Journal of the QRP Amateur Radio Club, International
January 1986 Volume XXIV Number 1

QRP Quarterly

Mike Michaels, W3TS, admires a 40 meter transceiver designed by Mike Bryce, WB8VGE.

QRP ARCI News

New Board Names Shattuck President

With Chris Page, G4BUE, leading the way, all candidates of slots on the QRP Amateur Radio Club's board of directors were elected in recently completed balloting.

Chris, the only incumbent running for re-election, was named to his second three-year term. Elected to full terms also were Michael Bryce, WB8GVE; Bob Brown, NM7M; and Rich Arland, K7YHA.

John Collins, KN1H, was named to fill the remainder of the term expiring December 31, 1987, of Fred Bonavita, W5QJM. George D. "Danny" Gingell, K3TKS, will fill the vacancy created by the resignation of Ellicott Valentine, K4JO. His term expires December 31, 1986.

Meanwhile, the board has elected Les Shattuck, WB2IPX, as the new club president, succeeding Ed Popp, K5BOT, who did not seek another term.

Other new officers for 1986-87 are Jim Fitton, W1FMR, vice president; Bill Harding, K4AHK, secretary-treasurer; Jim Stevens, KK7C, editor; Eugene Smith, KA5NLY, contest chairman; Fred Turpin, K6MDJ, awards manager; Danny Gingell, K3TKS, nets manager; Joe Sullivan, WA1WLU, publicity manager.

Put on a Club Cap

Baseball caps bearing name, call sign and "QRP ARCI" now are available to club members.

For $5.50 (postage, handling, and taxes included), members can get these baseball caps in an assortment of colors with a variety of lettering. Club name badges and QSL cards, mentioned in previous issues also are available.

Caps, which come with adjustable size, are available in a choice of solid colors: royal blue, black, red, green, or navy blue; or in a mix of white front with a back of royal blue, red, green or black. Lettering color options are blue, red, gold, white, black or green.

Orders must be typed or hand-lettered clearly and legibly to avoid errors. Include the name and call sign for the hat plus a shipping address. No COD orders.

Checks or money orders should be payable to Pat Arland and sent to her at 2042-C Flyer Drive, Langely AFB, Virginia 23665.

President's Message

I wish to say thanks to the officers, directors and members for your support and continued interest in QRP ARCI. The years I have spent in your service have been some of the finest in my 30 years of Amateur Radio. Thanks again. See you on the air! 73,

K5BOT

In a club like this, usually just seven percent of the members participate in balloting or contribute to the advancement of the group. But nearly a quarter of you got your ballots in in spite of the tight deadline. We can all be proud to belong to such a responsive group.

I am very honored to be your president for the next two years. I know that this is *your* club, and I am willing to work hard and to listen. If you have not yet completed the questionnaire in the October *Quarterly*, please do so right away. Drop notes to me, the directors, and the officers with your comments. From the word go, we want to start the ball rolling right.

The Quarterly is your magazine. There is tremendous creativity and good will in our group. *The Quarterly* is the way to share it. Send your articles and ideas to Jim Stevens, the new editor, or to those that conduct the columns. The more you contribute, the better *The Quarterly* will reflect the kind of hams we are.

Last April, I joined several other QRP ARCI volunteers to organize a forum and membership drive at the Dayton Hamvention. It was fantastic to meet so many QRPers face to face. Just as exciting was the interest shown by hundreds of hams who discovered QRP at our booth. Over a hundred became QRP ARCI members because of Dayton. The volunteers all agreed it was an experience worth the sacrifices. And we're preparing for Dayton again. Come. Volunteer to help if you can. Even though I will be living in Florida by the end of April, I'll be at Dayton, hoping to see you.

73,

WB2IPX

Editor's Word

In recent weeks we have received many kind and generous comments about our term as editor of *The Quarterly*. To all of you we extend a heart-felt "Thank you." Your support and encouragement made it all worthwhile. And the good hard work of *The Quarterly* staff made the difference for a quality publication. I'll be looking for you on the air!

73,

W5QJM

The passing of editing and publishing responsibilities has been attended by a number of slips, for which I apologize. *The Quarterly* is a big job, but by April I will have it reaching you at the start of each quarter.

With this issue we print articles by Barry Ives, AI2T, and Mike Bryce, WB8VGE, winners in the design competition. Congratulations to them. Other winning projects will be reported in future issues. Several columns have been initiated, and I urge you to contribute your ideas.

We have delayed publication of the reader survey results in order to include as many responses as possible. Every person's response is of great importance. If you haven't returned your questionnaire yet, please do so as soon as possible. Those received by February 20th will be tabulated for publication in *The Quarterly*. Even if yours arrives later we want to know your desires.

I have big shoes to fill. Fred and past editors have done a wonderful job. In fact, it was a reprint from *The Quarterly* that brought me to try QRP, and it was because of *The Quarterly* that I joined the QRP ARCI. I wanted to be in touch with all of you, to find out what you are building, to learn what you are discovering, to convince myself that I could do it too.

You are a special lot--daring to attempt the impossible, and doing it by small means and great patience; reaching across continents to touch a friend with the power of a penlight, devoted to the notion that when it comes to power "***less is more.***" I salute you. I am honored to serve you. 73,

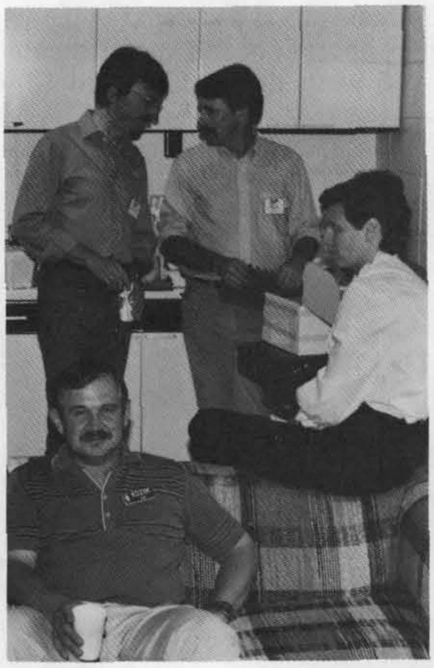
KK7C

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.

Contents

QRP ARCI at

by Jim Fitton, W1FMR*



Jim Fitton, W1FMR, and John Collins, KN1H, discuss NEN check-ins while Bob, KB2IM, awaits WB8VGE's slide show.

Jim Stevens, KK7C, and Mike Bryce, WB8VGE, admiring homebrew gear.

The time for the convention was approaching. I knew that Colin Turner, G3VTT, and Chris Page, G4BUE, were coming all the way from England to take part with Ade Weiss, WØRSP, in a QRP Forum. Les Shattuck, WB2IPX, and his wife had made QRP Banners and arranged for a display and sign up booth. Al Cox, KZ9H, and his wife had committed to manage a QRP swap table. I wanted to go in the worst way. I suspected there could be a number of other QRPers wanting to go if they knew what was going to happen. Wouldn't it be fantastic to have rooms near each other in the same location?

I started phoning for rooms. The town was absolutely full. Could the Hamvention organizers help? An angel there found us the last block of ten rooms together. I took the risk of signing up for them all and called Fred Bonavita, W5QJM, just as The Quarterly was going to press. Within a week my phone began to ring. QRPers from across the nation were calling. There weren't enough rooms, but at least there was a place to congregate.

On Thursday afternoon QRPers started arriving. In an hour Jim Stevens, KK7C, and I had strung up a 40 meter sloping dipole and loaded up an HW-8. Unseen around the corner Mike Michaels had set up his WWII German spy transceiver using 33 feet of bell wire in the shrubs. But as other QRPers began arriving, the rigs went unused as we huddled together talking field days, antennas, solar power and homebrew construction all day long and into the wee hours of the morning. As we talked, Dave Cornell, WB2UXI, took the candid photos featured here.

During the nightly talk sessions, the two Mikes, W3TS and WB8VGE, showed off beautifully crafted homebrew gear. Chris and Colin made eyes pop out with cubic-inch sized G-QRP transmitters and transceivers . Red Reynolds, K5VOL, showed how to make a sixty-foot field day tower from five two-by-fours. Bill, K4AHK; Bob, KB2IM; Joe, WA1WLU; John, KN1H; Pete, WB9FLW; Andy, W8JRO; and others, whose calls unfortunately escaped my log, were there too.

The dean of the group, Brice Andersen, W9PNE, told how, using one of the early transistors, he had made a 40 meter crystal oscillator. Late one night in 1955 he decided to connect it to his antenna just to see what 50 mW of RF would do. The reply to his tiny CQ launched three decades of QRP experimenting and competition, including WAC, DXCC and first place in a dozen DX contests with less than one watt.

Bill Harding, K4AHK, with SWL neighbor, recovers from 100 new member signups.

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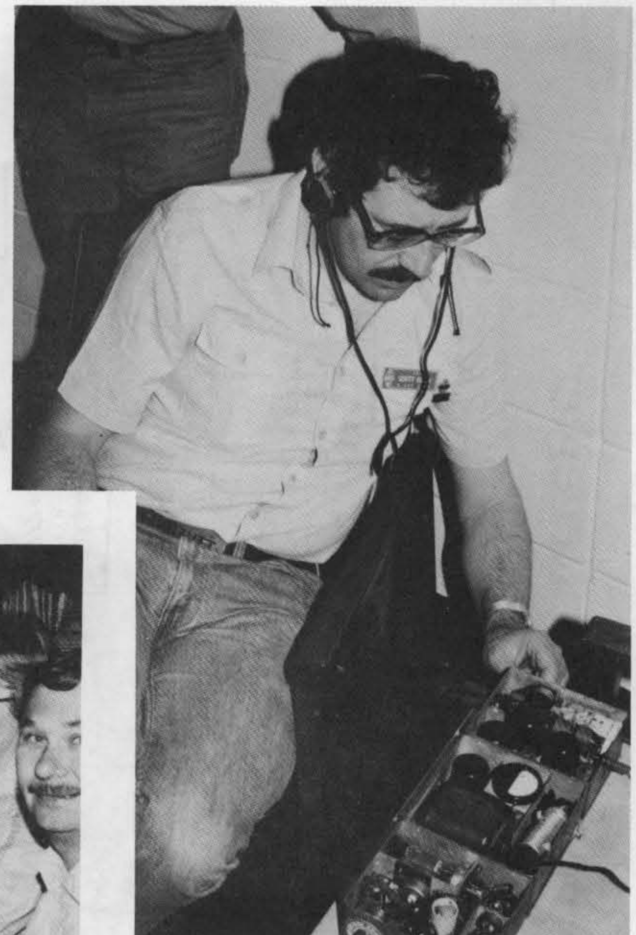
Dayton Hamvention

Pete, WB9FLW, attends slide tour of WB8VGE's solar and wind power system.



Colin, G3VTT, in QSO with W3TS' Spy Transceiver.

This year I have reserved 20 rooms and a hospitality suite at the Belton Inn in downtown Dayton convenient to the airport and across the street from the convention center. Ade Weiss, WØRSP, and Christ Page, G4BUE, will be back to lead the Forum. A bigger membership drive will be masterminded by Les Shattuck, WB2IPX. There will be a QRP flea market table and a QRP banquet. Most of the officers and directors of the club will be there for a first-time eyeball contact. Every night we'll have informal homebrew and antenna discussions.

The price of a room with two double beds is only $35, and I can arrange a roommate to share the cost. Special convention airfares are available. Food is cheap. The flea market is unbelievable. All this makes QRP-Dayton an economical vacation. Plan to arrive on Thursday, April 24th. The Hamvention is in full swing the 25th and 26th. Most of the QRP gang will be staying till noon Sunday the 27th.

The Shattucks relax after finding a bargain TT 515 in the flea market.

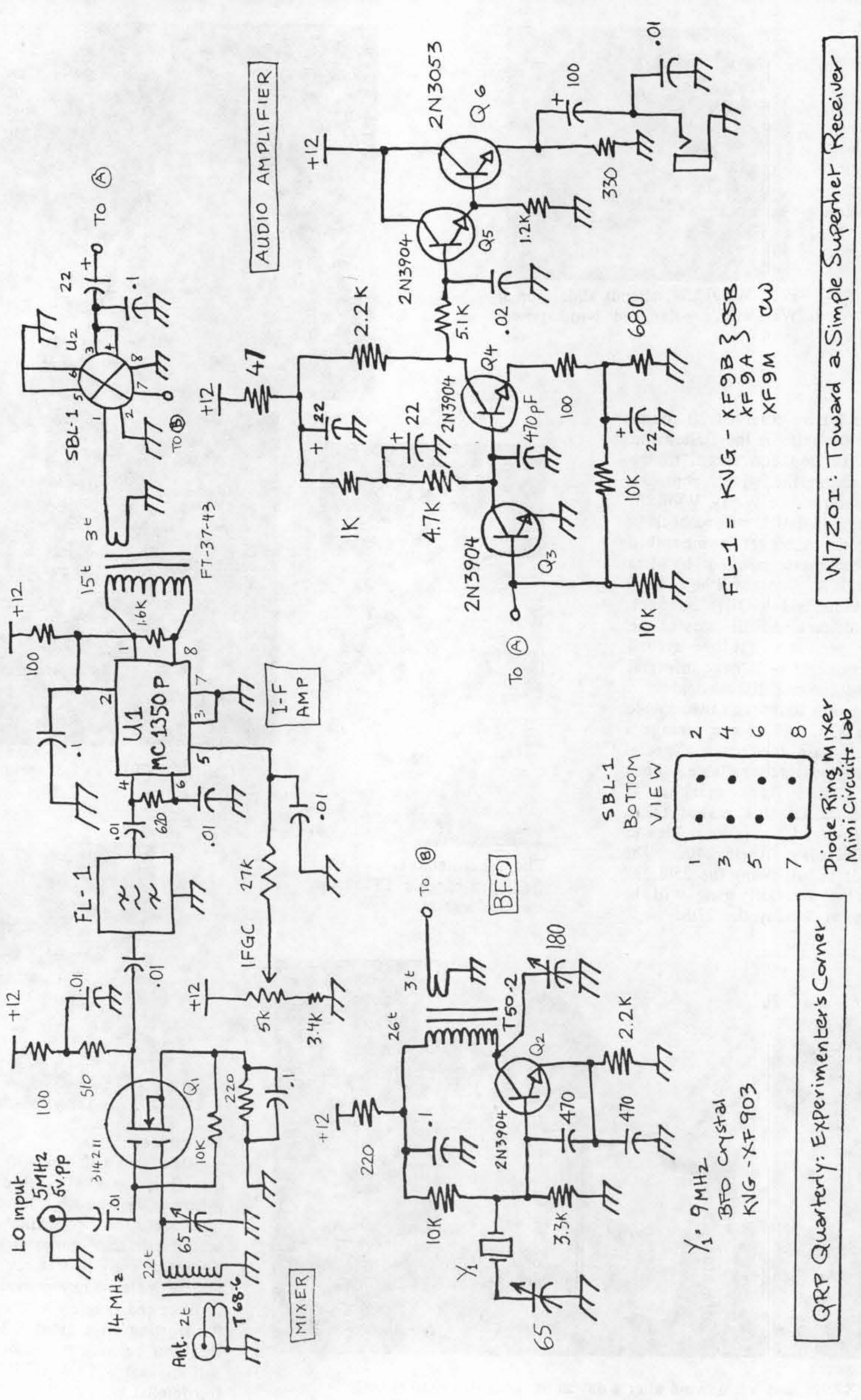
Al Cox, KZ9H, and YL unwind after a day at the club flea market table.

Volunteer

We need volunteers to take charge of the flea market table, the QRP information booth, hotel activities, transportation coordination, outside activities, and general information. These jobs are extremely important but not difficult. They provide a great way to meet and help each other, and will put the frosting on a great QRP get-together that will be long remembered. Write or call me at (617) 374-3595 / 681-2577 for details!

conducted by Wes Hayward, W7ZOI
7700 SW Danielle Ave., Beaverton, OR 97005

Toward a Simple Superhet Receiver



Toward a Simple Superhet Receiver

Most QRP Homebrew artisans seem to thrive on simple circuits. More often than not, their receivers are based upon the direct conversion (D-C) principle. Such a receiver, especially if well done, is satisfactory for a wide variety of operating situations. The most common application is CW operation in a sparsely populated band.

All too often, however, we wish to participate in a contest or chase some DX when the bands have become crowded. In other situations, including most of the time on 20 meter SSB, mere existence is impossible with a D-C receiver. The answer is to replace the ultra-simple direct conversion receiver with a simple superhet. It is bound to be a bit more complicated. However, we can keep things within reason with some care devoted to the design. The receiver described here was breadboarded in two short evenings.

A viable design approach begins with, and extends a direct conversion circuit to a superhet. Much of the overall gain is still obtained at audio frequencies. A good product detector circuit, such as a diode ring, is still used. Care is devoted to the audio chain to ensure reasonable fidelity with low noise.

Figure 1 shows the simple 20 meter superhet designed with these guidelines. The input stage uses a dual gate MOSFET mixer. No RF amplifier is used. Not only does this maintain simplicity, but it helps to preserve reasonable front-end two-tone dynamic range. There is but one front-end turned circuit, that at the antenna. The mixer drain uses a 510 ohm resistor as the load. This is the value required to properly terminate the KVG filters used with this design. Eliminating the usual tuned circuit aids simplicity.

The crystal filter output is properly terminated with a simple IF amplifier using the ever popular (and cheap) MC-135OP. I originally looked at designs that used no gain at the IF. However, the IF amplifier was deemed worthwhile, for it provides a convenient and simple way to control overall system gain. The output of the '1350 is matched to the product detector with a ferrite transformer, again avoiding a tuned circuit.

The diode ring product detector uses a MiniCircuits Lab SBL-1. This choice was largely a matter of convenience; it offers a quick and painless way to implement a good mixer or product detector. The SBL-1 is available from Circuit Board Specialists. You can build your own diode ring detector with no compromise in performance. Either hot carrier or matched silicon junction diodes will work well.

The audio amplifier was tailored to provide enough, but not excessive gain. Careful control of gain distribution often helps the receiver to "sound quiet." Obviously, you don't want to carry this too far. The ultimate "quiet" receiver is one that is turned off. You should always be able to hear antenna noise. The output amplifier, Q6, is biased to several MA, needed to drive the low impedance headphones without going into current limiting.

An available signal generator was used to drive the mixer local oscillator port. About 5 volts, peak-to-peak, at 5 MHz is required. The VFO that is normally built into the receiver was replaced by a substitute in the interest of experimental convenience. There are numerous VFO circuits available to be lifted from the literature.

This receiver was first built with the moderately priced KVG XF-9A crystal filter intended for SSB transmitter applications. The performance was adequate, but lacking in stopband selectivity. A XF-9B from KVG, their 8 pole receiver filter, was then borrowed from a friend and substituted. The improvement was dramatic! A 9 MHz CW filter, the KVG XF-9M , was also tried in the circuit, and found satisfactory.

Two KVG BFO crystals were available, the XF-902 and the XF-903. The later is the best choice for general purpose use. The 65 pF variable capacitor in series with the XF-903 allowed adjustment to either sideband. The range was not adequate with the XF-902.

The largest deficiency of this design is the lack of an AGC. This was especially evident the first evening the receiver was playing. The 20 meter phone band was open with numerous European stations copyable with a vertical antenna. However, the local "juicers" were out in force to chase the DX. You need something to keep the receiver from jumping off the table when you tune through one of them. A simple audio derived AGC would do the job with little added complexity.

The only costly item in the receiver is the crystal filter. A perusal of the advertisements in the back of *Ham Radio* magazine illustrates the relatively high cost of the KVG filters, but also suggests some alternatives. There are some economical surplus filters available in the 5 MHz region. Another alternative is to build your own crystal filter. It's not nearly as difficult as some might believe, especially if a CW filter is desired. There are some methods that allow very simple construction of reasonable CW filters. If there is any interest in this topic, we can cover it in a later issue. (Let me know!)

Occasionally we see superhet designs in the ham literature using a very simple crystal filter with but one crystal. A casual examination gives the impression that you are listening to a good direct conversion receiver. It's only after careful use that you can even tell that you are listening to a superhetrodyne. If you are going to take the plunge and build a superhet, you may as well take full advantage of the concept and use a filter that's good enough to provide a true single-signal response! This means at lease 3 or 4 crystals for CW work, and 6 or more for an SSB filter.

So where do we go from here? The first thing that comes to mind is to refine the design toward enhanced performance. A second MC-135OP and an IF derived AGC system would add a great deal. More front-end selectivity would improve image and spurious response rejection. An RC active audio filter would be useful if a CW crystal filter is not included. We would probably want to add bands as the design grows. The final limit is your choice; the design can evolve with your needs.

The ultimate refinement, and one that would not be especially complicated, converts this receiver to an SSB transceiver. That might be unique--how long has it been since you have encountered a station using homebrew SSB gear?

The Battery Topper
A Lead-Acid Battery Controller

by Michael Bryce, WB8VGE *

Design Competition
Second Place
Miscellaneous Category

Low-power operation and emergency communication go hand and hand. With the small size of the gear, and the low power consumption, QRP operation really stands out in the crowd. However, no matter what the type of fancy gear one may have, the need for some type of battery operation is a must. Instead of stealing the car battery for the next weekend contest, just to get the bonus points, try a full-time battery back-up supply. A battery supply really makes a difference in running direct-conversion receivers, too.

Perhaps the biggest problem is keeping the battery topped-up and ready for use at any given time. Just when you need it the most, it will be dead as a doornail. So take a look at this weekend project. I call it the "Battery Topper'. It will constantly look at the battery terminal voltage and determine if the battery needs to be charged. There is no muss or fuss in its operation. This article describes the control circuit. A department store battery charger does all the work. The controller will tell the station operator if the battery is getting low, both by an audio and a visual warning system. Using the plug-in circuit board (3"x 5") makes building this project a snap.

The use of CMOS devices allows for a very small stand-by current. The input voltage and all the control voltages are regulated, thanks to the on-board chips. The relay-driver transistor will handle up to one amp of current so almost any number of junk box, 12-volt relays may be used. And while I try to design all my projects so adjustments require no special test gear, a digital voltmeter will be needed for proper set-up of the comparators. The unit may be built on perfboard, but use of a printed circuit board will make for a neater and less troublesome project.

Figure 1 shows the topper's schematic. There are four comparators inside the LM339. Each comparator's input is connected to a voltage divider (R1-R4, each a 20K ohm, 10-turn trimmer). These are used to set the voltages needed for proper operation. R1 sets the "off" voltage, while R2 sets the "on" voltage. Also note that the inputs to the trimmers are not connected to the same spot as the power input to operate the circuit. This is done so the most accurate reading is available to the comparators. Just a few millivolts drop will cause an error.

The circuit works as follows: comparators A and B, sense the battery voltage and switch states. The output of both comparators is connected to one NAND gate, which is then used to SET the Reset/Set (R/S) latch. Think of the R/S latch as a type of latching relay. When the "set" input goes low, the latch is "set". It will then ignore all other inputs on the set pin. To reset the latch, a low must then be applied to the "reset" pin. When the latch is set, the Q1 output then goes high and turns on the transistor switch, allowing the relay to become energized. This turns on the charger and will, in turn, charge the battery.

If we start with a fully charged battery, this is how it works: The output of both comparators will be low; when the battery voltage starts to drop past the "off" set point, the output of the comparator goes high; this places a high on pin 4 of the R/S latch and pin 1 of the NAND gate, IC 1a. Since the battery voltage is still within the "window" nothing will happen. If the voltage drops out of the window, then the second comparator will go high. This high is applied to pin 2 of IC 1a. Two high inputs will force the output of IC 1a to a low state, causing the R/S to latch. The output of the R/S latch then turns on the transistor switching, and the battery starts to charge. Now that the battery is charging, the terminal voltage will rise. When it comes up to the ON voltage, the comparator will go back to a low state. when the battery voltage gets to the OFF set point, the comparator will go low, resetting the latch and turning off the relay and charger.

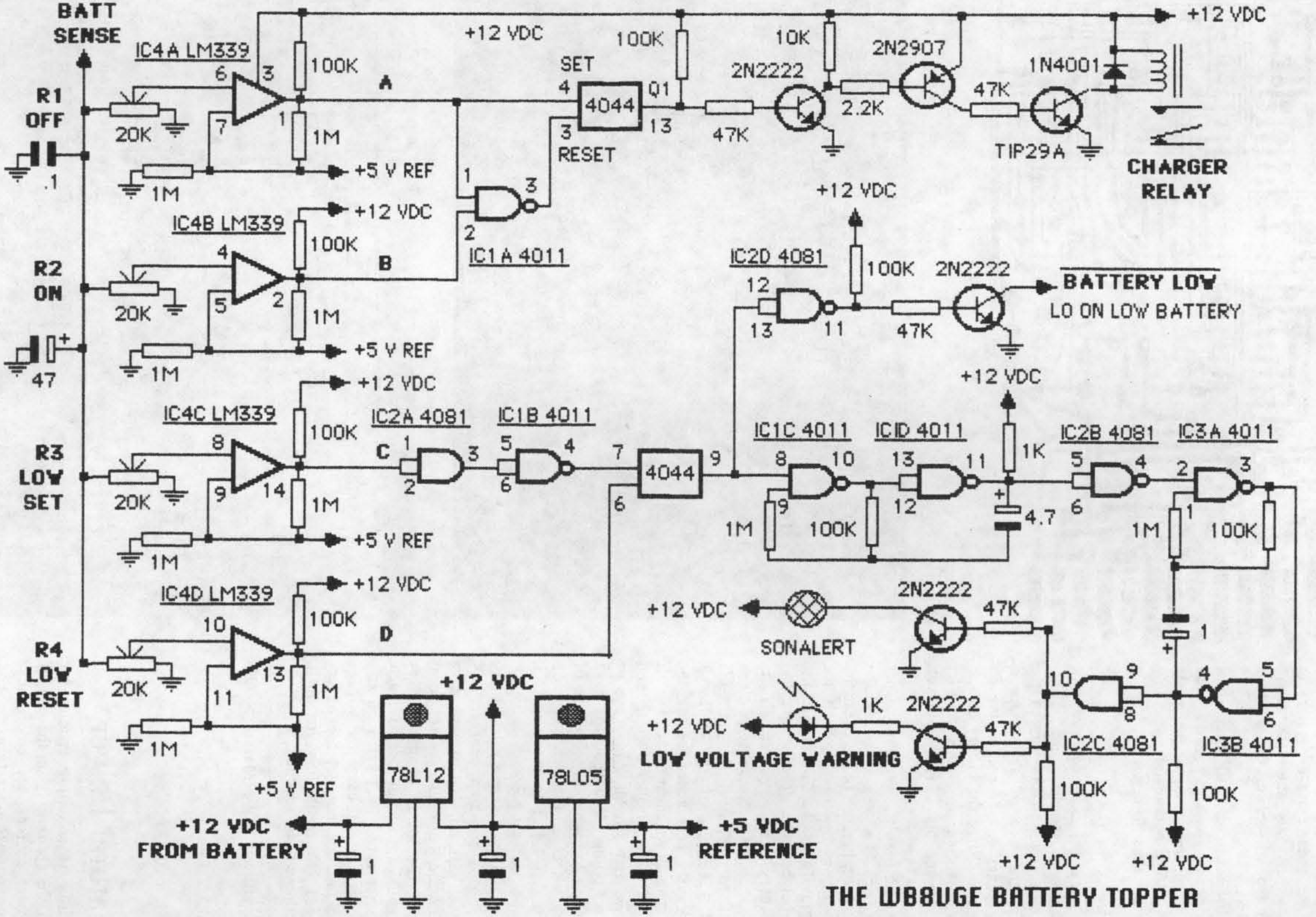
The two remaining comparators are used to set the "low battery warning." They work the same way as the first two. The output of comparator C needed some extra gates to invert the output and to buffer it from the R/S latch. The "low set" will turn on when the battery is just about completely dead. Once it is set, then the battery voltage must rise up to "reset" the low warning. This was needed so the warning would not sing along in step with a fluctuating (ie., CW or SSB) load. Pin 9 of the R/S latch turns on a gated oscillator, which then gates on a second oscillator. This in turn operates the transistor switching and allows for the low voltage warning. The output here is both an LED and a sonalert. With the two oscillators running, the output is rather interesting.

As a second thought, I connected a remaining gate to act as an open collector switch. The output will go to ground when the battery is low and will not follow the gated oscillator in the warning system. You may use the open output for whatever you want. Make sure you don't exceed the current requirement for the transistor collector.

Set-up requires a digital voltmeter to set the comparators. While it is possible to do it with an analog meter, it makes for a more accurate project to use a digital one. The first thing that has to be done is to determine the set points. These will be different in most cases. They will depend on the type of battery and the size of the charger you have. You may want to start with the set points that I use here. In addition to the meter, you will need a variable power supply and a VOM or logic probe.

Moving on to the comparators, turn on the power supply and set it (with the help of the digital voltmeter) to 14.8 volts. Connect the VOM or logic probe to pin 1 of IC 4a and adjust R1 until the voltage of pin 1 changes from high to low. Drop the voltage to 12.0 volts and run it back up to 14.8 volts. Make adjustments to R1 to get the comparator to switch at exactly 14.8 volts. There will be a very distinct switch from high to low at the output switching points. Move the logic probe to pin 2 of IC 4a and repeat the above procedure, this time using the turn on voltage of 12.3 volts. When that is done, a relay connected to the output will close when voltage is down to 12.3 and remain on till the power supply is adjusted up to the turn off point of 14.8 volts. The other two comparators are set for 11.7 for low warning and 12.3 for low warning reset. When that is done, increase the supply voltage to 14.8 and watch what happens when you slowly reduce it. When you reach 12.3 volts, the relay will close. When your reach 11.7 volts, the LED and the sonalert will start to flash and beep. Start to increase the voltage and the beeping will stop when you are at 12.3, and the relay will open at 14.8 volts. This completes the project.

All you have to do now is to connect the controller to the relay and place the whole thing in a proper box. Be sure to wire the 15-pin edge connector correctly. Also be sure you run two wires to the battery; one for the supply and the other for the battery



THE WB8UGE BATTERY TOPPER

sense. Don't cheat here, or you may have trouble later.

The battery charger will play a big role in the final operation. Get one that is big enough to charge the battery(ies) you have. Also don't use a regular car battery, since they are not made to be used in this type of service. Get a "deep cycle" battery.

This little circuit will keep that battery topped up and ready for emergency communications or just plain rag chewing. The bottom line is: "low power is better than no power".

POSTSCRIPT

There may be someone who will have trouble with the set points. This always comes down to the size of the battery and the size of the charger. Common troubles include not staying on long enough to charge the battery all the way, over charging, or the controller "cycling" on and off. First, a 12-volt battery is not 13.8 volts when fully charged, but 12.6 volts. We have to put back more juice than we take out, so the voltage must be higher (14.8). Test the battery with a hydrometer. If the specific gravity is 1.280 (check the specs of your battery's specific gravity) then the battery is fully charged. If the controller shuts of before that point is reached, then increase the turn-off voltage. Likewise, if the battery's specific gravity is reached before the controller shuts down, then reduce the off set-point. If the controller cycles, then the "window" is too tight. Move one or the other set point. You shouldn't have them too close to each other, because of the loading effect of the radio gear on the battery. If I had to move one, it would be the "on" set point.

With a 105-amp, deep-cycle battery you need about a 6-amp charger. A smaller one will do, but it will take longer to do the job. Also the set point will have to be lower as the battery terminal voltage will not rise as much. One the other hand, don't get a 50-amp charger either. It will cause the voltage to rise too fast and not get the battery fully charged. No matter how you do it, experimenting will be required.

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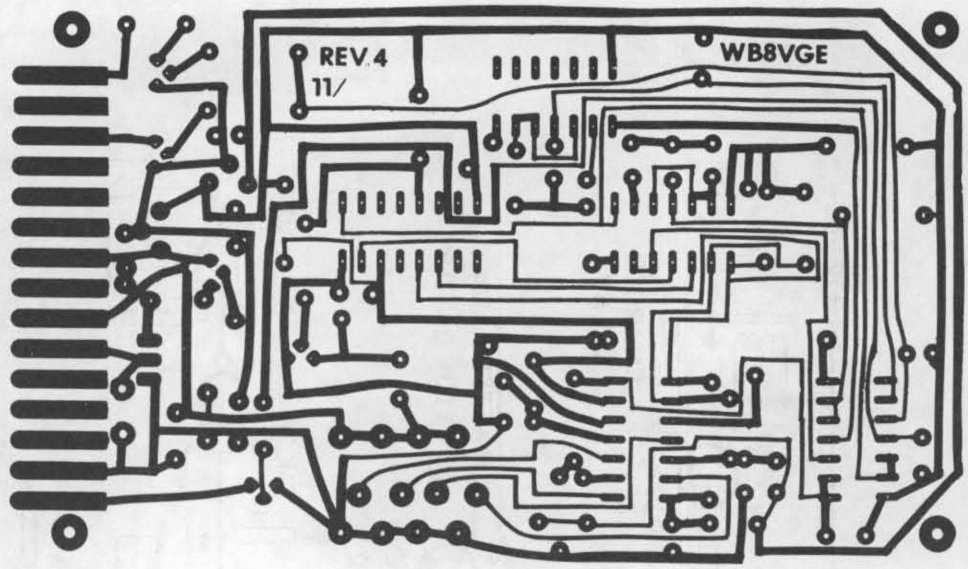
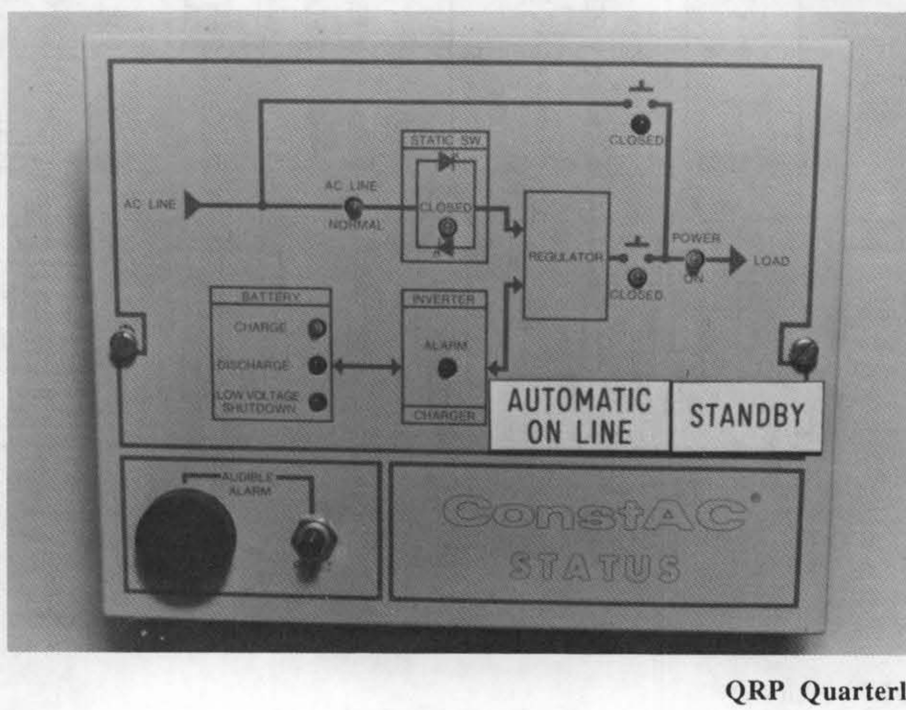
Natural Power

The editor is soliciting articles for the July 1986 *Quarterly* on the use of natural power sources for emergency, portable or normal operation. Send articles and reports by May 1.

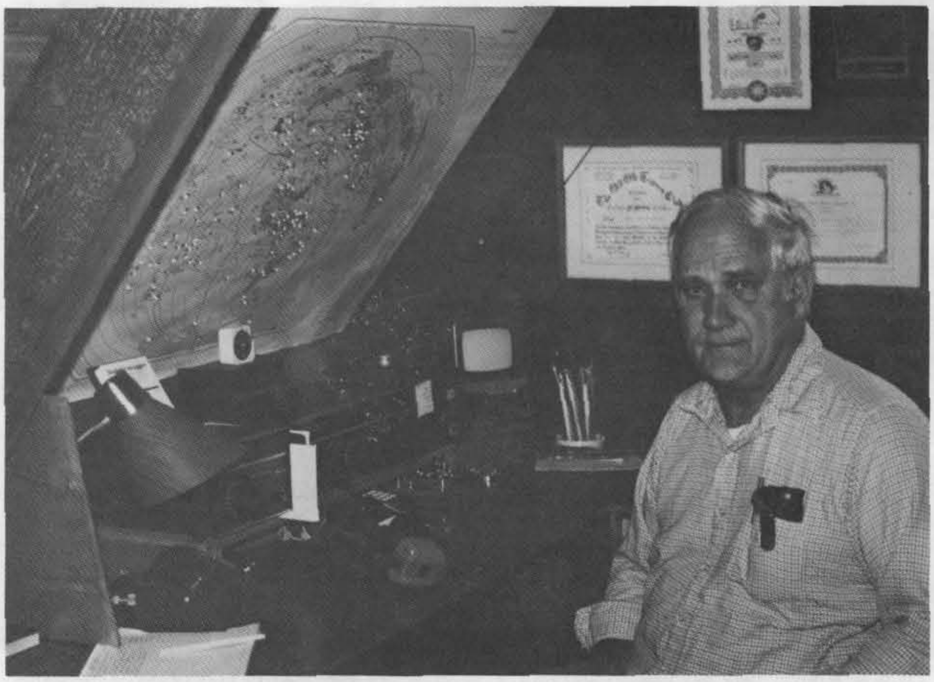




Propagation & DX

conducted by Bob Brown, NM7M
504 Channel View Dr., Anacortes, WA 98221

Elected to the QRP ARCI Board of Directors in the October 1985 elections, Bob Brown, NM7M, shares the ham shack with Mary Lou, NM7N, and writes a monthly newsletter to members of the QRP WSN. Bob taught physics at Berkely before moving to his Anacortes Island QTH. A quad, two phased verticals and a trapped dipole pump his QRP signals at the ionosphere.



One way of starting a discussion of propagation is to paraphrase Mark Twain, *"Everyone talks about propagation, but nobody does anything about it."* Even though your signals may be out of your control as soon as the key is pressed, I hope to convince you that the situation is not hopeless, because by understanding the factors which influence propagation you can use them to aid your QRP work.

Having gotten this far in ham radio, you know that solar *X*-rays and ultraviolet radiation interact with atoms and molecules in the upper atmosphere to produce a region we call the ionosphere, whose level of ionization varies in proportion to solar activity and follows an eleven-year cycle. Long distance propagation of high frequency radio signals changes in step with the strength of the ionosphere's F-layer, being better at times of high sunspot count and very poor at times like the present when low solar activity produces weak ionization.

But there is more to the story: Disturbances of the earth's magnetic field reduce free electron density in the ionosphere, weakening signals and causing signal fading. When ionization is already weak due to low sunspot activity as at present, geomagnetic disturbances have a determining effect on high frequency band conditions.

Knowing this, can we anticipate the quality of propagation on the hf bands? The answer is yes. Of course,future band conditions, like rolling dice, are predictable only within a certain range, but it is neither difficult nor impossible to improve our DX results beyond what ignorance and luck can do. All that is required is to make proper use of readily available solar and magnetic data. So where do we find the data and how can we use them to improve our QRPing?

Starting at 1818 UTC daily and continuing every hour thereafter, WWV broadcasts current measures of solar flux (radio frequency radiation) at 10.7 cm wavelength as well as the K- and A-indices of geomagnetic disturbance. Solar radiation at 10.7 cm, though not causing ionization in the F-region, is highly correlated with the sunspot number and much more easily measured. So with the usual cautions about statistical variation, the 10.7 cm solar flux measure permits us to monitor the extent of ionization in the F-region. Times of high solar flux correspond to better band conditions, times of low solar flux like at present correspend with marginal band conditions.

The geomagnetic K- and A-indices are more complicated to understand, but can be used just as easily for prediction purposes. The WWV K-index, a logarithmic measure of variations in the earth's magnetic field determined every three hours at Boulder, Colorado, gives a coarse measure of short term disturbances. The non logarithmic A-index gives a smoother measure of geomagnetic disturbance averaged over a 24-hour period. Low values of these indices, especially the A-index, mean a quiet ionosphere with little fading thus auguring well for band conditions.

So there we have the main ideas: the best band conditions exist when solar flux is high and the A-index is low, the worst when flux is low and the A-index is high. If we take into account just one more little twist, you will have all you need to get started on your own program for predicting band conditions.

That last twist is solar rotation. The sun rotates about its axis with a period of 27 to 28 earth days. Because of that rotation, active regions on the sun's surface return to face toward the earth every 27 to 28 days, producing recurring patterns of propagation, both good and bad. This becomes our key to anticipating future band conditions.

How do we do it? First we make a running plot of daily solar flux and A-index values,checking them against our experience of band conditions at those times. A scale from zero to 400 will accommodate both measures over their ranges during a complete solar cycle. When you have a little history, you'll see recurring patterns. Then you'll.be ready to predict when to 'go for it' and when to 'hunker down' and let the rig have a rest.

There's one more thing you should do with the data you accumulate, namely make a scatter-plot with solar flux plotted vertically and the A-index horizontally. You'll find that points in the upper-left corner of the scatter plot correspond to good hf band conditions while points to the lower right represent poor conditions. Based on my experience at this QTH, I have faired in a set of curves which divide my scatter-plot into five regions representing different observed band conditions, which I have labeled from +2 (good) to -2 (poor). Either by listening to WWV on a given day or predicting by reference to my running plot of measurements taken 27 and 28 days ago, I can convert the solar flux and A-index values into an estimate of band conditions for any given day.

Right at the moment, when flux is running at its cyclical minimum (measuring from 70 to 85), magnetic activity controlls what we can hear on the bands. As the A-index rises from 2 to 15 or greater, band conditions drop from normal (Ø) to poor (-2). This is characteristic of the very late phase of a solar cycle when there are practically no sunspots. Compare this with the second half of '82 when solar flux ranged from 90 to 310 with an average around 175! Low levels of magnetic activity at that time caused very little trouble because the ionosphere was so strong. Eighty-two was a great year for QRP DXing, very different from the present.

Starting with what I have just explained, you can begin doing something about propagation. In subsequent articles, I will touch on other aspects including sporadic flares, sudden ionospheric disturbances, polar cap absorption, geomagnetic storms, MUF, path analysis, signal strength prediction, and the use of Minimuf and other computer programs. But for now, when the ionosphere is weak and geomagnetic activity is in control of what can be heard on the bands, your attention should be on magnetic conditions and their relation to propagation.

Start listening to WWV and plotting data points, and let me know how it is working out. If you are interested in the way I do it, I can provide you with a copy of the scatter plots and curves I use. For those that are into computing, I also have a 1K BASIC program for WWV data. Simply indicate your choice and send me a business size s.a.s.e. plus a ten-cent stamp to cover copying costs.

QRPers Gather at Visalia

by Bob Spidell, W6SKQ

Coming all the way from England, Chris Page, G4BUE, will be joining local QRPers at the 37th annual DX Convention in Visalia, California, April 18th, 19th and 20th. An informal QRP get-together is scheduled for Saturday evening at the Holiday Inn where Chris and I are staying. All interested parties are invited to drop in from 5 p.m. on to see the latest in G-QRP homebrew creations and to talk QRP DX. Pizza will be called in.

Visalia is about one hour from the Pasadena, Burbank and Fresno airports. Bus service is available. Call me for more information at (805) 945-1292 / 948-9233

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.

AI2T Memory Keyer

by Barry L. Ives, AI2T*

Design Competition First Place Miscellaneous Category

This memory keyer is capable of storing and sending two messages of approximately 100 characters each, loaded by any keyer paddle, at speeds up to 50 WPM. When the keyer is in the STOP mode, the paddle generates dots and dashes in the usual way, and provision is made to drive an external oscillator so that loading the memories and practicing may be done without keying the transmitter. A TUNE switch is included to key the rig for adjustments.

A variable-rate clock oscillator (U7) drives a four-bit, shift-register keyer (U3) which puts out a logic high until loaded with a single bit (dot) or three bits (dash) by the keyer paddle. The resulting low level signal drives the output transistor through an OR gate and/or either of the RAMs (U1, U2), depending on existing logic states. The high on U3 (pin 3) insures an automatic bit space, and pin 10, the LOAD input, causes the shift-register to parallel load whenever the output goes high.

The clock also drives the three cascaded counters when directed by AND gate U8d. When the LOAD #1 button is pressed, all three counters reset to zero, U1 is enabled, and counting begins, cycling the RAM through 1000 bits of memory. When the LOAD #2 button is pressed, a high is loaded into U4 (pin 7) and a low into pin 6, allowing the counter to run and enabling U2 again until U4 (pin 6) goes high. Pressing the STOP button will stop the counters by loading highs into U4 (pin 6 and 7). The RAM logic decodes the signals at pins 6 and 7, enabling the specified RAM and controlling the clock signal to the counters.

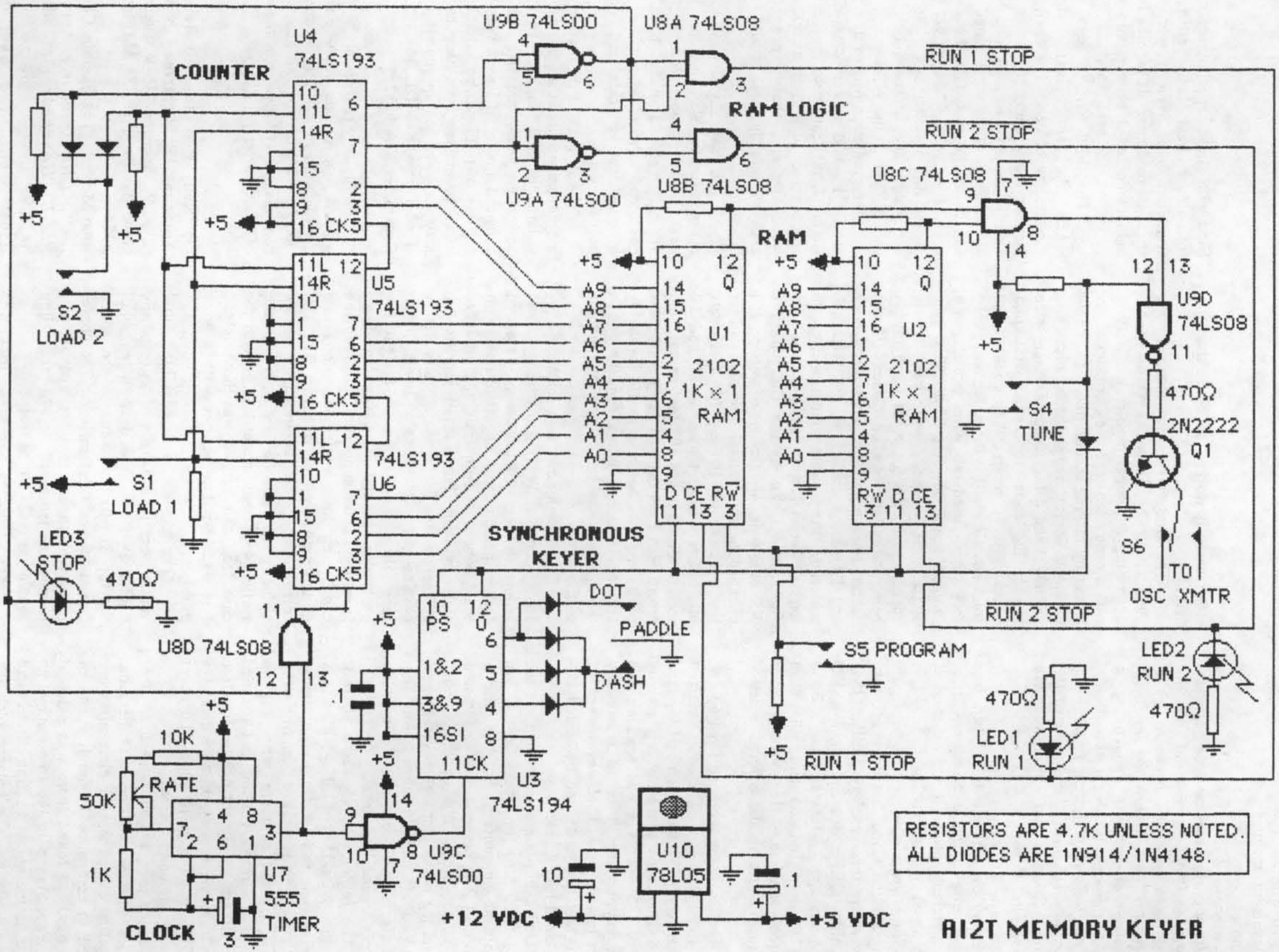
The low-level signal from the keyer (U3) is loaded into the RAM if the PROGRAM switch is closed and the memory is enabled. If the memory is enabled and the PROGRAM switch is open, the low level output of the RAM is directed to the output transistor through a three-input OR gate (U8c. U9d). LEDs in the circuit indicate whether RAM #1, RAM #2, or STOP mode is active. Gate U9c on the clock input of the keyer (U3) ensures that the memory address is stable when the keyer changes states.

I constructed my memory keyer on two sandwiched proto-boards with plated lands using point-to-point wiring and solder. Wire-wrap techniques could also be used. An oscillator board and a 2" speaker are included in the cabinet (Radio Shack 270-252). A source of 12 VDC is assumed, and an on-board regulator supplies the memory keyer with 5 VDC. Inputs and outputs appear on a barrier strip on the back panel, while switches, rate potentiometer and LEDs are located on the front. The PROGRAM switch is also on the back panel to prevent accidental erasures. All parts are readily available at the many mail-order and local parts outlets.

I used this keyer during the Spring 1984 QRP ARCI QSO Contest and netted a score of 9,150 in just two hours with battery power and a milliwatt rig. One RAM was used to send "CQ QRP" and the other to send contest exchange inform-ation. The enclosed photo shows the memory keyer on the right, atop the HW-8

* Rd 7 Box 312, Binghamton, NY 13904

The all homebrew station at AI2T features audio filter, power supply, Accukeyer and the AI2T Memory Keyer seen on the right, atop the HW-8 transceiver. The inspiring picture on top of everything is Barry's YL.


COUNTER
U4
74LS193
U5
74LS193
U6
74LS193
S2
LOAD 2
S1
LOAD 1
LED3
STOP
470Ω
U8D 74LS08
U9B 74LS00
U9A 74LS00
U8A 74LS08
U8B 74LS08
U8C 74LS08
RAM LOGIC
RUN 1 STOP
RUN 2 STOP
RAM
U1
2102
1K x 1
RAM
U2
2102
1K x 1
RAM
U9D
74LS08
470Ω
2N2222
Q1
S4
TUNE
S6
TO
OSC XMTR
SYNCHRONOUS
KEYER
DOT
PADDLE
DASH
U3
74LS194
S5 PROGRAM
LED2
RUN 2
LED1
RUN 1
10K
RATE
50K
1K
U7
555
TIMER
CLOCK
U9C
74LS00
U10
78L05
+12 VDC
+5 VDC
RESISTORS ARE 4.7K UNLESS NOTED.
ALL DIODES ARE 1N914/1N4148.
AI2T MEMORY KEYER

Cut & Try

Antenna Experimenters' Exchange
conducted by Jim Stevens, KK7C

Hanging wire may be your passion , a new idea impelling you out into the weather with rock and twine to try a different sky hook. When you try it, let us know what happens by sending a report to this column . We'll pass it on.

The following letter from Fred Turpin, K6MDJ, tells the origins of the Skelton Cone, and reviews his experiences with it.

"Every once in a while I run into someone else using a Skelton Cone. They invariably praise it and expound at length about it, and justifiably so.

"Some years ago, I tried to figure out the Skelton Cone, but drew a blank. That's where the issue lay until a QSO with fellow QRPer Bob Spidell, W6SKQ three years ago. Bob was using a Cone with 102 foot flat top and 300 ohm twin-lead feeders. He spoke in near reverence about it and offered a set of plans.

"The following weekend I put up one just like Bob's. The fun started immediately. With the same HW-8 and MFJ 941 antenna tuner my log activity doubled. Suddenly I was working just about anyone that I could reasonably expect to hear me. That was the end of my 50 foot high coax and balun fed all-band tuned-trap dipole.

"Our cabin-home is located on the top of 5500 foot Job's peak in the San Bernardino mountains of southern California. The range is heavily forested with sugar pines and cedars. Each antenna leg passed through several trees. I trimmed branches to allow a four foot radial clearance since winter storms whip the trees around like straw.

"The center support was a 50 foot sugar pine with 35 foot foliage diameter, so the antenna had far from an optimum installation, yet it worked just fine. I'm sure it couldn't compare with a good beam, but it really got out and it tuned like a dream, easily taking the full five watts from the Argosy on all bands at a 1:1 SWR band edge to edge. I'd never seen any antenna do that.

"Since then I have built four other versions. The second cone was the same as the first except that the elements were pruned to resonance in the low end of each band. I found there was a lot of stray capacitance in the trees and other objects in the antenna's immediate field at my installation. To balance each leg against the others, I ended up with 46 feet on one side and 50 feet on the other and it took a long time to get there. Frankly, I'm not sure it was worth the effort since it worked no better than the original.

"The third version was inspired by a 1963 article by Kelly & Wallis in *73* describing a conical dipole(1). Starting with a center fed zepp they broadened its tuning by making it look like a TV bow-tie dipole whose wedge-shaped elements, narrow at the center feedpoint and wide toward the ends, represent flattened cones. At 80 meters they couldn't use solid sheet metal for the antenna legs, so they simply used two wires per element, fanning them out at a 20 to 30 degree angle. It worked, and their article appears to be the source of what now is being called the Skelton Cone. (If you cannot find the article, send me a buck and I'll send a packet of the reference material. Any overpayment will go to the Ade Weiss Trophy fund.)

"Since I was having fits with the 300 ohm twin-lead feeders of version 2, I changed to commercial 450 ohm ladder line. I made the flat top 105 feet over-all, but it wouldn't load on 80 and 10 meters till pruned to 103 feet by trial and error. Had I not continued to have feeder problems, this antenna would probably still be in use. When run through a tuner, it was the best receiving antenna of the bunch.

"My fourth cone was influenced by Joe Spencer, W4IDX, whose 1984 article(2) suggested the use of balanced feeders made of two lengths of coax with braid bonded at both ends and grounded at the bottom. For a small sacrifice in efficiency, this feeder system completely eliminated my problems as I was able to tape the coax to a #6 lightning protection ground wire running down from the center support. This feedline can be run down vent pipes, along rain gutters and even be burried. The L/C settings on the antenna tuner are virtually the same as they were with the earlier 450 ohm ladder-line. With the coax feed, this version was the quietest. I recommend it to anyone with a noise problem.

"The present and possibly final version employs 3 pairs of legs and the dual coax feed. The over-all length of the top is 101 feet, due to the added capacitance of the third leg. The center is 40 feet up and legs are tied off at a height of from 10 to 24 feet. Leg separation is 24 to 29 feet.

"This antenna has been trickier to load since several combinations of L an C give a 1:1 swr. For previous versions I left the the inductance settings on the tuner and adjusted the load within the band with slight capacitor adjustments. I found the best L/C settings by a combination of SWR, power, and field-strength readings. It takes a little more inductance but I believe this version is giving me the best reports.

"The third pair of legs seems to make the cone less tolerant of surrounding objects. For example, I can measure the detuning affect when we park a car in the driveway 15 feed below one of the legs. Also, when clouds come in and cover the mountain the detuning is considerable, but I always get out. Last winter after a violent storm the cone was under three feet of snow, but I was still able to QNI on the WSN.

"The radiation pattern as observed at my QTH would appears omni-directional. Before I had trouble to my east, but this antenna does well in all directions. I can work any area that propagation will allow. I get the best results on 80 and 20 meters.

"I can't say anything as to the gain claimed for the Skelton Cone It is not a beam, but it gets out better than anything else I have tried. I am confident it will out-perform dipoles, inverted V's, verticals, and long-wires, hands-down.

"If you wish to try a cone, don't be too concerned about all the angles, separations, and heights. This is basically a non-resonant broad-band balanced dipole. If I were you, I would roll my own, given the variables of your location, and see what happens. You may very well put up your last antenna." (Fred Turpin, K6MDJ, Box 145, Cedarpines, CA 92322)

Field day is coming. What has worked best for you in the past? What do you plan to use for an antenna this time? Write to tell us, Your contribution will appear in the next issue of The Quarterly.

Notes:

(1) Kelly & Wallis, "All Band Conical Antenna,"***73 Magazine*** , Nov. 1963.

(2) J.W. Spencer, "This Antenna Is Too Good To Be True,"***73 Magazine***, Feb. 1984.

John McNeil, "The Skelton Cone Proves Itself," ***QRP Quarterly***, Apr. 1984.

RSGB Handbook, (3rd edition), pp 387-88.

Eddy Shell, "The Skelton Cone Antenna,"***73 Magazine***, Aug. 1969.

G-QRP Sprat, Spring 1984, "Skelton Cone."

Net News

conducted by Danny Gingell, K3TKS

by Jim Holmes, W6RCP

Two club members have recently qualified for the QNI-25 certificate and/or gold seal. WA3PTT/KL7: TCN-20 and W6SIY: WSN-40.

The QRP signals of W1FMR and W3TS have been heard on the west coast, 80 meter CW. W1FMR was calling CQ QRP and W3TS was calling CQ GLN. Two way contact was not established, but we will keep trying.

The meeting time for WSN-80 has been changed to 0400 UTC Saturday, (Friday evening local time). This change has been made to encourage DX check-ins. W5LXS and WA3PTT/KL7 are the record holders at this time.

This will be my last nets report. My thanks to all for the support you have given me. A special thanks and congratulations to the twenty-five QRPers who have earned the QNI-25 award during my term. Speaking of awards, I am being replaced by the QRPer who holds the record: QNI-25 awards for six nets. Danny Gingell, K3TKS will take over as Nets Manager January 1, 1986. Please give Danny your support. 73, W6RCP.

Net Schedule

TCN*	14060	W5LXS	Sunday	2300 UTC
SEN**	7030	K3TKS	Wednesday	0100 UTC
GSN	3560	W5QJM	Thursday	0200 UTC
GLN	3560	KZ9H	Thursday	0200 UTC
WSN-80	3558	NM7M W6RCP	Saturday	0400 UTC
NEN	7040	W1FMR	Saturday	1300 UTC
WSN-40	7040	NM7M W6RCP	Saturday	1700 UTC

*On weeekends of major contests TCN will meet one hour later.
**If conditions on 7030 kHz are poor, QSY to 3535 kHz at 0130 UTC.

First Sunday QSO Party

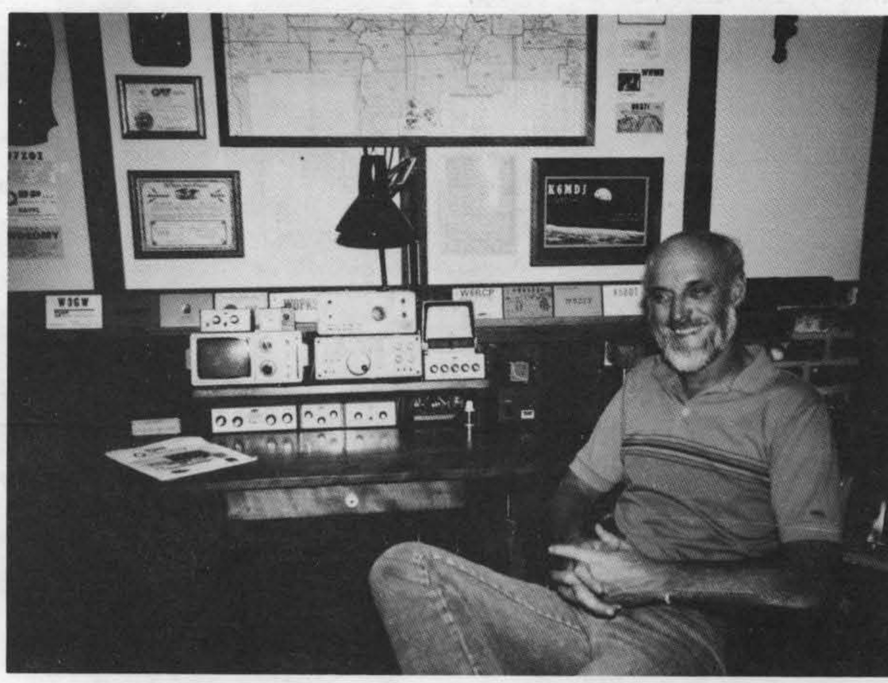
UTC	CW	SSB	NOVICE
14-16 h	14.060	14.285	
16-17 h	21.060	21.385	21.110
17-18 h	28.060	28.885	28.110
18-19 h	7.040*	7.285	7.110
19-20 h	14.060	14.285	
20-21 h	21.060	21.385	21.110
21-22 h	28.060	28.885	28.110
22-23 h	7.040*	7.285	7.110
23-00 h	14.060**	14.285	
00-01 h	7.040*	7.285	7.110
01-03 h	3.560	3.985	3.710

*Many other countries use 7.030. **Transcontinental Net--Join Us!

Activity and Awards

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

Just appointed Awards manager, Fred has been active in the QRP ARCI since 1966. He uses an Argosy and an HW-8 to feed a 6 legged Skelton Cone at his 5500-foot high QTH in the San Bernardino Mountains. First licensed at age 14 in 1953, he has operated from under water as a submarine radioman. The mountains are better.



The QRP ARCI Awards represent significant achievements, often requiring years of patient pursuit and involving many tiny triumphs along the way. I'll be describing the awards and writing about those that achieve them. But I want to hear from you before you reach your goal, as you go along. Companionship along the trail can be as rewarding as the final destination. Write. Tell me what you are working on and how it is progressing. Your experiences will inspire others.

Triple-Crown Patten Tears Lid off Fall Test

The perennial big-gun, Bob Patten, N4BP of Florida, truly stole the show this time, grabbing 48% of all points scored.

Mike Michaels, W3TS, and Chris Brakhage, WB5FKC, battled to decide between a second and a third, respectively, while Mary Lou Brown, NM7N, and Jay Sturdivant, KV7X, slugged away to bring fourth and fifth places to Washington State.

Since Bob Patten, N4BP, took an unchallenged win in both of our 1985 contests, he is hereby declared the winner of the 1985 Triple Crowns of QRP prize. Congratulations, Bob!

Soapbox Comments

Didn't hear a lot of activity up here, but was able to work a few. I like CW Sprints! (WA3PTT/KL7) I put up my first G5RV antenna and was quite amazed at the results! Always enjoy the ARCI contest. (KA9HAO) Poor band conditions. However, when the smoke cleared I had collected 13 new ARCI member QSO's and 12 new states toward 2 watt QRP WAS! (KK6MDJ) Surprised to hear the JA calling me on 40. I usually have to go looking for the DX. (W6RCP) Nice surprise to work Japan, both running 5 watts. (W6SKQ)

Fifteen were dead, 20 poor, and precipitation static on 40 and 80 made me work for each QSO." (KRØU) It's no fun to work the PA QSO party participants just for QSO points--QRP is the real game for me!" K4KJP Lousy propagation to the continental U.S. (KH6CP) Enjoyable, but slow, contest. (N9DHX) Well, at least I got some walls spackled while the contest was on. Very poor conditions. (K3TKS)

This contest was much more fun than the SSB contest. Maybe some consideration should be given to a mixed SSB/CW contest. (W1FMR) No other signals heard. Bad news! (N8CQA) Low sunspot count is beginning to have a big effect. (KN1H) First time I tried milliwatting and it's a real challenge. Would favor a multiplier for non-directional, no-gain antennas and for crystal control! (W5TTE) Conditions fair, some QRN/QSB in El Paso. Contest a pleasure, as usual. QRPers are the best ops! (NK5V)

Better propagation than last year at moments and no propagation at all at other times. Spent daylight hours on a new roof, so was able to operate only during hours of darkness. (KK7C) Not a

1985 Fall QRP CW Contest Results

58 logs received: 27 states, 2 VE provinces, 1DX

A=Bands worked
B=spc's worked
C=Power Multiplier
D=Bonus Multiplier
#=First place score in state, province, country
()=Top five scores, ranked

CALL		SCORE	NAME	RIG	A	B	C	D
				--ALASKA--				
WA3PTT/KL7	#	1,240	Bill	Argosy	3	10	2	1
KL7DG		24	John	Argo 509	1	1	8	1.5
				-ARIZONA--				
WB7APW	#	45,396	Jack	Century 22	3	26	6	1.5
KA9HAO		10,260	Randy	Argo 515	2	9	10	2
				--CALIFORNIA--				
K6MDJ	#	112,344	Fred	Argosy II	4	31	8	1.5
W6RCP		96,390	Jim	Argo	3	45	4	1.5
W6SKQ		65,988	Bob	Argo 515	4	39	6	1
W6SIY		32,368	Keith	TT Delta	3	34	4	1
N6GA		6,440	Cam	?	4	20	2	1
WF6D		2,580	Bill	IC-735	3	15	2	1
WB6AJV		1,344	Bob	HW8	2	7	6	1
W6PRI		220	Bill	?	2	5	2	1
				--COLORADO--				
KRØU		40,590	Tim	HW9	3	22	10	1.5
				--CONNECTICUT--				
W1SOX		21,736	Dave	Century 22	3	26	4	1
				--FLORIDA--				
(1) N4BP	#	2,025,220	Bob	TS-130V	5	109	10	2
K4KJP		90,432	Terry	Omni D	3	36	4	2
W4FRL		70,980	Leo	HW8	2	65	4	1
				--HAWAII--				
KH6CP		8,964	Zack	Argo 515	5	18	6	1
				--ILLINOIS--				
K9EIJ	#	81,648	Norman	Argo	5	28	8	1.5
W90A		22,836	George	Argosy	2	22	6	1
WB9HPV		16,080	David	IC-720	3	15	8	1
KD9NT		3,240	Norman	Argosy	5	15	2	1
				--INDIANA--				
N9DHX		11,088	Russ	Argo 509	3	14	8	1.5
				--IOWA--				
KDØCA		1,710	Jerry	IC-740	2	9	2	1
				--MARYLAND--				
K3TKS		43,232	George	Argo 509	3	28	8	1
				--MASSACHUSETTS--				
W1FMR	#	29,280	Jim	Argosy	5	40	2	1
N1BXC		11,832	Steve	HW8	4	17	6	1

			--MICHIGAN--					
N8CQA	#	114,240	Buck	Argo 515	5	35	8	1.5
WB8UUJ		14,952	Thomas	Argo 509	3	14	8	1.5
K8DD		7,008	Hank	TT Omni	5	12	8	1
K8KIR		375	Lester	Argosy	1	5	2	1.5
			--MISSOURI--					
KCØPP		57,600	Keith	Argo 509	2	16	10	2
			--NEW HAMPSHIRE--					
KN1H		128,240	John	Argo 509	4	28	10	2
			--NEW JERSEY--					
W2JEK		6,968	Donald	HW8	3	13	8	1
			--NEW MEXICO--					
W5TTE	#	76,820	Ed	HW7	2	23	10	2
KU7I		29,850	Dave	TS-130SE	2	25	4	1.5
W5SUV		400	Glen	?	2	5	2	1
			--NEW YORK--					
KA2KGP	#	11,934	Thomas	?	3	27	2	1
W2QYA		2,856	Merl	HW7	2	7	8	1.5
			--NEVADA--					
NJ7M/7		5,040	Chuck	Homebrew	1	7	8	1.5
			--NORTH CAROLINA--					
AA4CO		117,120	Joe	HW9	3	32	10	1.5
			--OREGON--					
N7EZG	#	432	Joe	TS-130	2	3	6	1.5
KA5NLY/7		72	Gene	Argo 515	1	2	4	1.5
			--PENNSYLVANIA--					
(2) W3TS		242,580	Mike	Omni C	6	39	10	2
			--TENNESSEE--					
KV4B		22,644	Richard	Argosy	2	17	8	2
			--TEXAS--					
(3) WB5FKC	#	227,520	Chris	TT Delta	2	36	10	2
NK5V		43,320	J.H.	HW8	3	19	10	1.5
			--UTAH--					
KK7C		13,400	Jim	HW8	3	10	10	2
			--VIRGINIA--					
W4FØA	#	17,820	Tony	Argo 515	3	11	2	1.5
K7HYA		2,788	Richard	TS-13ØV	3	17	2	1
			--WASHINGTON--					
(4) NM7N	#	185,120	Mary Lou	Argosy	3	52	4	2
(5) KV7X		160,650	Jay	IC-730	3	34	10	1.5
WB7SNH		18,972	Dennis	HW8	1	17	8	1.5
NM7M		7,392	Bob	Corsair	3	24	2	1
N7IS		1,008	George	?	3	6	4	1
			--ONTARIO--					
VE3FC		132	Bill	HW8	1	3	4	1
			--SASKATCHEWAN--					
VE5BEL		8,040	Peter	FT-101ZD	2	20	4	2
			--HONDURAS--					
** KD5VD/HR5		16,320	Glen	Atlas 210-X	2	20	4	2

** - QSL via WA7TZE (per call book)

good weekend up against PA QSO party. (K7HYA) Mary Lou, NM7N, had the duty here and I sneaked on the bands when she was asleep. I won't win any prizes. (NM7M) The PA QSO Party really caused a lot of QRM. (VE3EFC) First contest I ever entered. Lot of power line noise and the bands very noisy. (VE5BEL) I enjoyed the CW more than the SSB contest. (KD5VD/HR5)

W3TS Wins Summer Daze

Turnout was light for the 1985 Summer Daze SSB Sprint. The eight logs received complained of poor propagation. Mike Michael, W3TS, of Pennsylvania, took top honors with 8,280 points while Bill Shell, WA6IET, took the second place prize to the West coast with 7,320 points.

Sprint Results

( )=Standings (top 3) #=First place score in state province or country

CALL	NAME	SCORE	RIG
	--ARIZONA--		
(3) KN7N #	R.G.	6,000	TS-520
KA9HAO	Randy	30	Argo 515
	--CALIFORNIA--		
(2) WA6IET #	Bill	7,320	SS-15
W6SIY	Keith	448	TT Delta
	--IOWA--		
WAØVBW	Randy	2,016	Argo 509
	--PENNSYLVANIA--		
(1) W3TS	Mike	8,280	IC-735/502
	--TEXAS--		
WB5FKC #	Chris	4,800	TT Delta
KA5NLY/5	Gene	1,100	Argo 509

Soapbox Comments

Didn't hear much QRP activity, but by calling 'CQ QRP', I managed to work a couple of QRO guys. (KA9HAO) I liked the comments from the DX stations when I told them that I was running QRP. (WA6IET) Worked all QRP stations that I was able to hear (W6SIY).

Twenty was dropping out and 40 & 80 were washouts. Kept checking the bands until 0700Z, then threw in the towel! (WAØVBW) Six hours is too long for a sprint. Maybe the SSB sprints should be on Saturday or Sunday afternoon for 4 hours. (W3TS) You just can't load up a motel balcony without a tuner!! (KA5NLY)

Contesting

conducted by Gene Smith, KA5NLY

Our QRP contest calendar for 1986 is as follows:

Feb 2	Winter Fireside Sprint	SSB
Apr 19-20	Spring CW Contest	CW
May 31	Hootowl Sprint	CW
Aug 9	Summer Daze Sprint	SSB
Aug 16	Novice Sprint	CW
Oct 18-19	Fall CW Contest	CW

As you can see, we are going to CW mode for both of our 24-hour contests. There has not been enough participation on SSB to continue to hold a 24-hour contest in that mode each Spring, but we now have two SSB Sprints scheduled, and we continue to encourage operation in that mode.

I appreciate the feedback in your cards and letters. It helps me to keep our tests and sprints in sync with the needs and desires of participants

I continue to encourage you all to jump into other contests and to keep sending your logs and comments to me for mention in this column. Our presence in those contests does a lot to promote QRP.

Team Sprinting

A year ago, I asked QRPers to try the North American CW Sprint. A few of us gave it a shot and found it to be a great free for all of excitement. A two-QSO QSY rule prohibits big guns from claiming a frequency, and gives a chance for nimble pouncers to work each other, something that doesn't happen easily in the usual contest.

Since the NA Sprint has a ten station team category, a group from the WSN QRP Net, joined by John, KN1H, and Al, KZ9H, formed a team.

It was tremendous to hear them in there slugging in the midst of the QRO melee--QRP against the big guns! Bob, NM7M, came off with 92 QSOs, 43 being on 20 meters, where a quad above salt water gives him extra punch. Bob, W6SKQ, landed 60 QSOs, half on 20m, with a skelton cone. Jim, KK7C, landed 50 on 40m with a 17-foot high wire beam. John, KN1H, contributed 29 QSOs during a lightening storm. When hotdog kilowatts run up only 250 QSOs, the team's performance looks pretty good.

The WSN Net will field another team in the September '86 CW NA Sprint. They say they can beat sox off the rest of us. How about it NEN? GSN? GLN? SEN? Any challengers? Entry and sign up info from Rusty Epps, W6OAT, 948-H Kiely Blvd., Santa Clara, CA 95051.

KV7X Takes Novice Sprint in Close Battle

Jay Sturdivant, KV7X (Washington), racked up 15,075 points to squeak by Fred Turpin, K6MDJ (California), who scored 14,960 points as the two battled it out in the 1985 Novice Sprint. Well ahead of the rest of us, the two exchanged the lead 15 times during the four hours of the sprint.

Although Fred finished ahead in QSOs and spc's, Jay won top spot because his 950 milliwatt station earned a higher power multiplier.

1985 Novice Sprint Results

Bonus: A=Antenna, P=Power, D=Double Whammy, X=None; ( )=Standings; #=High score in state, prov., or country.

Call	Score	Name	Rig	Bonus
		--ARKANSAS--		
KA5NLY	480	Gene	Argo 515	D
		--ARIZONA--		
(4)WB7APW	9,300	Jack	Century 22	D
		--CALIFORNIA--		
(2) K6MDJ #	14,960	Fred	Argosy	D
W6SIY	648	Keith	TT Delta	A
WF6D	126	Bill	IC-735	A
		--HAWAII--		
KH6CP	756	Zack	Argo 515	X
		--IDAHO--		
NJ7M/7	6,080	Chuck	?	D
		--MICHIGAN--		
K8DD	4,000	Henry	HW8/Omni	D
		--UTAH--		
KK7C	310	Jim	FT-707	X
		--WASHINGTON--		
(1) KV7X #	15,075	Jay	IC-730	D
(3) NM7M	9,990	Bob	Corsair	D

Spring Contest

DATES: 1200 UTC Saturday, April 19, 1986 to 2400 UTC Sunday, April 20, 1986. Participants may operate a maxi - mum of 24 hours.

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 5 points, regardless of location. Non-member contact, same continent, 2 points. Each non-member contact, different continent, 4 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, 1 point each, then add up spc points for all bands to arrive at total spc multiplier.

POWER: 4 to 5 watts output x 2; 3 to 4 watts output x 4; 2 to 3 watts output x 6; 1 to 2 watts output x 8; less than 1 watt output x 10; Over 5 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 2. With storage, storage cells must be charged by the natural power source within 48 hours preceeding 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, 28110, 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 1) equals claimed score. Use of the scoring summary sheet will help avoid errors; summary sheets may be obtained by sending a large s.a.s.e. or 2 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 2 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, WØRSP, is sponsoring a special MILLIWATT certificate to the highest scoring station in the less-than-1-watt category, provided there are two or more entries in that category.

DEADLINE: Logs must be received by May 20, 1986. Logs received after that date or lacking information will be used as check logs.

SEND LOGS to QRP ARCI Contest Chairman.

The Great Novice Sprint Duel

(0159 UTC) Knuckles are white as fists grip CW keys. They're in the starting chocks, Jay, KV7X in Bellingham, and Fred, K6MDJ near San Bernardino.

Hot coffee?--Check!
Pencils?--Check!
Log sheets?--Check!
Etc?--Check!

(0200) Two WWV Timecubes go "BEEP". Two sidetones go "DA-DI-DA-DIT-DA-DA-DI-DAH."

(0212) KV7X draws first blood!

(0228) K6DMJ leaps ahead!

(0232) KV7X slithers into lead.

(0237) They meet in QSO: "Just watching Baryshnikov on the VCR. Paused it for wife to answer phone."

"Yeah, I was rotating the tires on my 10-speed...am taking a break."

"...Well,...see ya' round."

(0345) An hour of fighting, scratching. The lead goes to Fred.

(0349) Jay snatches it back!

(0357) Fred lashes out!

(0423) Jay counterpunches!

(0503) See!

(0504) Saw!

(0513) See!

(0516) Saw!

(0526) Fred throws a blow!

(0531) Jay counterpunches!

(0544) Fred parries and sneaks ahead!

(0552) Jay outsneaks the sneaker!

(0600) Two WWV Timecubes BEEP. Two sidetones go silent.

POSTSCRIPT: KV7X took it 15,075 to 14,960, less than one QSO difference in score! Are you ready for next time?

[As he tallied and compared the contest logs submitted by Jay and Fred, Gene Smith imagined this duel between the top scoring WSN buddies. We thank Jay and Fred for their permission to print the story. Let's *all* join the party next time, so Gene can have more of these late night adventures. - Ed.]

Idea Exchange

QRPers are experimenters, probing the limits of what can be accomplished with intelligence and skill using limited resources. The *ideas* you share are the life blood of *The Quarterly*. Write to tell us what *you* are working on and how it's coming along. Use the Idea Exchange to pass on tricks, techniques, speculations. hypotheses, queries, shortcuts.

Our thanks to Mike Michaels, W3TS, for the following contribution that will help many of us. --Jim Stevens, KK7C.

Inductors Made Easy

by Mike Michaels, W3TS*

Radio Shack's 10 uH radio frequency chokes have been used for a number of years in QRP construction. They are readily available, cheap and easily modified.

This chart shows how you can quickly make precise custom inductances by unwinding turns from the choke as sold.

Inductance Chart
Radio Shack 10 uh RFC*

Turns Removed	273-101 Old Style (31t) LuH	Q	273-101A New Style (21t) LuH	Q
1	9.7	100-105	9.7	121
2	9.1		8.9	126
3	8.8		8.1	127
4	8.4		7.4	133
5	7.8		6.7	132
6	7.4		6.0	136
7	7		6.3	144
8	6.5		4.7	143
9	6		4.1	145
10	5.6		3.5	147
11	5.2		3.0	147
12	4.8		2.5	150
13	4.4		2.0	155
14	4		1.6	149
15	3.6		1.2	**18
16	3.3		0.9	**14
17	2.9		0.7	**10
19	2.3		0.2	**8
20	1.9		0.1	**3
21	1.7			
22	1.4			
23	1.2			
24	0.9			
25	0.75			
26	0.53			
27	0.38			
28	0.24			
29	0.15			
30	0.06			

*Q at 5 MHz except **Q at 50 KHz

*Rd 1Box 144, Loyalton, Lykens, PA 17048

Membership

The initial QRP ARCI membership fee of $6 ($7 for DX) covers lifetime membership plus the first four issues of *The Quarterly*. A membership and renewal form is found on the inside of *The Quarterly*'s mailing cover.

Subscription Renewal

Subscription renewals are $5 ($6 for DX) for four issues. The subscription renewal date appears on the mailing label following the QRP membership number, i.e. 4174-3/86, means that member number 4174's subscription will expire with the 3rd *Quarterly* (July) in 1986. Renewal and new member applications must be received by the 1st of the month prior to the next month's publication to receive that issue, otherwise service will not begin until publication of the next *Quarterly*.

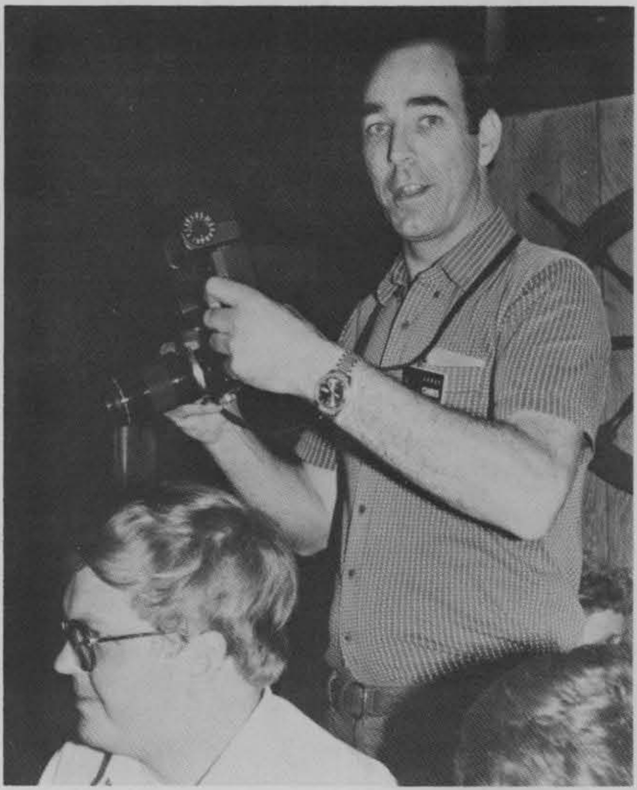
Technical Articles Wanted

Send technical articles to the general editor via modem or by mail typed double-spaced. Use abbreviations on the mailing cover of January '86 *Quarterly*. For construction articles include a complete list of parts and values. To reduce errors draw circuit diagrams well enough that they can be reproduced as is, then double check them before mailing. Include photos. Club and editorial staff are not responsible for testing projects.

Information for Writers

Articles on all aspects of low power communications theory and practice, homebrew construction projects, equipment modifications, antenna experiments, operating experiences, presentations on QRP for local clubs, announcements and letters to the editor are welcome. Black and white photos of your station, etc., are preferred. Send contributions to the appropriate column editors or to the general editor via modem or by mail typed double spaced. The editor reserves the right to select and edit material to space limitations. Press dates are March 5, May 15, September 1 and November 1. Material received less than four weeks before press date is difficult to include. Please include name, call, address and telephone number on all correspondence and material submitted for publication. Enclose s.a.s.e. if you wish material to be returned. Also include s.a.s.e. when requesting reply from officers or authors.

Joe Sullivan, WA1WLU, Dave Cornell, WB2UXI, at breakfast with Bob, KB2IM.



Chris Page, G4BUE, taking shots for *Sprat*, Mike, WB8VGE, in foreground.

Brice Andersen, W9PNE, counts the green while Jim Stevens, KK7C, and Red Reynolds, K5VOL, plan the next field day.

QRP Dayton '85 QRP Dayton '86

No group of hams got more out of gathering at Dayton Hamvention last year than the QRPers. As much as we can accomplish with QRP, it is difficult to maintain schedules with low power and more difficult to rag chew and trade experiences on the air. Our desire to communicate with each other builds up to the point that it explodes into exchange and interaction when we get together face to face. That's what happened at Dayton last April. Those who were there don't want to miss the chance to do it again.

Bob, KB2IM, Jim Fitton, W1FMR, John Collins, KN1H, Mike Bryce, WB8VGE, and YL at QRP banquet.

High fives for QRP-Dayton from Al Cox, KZ9H, and YL.

QRP Quarterly Abbreviations List

These are the abbreviations used in *The Quarterly*. Use them when writing to the editor or preparing material for publication.

a — atto (prefix for 10^{-18})
A — ampere (unit of electrical current)
ac — alternating current
ACC — Affiliated Club Coordinator
ACSB® — Amplitude Compandored Single Sideband
A/D — analog-to-digital
AF — audio frequency
AFC — automatic frequency control
AFSK — audio frequency-shift keying
AGC — automatic gain control
Ah — ampere hour
AIRS — ARRL Interference Reporting System
ALC — automatic level control
AM — amplitude modulation
AMTOR — Amateur Teleprinting Over Radio
ANT — antenna
ARA — Amateur Radio Association
ARC — Amateur Radio Club
ARES — Amateur Radio Emergency Service
ARQ — automatic repeat request
ARS — Amateur Radio Society (Station)
ASCII — American National Standard Code for Information Interchange
ASSC — Amateur Satellite Service Council
ATV — amateur television
AVC — automatic volume control
AWG — American wire gauge
az-el — azimuth-elevation

B — bel
balun — balanced to unbalanced (transformer)
BC — broadcast
BCD — binary-coded decimal
BCI — broadcast interference
Bd — baud (bit/s in single-channel binary data transmission)
BER — bit error rate
BFO — beat-frequency oscillator
bit — binary digit
bit/s — bits per second
BM — Bulletin Manager
BPF — band-pass filter
BPL — Brass Pounders League
BT — battery
BW — bandwidth

c — centi (prefix for 10^{-2})
C — coulomb (quantity of electric charge); capacitor
CAC — Contest Advisory Committee
CATVI — cable-television interference
CB — Citizens Band (radio)
CBMS — computer-based message system
CCTV — closed-circuit television
CCW — coherent CW
ccw — counterclockwise
CD — Communications Department (ARRL Hq.); civil defense
cm — centimeter
CMOS — complementary-symmetry metal-oxide semiconductor
coax — coaxial cable
COR — carrier-operated relay
CP — code proficiency (award)
CPU — central processing unit
CRT — cathode-ray tube
CT — center tap
CTCSS — continuous tone-coded squelch system
cw — clockwise
CW — continuous wave

d — deci (prefix for 10^{-1})
D — diode
da — deka (prefix for 10)
D/A — digital-to-analog
DAC — digital-to-analog converter
dB — decibel (0.1 bel)
dBi — decibels above (or below) isotropic antenna
dBm — decibels above (or below) 1 milliwatt
DBM — doubly balanced mixer
dBV — decibels above/below 1 V (in video, relative to 1 V P-P)
dBW — decibels above/below watt
dc — direct current
D-C — direct conversion
DEC — District Emergency Coordinator
deg — degree
DET — detector
DF — direction finding; direction finder
DIP — dual in-line package
DPDT — double-pole double-throw (switch)
DPSK — differential phase-shift keying
DPST — double-pole single-throw (switch)
DS — direct sequence (spread spectrum)
DSB — double sideband
DTMF — dual-tone, multifrequency
DVM — digital voltmeter
DX — long distance; duplex
DXAC — DX Advisory Committee
DXCC — DX Century Club

E — voltage
EC — Emergency Coordinator
ECAC — Emergency Communications Advisory Committee
ECL — emitter-coupled logic
EHF — extremely high frequency (30-300 GHz)
EIRP — effective isotropic radiated power
ELF — extremely low frequency
EMC — electromagnetic compatibility
EME — earth-moon-earth (moonbounce)
EMF — electromotive force
EMI — electromagnetic interference
EMP — electromagnetic pulse
EPROM — erasable programmable read-only memory

f — femto (prefix for 10^{-15}); frequency
F — farad (capacitance unit); fuse
FAX — facsimile
FD — Field Day
FET — field-effect transistor
FL — filter
FM — frequency modulation
FSK — frequency-shift keying
ft — foot (unit of length)

g — gram (unit of mass)
G — giga (prefix for 10^9)
GaAs — gallium arsenide
GDO — grid- or gate-dip oscillator
GHz — gigahertz
GND — ground

h — hecto (prefix for 10^2)
H — henry (unit of inductance)
HF — high frequency (3-30 MHz)
HFO — high-frequency oscillator
HPF — highest probable frequency; high-pass filter
Hz — hertz (unit of frequency)

I — current, indicating lamp
IC — integrated circuit
ID — identification; inside diameter
IF — intermediate frequency
IMD — intermodulation distortion
in — inch (unit of length)
in/s — inch per second (unit of velocity)
I/O — input/output
IRC — international reply coupon
ITF — Interference Task Force

j — operator for complex notation, as for reactive component of an impedance (+j inductive; −j capacitive)
J — joule (kg m^2/s^2) (energy or work unit); jack
JFET — junction field-effect transistor

k — kilo (prefix for 10^3); Boltzmann's constant (1.38×10^{-23} J/K)
K — Kelvin (used without degree symbol) (absolute temperature scale)
kBd — 1000 bauds
kbit — 1024 bits
kbit/s — 1000 bits per second
kbyte — 1024 bytes
kg — kilogram
kHz — kilohertz
km — kilometer
kV — kilovolt
kW — kilowatt
kΩ — kilohm

l — liter (liquid volume)
L — lambert; inductance
lb — pound (force unit)
LC — inductance-capacitance
LCD — liquid crystal display
LED — light-emitting diode
LF — low frequency (30-300 kHz)
LHC — left-hand circular (polarization)
LO — local oscillator; League Official
LP — log periodic
LS — loudspeaker
LSB — lower sideband
LSI — large-scale integration

m — meter; milli (prefix for 10^{-3})
M — mega (prefix for 10^6)
mA — milliampere
mAh — milliamperehour
MDS — Multipoint Distribution Service; minimum discernible (or detectable) signal
MF — medium frequency (300-3000 kHz)
mH — millihenry
mho — mho (use siemens)
MHz — megahertz
mi — mile, statute (unit of length)
mi/h — mile per hour
mi/s — mile per second
mic — microphone
min — minute (time)
MIX — mixer
mm — millimeter
MOD — modulator
modem — modulator/demodulator
MOS — metal-oxide semiconductor
MOSFET — metal-oxide-semiconductor field-effect transistor

ms — millisecond
m/s — meters per second
MSI — medium-scale integration
MUF — maximum usable frequency
mV — millivolt
mW — milliwatt
MΩ — megohm

n — nano (prefix for 10^{-9})
NBFM — narrow-band frequency modulation
NC — no connection; normally closed
NCS — net-control station; National Communications System
nF — nanofarad
NF — noise figure
nH — nanohenry
NiCd — nickel cadmium
NM — Net Manager
NMOS — N-channel metal-oxide silicon
NO — normally open
NPN — negative-positive-negative (transistor)
NR — Novice Roundup (contest)
ns — nanosecond
NTS — National Traffic System

OBS — Official Bulletin Station
OD — outside diameter
OES — Official Emergency Station
OO — Official Observer
op amp — operational amplifier
ORS — Official Relay Station
OSC — oscillator (schematic diagram abbrev.)
OTC — Old Timer's Club
OTS — Official Traffic Station
oz — ounce (force unit, 1/16 pound)

p — pico (prefix for 10^{-12})
P — power; plug
PA — power amplifier
PAM — pulse-amplitude modulation
PC — printed circuit
PEP — peak envelope power
PEV — peak envelope voltage
pF — picofarad
pH — picohenry
PIA — Public Information Assistant
PIN — positive-intrinsic-negative (transistor)
PIO — Public Information Officer
PIV — peak inverse voltage
PLL — phase-locked loop
PM — phase modulation
PMOS — P-channel (type) metal-oxide semiconductor
PNP — positive-negative-positive (transistor)
pot — potentiometer
P-P — peak to peak
ppd — postpaid
PRAC — Public Relations Advisory Committee
PROM — programmable read-only memory
PSHR — Public Service Honor Roll
PTO — permeability-tuned oscillator
PTT — push to talk

Q — figure of merit (tuned circuit); transistor
QRP — low power (less than 5-W output)

R — resistor (schematic diagram abbrev.)
RACES — Radio Amateur Civil Emergency Service
RAM — random-access memory
RC — resistance-capacitance
R/C — radio control
RCC — Rag Chewers' Club
RF — radio frequency
RFC — radio-frequency choke
RFI — radio-frequency interference
RHC — right-hand circular (polarization)
RIT — receiver incremental tuning
RLC — resistance-inductance-capacitance
RM — rule making (number assigned to petition)
r/min — revolution per minute
RMS — root mean square
ROM — read-only memory
r/s — revolution per second
RST — readability-strength-tone
RTTY — radioteletype
RX — receiver, receiving

s — second (time)
S — siemens (unit of conductance); switch
s.a.s.e. — self-addressed stamped envelope
SEC — Section Emergency Coordinator
SET — Simulated Emergency Test
SGL — State Government Liaison
SHF — super-high frequency (3-30 GHz)
SM — Section Manager; silver mica (capacitor)
S/N — signal-to-noise (ratio)
SPDT — single-pole double-throw (switch)
SPST — single-pole single-throw (switch)
SS — Sweepstakes; spread spectrum
SSB — single sideband
SSC — Special Service Club
SSI — small-scale integration
SSTV — slow-scan television
STM — Section Traffic Manager
SX — simplex
sync — synchronous, synchronizing
SWL — shortwave listener
SWR — standing-wave ratio

T — tera (prefix for 10^{12}); transformer (schematic diagram abbrev.)
TA — Technical Advisor
TC — Technical Coordinator
TCC — Transcontinental Corps
TD — Technical Department (ARRL Hq.)
tfc — traffic
TR — transmit-receive
TTL — transistor-transistor logic
TTY — teletypewriter
TV — television
TVI — television interference
TX — transmitter, transmitting

U — integrated circuit
UHF — ultra-high frequency (300 MHz to 3 GHz)
USB — upper sideband
UTC — Coordinated Universal Time
UV — ultraviolet

V — volt; vacuum tube (schematic diagram abbrev.)
VCO — voltage-controlled oscillator
VCR — video cassette recorder
VDT — video-display terminal
VFO — variable-frequency oscillator
VHF — very-high frequency (30-300 MHz)
VLF — very-low frequency (3-30 kHz)
VLSI — very-large-scale integration
VMOS — vertical metal-oxide semiconductor
VOM — volt-ohm meter
VOX — voice-operated switch
VR — voltage regulator
VRAC — VHF Repeater Advisory Committee
VSWR — voltage standing-wave ratio
VTVM — vacuum-tube voltmeter
VUAC — VHF/UHF Advisory Committee
VUCC — VHF/UHF Century Club
VXO — variable crystal oscillator

W — watt (kg $m^2s/3$, unit of power)
WAC — Worked All Continents
WARC — World Administrative Radio Conference
WAS — Worked All States
WBFM — wide-band frequency modulation
Wh — watthour
WPM — words per minute
WVDC — working voltage, direct current

X — reactance
XCVR — transceiver
XFMR — transformer
XO — crystal oscillator
XTAL — crystal
XVTR — transverter

Y — crystal (schematic diagram abbrev.)
YIG — yttrium iron garnet

Z — impedance; see UTC

5BDXCC — Five-Band DXCC
5BWAC — Five-Band WAC
5BWAS — Five-Band WAS
6BWAC — Six-Band WAC

° — degree (plane angle)
°C — degree Celsius (temperature)
°F — degree Fahrenheit (temperature)
α — (alpha) angles; coefficients, attenuation constant, absorption factor, area, common-base forward current-transfer ration of a bipolar transistor
β — (beta) angles, coefficients, phase constant current gain of common-emitter transistor amplifiers
γ — (gamma) specific gravity, angles, electrical conductivity, propagation constant
Γ — (gamma) complex propagation constant
δ — (delta) increment or decrement, density angles
Δ — (delta) increment or decrement determinant, permittivity
ϵ — (epsilon) dielectric constant, permittivity, base of natural logarithms (2.71828), electric intensity
ζ — (zeta) coordinates, coefficients
η — (eta) intrinsic impedance, efficiency, surface charge density, hysteresis, coordinate
θ — (theta) angular phase displacement, time constant, reluctance, angles
ι — (iota) unit vector
κ — (kappa) susceptibility, coupling coefficient
λ — (lambda) wavelength, attenuation constant
Λ — (lambda) permeance
μ — (mu) permeability, amplification factor, micro (prefix for 10^{-6})
μC — microcomputer
μF — microfarad
μH — microhenry
μP — microprocessor
ζ — (xi) coordinates
π — (pi) 3.14159
ρ — (rho) resistivity, volume charge density, coordinates
σ — (sigma) surface charge density, complex propagation constant, electrical conductivity, leakage coefficient, deviation
Σ — (sigma) summation
τ — (tau) time constant, volume resistivity, time-phase displacement, transmission factor, density
ϕ — (phi) magnetic flux, angles
Φ — (phi) summation
χ — (chi) electric susceptibility, angles
ψ (psi) dielectric flux, phase difference, coordinates, angles
ω — (omega) angular velocity $2\pi f$
Ω — (omega) resistance in ohms, solid angle

Calendar of QRP Events

Month	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
February		SEN	GSN,GLN		WSN80	1 WSN40,NEN	2 QRP QSO Party TCN
	3	4 SEN	5 GSN,GLN	6	7 WSN80	8 WSN40,NEN	9 TCN
	10	11 SEN	12 GSN,GLN	13	14 WSN80	15 ARRL CW DX* WSN40,NEN	16 TCN
	17	18 SEN	19 GSN,GLN	20	21 WSN80	22 WSN40,NEN	23 TCN
	24	25 SEN	26 GSN,GLN	27	28 WSN80	1 ARRL SSB DX* WSN40,NEN	2 QRP QSO Party TCN
March	3	4 SEN	5 GSN,GLN	6	7 WSN80	8 WSN40,NEN	9 TCN
	10	11 SEN	12 GSN,GLN	13	14 WSN80	15 WSN40,NEN	16 TCN
	17	18 SEN	19 GSN,GLN	20	21 WSN80	22 WSN40,NEN	23 TCN
	24	25 SEN	26 GSN,GLN	27	28 WSN80	29 WPX SSB* WSN40,NEN	30 TCN
	31	1 SEN	2 GSN,GLN	3	4 WSN80	5 WSN40,NEN	6 QRP QSO Party TCN
April	7	8 SEN	9 GSN,GLN	10	11 WSN80	12 WSN40,NEN	13 TCN
	14	15 SEN	16 GSN,GLN	17	18 WSN80	19 Spring QRP CW Test WSN40,NEN	20 RSGB* Spring QRP CW Test TCN
	21	22 SEN	24 GSN,GLN	25	26 QRP at Dayton Hamvention WSN80	27 QRP at Dayton Hamvention WSN40,NEN	28 QRP at Dayton Hamvention TCN
	29	30 SEN	1 AGCW CW* GSN,GLN		WSN80	WSN40,NEN	TCN

Note: Net dates North American local time; * = Major Contest with QRP section.

Protective Cover

QRP Quarterly

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January 1986 Volume XXIV Number 1

Technical

Features

Operating

QRP Quarterly
2996 Cherokee Lane

BULK RATE
U.S. POSTAGE