely, I would make a lot of contacts this field day. I pressed the key and peaked the rig. I could hardly wait for my first contact.

CQ Field Day

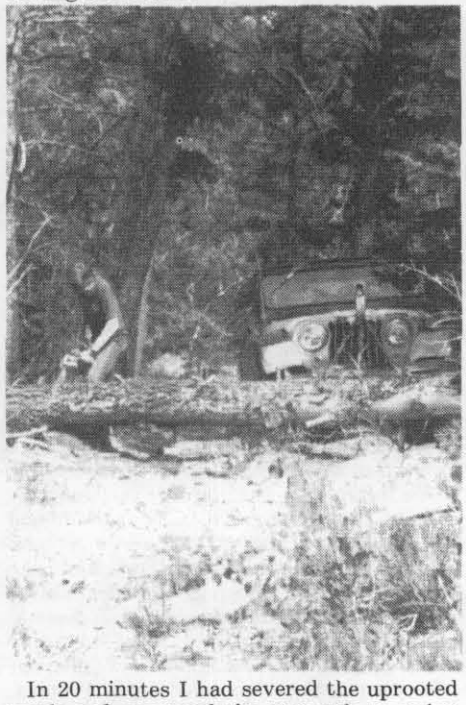
I turned up to 21070 and started down the band. There he was, K0NA calling CQ FD. As I reached for the key, Lynn's shout came through above the signals in my earphones. I looked up to see what was the matter. A raindrop struck my upturned face. Lynn was pointing to a dark formation in the sky in the Northwest. It couldn't be rain, could it? But it was. It wouldn't stay for long, nothing does on this mountain. The sweet mountain air was suddenly gone, replaced with a musty charged mass. Survivors in this valley had learned to smell the lightning before it came. My nose and eyes filled with its odor. This was no time to be under a tree on top of the mountain.

The sounds of CQ FD brought me back to my senses. Storms seldom lasted long. If I was tough and lucky, I could sit out a little rough weather. I looked down at the clay my feet were resting on. I pushed by heel into it and it slipped. A few drops of rain already had an effect. A little more and I would slide down the hill so fast my neck would pop before I could get my headphones off.

Above the noise of my thoughts, the call came through again, "CQ FD CQ FD de K0NA" my eyes shot northward to the peak. Lightning was already dancing through the trees five miles away. I was not ready to be the first field day martyr, and there was no multiplier for natural rain or lightning. Murphy had me in his clutches and I had to act fast to come out alive.

Lynn left first. With only two wheels and no shelter he was more vulnerable. My decent was an unrelenting series of crises lurking behind each curve and in the bottom of each gully. Since Lynn was way ahead of me, I would be alone if anything happened.

The rain was now pelting me merrily. I crested a hill and began to descend the steepest dugway of the trail. The motor sputtered, coughed and stopped dead. What was Murphy after this time? I had only run out of gas. Our check list had included filling the spare can before we left. How about a multiplier for being prepared? And one for coming back alive?



In 20 minutes I had severed the uprooted trunk and mustered the strength to swing the rest of the tree out of our course.

It rained all weekend. I was in the valley, my antenna still on the mountain. But that was last year. It was just round one for Murphy. This time it will be different. In 1987 it's going to be VanDyke's field day.

Natural Power

The editor is solicting articles for the *Quarterly* on the use of natural power sources for emergency, portable or normal operation. Send articles and reports by May 1.

Experimental QRP SSB Net

The WSN QRPers have begun meeting on 7.285 MHz Wednesdays at noon Pacific time. Listen for Chuck Lindsay, NJ7M and join in.

QRP Field Day: More Fun with Less Power

by Jim Stevens, KK7C

Field Day real winners are the QRPers. The November QST reported more than 150 QRP stations. Here is the breakdown by call area.

1986 QRP Field Day Stations

Call Area	QRP Field Day Stations
W1	8 (5CT, 2VT, 1MA)
W2	15 (13NY, 2NJ)
W3	12 (9PA, 3MD)
W4	19 (5NC, 4VA, 3AL, 2FL, 2GA, 1KY, 1SC, 1TN)
W5	12 (11TX, 1LA)
W6	18 (17CA, 1HI)
W7	19 (7WA, 5AZ, 2ID, 2UT, 1WY, 1OR)
W8	12 (6OH, 5MI, 1WV)
W9	15 (8IL, 5IN, 2WI)
W0	17 (5CO, 5MO, 2IA, 2KS, 2MN, 1SD)
VE	4 (2QU, 1BC, 1ON)

In addition to these stations there were at least another two dozen QRP efforts which went unreported. QRPers can be proud of their results. In virtually every category, QRP stations came out on top in the scoring. From the reports and plans we'll be reviewing here, it is clear that the QRP approach to emergency operations really does produce more with less.

The K2ECQ Field Day was reported by Chuck Ziehl, WB2BGA, who writes, "We ran our first QRP Field Day in June of 1980 as W2RUI and every year after until 1984, when the club voted "HIGH" power.

"In 1986 some of us decided to go back to QRP. We ran two transmitters at five watts output (one SSB and one CW) for the full 24 hours. Our group consisted of seven operator/workers: WB2BGA (QRP Member), WB2ITZ (QRP Member), K2JYV, WA2WPI, W2AET, WB2SWL and WA2DNC. Several others helped during setup and take down: K2ECQ, KA2EGC and WB2ZSV.

"Our equipment this year for SSB operation was 525D Argosy, 227 tuner, and a SWR Bridge made from the quarterly of July, 1985. We tried a Speech Processor but gave up after many bad reports. For antennas we used a TH7DX Tri-bander (turned by rope), 80-40 dipole, and a full 80M Delta Loop. The loop did not seem to work well.

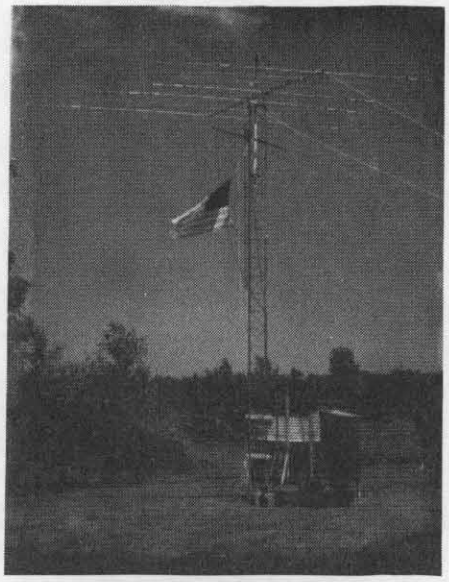
"CW equipment was a 525D Argosy, 227 tuner, Homebrew Audio Filter and Memory Keyer. Antennas were two Full 80M Delta Loops, 15 Meter Beam and all Band Vertical. Again the Loops did not seem to work well.

"Power was provided by a supply of five charged car batteries, including lights. We attempted to use a bicycle generator but found out too late that the generator was 12 volts AC. Next year we'll have a charger using a heater motor and bike to do the job.

"One thing we do to add some spice on FD is to have our own inter-group contest. We award certificates to the Best Operator in each mode. We take the time spent operating and divide into the number of contacts to get productivity. The operator with the best ratio gets the award at the September Meeting. In 1986 WA2WPI won for SSB and W2AET received it for CW operation.

"We had 206 CW contacts, 207 SSB contacts and 94 S/P/C.

In 1987 we hope to move up in the competition, and we are already making plans. In the works is an 80M-40M Beam. Our big need is more CW operators. Each year, someone at the Lockport Amateur Radio Association asks, "Is Field Day for fun or for blood?" The QRPers respond "For blood, but have fun in the process." We're ready for the Zuni Loop challenge!"



The K2ECQ QRP Field Day Station with Tri-bander, 80m inverted V and 80m Full Wave loop.

Doug (W1FG) and Dave DeMaw (N8HLE) formed a two-man team, Dave operating one five watt rig." We used a 1.5-A solar panel and a car battery. Solar power is excellent, but I would caution those who use a panel to have two fully charged batteries on hand at the start. Our small automotive lamp bulb depleted the battery sufficiently to cause performance problems with the rig just before dawn. If we had kept a spare battery we could have switched to it until sunrise, when the solar panel would charge the battery again. Another suggestion is to use a Coleman lantern or kerosene lamp for nighttime operation.

"We erected a 50 foot telescoping mast on the hill where we operated. A 40 meter delta loop with a 450-ohm feeders and a 4:1 balun transformer was our choice for 40 through 10 meters. Loops are very quiet, and they work well on harmonic frequencies, exhibiting gain as the operating frequency is increased. Our 80 meter antenna was an inverted V, supported by the same mast. With this system we were answered by 95 percent of the stations we called, irrespective of the band of operation.

"I strongly recommend loop antennas (not parallel to the ground) for multiband use during FD. An 80 meter delta loop would have taken care of all bands, requiring only one antenna.

"As for operating advice, well...make sure your primary ops can handle CW at 30 plus WPM! You should be able to average one or more contacts per minute if your signal is respectable and if your op can handle the Morse. I try to hold a frequency rather than hopping around the band and answering CQs. Much time is lost in tuning! Stay on one frequency and call CQ FD until you run out of contacts. Change bands when you run dry of new contacts, or when propagation demands a band change. Choose each band for its prime-time propagation: don't waste time on a half-dead band."

Ray (W5XE) writes, "QRPers Chris (WB5FKC), Jon (K5HPJ), Ray (W5XE), Bill (K5KK0), Jim (NK5V) and Bill (WA5FLG), planned to return to the mountains of Cloudcroft, N.M., where they had done FD the year before. However, unusually heavy rains caused the Forest Service to close roads to the area. Being flexible types, we drove to the City of Rocks State Park and began the task of setting up.

"City of Rocks is nearly void of trees but has gigantic rock formations rising in the middle of the southern New Mexico desert. Totally different from 1985 where we were at 9000 feet, with the antenna 50 feet in the trees, here we could only string the G5RV from the top of two rocks, perhaps 25 feet tall. Considering poor band conditions and antenna height, we did reasonably well with about 2210 points versus the 2600 for 1985. We were there for a good time, which we all had.

"The station used is a modified TenTec Triton 2, by-passed final for four watts output. This is powered by a 20 Ah GelCel battery charged continuously during light hours with a Spectrolab 18v 1.5 amp solar panel, giving more than adequate power for the duration of the contest. The station was setup on a table at the base of a very large rock formation. Operation was interrupted for over two hours due to thunderstorms in the area. This was by mutual demand of all participants as during the 1985 Field Day three of us were shaken by a ground return strike. Those tend to get one's attention! HI. Other than that, perfect weather prevailed.

"For the next Field Day, we will probably not make any major changes except for the antenna arrangement. Most found the G5RV somewhat cumbersome in that the antenna tuner had to be adjusted when changing bands and that cost a bit of time. Experimenting with power levels from one to four watts made little difference; we made the same number of QSOs per hour. Calling CQ made a significant number of contacts, so just hunting and pouncing is not always the best strategy."

Mack Avery (WA5ZKL), wrote, "We had tried for two years to get the Panhandle Amateur Radio Club to go 100 percent QRP, but they just wanted to do the same old thing. So, four of us went together to do a QRP Field Day, calling ourselves the Panhandle Mavericks, consisting of Dave (KE5XR) and Edna (KA5VLO) Thompson, my wife Julia (WB5PWC) and myself.

"We began setup at 1800Z on Saturday in the 95 degree heat of a vacant pasture down the street from our home in Canyon. Since there are no trees to speak of in West Texas,

we had to provide manmade supports. We setup a 55 foot portable tower/mast combination that hinged at the base and was pulled into positon with our car. It supported the apex of a V-beam aimed east and west that was 275 feet long per leg. We fed this with 300 ohm twin-lead through a Swan ST-2 tuner. Our main radio was an ICOM 740 adjusted back to run five watts PEP output as read by a WELZ SP-220 meter. We also setup a center fed Zepp and three Isotron antennas to use with an Argosy II.

"The entire two transmitter station including lights was operated from one 12V deep cycle battery that we did not charge during the contest period. We made our lights out of swing arm desk lamps with 12VDC amber auto bulbs installed. The lamps illuminated only the operating positions. We were amazed that we had NO BUGS with these lamps even though we were only set up under a canopy in the open air.

"Our 18 hours of operating time netted us 154 contacts of which 85 percent were made with the ICOM and V-beam. Our contacts by band were eight on 75, 32 on 40, 105 on 20, and nine on 15. The V-beam performed extremely well on all four bands while the other antennas were mediocre.

"Being on a well traveled street brought us many onlookers, the local police, and the KAMR-TV news crew for an interview on Sunday morning. We got about 60 seconds of air time on the 6 p.m. news.

"We impressed some good CW ops that were previously non-believers, and hope they will go QRP next year. We will again use the V-Beam and try some other long-wire antennas. We may even try the milliwatt category. Look out HAH!"

Ken Newbeck (WB2AMU), described his QRP Field Day saying, "Joe, NM2O, and I have done FD QRP for the last three years. We started QRP because of the challenge and because the big clubs were afraid of it.

"It's a great feeling to see how far a few watts can go. With just two operators we have averaged about 350 QSOs. It is great to operate off a battery and not have the drone of the generator all night. Next year we will go for long-wire antenna again."

Reagan Rowe (W4FH1), Ken Sanders (N4FYO), and Rude Real (N9CC) of the Carolina DX Association studied last year's QRP Field Day accounts and decided they would compete low-power. Running in the five watt battery power class, they made 471 contacts with two transmitters, using antennas stretched out over Lake Norman. Reagan writes,

"What did Field Day teach us?

1. We failed to have a fourth person for our two station effort (1 CW and 1 SSB). We should have stayed with coffee late in the night as we all went to bed at midnight.

2. We felt good about operating from a battery source but the batteries were not large enough to permit full weekend use. We only had 10 volts available at the end.

3. Our antenna choices were: 80M full wave loop horizontally mounted in diamond shape; 40M twin dipole slopers tied in center; 8JK style w/450 OHM twin lead; 20M vertically mounted, triangle, full wave loop moveable for N-S and E-W directions. We liked the broad-band loops for both CW and SSB operations.

4. Our equipment was two Ten Tec Argosy's at the five watt position.

5. The site selection was a small cottage at a lake near our city with ample outdoor deck covered by a tarpaulin. It did shower and we were happy the tarp was there. We all slept comfortably-too long.

6. We prepared our own food except for ordering a fish dinner Saturday night.

What will we do next year?

"1987 FD we plan to increase our contestants to four so we can take shifts through the night. We will have a solar powered transmitter and solar charge all batteries for those extra points. An addition to the 20M triangle loop of a 15M loop element.

"We enjoyed so many stations being surprised at our good QRP signals. We had a wonderful Hammin weekend together and vowed to repeat the good times in '87."

Contesting

conducted by Gene Smith, KA5NLY
P.O. Box 55010, Little Rock, Arkansas 72225

OOPS!
April QRP QSO Party correct dates are April 18 and 19

18 Apr. 1200 to 19 Apr. 2400 UTC

Reminders

The annual calendar of QRP operating events was published in the January 1987 issue, including QRP events sponsored by other groups. Be sure to watch that calendar so as not to miss out.

Events scheduled for this quarter include the QRP ARCI spring QSO party on April 18-19 (details in the January *Quarterly),* the Hootowl Sprint on May 30th (see below), QRP Field Day June 27-28 (see Ade Weiss's article this issue for scoring details).

The first Homebrew Sprint will take place on July 11th from 2000-2400Z. Details will appear in the July *Quarterly.* But count on scoring bonus points for working homebrew stations and bonus points for each piece of homebrew equipment you use.

Other events include World QRP Day on June 17 (see January *Quarterly)* and the QRP sections of the WPX and IARU Radio Sport contests.

Hoot-Owl CW Sprint

DATES: From 0200 UTC to 0600 UTC Saturday, May 30, 1987. (This is Friday evening in North America).

EXCHANGES: Members give RST, State/Province/Country and QRP ARCI membership number. Non-members give RST, State/Province/Country and power output. Stations may be worked once per band for QSO points. Each member contact five points, regardless of location. Non-member contact, same continent, two points. Each non-member contact, different continent, four points.

MULTIPLIERS: States, Provinces, and Countries. The U.S. and Canada do not count as countries (count states and provinces only for W/VE). An spc may be worked once per band for spc multiplier credit. Add spc's separately for each band, one point each, then add up spc points for all bands to arrive at total spc multiplier.

POWER: four to five watts output x two, three to four watts output x four, two to three watts output x six, one to two watts output x eight; less than one watt output x 10. Over five watts output counted as check logs only. The highest power used for any contact, any band, will determine the multiplier to be used for scoring the whole log.

BONUS MULTIPLIERS: Natural power (solar, wind, etc.) with or without storage x two. With storage, storage cells must be charged by the natural power source within 48 hours preceding the start of and/or during the contest. Battery power x 1.5. No other source of power may be used at any time during the contest to qualify for these multipliers.

SUGGESTED FREQUENCIES: 1810, 3560, 7040, 14060, 21060, 2806, 50360, KHz: Novice and Technicians 3710, 7710, 21110, and 28110 KHZ. No 30-meter (10 MHz) or 12-meter (24 MHz) contacts will be counted.

CALLING METHOD: CQ CQ QRP DE (Call sign).

SCORING: QSO points (total all bands) times spc multiplier (remember, a spc may be

worked on more than one band and counts once on each band for spc multiplier points) times power multiplier times bonus multiplier (if none, use one) equals claimed score. Use of the scoring summary sheet will help avoid errors; summary sheets may be obtained by a large s.a.s.e. or two IRC's to the contest chairman.

LOGS: Separate log sheets for each band suggested for ease of scoring. Send full log data plus separate worksheet showing details and time(s) off the air. No log copies will be returned. All entrants desiring results and scores please include a large s.a.s.e. or two IRC's. It is a condition of entry that the decision of the QRP ARCI contest chairman is final in case of dispute.

AWARDS: Certificates to stations scoring in the top 5% overall and the high scoring station in each spc which has two or more entries.

In addition, Adrian Weiss, W0RSP, is sponsoring a special MILLIWATT certificate to the highest scoring station in the less-than-one-watt category, provided there are two or more entries in that category.

DEADLINE: Logs must be received by July 1, 1986. Logs received after that date or lacking information will be used as check logs.

SEND LOGS to QRP ARCI Contest Chairman.

Field Day is the biggest QRP event in Amateur Radio

The April QSO Party, Joe QRP and the Woodpecker

by Bob Brown, NM7M

Remember Joe QRP? He's that young chap I told you about back in late '86. That's right; he picked up an HW-8 at the Flea Market in Wichita, KS, and took it home to start on a new career, QRP DX'ing. Okay. Joe has done well since we last looked in on him but now he's about to try his first QRP QSO Party with that HW-8. I have to think he's excited; after all, before he got that rig, he was rockbound. We all know that's a FB way to start QRPing but not up to the demands of contesting. But I digress.

Having an interest in Joe's career, I thought I'd give him a timely propagation forecast to help him with QRP contest. That should be of some assistance since the propagation data in QST doesn't really help Joe, giving information for paths from the Midwest to DX locations but nothing to either of our coasts. Okay, he might get lucky and work some DX in the QRP QSO Party but since most of his contacts will be within the U.S., that DX approach by itself is not a winning strategy. So I'll give it a try but you have to understand I'm looking deep into my crystal ball as this is being written a couple of months before the contest. But if you get out your current plot of the solar flux and A-index, you can see that things have been pretty steady and/or dull in the early part of '87. Now if I use those conditions as a guide, I'm giving Joe an indication of what his minimum expectations might be for the contest. Given a little flux, he can always raise his sights.

Okay, let's get with it. I've calculated what Joe might expect in the way of propagation, as given first by the maximum usable frequency (MUF) from his location to the four corners of the country; Seattle, Los Angeles, Miami and New York City. Those paths are all just one hop from Joe's (QTH) and the distances are in the 1900-2300 km range. Taking the solar flux at 75, we find that the maximum MUF is 17.6 MHz and the minimum MUF is 7.3 MHz. Right off, that tells us that the MUFs will be just too low for Joe to expect any sort of action on 15 meters in either direction, to the east or the west. As for 20 and 40 meters, we'd have to look at the MUF plots to see how things shape up and doing that, the following table shows when the MUF would be above Joe's operating (QRG:)

Band	Seattle	LA	Miami	NYC
14 MHz	17-03 UTC	17-03 UTC	15-02 UTC	16-01 UTC
7 MHz	00-24 UTC	00-24 UTC	00-24 UTC	00-24 UTC

Okay, the 20 meter information looks fairly reasonable but the 24 hour openings on 40 meters are utterly ridiculous and out of the question. The problem is that while they show the minimum MUF is greater than seven MHz, they completely ignore such important factors as the E-layer and the D-layer absorption. So we need our signal strength program to do the calculations right, putting in QRP power levels. Let's see what we get with Joe's dipole up there at about 37 feet.

So having taken the time to do all that, let's see what the times are when Joe can hope to make those contacts:

Band	Seattle	LA	Miami	NYC
14 MHz	21-03 UTC	17-01 UTC	15-17, 19-02 UTC	17-00 UTC
7 MHz	00-12 UTC	23-12 UTC	22-12 UTC	22-11 UTC

Okay, that makes more sense as we know that 40 meters is more of a nighttime band at those distances. Having said that, the rest of us in the various corners of the country could also use those figures to apply for 1-hop paths from our QTHs to the center of the country. Actually, those times wouldn't be too bad for one's entire effort in the QSO Party. I say that as on looking over my earlier logs, I find that most of my contacts were in the 1-hop category. So my attitude is simple; take care of those 1-hop paths as well as some on 80 meters and the rest of them will take care of themselves. So with that, I'd stop right where we are at this point, wish Joe all the best in his first QRP Party and hope that he can take First Place in Kansas. But I'd have to be honest and tell him that he's going to be up against more than other QRPers and the ionosphere. What else, you ask? Well, how about THE WOODPECKER!

How did I come up with such an ugly thought when talking about his first effort in QRP contesting? Well, I hate to say it but the idea came to me without much thinking, in particular. I had a recollection of a figure in an article about the Woodpecker and, to make matters worse, my recollection was that the Woodpecker was zero'd in on our hero in Wichita. When I checked it out, I found my memory served me right and if you don't believe me, just turn to page 44 of the November '84 issue of *Ham Radio*. There, you'll find a figure showing the coverage of the various Woodpecker radar systems presented in an article by Brad Wells, (KR7L). One of those OTH (Over the Horizon) radars is west of Sakhalin Island in the Orient and the other is south of Leningrad in the heart of the USSR, and, as I said, their beams intersect right in America's Heartland where Joe QRP plans to try the April QSO Party. Given that, what can we say to Joe to ease his burden? Let me tell you for what it's worth.

First, I doubt that Joe's concern would be lightened if we told him that the radiated power coming from a Woodpecker transmitter is in the range of 20-50 megawatts. That's about 66-70 dB above the power level he's involved with in the contest. And we'd also have to throw in about 15 dB1 of antenna gain as a minumum. On the bright side, we can take away about 130 dB for signal spreading from 8500 km distance but that still leaves a hefty signal at Joe's QTH, more than enough to blow his ears off, as we say, if they came right at him. So is there any hope for Joe other than what seems to be the vagaries of the programming of the Woodpecker's frequency scanning? Well experience suggests that their choice of frequency is not all that random. In fact, those radars can and do follow propagation quite closely. The reason is simple; as the operating frequency approaches the MUF, their paths lengthen and that serves to greatly reduce path losses. So let's just see how the MUF changes for paths from those two radars to Joe's QTH; maybe that sort of information would be of help to Joe in his very first QRP contest.

So if we put those OTH radar locations into our MUF program, we find that the MUFs for those paths peak at different times, around 0100 UTC from the west and about 1800 UTC from over the pole. By going to the signal strength program, we find not only the times when the Woodpecker could threaten Joe on 20 meters but we can also look at the lower MUFs to see when 40 meters might be in jeopardy of being QRM'd. So we see that the Woodpecker could QRM on the hf bands at the following times:

Band	QRM from Orient	QRM from Poleward
14 MHz	23-04 UTC	15-20 UTC
7 MHz	09-14 UTC	00-05 UTC

If Joe looks at those times, he could expect to be fairly free and clear of the Woodpecker on 14 MHz from 04 to 15 UTC as well as 20 to 23 UTC, while on 7 MHz the times are 05 to 09 UTC and 14 to 00 UTC. Now all of that is only a threat but Joe now at least has an idea of when the Woodpecker could show up. As they say, forewarned is forearmed!

With that in the back of our minds, let's put together a strategy for Joe to follow in the QRP QSO Party. At the outset, he could rise early and start at 12 UTC on the first morning, working either 80 or 40 meters until things dry up there. There'd be no Woodpecker on 80 meters but 40 meters is another matter. Then, he could go on to 20 meters and stay there throughout the day and into the early evening. If the Woodpecker should show up on 20 meters, threatening to give him a throbbing headache, he'd have to take a break, as 40 meters is not all that good for contesting in the middle of the day. When the Woodpecker moves on, he could then go back to 20 meters until the band folds or Woody rises to make life miserable again. After that, it's on to 40 meters and then the question becomes one of personal stamina or the condition of the 80 meter band. All of that could use up about 16 hours of contesting time the first day.

Come morning, he could rise early again, check out 80 or 40 meters around 12 UTC and then move to 20 meters when it opens up, hoping that Woody does not come on to spoil the rest of the Party. Depending on how much time Joe has left for the second day, one's strategy might be to QRX if the Woodpecker made life miserable early in the day; that way Joe could come on strong near the end of the QSO Party when all the QRP'ers are really hungry for those last contacts to top off the log.

Having said all that, I don't know that I can add much more to help Joe or you, for that matter. So we'll just have to give it our all, in the best of QRP'ing. I'll be there looking for you, and Joe, too.

Activity and Awards

conducted by Fred Turpin, K6MDJ
Box 145, Cedarpines Park, CA 92322

I talked with Vice President Jim Fitton (W1FMR) today and he reports that by January all the rooms in and around Dayton were booked. That's three months away!

It makes me feel good to see that nine of the 19 "QNI-100" recipients are from the WSN region, as I know the sacrifice and personal commitment of those who accomplished the feat. It's a long haul between contests. I have received numerous comments from the troops about the lack of QRP activity in between, but its the nets that provide the link between major events and keeps the home fires burning. Things don't get much worse in radio than they are right now, at the bottom of cycle 21. The "good time Charlies" have long since jumped ship. Those who support the nets, contests and forums, and contribute to the advancement of our cause, form the nucleus that perpetuates the philosophy and principles of QRP. So, look around and remember the names and calls of those who, during this period of poor prop are preserving the QRP spirit for the future, against all odds.

The Fall QSO was one of the best. Many were professing a bleak outlook for the contest, but QRP faith runs deep. The troops came out in force, old Sol provided the flux, and it was QRPing at it's best. Net activity picked up a bit after that. I wouldn't want a steady diet of it, but maybe a little "jolt" of solar juice now and then keeps a fellas' head clear.

Those of you treating yourselves to Mike Bryce's QRP column in '73, make sure you mail in those reader survey cards, they play a big part in the space and content allocated to QRP. Drop Mike a note and let him know how you like the column. Tell him what you would like to see in the future.

Notice: Bring or send your photographs to Dayton. You, your shack, a project or FD. We'll include them in the ARCI scrapbook on display in the QRP hospitality suit. If you're not attending this year, send in your photographs so everyone can meet you.

If you've been around QRP very long you have no doubt read a lot of the "Rock," otherwise known as C.F. Rockey (W9SCH). Rockey's contributions for over 30 years to QRP have been published in every QRP periodical in the world. He prefers the cerebral, creative side of QRP to the"rock-n-roll' of DX chasing and contests. Rock suggested overhauling the KM/W award, and his suggestion has been echoed by many of our members.

This KM/W award is by far our most popular with 970 issued since 1966. But if an award stifles or fails to recognize growth after receipt, in an arena of infinite expansion, then some sort of adjustment needs to be made. The KM/W average of the past year's applicants was 3760 M/W.

I will review all the options and suggestions given me and place a motion before the BOD to change or modify the KM/W award in a way that recognizes and stimulates continued achievement. Thanks for the input, Rock. I'll take your suggestion and those of others to Dayton this year for discussion at the club work sessions.

Paula Franke (WB9TBU), recently earned her QRP WAS-30 and has 13 more to go (see WAS Want Ads). She also qualified for QRP-50 and has 30 countries toward her QRP-DXCC. Having just installed a 80-10M horizontal loop at dusk, she quickly worked AZ, NM and XE1 on 40 m. She went to bed that night with high hopes for an early attack on 20M. Paula commented one month later, "The loop could easily replace all my other antennas, including the tri-bander." Hope to see you again at Dayton, Paula!

Alan Shapiro (NM5S), was able to nail down CE0FFD last May to earn his KM/W certificate. The same Easter Island station was also heard at this location that month but without the same gratification.

Chris Brakhage (WB5FKC), received QRP-200 No. 104 last July, and I wondered then who would be the next "300," since Jim (W6RCP), Mike (WB8VGE) and Danny (K3TKS) had all received their "200" and are still active. It wasn't long before Danny Gingell (K3TKS), crossed the wire with 322 confirmed. Unless those other guys move faster, Danny just might be the next "400." Just for the record, here is how many certificates have been issued to date: QRP-100 to No. 309, QRP-200 to No. 104, QRP-300 to No. 47, QRP-400 to No. 22, QRP-500 to No. 16, QRP-600 to No. 10, QRP-700 to No. 6, QRP-800 to No. 4, QRP-900 to No. 2, one of which was issued to Rollie Crider (K9VCM). Only one "QRP-1000" has been issued. It went to WA8CNN in 1979, and unless there has been a call change, he may have rested there.

Keith Clark (W6SIY), asked about the "c" in his DXCC certificate No. 76c issued last October. It means it's the third revision of the certificate since its inception in 1963. Sixty-three "a's" were issued and four "b's," bringing the total to 143. You're in good company, Keith. Congratulations, and thanks for the FB "QRP DX Chasing" article last issue.

Eric Jackson (KA0DQZ), earned a KM/W award for his FD efforts this year, operating an ARGO 515 into an inverted Vee from atop Loveland Pass, Colo. Apparently the 12K elevation made up for the simple antenna and produced ZL1BYZ on 20M.

Acting upon a motion by Fred Bonavita (W5QJM) in 1986, the Board of Directors unanimously approved a special Award of Appreciation for Wes Hayward (W7ZOI), for his many and sustained contributions to low power communications and in particular, his series, "The Experimenter's Corner." A handsome walnut plaque bearing this inscription marks the debut of the "laser-etch" process to our clubs non-operating awards. In Wes' reply, he asked that I extend his "sincere appreciation to all the members of QRP ARCI." Wes has changed jobs within Tektronix and is doing applications engineering in connection with CCDs, which are charge coupled devices used in all sorts of things like planetary fly-by photography. It sounds like he enjoys the new challenge outside the RF field, with amateur radio and his consulting work giving him all the RF his system requires.

Foul weather put the skid to Wes' father/son backpacking/FD trek into the wilderness. Undaunted, he and Roger (KA7EXM), his youngest son, joined forces with fellow QRPer Bob Culter (N7FKI), and made a close -in one day stand, using Bob's version of the little W7EL Tcvr and Wes' latest superhet Tcvr, pictured with G4BUE and SPRAT No. 48.

In case you didn't know it, fellow QRPer Zac Lau (KH6CP/1), has joined the technical staff of ARRL in Newington. We will all miss that tough "HI" multiplier in the contests. We still wish you the best of luck, Zac. Look for Zac in all the CW contests as well as the NEN, SEN, GLN and TCN.

President Les Shattuck (WB2IPX) and his wife Joyce, along with Contest Chairman Gene Smith (KA5NLY), enjoyed dinner and the company of Membership Secretary Bill Harding (K4AHK) and his wife in their home last December. It was a first meeting for several of them and a good opportunity to go over club strategy for 1987. All three will be

at Dayton.

Having served as Vice President of YLRL last year, Mary Lou Brown (NM7N), has assumed the presidency this year. If that isn't enough, she will be treating herself to the fulfillment of a dream, that of going on a DX-pedition. Hubby Bob tells me she's not quite ready to take on the artillery from Clipperton Island or the head-hunters of New Guinea, so look for her to settle for Fiji or Somoa. It's not beyond Mary Lou to reserve a QSO for a fellow QRPer so I'll pass along the details as things develope.

A bottle of scotch hangs in the balance as Roger Rose (W5LXS) and Bob Brown (NM7M) blast out of the gate on the first "WAACY" competition. I think it means, "Worked All Area Codes Ya'll" or something like that. Bob and Roger invite everyone to join in, but be warned – by the time you read this, this flaming duo will be well on their way to "WHACKY."

Before Bob started going "WAACY," he was the first human ever to go "NANNY." QRP that is. "NANNY" has nothing at all to do with goats, but does smack of a lot of hard work and diligent effort. Not to be outdone, Mary Lou Brown (NM7N) threw Bob out of the shack, laid claim to the Quad and crossed the wire in the 11th hour to claim "QRP NANNY" No 2. So what is a "NANNY?" I'm not quite sure, but to be one you will have crossed every letter to every number until you worked the 250th DX station. And you will have done it in one calendar year! Here are Bob's stats: 44 percent came from Asia, 25 percent from Europe, 20 percent from South America and 11 percent from Oceania. The rig was a TenTec Corsair (great receiver!) with the drive down to five watts out, feeding a two-element 20 meter Quad at 38'.

Ralph Knight (N7CCN), is active in Sparks, Nev., and enjoys "playing around" with miniature loop antennas for 40M. His latest creation is a 40 meter loop that is only 10 feet around, but gets out like a dipole. Ralph also fills in now and then at the counter of Reno Radio. He says that RR is affiliated with Missouri Radio and Colorado Radio so they have access to just about anything you might need pronto; and will meet or beat any competitors prices. Call toll-free, 1-800-345-5686.

Welcome back Doug Crittendon (WB1ESN)! Doug's signal has been missing for some time now so it's good to hear our ex – award manager back on the air. Doug is another one of the growing number of "loop" antenna believers, having just put up a 40M loop with which he landed a ZS6 and an AL7 the first day on 15M. Several days later he worked LU1KHV followed by JA4ATV on the 20M, using his HW-9 at three watts. Doug's inspiration to return to QRP came from the pages of the *Quarterly* provided by our Publicity Manager, Joe Sullivan (WA1WLU).

Member comments and activities in the *Quarterly* inspired his upside-down delta loop, which may have been a big factor in the 28,808 points he ran up in the CQ-WW DX contest, collecting 34 Zones and 70 prefixes on 40, 20 and 15M, running two-four watts. Nice work Doug!

From where I sit, there appears to be a clear connection between "loop" antennas and results like Doug's. Although no height was given on Doug's loop, most of the loops I know of are quite low by prescribed standards.

QRP ARCI Awards Summary

Call	Date	Basic	Endors.-Miles/Watt-Notes	Power	Mode	Band
DXCC						
W6SIY	10-28-86	76c			Mix	Mix
WAC						
VE2TH	9-27-86	457c		2W	CW	15M
W6SIY	10-20-86	458c			Mix	Mix
WB1ESN	1-12-87	459c			CW	Mix
WAS						
WB9TBY	11-16-86	244c	30 states	2-5	CW	Mix
W5TTE	1-12-87	245c	40 States 2 x QRP	3	Mix	Mix
QRP-25						
K8DD	9-27-86	971	25 Member			
WF6D	10-20-86	972	" "			
W6SIY	10-20-86	973	" " + 50 Seal			
NT0Z	11-16-86	974	" "			
WB9TBU	11-16-86	975	" "			
K7YHA	1-12-87	976	" "			
NF0R	1-12-87	977	" " + 50 Seal			
NF5Y	5-25-86	520	50 Member			
WB5FKC	7-7-86	104	200 Seal			
K3TKS	1-12-87	47	300 Seal			
QNI						
W6RCP	9-27-86	2-	WSN-80 Seal			
W6RCP	9-27-86	2	NWN-40 Seal			
W6RCP	9-27-86	2	WSN-40 Seal			
W6SKQ	9-27-86	15	TCN-Seal			
W6JHQ	9-27-86	21	WSN-40 Seal			
K6MDJ	9-27-86	28	TCN Seal			
W6SIY	9-27-86	31	WSN-40 Seal			
WF6D	9-27-86	36	SWN-40			
KA7QNZ	9-27-86	36	WSN-40			
KH6CP/I	9-27-86	38	TCN			
KM/W						
K4KJP	9-29-86	958	To W4ODW 21,000 M/W	2.0	CW/SSB	13 CM
W4ODW	9-29-86	959	To K4KJP 21,000 M/W	2.0	CW/SSB	13 CM
G4ASL	10-5-86	960	To EV6AW 4853 M/W	.45	CW	20M
G4ASL	10-5-86	961	To UO5UID 1,653 M/W	.8	CW	40M
SO5ASL	10-5-86	962	To UI8AHO 1,462 M/W	1.4	CW	20M
N8HOB	10-5-86	963	To W7EOF 1552 M/W	1.3	CW	20M
WB8VQU	11-16-86	964	To DL9YA 2615 M/W	1.5	CW	20M
KB7M	11-16-86	965	To CE4BQO 1430 M/W	4.0	SSB	10M
WA4PFG	11-10-86	966	To G0AHT 2091 M/W	2.0	CW	20M
NM5S	1-2-87	967	To CE0FFT 2129 M/W	2.0	CW	15M
KA0DQZ	1-12-87	968	To CT1UA 1615 M/W	3.0	SSB	20M
SA3HZT	1-12-87	969	To ZS2RM 8512 M/W	1.0	CW	15M
KA0JWO	1-12-87	970	To ZL4CO 7593 M/W	5.0	CW	20M
KH5JOI	1-12-87	971	To ZS1H 6420 M/W	1.8	CW	20M

Carl Bundschuh (NE5U, exW5OP), responded to my comments about "apathy," indicating "instant gratification" and "no effort radio." Carl suggests that the mandate of Amateur Radio include, "enhancement of technical expertise on behalf of the national interest and common good." Carl has the Rx portion of his "Mini-Max QRP Tcvr" just about ironed out. The design is part his and part "borrowed" and shows good promise. Send us an article for the *Quarterly*, Carl, as soon as you have the project on-line. Carl also gave high marks to the *Quarterly* and would like to see a balance between technical and activities related articles.

More good input came from "Geno" McGahey (AL7GO), along with a FB all-band antenna article soon to appear in the *Quarterly*. Geno is a radio specialist from Mississippi and is currently designing a communications system for the new state prison. He also pulls the NCS duties on the "Magnolia Net" each Thursday at 1200Z on 3862.5Khz. Geno reports that the Skeleton Cone apparently has a much lower angel of radiation than he first suspected, since QNIs are further out and local signals are stronger than on his dipole.

I've been following the saga of Geno's "Tree Rats vs the Antenna Farm" since last fall. Instead of eating nuts like normal squirrels, these little critters are chewing the insulation off his coax and have even chewed through 14ga. copper-clad steel, which accounts for the name affectionately given the little cuddlies by his XYL. If anyone has experienced this before please contact Geno asap as they're headed for the plumbing! Geno sends out a terriffic QRP information package to

potential members. It includes a letter and information/application as well as a copy of the recent issue of the *Quarterly*.

Bob Spidell, W6SKQ, finally has has his tribander going around in circles again instead of himself. After a year of fighting with the power company over noise, the last thing he needed was a broken rotor. Bob says the factory completely rebuilds them, including the housing if necessary, for $75. Bob and myself have been working on a variety of money generating products for the club, hopefully, if things all work out, we will have a line of QRP goodies for Dayton and life after.

Last year's member survey revealed that we had a "disc jockey" in our ranks. That would be Ed de Bevitz (W5TTE) of Albuquerque, N.M. Ed's attempt to shake the habit and become a fulltime writer is enjoying budding success around Santa Fe and as far west as LA, where several staged readings of his short acts have been favorably received. Look for Ed with his HW-7 and vertical in all contests where CW is spoken and on many of the nets. I heard unconfirmed rumors last week on WSN that Ed is two away from 2xQRP WAS! Best of luck, Ed, and CU at Dayton!

Bert Matthies (DL2HCB) entered the CW WPX after having been licensed for just a few months. He pulled down 99K points (last year's DL winner had 96K). That's a respectable feat! Bert will have served a three year apprenticeship as a technician in Germany's telephone company by the end of this year. At that time he will enter military service for a mandatory 15 months. Bert is 20 and likes DXing and QRP contesting. He enjoys country and western music and is interested in meteorology. Antennas are a favorite pasttime, with a variety of Vees, verticals, slopers and beams to choose from. I'm still waiting for that last QSL for QRP WAC, Bert!

Things are a little more relaxed around the shack of Keith Clark (W6SIY), now that his DXCC/QRP, WAC/QRP and QRP-50 are hanging on the wall. Keith is having to do a little catch-up around the place but still managed to work both September and February NA Sprints and the Fall QSO Party. More than likely he ended up in the CQ WW phone contest also, as the flux was on it's way up around then.

Bill Young, WF6D, ex N6GTI, is an Agronomist, (the science of crop production) and is the owner-manager of Young's Mesa Nursery. Catching the enemy (bugs) in the act requires long days and pre-dawn hours during the growing season which makes it difficult for Bill to QNI the WSN and TCN as often as he would like. Nevertheless, he has the SWN-40 QNI certificate and is getting close on TCN and WSN seals. Bill was a big hit with the Zuni-Loopers last FD when he drove close to 500 miles to join in the fun. Aside from having a great time, Bill left rejuvenated, with a lot of respect for gain arrays. Bill's idea of a QSL Bureau will be taken up at one of the club work sessions at Dayton. Let me know what Tcvr circuit you settle on. I think I'll go with the "Two-Fer" and see just how far I can take it.

Joe Mead, K2JT, ex WA2IRS, joined the ranks of QRP quite by accident when his SB-220 went up in smoke. Motivated by the challenge of QRP and the smoking embers in his shack, and having already achieved QRO 5 Band DXCC with 200 DXCC countries confirmed, Joe made the plunge in mid-'85 and is now helping out as temporary NCS for the GLN each Wednesday evening. Joe also did a FB solo FD effort in the "1B" class last year, finishing sixth of 44 nationwide. Not too shabby! He also picked off GM3OXX on 20 CW for a fine two-way DX QRP QSO in the Fall QSO Party. Joe's first Novice station sure brought back memories, an S-38c and 6L6 Osc. Mine was the same, only a "b!"

Bill Slabonik (KZ3I/KL7), can still be heard now and then lurking about the WSN or TCN and in most of the CW contests. Bill reports that W6RCP/7 and W5TTE had the outstanding signals up north during the Fall QSO Party.

Many thanks to Bob Brown (NM7M), for once again bailing me out after I fried the old TRS-80 computer. Due to extensive modifications, the cost of repair would have exceeded the cost of a new TRS-80 Mod.II 64K color computer which was on sale for $99. So I sprang for the computer and Bob provided the extended Basic KM/W program and we're back on-line in "flamin-color."

Rollie Crider, (K9VCM), one of the longest standing active members, considered the Fall QSO Party one of the best in years. Rollie uses a cranked-down TS-520, a three-element tri-bander and a three-wire dipole for 40M. I suspect that Rollie's QRP-900 will be the last issued for many, many years. Come on Rollie, it was 1981 when you earned that, you must have several hundred more by now.

QRP FD enthusiast Bill Stocking (W0VM), under the weather and hospitalized since before Thanksgiving, spent his last days writing the article which appears in this edition of the Quarterly. Bill became a silent key Jan. 11. He was one of the early QRPers, and we are much indebted to him and his family for sharing his knowledge and experience with us. How about taking a couple of minutes and dropping his family a QSL card with a word of thanks, via his daughter, Mary Griswald. (address in article)

The M-QRP contest last January sure was lively. I was able to join in for a few hours Saturday and worked 20 contacts and 12 spc's, including HI and two VEs. I operated mostly on 20M with the Argosy at one watt to a Skeleton cone with six-legs at 42'. Propagation on 40M never developed to the east sufficiently to use the big three-element 40M Zuni-Loop delta beam. That beam can be a ton of fun on both ends when the band is hot.

David Gauding (NF0R, exKA0JWO), managed to turn adversity into prosperity by putting up a G5RV bent around the attic of their townhouse. The unique part of the installation is the 12" heavy duty aluminum foil from which it is made. This has a broadbanding and a Q-lowering effect, creating a more harmonious match at the antenna feed point. If you believe in capture area, this antenna should be a winner. And apparently it is – All Dave needs to finish out his QRP WAS is Alaska, which of course, puts him in the hands of Bill Slabonik, KZ3I/KL7, or John Trent, KL7DG. Sounds like time to check into TCN! Good luck, Dave, and thanks for sharing a great idea!

Dave Benson, (KU7I), and his XYL spent a nice vacation in New England last fall, which allowed him the opportunity to see the action from the other end in the Fall QSO Party. Operating from his car in Green Mountain National Forest in S/E Vermont, Dave made 45 contacts on 40 and 20M with a simple low dipole in five hours. Dave indicates he will be moving to New England and would welcome hearing from readers needing the rarer N/E states for QRP WAS. Dave might be able to do a mini-WAS-expedition. Here's my request Dave: VT and NH on 80, 40 and 10 meters, two-way QRP CW.

Bob Spidell (W6SKQ) and family combined some business with pleasure again this year in a fashion buying trip to Hawaii. Bob's XYL, DeDe, operates a Hawaiian fashion store which specializes in swimwear. Bob has the hard part, he does all the advertising photography (the dirty dog). Another Ham-Luau took place at the home of QRPer Ray Hasagawa (KH6JOI), with other local hams attending.

Ralph Caryl, (W8LHG), sent me a great short story which I'll work up for the *Quarterly*. Since being "nabbed" by QRP in '84 he had 40 states worked and 37 confirmed towards QRP WAS. Ralph admits that he's not fully converted yet, in that he still has QRO nightmares now and then!

Oh the many faces of George Bowman (N7IS), with his AEA PK-64 all-mode terminal unit tied into this Commodore-64! George suggests that all the modes are fun, but places "Packet" in the novelty category due to all the waiting that goes on. In short, he says that the PK-64 won't replace a set of ears and what's between them for CW, which sort of ties into Keith's statement (W6SIY), in "QRP DX Chasing," "all the theory and computer programs available are no substitute for listening to the bands."

Dana "Mike" Michael (W3TS), should be moved into his new home in Halifax, PA, by now. It's located about 10 miles from his old QTH. I suspect Mike had radio on his mind when he purchased the place as it sits on top of a small hill, with a clear shot in all directors. Mike's score in the Fall QSO Party was 1,245,000 which may be enough to nab the Triple Crown of QRP trophy, which is no small feat! Mike has become a major technical contributor in the worldwide QRP community and points out the merit of W7ZOI's "Ugly construction" technique which is far easier to modify and improve than the PCB method. Thanks for all the "Two-fer" project help and the Idea Exchange, Mike!

I chuckle when Tom Root (WB8UUJ), editor of the Michigan QRP Quarterly, *The Five Watter*, remarked in his last note that he had no personal operating news to pass along as he has been too busy with the T5W to operate. Well, it's the same on this end, Tom. QRP radio will be a snap after this, huh? The December issue of the T5W was just superb, Tom; chuckfull of good QRP stuff. I'll bet you got a lot of favorable response from it. If any of you have a spare $7 to invest and want a fair return, look no further than the T5W. Annual dues are $5 plus a one-time $2 initiation fee. Write Membership Chairperson, Michigan QRP Club, 5346 W. Frances Rd., Clio, MI 48420 for information.

Cam Hartford (N6GA), did a great product review of the HW-9 for WSN members, and I hope it finds its way into the *Quarterly*. Many of the loopers were able to use his rig last FD and observed it's broad, double crystal filter, which turns out to not be a true "cyrstal" filter at all. This problem is not unique to Cam's rig. Cam says he received a lot of help from Wes (W7ZOI), and he learned an equal amount about filters when he tried to

improve its performance.

John Westphal (W8YNA), has been busy over the past year building what will closely resemble a HF-200 Tcvr, minus the 200W amplifier. He's building it from unfinished factory boards and home brew PCBs. You'll recall that John put up a "Skeleton Cone" last year, and he reports that it's one of the quietest antennas he's ever tried.

The first known QSO in the playground area on 2340 MHZ, took place July 26, 1986, when W4ODW and QRPer Terry Young, K4KJP, gave the 13 cm Ham Band a try with some linear transverters constructed by Gene, W4ODW, SSB CW, and NBFM modes were all worked successfully over the 12.6 mile path betwen Niceville and Fort Walton Beach. K4KJP was 5X9plus10 dB at the 600 milliwatt output level and S7 at the 20 dB down level of six milliwatts. At 6/10 of a milliwatt output he was 3X2 on SSB and RST 339 on CW while using a non-resonant antenna-the 432 MHz beam. These power levels were very accurately measured with a

Hewlett-Packard HP-4345A power meter. The dB attenuators, good from DC to 4 GHZ, were used to accurately reduce power to these milliwatt levels. W4ODW was using a dish antenna with a 2340 MHz feed and a home-brew amplifier. This represents a 21,000 miles per watt achievement. Both W4ODW and K4KJP have earned the first Kilo-Mile Per Watt Award issued for the 13 cm Ham Band.

Net News

conducted by Danny Gingell, K3TKS
QRP ARCI Nets Manager

QRP ARCI NETS
1986 QNI CONTEST RESULTS

MEMBERS CALLSIGN	TCN	WSN	GLN	SEN	NEN	QNI TOTAL	BONUS POINTS	TOTAL SCORE
K3TKS	15	---	15	49	42	121	15	136
K6MDJ	11	36	2	9	20	78	31	109
WB8ZWW	25	3	10	28	4	70	28	98
NM7M	45	49	---	---	---	94	--	94
W1FMR	10	2	13	14	35	74	12	86
NJ7M	9	63	---	1	---	73	1	74
W6RCP	20	41	---	6	---	67	6	73
W6JHQ	27	35	---	---	---	62	--	62
W3TS	---	---	29	1	23	53	--	53
W5LXS	47	---	---	---	1	48	1	49
VE1BF	8	---	3	15	14	40	8	48
NW6F	34	9	---	---	---	43	--	43
W6SIY	8	32	---	---	---	40	--	40
K2JT	---	---	29	7	3	39	--	39
WB7BIV	3	36	---	---	---	39	--	39
KD2JC	18	---	---	---	1	19	18	37
KH6CP/1	3	---	14	10	6	33	3	36
K4KJP	17	---	---	1	---	18	17	35
W5TTE	21	11	---	---	1	33	1	34
WA1JXR	1	---	18	---	13	32	1	33
WB2IPX	6	---	1	9	9	25	6	31
N7FEG	11	18	---	---	---	29	--	29
N7IS	---	28	---	---	---	28	--	28
NF5Y	12	---	1	6	---	19	7	26
N6GA	6	18	---	---	1	25	1	26
WF6D	---	24	---	---	---	24	--	24
KA7QNZ	1	22	---	---	---	23	--	23
NF9X	8	---	1	6	---	15	8	23
KK7C	---	19	---	---	---	19	--	19
KZ3I	9	4	---	---	2	15	2	17
K5BOT	13	---	---	---	2	15	2	17
K8JRO	5	---	1	5	1	12	5	17
KA6SOC	---	15	---	---	---	15	--	15
AA4CO	7	---	---	---	---	7	7	14
KI4IO	---	---	---	---	14	14	--	14
W6SKQ	10	4	---	---	---	14	--	14
KR0U	---	14	---	---	---	14	--	14
NO7V	---	13	---	---	---	13	--	13
N3DQN	6	---	---	---	---	6	6	12
NV7X	9	3	---	---	---	12	--	12
WD8JCR	---	---	12	---	---	12	--	12
WB1ESN	---	---	---	---	10	10	--	10
N4EL	---	---	7	---	2	9	--	9
WB7BQY	---	1	---	---	4	5	4	9
W2KJ	---	---	---	---	8	8	--	8
KA4LKH	4	---	---	---	---	4	4	8
W1CFI	---	---	---	---	7	7	--	7
WA6FLN	---	7	---	---	---	7	--	7
WA3SLN	1	---	3	---	1	5	1	6
K4AHK	3	---	---	---	---	3	3	6
W4FOA	---	---	---	1	5	6	--	6
WN6F	4	2	---	---	---	6	--	6
WA7NZN	---	6	---	---	---	6	--	6
K8DD	2	---	2	---	---	4	2	6
KZ9H	---	---	---	---	3	3	3	6
W9OA	---	---	1	---	2	3	3	6
W0RE	---	6	---	---	---	6	--	6
KA0EGJ	---	---	---	1	2	3	3	6
N4PC	2	---	---	1	---	3	2	5
KB5DQ	5	---	---	---	---	5	--	5
W5QJM	3	---	---	---	1	4	1	5
KY9L	1	---	2	---	---	3	2	5
K1MPM	---	---	---	---	4	4	--	4
KA3K	---	---	---	4	---	4	--	4
NB3V	2	---	---	---	---	2	2	4
K5VOL	---	---	---	---	2	2	2	4
NA5W	---	---	---	2	---	2	2	4
WB6PUM	---	4	---	---	---	4	--	4
VE7FOU	4	---	---	---	---	4	--	4
NN8B	---	---	2	2	---	4	--	4
NOETQ	4	---	---	---	---	4	--	4
W5XE	3	---	---	---	---	3	--	3
WBDYF	1	---	---	1	---	2	1	3
KE8P	---	---	---	3	---	3	--	3
K9ZZ	1	---	---	---	1	2	1	3
WA1MBK	---	---	---	---	2	2	--	2
K1THP	1	---	---	---	---	1	1	2
W1XH	---	---	---	2	---	2	--	2
N2BOG	---	---	---	2	---	2	--	2
N2EIA	---	---	2	---	---	2	--	2
K3AS	---	---	---	2	---	2	--	2
W3IGS	---	---	---	---	2	2	--	2
K3LS	---	---	---	---	2	2	--	2
NW6A	---	2	---	---	---	2	--	2
VE6BLY	2	---	---	---	---	2	--	2
NV6X	2	---	---	---	---	2	--	2
WL7BDK	2	---	---	---	---	2	--	2
VE7EKS	---	2	---	---	---	2	--	2
KA7KXA	---	2	---	---	---	2	--	2
NM7N	2	---	---	---	---	2	--	2
N8CQA	---	---	---	2	---	2	--	2
N8CSX	---	---	---	---	2	2	--	2
K8DSL	---	---	---	---	2	2	--	2
KD8G	---	---	---	---	2	2	--	2
NM8L	---	---	---	---	2	2	--	2
W8LCU	---	---	---	2	---	2	--	2
144 Others	38	16	18	36	36	144	000	144
TOTALS	512	547	186	228	294	1767	223	1990

QRP ARCI NETS
1986 QNI CONTEST RESULTS
LISTING OF ALL STATIONS PARTICIPATING IN THE CONTEST

CALLSIGN	CALLSIGN	CALLSIGN	CALLSIGN
K3TKS	K6MDJ	WB8ZWW	NM7M
W1FMR	NJ7M	W6RCP	W6JHQ
W3TS	W5LXS	VE1BF	NW6F
W6SIY	K2JT	WB7BIV	KD2JC
KH6CP/1	K4KJP	W5TTE	WA1JXR
WB2IPX	N7FEG	N7IS	NF5Y
N6GA	WF6D	KA7QNZ	NF9X
KK7C	KZ3I	K5BOT	K8JRO
KA6SOC	AA4CO	KI4IO	W6SKQ
KR0U	NO7V	N3DQN	NV7X
WD8JCR	WB1ESN	N4EL	WB7BQY
K2KJ	KA4LKH	W1CFI	WA6FLN
WA3SLN	K4AHK	W4FOA	WN6F
WA7NZN	K8DD	KZ9H	W9OA

The 1986 QNI Contest has come to an end, but the high net activity levels continue. The WSN reported record check-ins in late January, and the GSN started up again with 14 check-ins on its first night of operation.

An SSB net has also gotten underway collecting check-ins from all over the west. I'll have details later. But first here are the results of the 1986 QNI Contest.

1986 QNI Contest

Fred Turpin (K6MDJ), came out strong with coast-to-coast check-ins giving him top bonus point honors. As the letters and awards started piling up, he missed the nets more and more often, letting Wayne (WB8ZWW) nearby pass him in the closing hours of the contest, while he was grinding

WORE	KA0EGJ	N4PC	KB5DQ
W5QJM	KY9L	K1MPM	KA3K
NB3V	K5VOL	NA5W	WB6PUM
VE7FOU	NN8B	N0ETQ	W5XE
W8DYF	KE8P	K9ZZ	WA1MBK
K1THP	W1XH	N2BOG	N2EIA
K3AS	W3IGS	K3LS	NW6A
VE6BLY	NV6X	WL7BDK	VE7EKS
KA7KXA	NM7N	N8CQA	N8CSX
K8DSL	KD8G	NM8L	W8LCU
W1FD	WA1CJT	VE1VX	W1AW
K1TUP	K1RGO	W2WWP/4	N1QY
KB1MJ	WB1CMQ	K1KQI	W1UAR
IK1FJI	KA1MP	W1DXQ	N1BNG
NC1E	K1BHT/4	KA2KJP	KA2KMU
W2HCN	WA2QIN	KA2ZKD	WA2WGS
WB2UXI	K2RS	W2JQE	VE3LXJ
VE3JPN	VE3PQB	GI3DLJ/W7	KA3IVB
VE3MTX	W3RNL	K3SQO	N3DX
VE3PKJ	AC3I	W3NZ	W3QF
N3EHR	W3RLA	N3ELR	WB3AAL
K2KMO	WB2PEF	W2PFS	KB2BSU
KB2QM	W2GUM	XE2FRJ	WA2VEZ
WA2FKN	W2JRP	KE4EB	N4DVE
KB4LXW	W4LRD	K4FCT	N4FRX
N4HBJ/8	W4GCW	K4IKB	N4LST
W4DRJ	N4ERP	W4SVG	KB4NRY
K4HZK	KB4MYW	K5TF	WB5FKC
KD5VD	K5HPJ	W5LYM	WD5GLO
NR5T	KE6HV	K6XR	KB6LY
KB6FIC	W6JHM	W6SGT	W6SHE
WG1UA	W6SGJ	K6LJE	N6COV
W6JXA	WJ6Q	W6PRI	KU7I
WN7SIU	KE7IA	KA7RSF	KA7SPS
WB7OJV	KU7Y	WB7SNH	KL7IUN/6
K7PQS	WA7FKD	K7WA	KA7BCD
NW7N	W7LNG	W8NI	AK8N
AC8W	WA8TCG	K8KIR	WB8IEK
KA8BAI	W8HXX	W8IG	W8EGI
NK8H	WB8SVK	K9IFO	KE9P
KA9ROM	WA9WJB	W9UKV	W9TKV
W9DLJ/6	WA9USD	W9KSR	KA9RML
KA9AZS	W9YTZ	N9CZT	WB9PSH
KA9NZI	W9FD	KA9HAO	KR0T
K0MAT	N0FYN	KA0PQW	W0BTP
N0GTI	WB0CIY	WA0SRJ	WB2IVX/NS2L

THERE WERE 240 WINNERS TO THIS EVENT.
The average number of Check-in's per station was 7.3625 .
We are looking forward to seeing your names on this roll again next year. Thank you for your support. The QRP ARCI NET MANAGERS.

The QRP Amateur Radio Club International

QRP QNI 100 HONOR ROLL

CALLSIGN	TOTAL	NAME	QRP #	STATE
K3TKS	598	DANNY GINGELL	4368	MARYLAND
W6RCP	517	JIM HOLMES	4300	OREGON
W1FMR	341	JIM FITTON	4963	MASS.
NM7M	335	BOB BROWN	5035	WASHINGTON
NJ7M	273	CHUCK LINDSAY	5343	IDAHO
KBIF	246	THOM DAVIS	2287	MICHIGAN
K4AHK	218	BILL HARDING	4647	VIRGINIA
W6JHQ	212	TOM BROWN	4974	CALIFORNIA
WB2IPX	169	LES SHATTUCK	4152	VIRGINIA
W5LXS	169	ROGER ROSE	4156	TEXAS
K6MDJ	168	FRED TURPIN	2401	CALIFORNIA
WN6F	156	BRIAN GREER	5110	CALIFORNIA
WA9WZV/4	150	GARY BEAM	4126	FLORIDA
W5QJM	147	FRED BONIVITA	4577	TEXAS
KV7X	147	JAY STURDIVANT	5127	WASHINGTON
K5BOT	146	ED POPP	4190	TEXAS
N6GA	130	CAM HARTFORD	3437	CALIFORNIA
W3TS	124	MIKE MICHAEL	3315	PENN.
W6SKQ	120	BOB SPIDELL	3135	CALIFORNIA

out his activities and awards column. Danny (K3TKS), pounding away consistently from the east coast, managed to hold the lead to the end of the year, but once the tallying of results got underway in 1987, he began to fall behind, so the 1987 race is anybody's game.

When it comes to nets, the Western States QRPers took top honors in 1986, with 547 check-ins to their 40 meter CW net. The Trans Continental Net on 20 meters came in a close second.

With 1767 QNIs from 240 stations, including W1AW, the 1986 QNI Contest was a great success. In my mind, every participant was a winner.

Particular congratulations belong to WB8ZWW, W1FMR and K6MDJ who succeeded in checking into all five nets, a real testimony of their avid persistence and good signals. Can any of the rest of us pull off that achievement? I'm going to go for it. Let's see how many of us can succeed in putting a signal into every net during 1987.

When it comes to the prize for the 1987 QNI Contest, everybody is eligible except past year's winners, so go for it, champs! I'll be rooting for you all.

QRP SSB Net

Holding fourth at noon Pacific time on 7.285, the WSN has started its first SSB QRP net. It all started with Chuck (NJ7M) in Boise, Idaho, then expanded into Oregon with Jim (W6RCP/7), Bob (WB7BIV) and Lewis (KA7KXA). From further south, Keith (W6SIY), Tom (W6JHQ), Bill (WF6D) and Bob (W6SKQ) have joined in. From Washington, George (N7I5) and Bob (NM7M) have also been checking in. Ed, (W5TTE) has also joined up from New Mexico. Signal strengths are surprisingly good, and the group had been able to hold their frequency surprisingly well. They listen everyday for DX check-ins from the east, so let's see what kind of records we can set!

Special Event Stations

The Dayton QRP Convention will see the activation of Special Events QRP stations from QRP headquarters in the Belton Hotel. Stations will sign "/8" and will be heard on all QRP frequencies in the evening and early morning hours. Special commemorative QSLs will be sent out, so be sure to win your QRP wall paper by QSOing them.

The *Quarterly* will accept short "classified" ads from its members who desire to sell equipment and other items of interest. They will be printed on a space-available basis.

Send information to publisher, labeled "*QRP Quarterly* classified."

Needed: QRP Lawyer

The club needs the volunteer help of a lawyer who can help us with the new by-laws and revive our application for tax exempt status. Call or write Les Shattuck.

Idea Exchange

conducted by D.A. "Mike" Michael, W3TS
Box 593 Church Lane, Halifax, PA. 17032-0593

Hustler Resonators Again

In the April 1984 *Quarterly,* Wayne Sayles, N9AKM provided some ideas which stimulated Dick McIntyre, K4BNI, to phone the manufacturer. Dick writes: Hustler told me that the base length was not critical but that the resonator might need adjusting as the base section length was extended. "With that in mind I built an aluminum tubing base of sixteen feet and mounted the 40 meter Hustler resonator on top of it. With slight adjustment of the resonator, it worked fine with a perfect match. Next I mounted an Expander 5, which permits adding up to four additional resonators, on top of the base section and added the twenty and ten meter resonators to the already mounted forty meter resonator. Adjustment of the resonator was more critical but all three bands matched. Those of you with idle Hustler components may wish to experiment. I feed the antenna with coax and my ground plane is the aluminum pool screen frame common for those of us who have pools in Florida."

Dick uses an Argonaut 515 with his vertical and gets out well.

Running QRO Rigs on QRP SSB

Most QRD rigs have a tune position and CW drive level control, but if you set the CW level to 2 watts output on an external wattmeter, then switch to SSB you may have either no output at all or full QRO output on SSB. The zero output condition results when the CW level control is also the mike gain control, and when adjusted for 2 watts CW it is too low for any audio to get through. Full QRO output on SSB occurs on rigs that use a seperate control for CW level and mike gain, under which conditions, the level control has no effect at all on SSB output.

One way to set a QRO rig mike gain to 2 watts QRP output is to say a long "HELLOOOO" into the mike while it is set for SSB. Adjust the mike gain for 2 watts as indicated on an external wattmeter. (For this I use a Drake WH-T meter which is NOT a peak reading meter). Then when you speak in a normal voice, your peaks will not be much over 2 watts.

Another possibility would be to rectify a bit of the out going RF and feed it into the rig's ALC jack so that the RF amplifier would start to clamp at 2 watts. I haven't tried it, but I'm sure someone has. How about writing to tell what you have done?

Field Day "Omni-Box"

Doug DeMaw, W1FB, writes to say he has just finished a QST article describing a field kit containing a field strength meter, dummy load, SWR bridge, RF power meter, 100-KHz frequency standard and continuity tester.

Doug is presently working on a full QSK 1.5 watt 40 meter transceiver. It uses a DC Rx based in part on W7EL's design, and a VVC tuned VFO. It will be small enough to fit in a pocket. Doug closes saying, "I think you fellas are doing a super job with the *Quarterly* and the QRP movement in general. Keep it up! -- The QRP cult seems to represent the last frontier for experimenting and the development of good operating practices."

Computer Beam Headings

Paula Franke, WB9TBU, QRP column head for *Radiosporting* has done a C-64 program for calculating beam headings, which we don't have room for this issue. Her program stands alone and does not have to be restricted for separate sets of directions. Write her for a copy at P.O. Box 873, Beecher ,Ill. 60401.

CQ Morse Buffs

If you are into QRP, you are almost certainly into Morse. If you are into Morse, you will be interested in a new venture involving QRP ARCI member Tony Smith, G4FAI.

Two Dutch amateurs, PA0BFN and PA3ALM publish *Morsum Magnificat,* a quarterly journal dedicated to the worldwide traditions and practices of Morse, past and present, the only snag being that its in Dutch.

Now, Tony has joined with the Dutchmen to produce an English language, international edition of *Morsum Magnificat,* the first issue of which is due out this autumn (fall). Material will be used relating to all aspects of Morse telegraphy, wire, wireless and others and while there's a definite historical slant, today's Morse scene will not be overlooked.

Apart from Tony, Dick PA3ALM, is also a QRPer, so we can be fairly sure that QRP CW will find its place somewhere in the magazine! Annual subscription, for four issues, is $10, sent to M. Hellemons, PA0BFN, Holleweg 187, 4623 DXD Bergen Op Zoom, Holland. Banknotes will be appreciated as there are difficulties and high charges involved in clearing foreign checks in Holland.

New Member / Renewal Data Sheet

Call Handle Recommended by
Age Occupation
License Class Held since Other calls
Rig TX RX Ant
Bands most used (rank in order of use:
160 80
40 30 20 15 12 10
6 2 VHF/UHF

Please circle your interests and elaborate if desired on separate sheet. Thanks!
Rag Chewing DXing Contests Traffic Award
Homebrew Experimenting CW SSB RTTY
ATV Packet VHF/UHF Satellite Other:_____

Do you plan to participate in club activities? Y/N
Would you like to be a club officer/director? Y/N
Do you have access to duplication equipment? Y/N
Are you interested in our award program? Y/N

Have you applied for any of the club awards? Y/N
Are you in favor of QRP calling frequencies? Y/N
Are you in favor of member QSO parties? Y/N
Would you help write for the *Quarterly?* Y/N

What subjects?
What awards/achievements have you won with QRP?

Why do you run low power?

[ ] Renew for _____ years. (U.S. $5, DX $6)
[ ] New Member _____ years. (U.S. $6, DX $7)
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p23

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Amount enclosed_____ QRP ARCI #_____ Call_____

PLEASE MAKE YOUR CHECK OR MONEY ORDER PAYABLE TO:
QRP Amateur Radio Club, International
* * * * * PLEASE DO NOT SEND CASH * * * * *

Bill Harding, K4AHK
10923 Carters Oak Way
Burke, VA 22015

QRP NET SCHEDULE SUMMER 1987

NET	QRG	NCS	DAY/ HR	UTC
TCN*	14060	W5LXS	Sun	2300
SEN**	7030	K3TKS	•Wed	0001
WSN SSB	7285	NJ7M	Wed	2000
GSN	3560	W5LXS	•Thur	0200
GLN	3560	K2JT	•Thur	0200
WSN-80	3558	NM7M	•Sat	0400
NEN	7040	W1FMR	Sat	1200
WSN-40	7040	NM7M W6RCP	Sat	1600

*On weekends of major contests will meet one hour later.

**If conditions on 7030KHz are poor, QSY to 3535KHz at 0030 UTC. Please note that 3535 is the Michigan QRP Club Net Freq. at 0100 UTC.

• Evening of day before of W/VE.

QRP Quarterly
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