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# The Five-Watt QRP Movement in the US, 1968-1981

by

**Adrian Weiss W0RSP  
(ex-K8EEG)**

author of

**Joy of QRP: Strategy for Success  
History of QRP in the US, 1924-60  
Ionospheric Propagation, Transmission Lines, and  
Antennas for the QRP DX'r  
*The Milliwatt: National Journal of QRP***

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*Dedicated to Key Contributors to the Growth of 5-Watt QRP*

**Doug DeMaw W1CER/W1FB (SK)**

*Technical Editor, QST*; many QRP articles/projects in **QST** and **THE MILLIWATT**.

**Alan Dorhoffer K2EEK (SK)**

*Editor, CQ MAGAZINE*; created the **QRP Column** in **CQ** (November, 1973); initiated **QRP** sections in the **CQ WW DX CONTEST** and **CQ WW WPX CONTEST**; his lead was followed by the **ARRL** in all of its contests.

**Albert Kahn K4FW (SK), Jack Burchfield K4DCD/K4JU**

*Co-Founders* of **Ten-Tec** and the ground-breaking QRP transceiver **Argonaut 505**, followed by the 509 and then the 515. Over 10,000 units were produced and on the air. **MILLIWATT** contributors: advertising support and advance information on the Argonaut 505 for the December, 1970, issue review.

**Fred Bonavita W5QJM (SK)**

“**QRP**” columnist in **WORLDRADIO** magazine; active in the 5-watt QRP **ARCI** in various capacities; editor/creator of *The Hotwater Handbook* (HW-7, HW-8 mods).

**Marty Jue, MFJ Enterprises**

**MILLIWATT** advertising support and QRP product development.

**Ron Moorefield W8ILC**

**MILLIWATT DXCC 300 #1 S.S.B.** Planning Committee initiator of the **QRP FORUM** at the Dayton Hamvention.

**Wes Hayward W7ZOI**

Seminal articles on solid-state design and many QRP projects in **QST** and **THE MILLIWATT**. Co-author with DeMaw of **Solid-State Design for the Radio Amateur** (1977).

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and to the many QRP'rs mentioned in this history (and the even many more left unmentioned because of space) who encouraged the growth of the 5-watt QRP movement by contributing to **THE MILLIWATT**, **CQ**, **QST**, **HAM RADIO**, **73**, **SPRAT**, **THE FIVE-WATTER**, the Australian **EEB** (Electronic Experimenters Bulletin), the **Pacific Amateur Radio Guild (PARG)** newsletter, and the **QRP QUARTERLY** in the later part of the decade; and also those who **ELMER**'ed other hams in QRO clubs, thus spreading the interest in QRP.



**The Author W0RSP (then K8EEG/0) at his operating position.**



The SP600JX-21 receiver (bought at the auction of the National Radio lab in Medford, MA, in 1972 and carried down three flights of stairs and across the parking lot) is at the right on the desk. The main tuning knob has had a 6-inch dial plate on a 6:1 vernier attached to the tuning capacitors (article in **CQ**). A white-front 20 meter transmitter he designed sits on the left top, and the Breune SWR Bridge/ Wattmeter on the right top of the SP600JX-21. The speaker grill is at the rear of the receiver. The 160 meter transmitter (black with white semicircular dial plate – see text) is atop the left end of the speaker, and on it another SWR/Wattmeter. Note the classic mike. Behind the mike is the silver-plated bug sitting in front of the DeMaw 80-10 D.C. receiver (see text) which is in the bottom of a box with a single middle shelf, on which is the 80-15 meter transmitter featured in **HAM RADIO** (see text). The “Viking-5” figurine can barely be distinguished on the top. The adjustable power supply with meter (described in the June 1973 **MILLIWATT**) can be seen (partially obscured by coffee cup) to the left of the mike head. The HP-410-B VTVM is above the author left elbow. The typewriter is to the left of the VTVM but not in the picture. **MILLIWATTS** and **CQ**'s on the desk behind the author's left shoulder. Hey, the picture is 40 years old and fuzzy, but zoom to 200% and a lot more detail pops out.

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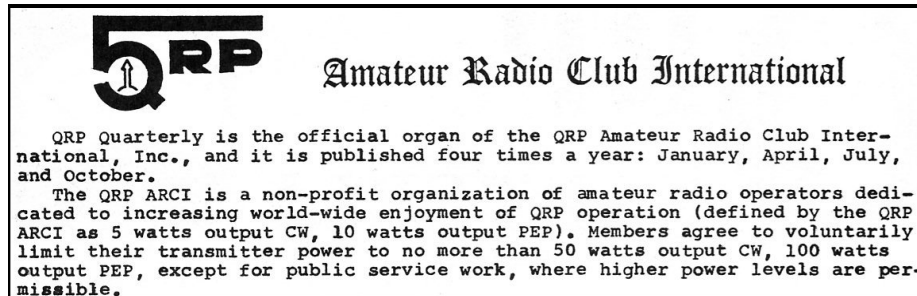
by

**Adrian Weiss W0RSP (ex-K8EEG)**

*(Parts of the following text were delivered as the 1998 **FDIM** Banquet speech and, at the behest of **QQ** Editor Ron NU7Y, printed in a different version in the **QRP QUARTERLY** [July, 1998, 40]. In jest(?), G3RJV referred to it as “A Nordic Saga”, presumably because of the length of the speech. The text quotes historical correspondence between Mike Czuhajewski WA8MCQ and Adrian Weiss K8EEG/0 (W0RSP), so the author of each quotation is identified with a speech prefix.)*

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## QRP ARCI Club History 1968-1981

by

**Mike Czuhajewski WA8MCQ and Adrian Weiss K8EEG/W0RSP**

(sections by each author will begin with their respective calls.)

(Parts of the following text were delivered as the 1998 FDIM Banquet speech and, at the behest of **QQ Editor Ron NU7Y**, printed in a different version in the **QRP QUARTERLY** [July, 1998, p. 40]. In jest(?), G3RJV referred to it as “A Nordic Saga”, presumably because of the length.)

### Part 1. K6JSS and the 100-watt Club

**Mike WA8MCQ.** In private mail recently [around 1993], I received the following query: “...Your comments that the QRP ARCI started in 1961 as a group of amateurs volunteering to run 100 watts input or less caught my interest. Being new to modern QRP activities I have not yet figured out too much about the QRP ARCI and G-QRP groups. I was, however, a member of a QRP Amateur Radio Club in 1961 that started with James R. Perry, K4WVX (in Florida if my memory is correct). I was member #51 of that group. Is the QRP ARCI the same group?”

I'll answer this publicly (**QRP-L**) since others might be interested in a bit of QRP history. Yes, it's the same club in some ways, but it's now a “QRP” club. It was originally started up by the late Harry Blomquist, K6JSS, with the idea of voluntarily limiting power to 100 watts to reduce QRM on the bands and make ham radio more enjoyable. (Hams used input power in those days, not output like we do now.) The name then, as now, was QRP Amateur Radio Club International. The goals were laudable, although it was not what we'd consider a QRP club nowadays. Don't forget that the term “QRP” actually refers to a reduction of power, not a specific power level, although common usage of the term now usually refers to power levels of 5 watts and below. The name and goals of the club were in harmony with the definition of the term as a reduction of power.

**Ade W0RSP.** The original 100-watt QRP ARCI Club grew out of a letter in the August 1961 issue of **QST**. Harry Blomquist K6JSS wrote, in part:

“I admire those with a kw. final, but I don't need nor want one. It should be readily apparent to all of us that now is the time to cease interfering with one another through high power and also to cease alienating our fellow hams in other countries

(limited to a lot less power) through our "brute force" tactics. Anyone interested in joining up with me building up a QRP Communications Club, to prove the point? - Harry F. Blomquist, K6JSS, Saratoga, Calif."

A response from a self-proclaimed California Kilowatt WA6TKT countered with the "reliability" argument in the December 1961 issue. It seems fair to say that many hams agreed with him when he said:

"If anything, more reliable communications could be obtained by increasing, not decreasing, present power levels, not only because an increase would mean higher signal strengths, but also because the present QRP operators would be less tempted to use an already occupied channel where they should not be trying to operate anyway. Gary B. Jordan, WA6TKT, Downey, CA."

Bear in mind that K6JSS defined QRP as 100 watts, not 5 watts. Just imagine, for a moment, how you would have felt when reading K6JSS's letter and trying to figure out just where you belonged if "QRP" meant 100 watts and you were running a 6L6 transmitter! And then being told by WA6TKT that even 100-watters don't belong on the air if a KW decides to plop down on a frequency?

K6JSS's first newsletter of Sept. 1961 entitled **QRP NEWS** listed 25 charter members, including Mac McCullough W4VNE, Joe Szempias W8JKB, and Sandy Wagner K6TBW, soon to be joined by L.B. Cebik W4RNL (SK), QRP'rs who would later make a big difference in our club. The total focus of the club was on the reduction of QRM by voluntarily running no more than 100-watts input, *unless you wanted to*, in which case you could join up as an *Associate Member*.

This was the fatal flaw in K6JSS's conception of a QRP Club. His definition of QRP at 100 watts called for US hams to operate at the maximum power level allowed by the vast majority of IARU countries. And a majority of US hams operated at that level or below anyhow -- most commercially available transmitters like the ubiquitous Heath AT-1, DX-20, DX-60 kits, the Globe Scout, the Viking Ranger and Adventurer or the Heath DX100 were within his definition of QRP. Generally, one needed a Leo Meyersen Globe Champion 300 or a linear amplifier to push the power beyond 100 watts. And as I've shown in **HISTORY OF QRP in the US, 1924-60**, in choosing the 100-watt limit, K6JSS rejected a foundation concept of QRP as 5 watts that had been accepted since the beginning of the vacuum tube era in the early 1920's and encouraged by the ARRL staff through articles and activities featured in **QST**. He simply did not know the history of amateur radio. For a club to generate enthusiasm and group-identity, its boundaries must clearly differentiate its purpose and its members from the rest of the world. The 100-watt limit did not do that in any significant way except in regard to 1960's equivalents of Hatry's "ether-burners" and "watt-hogs" of the 1920's and 1930's.

The club had sown the seeds of its own destruction in the 100-watt limit. A kid in Paw Paw MI -- don't ask where that is! -- had joined the club, and risen to the Board of Directors by 1969 or so. He wanted action, and the club was not providing it. So he, as

eighth district representative, decided to start up a newsletter for the district, appropriately titled **QRP/8**. At the same time, he pestered the board about recognising genuine 5-watt QRPP achievements with an award. As a result WAS-QRPP was approved. The announcement in the Sept. 1969 issue of **QRP/8**, if read suspiciously, raises some concern about his motivation in getting the WAS-QRPP award approved. (I seem to recall that he designed the certificate and rules, which included “endorsements” for every 5 states above 20). He noted:

“Certificate #1 has already been applied for, and has been promised to **WA8MCQ**, who will get the basic certificate plus endorsements for 45 states and using under one watt.”

Now, Mike is a nice guy, and all of us who know him just know that he wouldn't go as far as having an award created just so he could get the first one! If anyone would make such a charge against me for starting up the **MILLIWATT DXCC QRPP Trophy** program, well, I'd just have to say, “how'd you guess?” At least I didn't have anywhere near a 100 countries in the bag when I started up the program! To be fair to Mike, he also hassled the BoD into adding a QRPP section to the QSO's Parties, and eventually, a stand-alone QRPP QSO Party. Now, we could never be convinced that he did that because he actually believed that he could win!

**Mike WA8MCQ.** A number of people joined up when they heard the name with QRP in it and were disappointed when they found that it was not a true low power club. Many of them left, some stayed around. I was one of those who stayed around, although my primary interest was in “real QRP”, with small, simple radios, etc. We were a barely tolerated lunatic fringe in the QRP ARCI, and the “**QRP**” quarterly newsletter of that era had only rare tidbits on the subject. I joined in 1967, with number 2706, and stayed around until I left ham radio in 1970 when I joined the Air Force. However, I did do my part for true QRP in those few years. I was on the Board of Directors in 1969 and 1970, I think it was. Except for the 1000 Miles per Watt award, which was in existence for some time already, the club awards (QRP DXCC, QRP WAS, QRP WAC, etc) were all for achieving those goals with 100 watts (input) or less. I proposed an additional award for working states (starting at 20) with 5 watts or less. The other BoD members agreed quickly, and I designed the certificate, wrote the rules, etc, and got one of the early awards myself (see above).

## **Part 2. QRP/8 Newsletter, QRPP CORNER Column, and THE MILLIWATT.**

In those days, the QRP ARCI also had Call Area Representatives, and I volunteered to be the one for the 8th district. Since my mother was doing the bulletin every week at church I had access to a mimeograph machine, so I started putting out an 8th district QRP ARCI newsletter called **QRP/8** (every 2 months, I think). It was just another little newsletter except for one thing--since almost the very first issue I included a section which I called the **QRPP Corner**, dedicated to news and projects of “true” QRP. After a while, Ade Weiss, W0RSP (K8EEG/0 at the time) stumbled across a copy and **went through the roof** when he saw the **QRPP CORNER**--he found out he wasn't crazy, and he wasn't alone--there were OTHER people happily working with a handful of watts just like he

was! He immediately proposed that we chuck the QRP ARCI part and convert the **QRPP CORNER** into a 100% QRP journal, since the **QRPP CORNER** was why most of the people were subscribing in the first place. He suggested a name change, and I liked his idea of **THE MILLIWATT: NATIONAL JOURNAL of QRPP**. He took over the printing at the U of SD where he taught (and still does: [now retired]) and the rest is history. Ade did the bulk of the work on the new magazine himself, and I handled the subscription end. Even while I was still there he did all of the publishing work, and Ade deserves the credit for the vision that produced **THE MILLIWATT** out of the **QRP/8** newsletter.

**The Beginning of the Modern QRP Movement in the US: WA8MCQ's  
Announcement of the New "THE QRPP CORNER" in QRP/8.**

THE QRPP CORNER

I hope to make this a regular feature, with news about what is going on in the way of QRPP. Please send in anything you can. Hunt through old magazines if you have to, just send me some info on what guys are doing with QRPP. (For you who ain't never hrd of it before, QRPP is the generally accepted designation for low power, up to a maximum of five watts.)

From February 1958 CQ--Starting on page 58 is the Transistor column. There is a schematic of a ten meter walkie-talkie, using two transistors. Also, a QRP rig using two 2N247s. Don Stoner, the editor of the column, suggests a "battle of watts" using xistor rigs, and proposes a formula for determining the number of points to score by. Divide the freq in Mc. by the power in  
(Cont.'A)

**Ade W0RSP.** But seriously folks, WA8MCQ's newsletter entitled **QRP/8** is where our 5-watt QRP club actually began. In the July 1969 issue, which was the 6th in the series, Mike reprinted a whole page of a letter from **W7NUN** about lack of participation in **RANDOM RADIATION**, the newsletter of the **PACIFIC AMATEUR RADIO GUILD**, a group which had splintered off from K6JSS's 100-watt QRP ARCI in 1968 or so in order to provide a more clearly defined focus. On p.10, Mike struggled to find such a focus for QRPP within the 100-watt club, reporting:

"I have suggested to W4RNL that the membership lists include some indication of those who use QRPP, or else a separate list of QRPP'ers, to enable them to get together, exchange ideas and brags, and to get together on the air with two-way QRPP QSO's."

Little did he suspect that this statement of focus was soon to define **THE MILLIWATT: NATIONAL JOURNAL OF QRPP**. That took a bit of doing on my part -- but we're getting ahead of the story. And incidentally, you heard correctly -- our "Mr. Antennas of the QRP World", L.B. Cebik (SK), is the same W4RNL mentioned by Mike -- he was on the BoD at the time. Now (i.e. 1998) he officiates over an incredibly valuable WEB page featuring materials about antennas -- hit it and you'll see what you've been missing. (Since L.B. Cebik's passing, it is being maintained on [www.AntennaX.com](http://www.AntennaX.com))

After a page or so of the usual QRO club trash in the July issue, a new heading appeared with the title **QRPP CORNER**, which Mike resurrected from a section of Don Stoner's column, and under it, the introduction that launched us. He wrote:

**“THE QRPP CORNER.**

I hope to make this a regular feature, with news about what is going on in the way of QRPP. Please send in anything you can. Hunt thru the old mags if you have to, just send me some information on what guys are doing with QRPP. For those of you who haven't heard of it before, QRPP is the generally accepted designation for low power, up to a maximum of five watts....” (see above facsimile).

Mike went on to report some QRP news and finished up with a half-page description of Technical Editor Doug WICER/W1FB's “The QRP 80-40 CW Transmitter” (see below) published in the June 1969 issue of **QST**, noting: “it looks kind of complicated, using three transistors, but it is worth the complexity.” At this point, very few ordinary QRP'rs were designing their own rigs -- there was virtually no information out there to guide us. Luckily DeMaw, and Wes Hayward W7ZOI paved the way for the rest of us “imitators” who, lacking the technical expertise to design our own, have taken bits and pieces of published circuits that looked good and combined them into rigs without actually knowing why they worked and whether they were working! Two actual circuits were included – one of these, W7IGV's unit from **RANDOM RADIATION** used a 2N3053 crystal oscillator to drive a pair of 2N3053's in the amplifier. WA8MCQ's closing plea for circuits reflects the situation:

“That's about it for this month. Let's see some stuff for this ‘column’. It's OK if you dig something out of a magazine, but be sure to tell me where you got it, so I can ask the editor for permission to steal it!”

Ultimately, our 5-watt QRP ARCI evolved from this humble beginning -- a report of a few QRP QSO's and two QRP circuits -- a total of roughly two pages of QRPP stuff. But the conversion process would take a full decade.

By chance, as K8EEG, I received this issue of **QRP/8** courtesy of Mike's sample mailing to 8th district members. It was a fire and gasoline situation. His complaints of no materials being submitted, the mind-blowing stuff in **QRPP CORNER**, the bit about the list of QRPP'rs, the statement of focus, and the phrase “**exchange of ideas**” ignited an enthusiasm in me that has never waned. As all QRP ARCI members know, Mike's monthly column has been the “backbone” of the **QRP QUARTERLY** since he returned in the late 1980's. The title of his column shows that Mike can run with a good idea once he has it! At any rate, I fired off an excited letter offering to write up my QRPP info and rig and Mike welcomed the offer.

But I was to discover that we were on two different frequencies. He was a QRP ARCI BoD member and a loyal one at that. It had never occurred to him that the 100-watt QRP ARCI was **not** an environment conducive to the flourishing of QRPP. My instant reaction to the stuff in the July issue was simple -- who needs the 100-watt QRP Club anyhow! It

will never become a place focusing on an **idea exchange** for genuine QRPP'rs, not in a thousand years!

There was another slight misunderstanding. Mike apparently thought I'd write a tidbit that he could include in his **QRPP CORNER**. What he got was two pages of text, followed by another page of schematic and instructions for duplicating my rig and making it work. I kind of sensed that he didn't realize that **I** wanted to write **QRPP CORNER** while **he** edited the **QRP/8 QRO** stuff. So, I titled my piece **QRPP KORNER**, spelled with a **K**. When my **QRPP KORNER** sheets arrived, Mike replied on August 25:

"Got your papers today. You did a wonderful job, both with the [mimeograph] machine, and with the content. I did not expect you to, or especially want you to, do the **QRPP Corner**, but that's OK. I mean, LABEL it the **QRPP CORNER**, seeing as how we already have such a column by the same name.... Boy, you really went and did it now, cuz now I am going to send all my QRPP dope to you and you will forever be responsible for writing the **QRPP CORNER!** If you have no objections, I really would appreciate it if you would..."

As for my strategy of spelling the title, Mike commented:

"I was kind of disappointed that you labeled the papers as you did **KORNER** with a "**K**". I would do that kind of thing, but somehow I can't see that from a prof at a big university, an English prof no less!"

Both Mike's **QRPP CORNER** and my **QRPP KORNER**, spelled with a **K**, appeared in the Sept. issue of **QRP/8**. Mike introduced me in the section titled "NEW WRITER FOR **QRP-89**" and explained:

"With this issue, perhaps, we acquire a new writer for the **QRPP CORNER**. K8EEG said he would write me a little bit, with some QRPP news he has gathered over the air, and include the schematic of his QRPP rig. I told him to go ahead, and he wrote up a nice little column, ran them off for me, and sent them in. He titled his contribution **QRPP KORNER**, so in this issue we have two such columns. In the future, I hope to get Ade to write the entire column. He did an excellent job this time, and am sure he can continue to produce such fine work."

In the regular news section, I am quoted as saying: "Perhaps it would be well to set up an editorial staff for this **QRP/8** thing, and even better, consolidate with other newsletters being published ... I'm less inclined to contribute some item that I know will not get out of the 8th district, or if it does, only a little farther..."

Mike was trying to expand -- but just into the combined 8th/9th district newsletter. Big expansion! I guess that to a kid in Paw Paw, MI, the 9th district looked pretty far away! But that idea never worked out.



The Sept. issue of **QRP/8** was a landmark in the history of QRP. Mike's **QRPP CORNER** and my **QRPP KORNER**, spelled with a **K**, together put into print 5 solid pages of genuine QRPP stuff plus three QRPP rig circuits. It also contained the first **Ten-Tec** advertisement with photos of the four basic modules, at \$7.95 each, which could be purchased separately or combined into the first ever full-fledged QRPP **PM-1** transceiver for 80-40 meter (also in the first **MILLIWATT** issue and later issues). **THE MILLIWATT**, **TEN-TEC**, and QRP grew up together. Almost five months would pass before **THE MILLIWATT** replaced **QRP/8**. And therein lies a story of its own .

## QRPP KORNER ... DE ... KBEEG

HI Fellas! Hope you all had a good time in the QRP QSO Party and managed to make a decent number of QSO's. It was a good test, but not the best we could have had if more members had shown up. After a fair late afternoon start, the band went long-skip and QRN here, and things didn't settle dwn to good coast-coast until 0700Z. I managed to bag 3 Wash. stns then with my 900mw and 400' longwire. The 6's and 7's were really booming in S-9 for a good portion of the night here, but didn't manage to get K6MDJ and other Calif. stns. The QRPP turnout was, as far as I can tell, kind of poor, as I only QSO'd afew QRPP stns hr, and the reason seems apparent--its kind of difficult to make contacts in the midst of 50-100w QRP stns battling it out. The fact that I had much better luck with the KW's in NJ QSO Party makes me wonder if the QRP ARC motto concerning better operating habits is actually a realistic estimation of the membership's talent. Worked abt 35 NJ stns without any hitch, but had to call and recall several of the QRP stns that I worked.

But it should be clear to all who heard and worked the QRPP stns that 5w and a good ant. puts out a readily copiable sig that succeeds well in a test. WASZDR/8's 3w was a bit raspy, but certainly prominent on 7 mc during the entire test, and he worked quite a few stns. W2NEP with 4 w was less prominent, and I didn't hear him work many stns, but I hope his logs prove me wrong. Probably out of fear of failure, WB4GPX went QRO-QRPP with 8w for the test (I had wrked him & his 4w sig couple weeks before), and he certainly spread the Fla. multiplier out across the country--he was working the 6's and 7's in quick succession once the band opened. Perhaps the most interesting revelation frm the whole test regards the non-members, who provided many of the QRPP sigs on 7 mc--seems they interpreted the test in the proper spirit, that is, to make QSO's with the minimum necessary power. Among those wrkd here were WASZDR/8 (3w), W2NEP (4w), WA3GVP (5w), K4COE (5w), and I think WA0PZH (10w) and WLDIT (22w) deserve mention here. Of course, it goes without saying that we should take our hats off to WA3IYS and his 800mw sig which several members wrked--he was the QRPP-est sig I heard on 7 mc, and bettered me by 100mw. KBEEG (me) managed to bag an even 90 QSO's with 900mw for 26 states. I heard a few other very weak sigs which I suspect were QRPP, but didn't manage to QSO them--I certainly hope noone went to bed totally frustrated with QRPP operation!

In general, I hope the performance of these and other QRPP stns awakens the general membership to the fact that QRPP does suffice!!!! A few transistors and a lantern battery will get WAS for you, as Mike W8MCO can well (well almost) confirm with his 47 states & 800mw. You neednt wait for the next year's QRP test to try out QRPP tho'. There are many tests, such as the state WQSO Parties, SS, CD parties, FD, (anyone for WWDX Test?) which provide very good opportunity for trying out QRPP, and both Mike W8MCO & I can vouch for this type of opp. He worked some 70 stns in recent CD, & I came up with 15 in three hrs w. 300mw. That, gentlemen, represents respectable accomplishment for any QRP stn, let alone QRPP, as the best average needed to place in the big ones (SS etc) is only abt 24 per hr. So get going on your transistor rigs--Polypaks and many other houses offer bargain packs of transistors--like 3 2N697 (2w) for a buck. 2N2102 only runs \$.90 etc. I'm including the schematic of my rig below (non-original, but gathered out of many and sundry places, which none will recognize because of modifications!) which looks complex, but ain't in reality. It represents the basic ~~Z~~minimum in stability and harmonic reduction, along with the utterly necessary vfo control, sooo, fellas, get out your mini-parts, hot-iron, circuit boards, & wrk the world on a lantern batt.!!! Mike W8MCO referred you to QST June rig & it looks like a vy good one, except no vfo--you could use the one from my rig with it with no problem. Also, get circuit boards (all houses have cheap

QRPP KORNER . . . de . . . K8EEG

p.2

kits with all the essentials, and circuit boarding simplifies construction greatly, in addition to giving vent to your artistic potential that lies so dormant and wasted!)

The QRP calling freq. 7075kc has been miserably uninhabited since the latest issue of the natl letter came out in June(?), and perhaps the reason is too apparent to warrant comment. You guys who run 100w can make QSO's anywhere on the band, and that is okay. The QRPP'r, however, has to depend on the calling freq. since that is where he is most likely to find other QRP guys who share in his interest and wll give the time and patience necessary for really QRPP wrk. Hence, I think that every QRP ARC member ought to make a habit out of listening to the calling freq. every time he gets on the air, before and after QSO's and before QRT--and TURN UP THE R.F. GAIN!!!! That faint 100mw sig wll not even be audible with the r.f. gain backed-off, but wll be S-6 with it opened up!!! and he needs your help!!! Actually, anyone will usually put out a great deal of effort once he knows you're QRPP--I've been helped almost to the point of embarrassment, but oftentimes, the other guy is really turned on by working a QRPP stn--like the guy who patiently struggled for 45 min. and finally went to bed ecstatic because he had QSO'ed someone w. 300mw!!! So much more should the QRP member lend an ear to the little guys.

With the fall & winter season coming soon, QRPP condx will be optimum, so everyone should try to show up with a few hundred mw. QSO's will be no problem, and the possibility of DX is high--you won't even need 50w to make good QSO's and work across the country on 7 mc. Fella I worked on 20 last summer ran abt 7w to transistors (I'll put the schematic in next time) on 20mtr & wrkd 35 countries and most VE's w. a DIPOLE!!! No telling what can be done on 20 w. a few milliwatts--but I'm certainly going to find out this year. In the past, I've gone to 160mtr during winter--best is Okla. with 1 w, & had many QSO's with abt 3w dsb on 160--if things are that gud on 160, just think of what it'lll be like on 20!!! Join the fun and challenge!!!

Actual QSO's made here on 7075 since late June include only abt 7 QRP stns heard, and 5 worked. Had nice long QSO w. WB2TEN (#2287) in July, WB4GPX 4w (#3190), & he reported that the only other QRP stn he wrked was WB4GWC/4 (4w). WABYD reported wrking WA3APN on 7 mc. Others wrked were K9OVK (#689) who accepted an invitation to join the QSO Party and did a real fine job handing out QSO's. WA0VDX (#388) was running 50w to his rain gutterspouts(!) when I worked him early Aug. In short, things are rough for the QRPP'r on 7075. We have to work up some activity on freq. among QRPP'r--perhaps a weekly net-type arrangement so we know when we can get a sympathetic ear for the tryout of a new QRPP rig!! I'll be available every evening from South Dakota if any one wishes to sked on 7075 (& eventually 80 & 20 meters).

So much for the news and comments. I'll try to squeeze my rig on next. OOOPPS!!!! mimeo machine busted on the schemative. Following parts seem obscured on many copies, so here is clarification. Resistors 1/2w. Q4=2N697. Q5=also RCA SK3024. L1=24t. on Amidon T-50-2. L4=24t on same. "Wind L5 as 10 turns over whole form." "Next add final 2N2102." The rest is clear in text. The coupling cap. between Q1 & Q2 is 33pf s.m. All three parts connected to base of Q2, i.e., 33 pf, 15K, and 3.3K res. Might as well use up the rest of the space here. The 470 pf cap. on base of Q4 may not be necessary with your setup. It gave better drive with one of the @ 2N697's I used. One point of caution. DO NOT LEAVE THIS RIG CONNECTED TO YOUR ANTENNA WHEN NOT OPERATING: I LOST TWO TRANSISTORS (Q4 & Q5) DUE TO STATIC DISCHARGE ON MY ANTENNA DURING SOME THUNDER AND LIGHTNING!!!!

I will be moving to S. Dakota by the time you get this QRP/8 edition, and I will have the address: Adrian Weiss, English Department, University of South Dakota, Vermillion, S. Dak., where I'll be on the English faculty and have access to mimeo machines. I want to hear from all you QRPP guys, and any one else who has information on QRPP QSO's and activities. Also, as Mike requested last issue, send in any schematic that will work to share it with the members. If you guys put pressure on the head man, maybe some QRPP stuff will get into the natl newsletter. 73's and good luck, Ade.

It took two months of correspondence, during which Wes Mattox K6EIL/2 came on board, to talk Mike into ditching QRP/8 and going to an exclusively QRPP national publication.

The Sept. issue of QRP/8 arrived on Sept. 16, and I wrote Mike congratulating him for the fine job, and then I started planting the seeds for THE MILLIWATT. Mike had suggested that I mail the QRP CORNER directly from SD, and I replied:





me with that vein of pessimism that seems to have grown out of his experience with the lack of interest in QRP/8:

“So far, no guys have been attracted to QRP/8 by the QRPP CORNER, either yours or mine. There hasn't been time for anyone to subscribe because of it yet, and I very seriously doubt if they would just to get it. Strike that last -- I think they WILL, eventually. But the “mainstay” of the publication? If you refer to your own contribution, your head is getting kind of swelled, isn't it?”

### Actual Mimeograph Color Copy Converted to B/W above

QRPP KORNER . . . de . . . KSEEG  
 Schematic for 300mw-1.5w vfo control transistor rig. p. 3  
Elmenco 424

Parts description.  
 All resistors  $\frac{1}{2}w$ ; vfo resistors can be  $\frac{1}{4}w$ . Use silver mica except for by-pass.  
 Transistors: Q1, Q2: 2N4124; Q3: 2N4121 (or 2N4124); Q4: 2N697; Q5: 2N2102, 2N1613, RCA SK3024, TIP-14 (can run higher voltages).  
 Coils: L1= 24t. on Amidon T-50-2 form (3/8" dia. toroid); L2= 26t on T-50-2 (app. 2.5 mh). L3 = 6t over L2 in same direction and spread out over whole form; L4= 24t on T-50-2, tapped 8 turns up from B+, L5 = 4t over L4 spread over half of form (you may follow my procedure for the best match. Wind L5 as 10 over whole form to start with, and keep tapping toward bottom till you get the best drive, cut and solder at that turn.) L6 & L7 are Amidon T-68-2 toroid forms; (11/16" dia.) wound with # 22 copper enamel wire, 25t spread over whole form. Coils except L6 & L7 are wound with #26 enameled copper.  
 Operation: Standard tuning procedure of working from first stage to the final. First, vfo should be checked out and tuned to proper 7 mc range; if the above listed coil and 100pf s.m. doesn't hit the band right, you can shift the freq. of the tank by either spreading out or compressing the turns on L1, and may have to trim a few turns off, or add a few. When vfo is running, put Q3 and Q4 into sockets, or solder them to circuit board as I did. Q3's tank is untuned and serves merely as transformer matching section, and Q4 is biased and won't draw current till Q3 drives it. Put flashlight bulb across L5 (never!!! turn transistor on without load), tune in sig of your receiver, and apply power in brief spurts while tuning L4 with the trimmer cap. The loudest sig will indicate that its tuned to 7mc freq--and you may get some indication on the bulb if it is a #49. Next, add final 2n2102 or whichever one you use, connect to ant. thru SWR meter, or put dummy load across output. Tune in brief spurts until you get output--listen in your receiver meanwhile to see how much the final "pulls" the vfo--it shouldn't be more than several hundred cycles, which is good. Tune into antenna as you would with regular pi-net. After rig is putting power into antenna, check the SWR--if it is higher than you get with the antenna with another rig, this can indicate that you're generating superfluous harmonics. In which case, retune Q4 and the output stage until the SWR is down where it should be. Finally, sweep the receiver across the band from about 6 mc to 12 mc to check for any bad parasitics. My rig is real clean, as I find no other sigs except for one at about 6.7 mc, and that is down at least 10db. One further note: the two bypass caps from emitter of Q5 should be used, and they should be in a ten-to-one ratio. However, one 2N1613 I used required only a .01 mfd for stable operation. Individual transistors usually have individual characteristics. With two six volt lantern batteries in series, my rig draws a total of 160ma, and the bateries are good for at least a month without recharge.  
 I've had extremely good reports from this rig. The keying is clean (simply breaking the B- with the key) and not chirpy, and the rig is as stable as your installation permits. So far I've worked about 250 stns since late June on 7mc, and in the evening at that with all the QRM. AST 30 stns

In my letter of Sept. 16, I had continued with:

“If **QRP CORNER** were to be handled separately, then two advantages might accrue. First, a much wider distribution could be drummed up among the other call area guys interested in QRPP, and the thing could eventually become the national newsletter of QRPP. This is an eventuality which I consider very desirable, because it is in line with my interests in QRPP, my desire to see operating info from W5's or W1's, or, in short, the happenings on the national QRPP scene. Mike replied:

“Yes, it has great possibility for becoming the national QRPP scandal sheet. I don't know how to go about it. We really should keep it a part of the **QRP/89**, as it helps the newsletter considerably, plus **QRP/8** started it so **QRP/8** keeps it! HI!”

The problem of getting materials for **QRPP CORNER** was the next consideration. I had commented on Sept. 16:

“It seems clear from this latest issue of **QRP/8** that there is much more than adequate material for **QRPP CORNER** as a separate publication. If we build up a good intelligence network here in the 8,9,0 areas, there will be adequate info for a good four-page issue six times per year, especially with the anticipated rise in QRPP with the advent of the winter season. Your QRPP CIRCUITS booklet idea would be a very helpful item in any effort to render **QRPP CORNER** separate but organically related to **QRP/89**.”

Now when I look back, I don't recall whether the reference to “a good four page issue six times a year” was my *actual* expectation, or whether I watered it down so as not to pull Mike's pessimism chain. At any rate, Mike replied with a word of encouragement about my job of writing up **QRPP CORNER** for future issues of **QRP/8**:

“I hate to say this, but you think there is more than adequate material for it? Just try to make another sheet as good as your last! Actually, it seems like the typical QRPPER is not dedicated to the art of QRPP, but is in it for the momentary fun of it, then goes QRP again. Result -- the guys give lots of QRPP news for short periods of time, then run dry, and you have to seek new sources of information ... In any event, don't ever give up for lack of information -- just do some editorializing on QRPP when space runs rampant.”

Before Mike's reply of Sept. 21 to my Sept. 16 letter had even arrived with his above noted reactions, I had written on Sept. 19 to Howard Pyle, W7OE, General Manager of **PACIFIC AMATEUR RADIO GUILD**:

“Mike WA8MCQ and I are thinking of running the **QRPP CORNER** off separately and mailing it separately to both subscribers and non-subscribers to **QRP/89**, ... I don't envision getting this underway as a separate operation until the first of the year. I'd like to ask you to insert a simple query into your **RANDOM RADIATION** to the effect that an effort is being made to provide a general QRPP newsletter designed specifically for

the QRPP'er ... it will be the only source of operating information for them. ... Once it is underway, we'll push for separate subscriptions so that it can support itself...."

Four days later on Sept. 23 I responded to several issues in Mike's letter of Sept. 21:

"About the problem of the QRPP sources running dry, I think you're right in this respect ... Actually, you've hit the nail on the head in your inimitable manner in regard to the weakest part of my expectations regarding information -- and the challenge about repeating the last **QRPP KORNER** was well placed. It led me to question why such an attitude of pessimism is so possible and prevalent, and my answer is: if we sit on our asses waiting for the stuff to come in, it won't! But if we go out and get it, it probably will come in."

I then went into a half-page paragraph about setting up an intelligence gathering network and mailing samples and query sheets to anyone who seemed remotely interested in QRPP. The end result was that we both cranked out query sheets and started mailing them. I had to back away from the idea of a separate publication in my Sept. 23 letter because I sensed that the "turf" issue was a sensitive one for Mike:

"Your response to the idea of a separate **QRPP Corner** is well-taken. I hesitated to make my suggestion, because I, too, see **QRPP Corner** as an integral part of **QRP/8**, and essentially your creation ... To be clear then, **QRPP CORNER** should remain in the **QRP/8**, and in no way become totally separate -- if I had that idea, I'd probably start up my own operation, which I have no desire to do."

Admittedly, I was diplomatically lying thru my teeth, as should be clear from my Sept. 19 explanation to W7OE mentioned above, and it would not have taken a Ken Starr and his Grand Jury to prove it! But Mike had to be nudged along step by step. With the turf issue temporarily settled, Mike got down to business and covered a lot of ground in his Oct. 3 letter:

"First off, **QRP-89** is dead. Lack of interest, so K9VCM and I aborted by mutual consent. I am glad, as it would have been much more work for me, and also, I changed my mind and now feel that I really like **QRP/8**, and don't want to end it all after it has, hopefully, built up a good reputation."

About the sheets asking for QRPP info, this is an excellent idea, so go ahead with it if you will. However, send me 25-cents for each person you promise a free issue of **QRP/8!!!**. No free issues just for news! However, you could *promise them a free issue of* "The **QRPP Corner**, a regular column appearing in **QRP/8** which is devoted to news of what is going on with 5w or less..." Frankly, I do not want to use **QRPP CORNER** as bait to get more subscribers. I have so much trouble with the mimeo machine, the 70 copies I run off now is a real experience, and if I went to more, it would kill me.

Okay buddy, how about this --- what I want is QUALITY, not quantity necessarily, but I would much prefer to have the QUANTITY to be made up of 8th district members, and

QUALITY, which I want the most of, to be QRPP. I want all the QRPP news I can get, regardless of whether it comes from a member or not.

About the **QRPP CORNER** -- I sent you some news recently. Now, will you be willing to be editor of that part of the newsletter? I would appreciate it. It is enough to know that it is my creation. I do not really care to get the credit for the actual work. I'm getting lazy, and getting tired of all this work!"

As you'll notice, 25-cents for a "*free issue*" meant that I had to pay for the samples I promised! In addition, Mike's statement assumes that there are *two distinct publications*, one of which can be promised and sent without the other. Under his signature, Mike scribbled the reminder: "YOU [underlined] are paid up for 4 after this issue, but as you are printing it, you may get some extra, HI!" Mike always counted the pennies! I was grateful for that because I had no interest in the business end of the operation.

Something happened between the Oct. 3 letter and Mike's next letter on October 16. I hadn't written him since Sept. 23. But whatever happened, it pushed him over the edge. Perhaps the ideas I'd been feeding him finally gelled. In any event, **it was the turning point for the ORP movement in the US and indeed worldwide.** Mike wrote:

"Starting with the Jan. issue, **QRP/8** will change its purpose from that of being an 8th district QRP ARCI newsletter to be a QRPP newsletter, with no geographical restrictions. I've been thinking about this all day, and finally decided it would be the best thing ... You mentioned that, really, an 8th district newsletter is useless unless it coordinates a lot with other newsletters, and this is not being done. Finally, there is NO bulletin devoted to QRPP news. So, starting with the January issue, we will devote our pages to QRPP news from all over the country, and not just to member news of QRPP'rs. We will print regular-type QRO news if we have room, but will devote our pages mostly to QRPP news. You had a good idea about making the **QRPP CORNER** the national QRPP newsletter, and this is sort of what we are going to do now. The name will stay the same....

I would like you to be my helper and associate, helping to get the news, and helping to put it out. One reason I need you is in case I get drafted or something, the newsletter can go on... Please let me know what you think of the idea. It is going to come to pass anyhow but would really like any suggestions you have. Again, I think this will really be welcomed by all those interested in QRPP whether associated with the club or not."

My response of Oct. 20 crossed Mike's next letter of the same day. I informed him:

"As far as your earlier comments to the effect that we'll never match last issue's **QRPP CORNER** stuff, I can only say that was a rather naive statement! So far, I've gotten five pages of stuff, including three vfo rigs for 80/40 and 20m from **K4OCE**, including one computer-designed attenuator for dropping to QRPP from QRO rigs etc. This stuff can keep until the Jan. issue."

I included a list of 13 items about the operational organization. I tossed out a couple possible names: “QRPP CORNER: JOURNAL OF THE MINIWATTER” and MILLIWATT JOURNAL. And I asked about what my role would be in the new QRPP newsletter “Who is chief editor of **QRPP CORNER**, now that **QRP/8** isn’t any longer?”.

Mike’s letter of Oct. 20 anticipated my question and added the clarification:

“Now that we are converting **QRP/8** to a national QRPP newsletter, I will assume most of the responsibility for handling the QRPP news. I suppose you can stay on as Associate Editor or some such ... Now that we are going nationwide, we should get more interest, but I doubt if we will reach 100 or even 75. Maybe we will, I don’t know....”

Now it was MY turf that had to be defended! This was red-flag stuff! I was the one who scrounged around for the five pages of material! Now that I read over my letter to Mike of Oct. 22, I get the distinct impression that I was really infuriated about being phased out of **QRPP CORNER**.

“Got your letter today and I feel the need to clarify a few matters. I don’t see why you have to assume responsibility for the QRPP news, unless a) you consider yourself the only one who can do it, b) consider yourself indispensable to the QRPP movement, c) you consider me totally incompetent. As I see it, WE should make the thing a success ... I don’t want to ‘stay on’ as an associate editor, whatever that is, or as chief editor. You can be chief editor if you want -- I am in it to serve the common need of QRPP’rs. I suggest that you decide to take a similar attitude if you don’t already have it.

Secondly, I think that I can help by providing a counterpoise to your pessimistic approach to (a) work, (b) the actual value of what we can accomplish, and (c) the desire to serve as many QRPP’rs as we possibly can. We have to stabilize so that I know what we’re doing, so that the guys know what’s going to be going on next month, so that we don’t change form and purpose everytime you get to thinking about something. [...] In short, we need a succinct statement of purpose that will stand for the newsletter and its whole setup. Individuals then don’t come in too much, but are agents for the common goal. So, let’s get down to writing a set of articles for this newsletter, pick a name if we can think up something better than **QRPP CORNER**, and get going on this in a professional manner.”

The key to the whole shift from **QRP/8** to **THE MILLIWATT** was Mike’s flexibility and readiness to accept new ideas and ways of doing things. If he had chosen to dig in and fight the inevitable at any point, we’d probably have gone separate ways -- I was already committed to an exclusively QRPP publication. So, his reply of Oct. 23 was a great relief. In addressing the turf issue, his first comment was:

“I don’t quite know what to call you. You certainly aren’t going to be editor in chief, as it’s my baby, and no one is going to take it away from me. Well, now let’s see -- choose either arrangement that suits you best. I am the editor and you are the reporter; or, I am



editor in chief, and you are associate editor; or, and this would be closest to what actually is, we are both co-editors.”

Two days later on Oct. 25 he crossed that out and rephrased it [bear in mind that in pre-computer days, it could take a couple of days to typewrite a long letter, so we just didn't send it until nothing more was left to say]:

“Well, you're right on all of that. The main trouble is that I look on the newsletter as 'my' baby, a personal project, and was acting like you were trying to take the thing away from me. However, you're right about it all, and the important thing is just to get it out. Let's both be co-editors of whatever it would be called...”

He seemed relieved now that the issue of focus was resolved, and commented:

“Remember, this November issue is still **QRP/8** technically, and I am obligated to print the QRP Club news that I have, even though I don't really want to print it. So please do not omit any of it. I certainly will be glad when the January issue comes. We will no longer have to print that trash we have been doing. It has been lots of fun, but I am getting sick of it at least in the present form. Glad to hear that you have so much QRPP stuff. Well, if you want, you can try and save a lot of it for the January issue.....

Now about the name for the newsletter -- I would have liked to keep **QRP/8**, but now I don't think that is such a good idea. **MILLIWATT JOURNAL** sounds good, but perhaps something a little more unique is in order. But unless you come up with something better, I suggest that we use either **MILLIWATT JOURNAL** or **QRPP CORNER**.”

Along with his four page letter, Mike included an organizational sheet including all the items we had settled, including our early concept of format.

One of my favorite WA8MCQ-esque passages is in this letter of Oct. 25, a revealing item that I'm sure you all will find interesting:

“You can write the ads if you want to, but I don't know if you can do a good job of it. I have this bad habit -- when I see something in print, I always feel that I can do a better job, and explain it more clearly. That's why I wrote my article for **73** after reading **W6TYP**'s article, which I felt was quite confusing and “Yechyy”. For instance, from reading his article, one gets the feeling that one must build a one watt rig (no other power will do) and work a guy exactly 1000 miles away, to get started in QRPP. Perhaps I cannot do better after all, but at least I try. Oh well. Now, getting back to the ads, I am going to tear your last ad in the **HAM TRADER** to pieces. I have a copy right here. I hope you take this criticism in the spirit in which it is offered.” [FYI: **HAM TRADER** was a “classifieds” advertising publication mimeographed on yellow paper (usually around 6-8 typed on 8.5x11” sheets); hence when an old veteran QRP'r talks about finding a mint AT-1 in the “yellow sheets”, you newcomers won't be baffled.]

What gall! I had a Ph.D. in English and therefore no need to prove my command of the

language to this kid from PawPaw, MI! However, having said that, I must note that Mike was a superb writer -- and not just because he was a kid writing well. I haven't edited anything of the parts he's written and I've quoted -- that is how they rolled out of the typewriter patten (1969).

To get back to the story, the die was sunk, and all we had to do was file off the rough edges and pour in the stuff to make **THE MILLIWATT**. We put out perfunctory November and December issues of **QRP/8** and saved the good stuff of the first issue of **THE MILLIWATT**, scheduled for January 1970 but delayed until February. By December, Wes Mattox K6EIL/2 joined us with responsibility for handling the 1-2-3 call areas and listing active QRP'rs; I handled the 5,6,7 areas, and Mike took the 4,8,9, and 0 areas. We commenced mailing queries and running some ads. Mike added an ominous note at the end of his Dec. 13 letter: "I am draft #361, but the Michigan head of the Selective Service says all will go, so I am sweating it." The Vietnam War wasn't over yet. Mike delayed mailing his material until after the Xmas rush on the theory there was less chance that it would be lost. So the PO lost it out of spite! That created a delay. By Feb. 26, Mike complained: "No newsletter yet. Come on, we are now fully one issue behind. Never again will I trust the PO with anything." When I told him I was printing 300 copies, he said "Wow!!" with 2 exclamation points. When he got the first issue of **THE MILLIWATT: NATIONAL JOURNAL OF QRPP** two days later on Feb. 28, he wrote:

"Got my issue of **THE MILLIWATT** today. All I can say is Fantastic!!!! WOW!!!! Well worth waiting for!!!!"

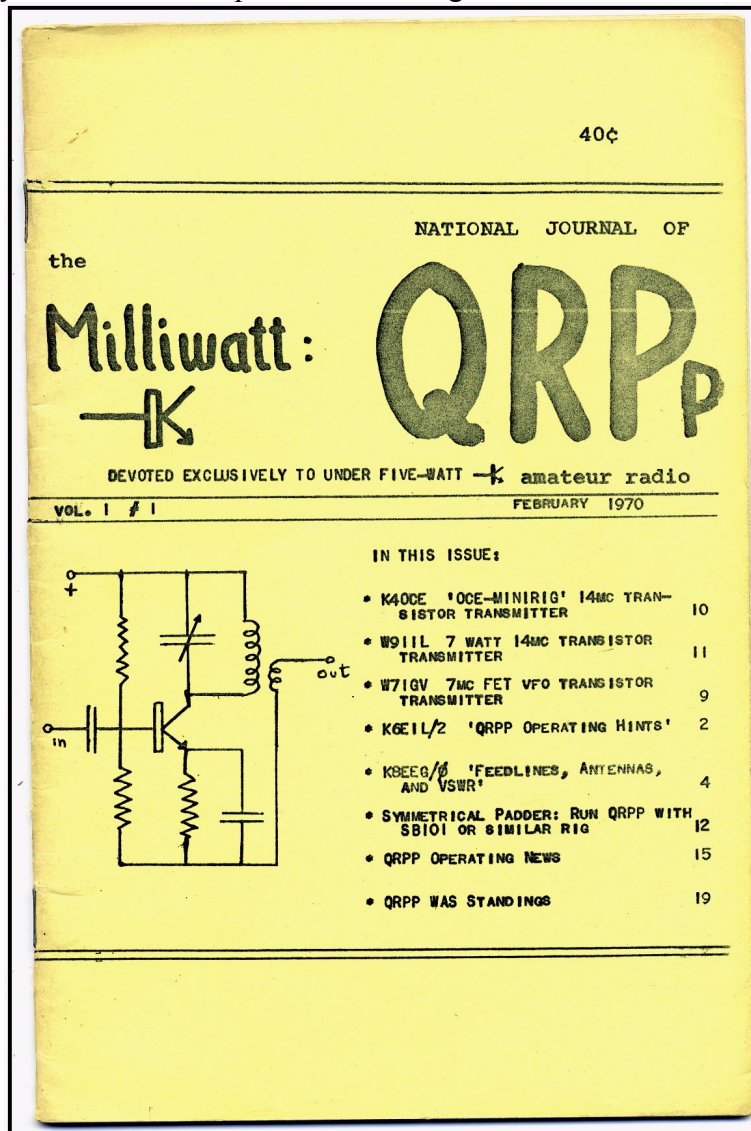
Five exclamation points after each adjective. Instead of mimeographing **THE MILLIWATT**, I managed to have it offset printed and folded into a booklet of 16 pages thanks to Ten-Tec's full-page ad. It wasn't a newsletter and it sure wasn't going to look like one. I modeled the cover after Jim Fisk's **HAM RADIO**. The rest is history.

**Mike WA8MCQ.** Although the total run of **THE MILLIWATT** was 33 issues, I left after 4 issues to join the Air Force, which was an attractive alternative to being drafted into the Army while Viet Nam was still hot. [I say that every time I talk about **The Milliwatt**, but the truth of the matter is that while my student deferment had ended, I could have easily renewed if I had chosen to move over to the 4 year university and finish off an engineering degree. I was in the first year of the draft lottery, in which they picked capsules with birth dates from a drum, with the first hundred or more guaranteed to be drafted, and depending on where you lived you weren't reasonably safe unless your number was somewhere in the 200's. Mine was 361! Needless to say, since a large number of people "voluntarily" enlisted in USAF because they were about to get drafted into the Army, and not too happy about it, I didn't advertise my lottery number much!

**Ade W0RSP.** Mike ended his brief but very important work getting **THE MILLIWATT** off the ground not with a whimper but a bang. The **ARCI** newsletter "**QRP**" for June-July-August 1970 carried the announcement "AREA REPRESENTATIVES NEEDED" (p.6), and specified: "Our most recent resignationis Mike Czuhajewski WA8MCQ as 8<sup>th</sup> area representative. Mike has resigned pending his

results from his Air Force tests.” That was the “whimper” part of his leave-taking.

**First Issue of THE MILLIWATT: NATIONAL JOURNAL OF QRPP.** (note the partially successful attempt at hand-writing the “Milliwatt” and “QRPP”)



The “bang” was his final act as 8<sup>th</sup> area representative – a full page of excerpts from **THE MILLIWATT** titled “Low Power News” (see below), including K6EIL’s operating tips, QRPP Operating News, New QRPP DX Record, WAS/QRPP Standings, and an offer to send a “free” sample copy to anyone requesting one and providing a 12-cent stamp. At least this time I did not have to pony up 25-cents for each sample copy. But he’d be long gone and I’d have to pay anyhow! Humour aside, this was sort of a monumental event – in one stroke, Mike showed the QRP ARCI members who were interested in real QRP where they could find a source of information and share knowledge and experience.

Except for the QRPP C/Korners, this was the largest amount of real QRP material that



had ever appeared in an ARCI "QRP" newsletter. Even now, when everyone reading this

### WA8MCQ's Final Contribution to the "QRP" ARCI Newsletter, August 1970

#### Low Power News

The following is a sample of the features and news being printed in The Milliwatter, The National Journal of QRPP.

Some operating tips for the QRPP ham....K6EIL/2

Answer rather than call CQ: You will make more QSOs.

Let the other station know you are using QRPP: Explain very early in the QSO that you are using QRPP. This tells him why you are relatively weak, and often will excite him that he won't mind spending an hour trying to copy a 4 4 9 signal

QRS: Slowing down increases readability when the going is rough.

Operate Contests and CD Parties: RF gains are cranked wide open and hams are willing to suffer a bit to get one crummy contact and perhaps a new multiplier.

Do not break into a QSO: This is tempting, especially when you just hooked up a new rig, but chances are they have their RF gains way down and will not hear you. Do not call a single station all night. If he cannot hear you after three or four calls, give up. He is either a lid, has a crystal set for a receiver, or propagation is against you.

#### QRPP Operating News:

K6EIL/2--I was in the SS for 8 hours, running 1.6 watts to a pair of 3S4s. I made 31 contacts in 13 sections (10 States). I worked only 7 mc cw.

WA8MCQ--I was in the SS for about 9 hours, running a EC-474A On 80 with 4 watts. I got some 80 contacts and 25 sections.

W7NUN--Have been in radio since 1935, during which I have always been interested in QRP and QRPP, especially during the past two years. Rigs are: International Crystal OX crystal oscillator, Omega LT-5, and I2BY7A-VFO in the big rig running a measured 2 watt output. W7GNT and myself had a 100% transistorized contact last year. Both receivers and transmitters were transistorized. As far as I know this is a first and no challengers have appeared.

Some contacts made by W9IIL with the 20 meter rig described in Feb. issue (?) PAØBRM, I1HM, G3TXJ, DLØDG, plus TI2, OX3, HK3, OH5, SM3, and others for 35 countries. Also worked 45 States. The rig runs up to five watts.

NEW QRPP DX RECORD: KL7YU worked W7BVV while running one microwatt over a 1,650 mile path. This represents 1,650,000,000 miles per watt. W7BVV was running high power, (50 milliwatts). Dick, KL7YU, says much credit must be given to W7BVV's excellent antenna and receiving system.

#### WAS/QRPP Standings: 6all, States worked, maximum power used

W4UM 50, 3W	K8EEØ 39, 1.5 W	WA7HQE 23, 4W
WA8MCQ 48, 4W	WB8AFX 13, 1 W	W9IIL 47, 5 W
K6EIL/2 22, 1.6 w	W7PUL 23, 4W	K4DCD 25, 2 W

The above is just a sample of what is published every issue in The Milliwatter. It is the only magazine devoted exclusively to QRPP. It has feature articles, QRPP operating news, and construction, projected etc.. We will send a free sample to anyone desiring it an including 12¢ postage. The subscription rate is \$2 a year for 6 issues. Send your check or inquiry to; Mike Czuhajewski, WA8MCQ, Route 3, Paw Paw, Michigan 49079

has been through tons of such material, this stuff is still interesting – note that K8EEG/0 stands at WAS-39 with 1.5 watts output, but WA8MCQ is WAS-48 with 4 watts. That's only 9 more states with about an extra 3dB of r.f. output (recall his success at getting the 100-watt club to create an endorsement for WAS QRPP). Val Buccicone W9IIL is at WAS-47 with his solid state rigs – he played a pivotal role in my own involvement in QRP. I was fiddling unsuccessfully with a two transistor transmitter and only managed to work a guy down the valley, probably not even a mile away. Then I finally connected with W9IIL on 14MHz back in 1966 and was blown away by his description of his solid state rig as well as his signal! He sent me a schematic plus comments and that turned the tide for me! He eventually published the 3-stage circuit in the very first issue of **THE MILLIWATT** (February, 1970; see below) and contributed more in later issues.

Word got out about **THE MILLIWATT** quickly, as is clear from the range of contents in the first issue (see front cover above). After Mike left for the Air Force, C.F. Rockey W9SCH came on as Contributing Editor. In addition to encouraging participation with QRP in regular events such as SS, we started up the **MILLIWATT DXCC QRPP TROPHY Program** and the **MILLIWATT QRP FIELD DAY TROPHY Program**

By the completion of the second year, the 300 copies of the first year's run were gone -- QRP'rs not only subscribed but bought all published issues, so running reprints became a regular chore. By 1975 when it ceased publication after 33 issues, we had over 800 subscribers in over 40 countries!

The reprints business has an interesting and absolutely “fresh off the press” conclusion. While WA8MCQ was away, I handled the reprints, and still had something of a decent selection remaining in stock by the time he reappeared as a contributor to **QRP QUARTERLY** in the late 1980's. He undertook the job of reprinting the whole series a couple of times, which stretched the “printed publication life” of **THE MILLIWATT** well into the 1990's. For instance, I posted a note on QRP-L as a follow-up to one of Mike's announcements of a pending reprint operation in which I summarized the history of the journal (see in the book reviews section of my CD book **IONOSPHERIC PROPAGATION, TRANSMISSION LINES AND ANTENNAS FOR THE QRP DX'ER** September, 2011, contents and ~20 sample pages from:

[www.QRPdxPropagationAntennas.com](http://www.QRPdxPropagationAntennas.com)

A most incredible coincidence just occurred last evening (9 August 2011) when I checked the **QRP-L** and found, of all things, the following posting by WA8MCQ:

“The Milliwatt: National Journal of QRPP” has been available in scanned format for many years now, thanks to Tom Arvo, but if you'd like a printed out, paper set here's your chance. I'm cleaning out the ‘back room’ and this has to go.

In 1992, a few years before Tom did his scans, I borrowed most of the originals from Rich Arland, with K3TKS supplying the one that was missing. I carried them down to a local Office Depot, copied the entire batch, then had them reproduce a couple of dozen sets. (Due to the nature of the originals, which were done on a typewriter, they can be

hard to read in places.) They went fast, but I still have my own copy left. It's done on 8 1/2" X 11" paper, plastic comb bound in 6 volumes, total thickness about 2 inches. If anyone wants the batch you can have it for cost of postage from ZIP 21144 (near Baltimore, MD).

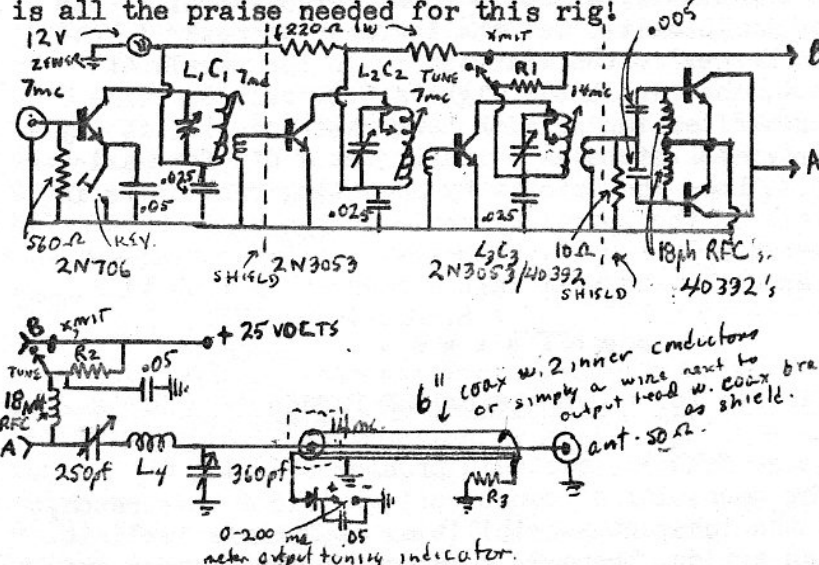
W9IIL 14mc, 5-8 watt transistor rig.

THE MILLIWATT  
Feb. 1970 v1#1

(The following rig is in large part responsible for my role in The Milliwatt and QRPP operation. About 4 years ago, I QSO'd Val on 20 mtr while he was using this rig, and immediately the experience awakened a desire to get involved in this interesting aspect of the hobby. So it is with a certain degree of nostalgia that I present the W9IIL rig--K8EEG/Ø)

At present, most of the QRPP rigs run in the big ham mags are for the low bands (80/40), and this is unfortunate, because propagation on 20/15/10 is ideal for the QRPP'r. Further, rigs designed for 20/15 usually require straight-thru operation (like the 'OCE MINIRIG') and the investment in a proper fundamental freq. crystal. The W9IIL rig is designed to use 7mc input from a vfo or crystal oscillator, which it doubles in the driver stage. For this reason, it should be ideal for anyone possessing a standard commercial vfo, as they usually provide 7mc output.

In three months on the air, using only a dipole, Val worked the following with this rig: 45 WAS, VE1-7, UL7, PAØ, IL, KH6, DLØ, G3, TI2, CX3, HK3, VP9, KP6, VP2, OH5, SM3, and others to a total of 35 DXCC. That, in effect, is all the praise needed for this rig!



L1C1, L2C2 to tune 7mc. (180pf trimmer, 25t #24 on 3/8" slug tuned form. Links=2t on cold end. Tap set for best drive to next stage.) L3C3=to tune 14 mc. (60pf trimmer,



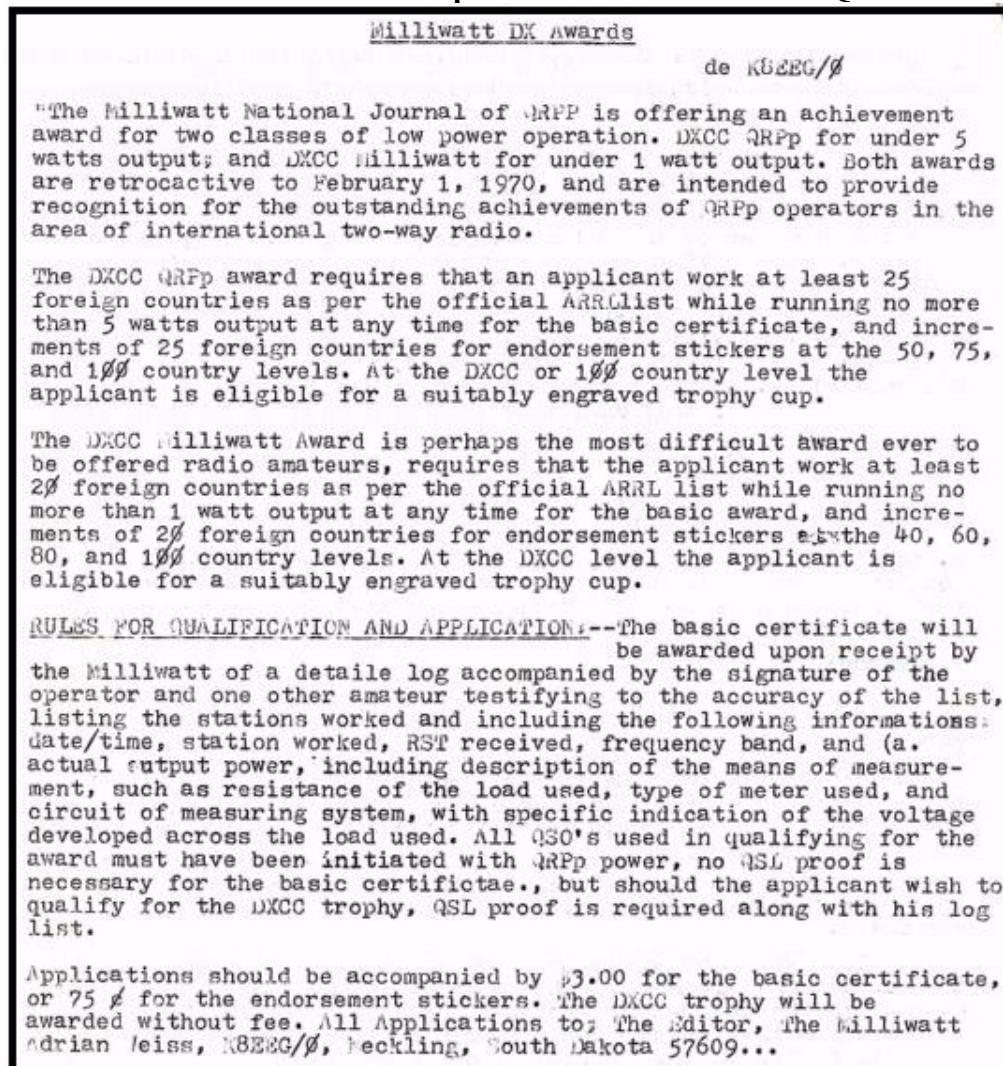
Tom sold CDs of his Milliwatt scans for a while and *later donated the rights to the QRP ARCI\*\**, which has them available through the “toy store” on their web site, [www.qrparci.org](http://www.qrparci.org). (Disclaimer--I have no financial interest in any of the items sold by the club.)  
73 and queue our pea DE WA8MCQ”

[\*\***Correction:** WORSP granted written permission individually for both Tom Arvo’s CD’s and the CD’s sold by the “toy store” and reserves the rights to copy and/or distribute **THE MILLIWATT** or copies of it in any form.]

So, Mike finally let his hard copy of **THE MILLIWATT** go for free – not even something to cover the cost of printing. I still have two complete sets. My original set is intact. Then, sometime in the late 1980’s, the mailman delivered a well-worn and tattered manilla envelop with several rubber-stamp messages in red-ink about the fact that the package could not be delivered to its Canadian address. Somehow it managed to float around and hide for more than a decade and then find its way back to South Dakota! It only took a couple of minutes for Mike to unload his set on the QRP-L – no surprise. It could have brought some good \$\$\$ on eBay! At any rate, I think I still have a box of assorted reprints stashed back in SD that can be available at a later date. These are “original” reprints from the 1970-75 period. [Check back later.]

In addition to WA8MCQ’s “Low Power News” page in the August 1970 issue, one other specific recognition of the existence of the 5-watt QRP world outside the K6JSS 100-watt club came in the form of the announcement of the **MILLIWATT DX Awards** in the September 1971 issue of the “**QRP**” **ARCI** newsletter where Editor Robert L. Jenks K7ZVA printed the details I submitted to him (see below). The August 1970 issue also lists a bit of information that linked **THE MILLIWATT** to the outside world, in which “world” is meant literally. John A. Attaway K4IIF was listed in the “new membership” section. He was DX Editor for **CQ MAGAZINE** and made **THE MILLIWATT** internationally visible (see below). The September 1971 **QQ** issue was the “Tenth Anniversary” issue for the 100-watt club which was founded in 1961. The spring QSO Party was to celebrate the anniversary. It is interesting to note the ratio of QRP vs QRO entries. In this case, the power is defined as “input power”, so the usual rule of thumb regarding efficiency is r.f. output = 50% of d.c. input power. A total of 77 entries were submitted, with a majority in the QRO category. 22 were in the less than 10-watt category (QRPP); 12 operated both under and over 10 watts; 44 were all QRO. The top score was 177,904 by WA5QBO running 10 watts input; 2<sup>nd</sup> place was Howard Battie W7BBX/4 at 176,694 in the “both” category. 7 were in the “milliwatt” category (<1w). Sandy Blaize W5TVW scored 25,886 at the 1.5-5-watt range. Bob Rosier K4OCE (**DXCC QRPP #1**) scored 77,176 in the “both” category. These and a couple others were **MILLIWATT** subscribers. The latter two still show up in QRP events regularly. (Footnote these results for later comparison to the 1980 Fall **ARCI** QSO Party when the club was voting on the definition of QRP and the changes in the bylaws.)

### DXCC Announcement in September 1971 Issue of the "QRP" n/l



### Part 3. The QRP World Outside the 100-watt QRP ARCI

The founding of **THE MILLIWATT** "began the modern QRP movement" in the same sense that **FaceBook** began the modern social networking phenomenon. Both needed the prior development of the applicable technology.

In the former instance, tube technology was replaced by the appearance of transistors and integrated circuits that made possible portable operation away from power mains at any location that could be reached by the QRP'r. In regard to the latter, since almost the beginning of the personal computer era, Chat Rooms, pings and Bulletin Boards allowed individuals to make contact via phone line modems and the computer "internet" networks that were emerging. But it took a guy (Sir Tim Berner-Lee) at the CERN Lab in Switzerland back in about 1990 to create HTML and the WEB network concepts to



enable the scientists there, and then abroad, to link to and transfer and share the critical masses of data that were being generated in research experiments. His WEB concept made **FaceBook** possible, although it could be argued that the significance of the data deteriorated by many magnitudes as a result!

With respect to the QRP movement, the emerging solid-state hardware technology had to be applied specifically to the various needs of amateur radio communication. As in the 1920's when vacuum tube circuits replaced crystal receivers and spark-gap transmitters, the staff in the Newington lab of the ARRL led the way through their own design work and others' articles published in **QST**. The few largely "novelty" type applications published in the later 1950's and early 1960's (see the Stoner detail given in **QRPP Corner** above) aroused interest but did not fulfill the needs for practical communication. Neither did the "engineer's dream" applications at the other end of the spectrum. Two individuals laid the foundation for the modern QRP movement: Wes Hayward **WA6UVR/W7ZOL**, Engineer at the Communications Division of Tektronix, and Doug DeMaw **W1CER/W1FB (SK)**, Technical Editor of **QST**.

In his "A Transistor CW Station for 7 Mc" (**QST**, August, 1964, 11), Hayward described the situation at that time:

"While transistors are becoming more popular with the radio amateur, semiconductor ham gear is still a novelty. Certainly the full potential of semiconductors in ham equipment has not been realized. It is the opinion of this author that this situation is in part because of the nature of the articles which been published on the subject. Many articles have described interesting but very simple gear which can be expected to give only limited performance."

The sidebar editorial description of Hayward's project noted: "In the receiver and transmitter described here, the author has aimed at circuits that can reasonably be expected to be duplicated by the average amateur not too familiar with transistors." However, the article could have seemed rather intimidating to the "average amateur". The receiver circuit is a superheterodyne design with front-end r.f. amplifier stage, two stages of i.f. amplification with a crystal lattice filter, a simple diode audio detector and a single audio stage. An external audio amplifier circuit is included for higher output.

But an examination of the parts list shows commonly available parts except for the T2 transformer which is wound "engineer-style" on an Indiana General toroid (40 turns bifilar-wound, i.e., 20 double-strand turns cross-connected) as explained in the text and illustration. So, it could be claimed that, from the very beginning, the bifilar/trifilar-wound toroid has been the curse of QRP homebrewers! (Later on, DeMaw helped out with the making and use of "Toroidal-Wound Inductors" in **QST** for January, 1968).

The directions for the 1140-kc. crystal for the b.f.o would puzzle a modern QRP'r: "etched to give desired beat note." The FT-243 crystals in use then allowed disassembly and carefully sanding, filing, or etching away some of the germanium wafer of the crystal to raise its frequency (but could not lower its frequency). The companion

transmitter (the “transceiver” combination was uncommon at the time) was a simple circuit using four good ol’ 2N696’s (crystal oscillator, buffer, parallel pair amplifier) terminated in a double-pi network output filter. R.f. output at 12 volts was 1 watt. Hayward added a TI486 power amplifier circuit with a 32-volt d.c. power supply capable of 10 watts r.f. output when driven by the transmitter. The units were built old style (terminal strips, sockets, copper strip buses, jack and pot terminals etc.). Overall, Hayward’s design is not overly complex, and looks like a tube design except that transistors appear where tubes usually did, and of course, the changes in circuitry for biasing and coupling stages and only three terminals where tubes required at least two more terminals for the filament voltage.

## *Direct Conversion A Neglected Technique*

BY WES HAYWARD,\* W7ZOL AND DICK BINGHAM,\*\* W7WKR

**A**n amateur activity of increasing popularity is the construction of small, compact equipment for portable operation. Certainly a review of recent amateur literature will reveal significant interest in rigs of the pocket or rucksack variety. Although the construction of a simple solid-state transmitter with an input of a few watts presents no obstacles to the experimenter with minimal experience, the fabrication of a suitable companion receiver does impose some problems. The portable receivers typically in use are of the regenerative type, the regenerative superhet, or a tunable converter operated ahead of a broadcast band superhet. While all of these techniques have the distinct advantage of simplicity, the results obtained are frequently less than optimum, especially when strong signals are encountered.

Another approach to the portable receiver design problem is the direct conversion technique. Basically the direct conversion method involves the applying of the desired r.f. signal and a local oscillator signal to a product detector. The beating of the two signals produces an audio-frequency signal which needs only further amplification in order to be heard.



Complete receiver, as shown, is rather compact. The antenna trimmer capacitor, C<sub>1</sub>, is the control to the lower left. The vernier dial is mounted directly on the front panel.

pler circuit.

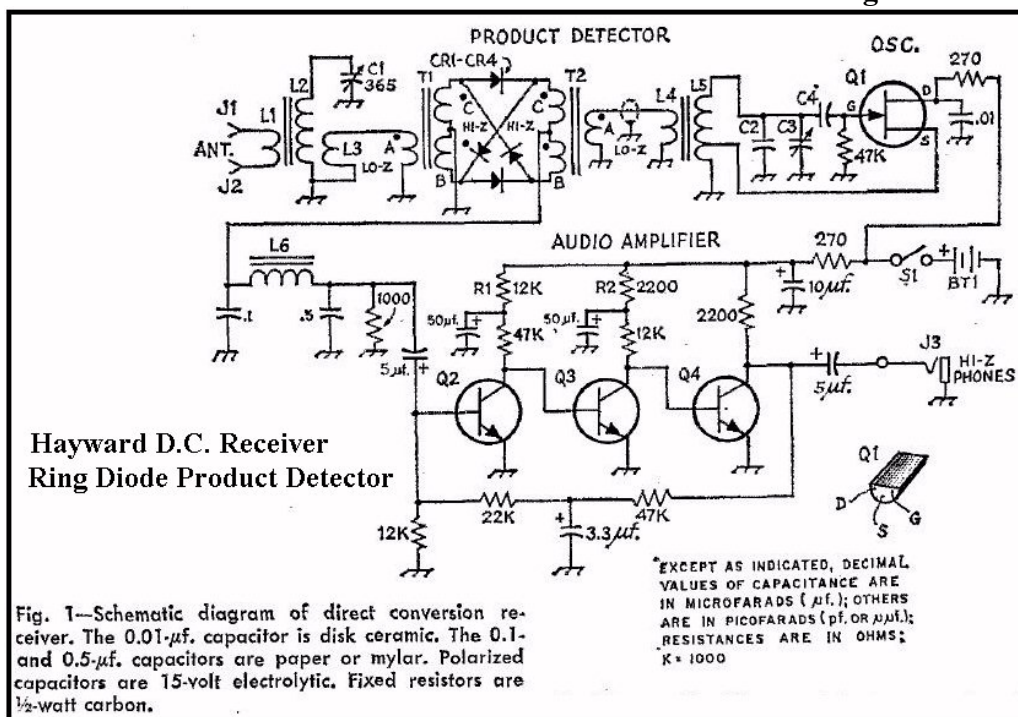
The unit built by the authors is shown schematically in Fig. 1. It operates in the 3.5 MHz

It so happened that W7ZOI was a mountaineer given to climbing and camping on various peaks in addition to his amateur radio hobby. The 1964 7MHz combo described above was portable in a sense – but still involved 2 separate units and quite a bit of space and weight (including batteries) for a back-pack. The first step toward simplification occurred in a collaborative project by Hayward and Dick Bingham W7WKR titled “Direct Conversion – a Neglected Technique” in QST November 1968.

The signal input of the circuit of the d.c. receiver (see below) is via a tuned double-link tank coil wound on a toroid core and uses four hot-carrier diodes in a passive ring in the product detector configuration. The passive circuit eliminated the internal noise usually generated in an active product detector using a transistor, MOSFET, or IC. Simplicity itself, but then the coupling part of the circuit turns “ugly”, i.e., toroidal input and output transformers T1 and T2 consisting of trifilar windings (15 turns) with the ends properly connected at points A, B, and C. A MPF102 FET is used as Q1 in the Hartley local oscillator circuit. L6 is an 88mh surplus-market toroid shunted by two capacitors to filter

out high audio frequencies. The passive product detector output required 100dB amplification provided by three NPN transistors (RCA 40233, not critical) to drive high impedance (~2000 ohms) phones -- this was before the Walkman and 8-ohm phones, and everyone still used the old 2000-ohm phones and ¼-inch plugs/jacks! But by the time I published my **VIKING 3X5** design in **CQ MAGAZINE** in May 1980, I had to scrounge around to find a set of high impedance phones – antiques by then!

### W7ZOI / W7WKR Direct Conversion Receiver Design



While this design was quite simple, anyone who built it and listened on 80 and 40 meters was struck (more like awe-struck) by the virtual absence of internal noise – it sounded like one was listening directly to the ionosphere with nothing in between. The one drawback of the direct conversion technique is that *both sidebands* pass to the audio amplifier. The passband filter shape could be improved by the addition of an active audio filter (see Hayward, “Simple Active Filters for Direct Conversion Receivers,” **HAM RADIO**, April 1974). However, these circuits automatically increased the internal noise significantly in proportion to the narrowness of the shape. But they could eliminate out-of-passband signals with a fairly sharp slope. And an advantage was that strong interference in one sideband of a signal could be eliminated simply by tuning to the other sideband. But the direct conversion was a great improvement over the finicky regenerative detector often used in simple and portable equipment.

In the April and May 1968 issues of **QST**, a consortium of authors Wes Hayward W7ZOI, George T. Daughters WA6AIG, and Will Alexander WA6RDZ presented a leading-edge receiver design using MOSFET’s for superior performance. The circuitry was advanced with bells and whistles and based upon the use of the crystal lattice filter in the first i.f. stage to enhance cross-modulation susceptibility of previous kinds of circuits.



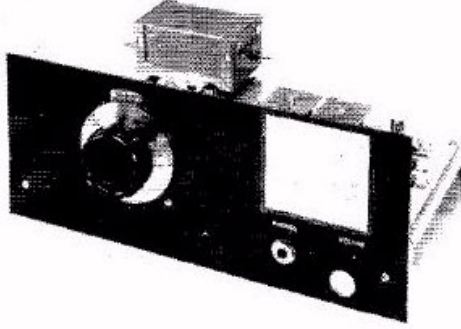
The papers were of the “design theory” type, explaining the problems and their solutions in the effort to advance solid-state receiver technology. The individual stage circuitry was

## The D.C. 80-10 Receiver

BY DOUG DEMAW,\* WICER

**T**HE D.C. 80-10 should appeal to those amateurs who are interested in building practical solid-state equipment. This receiver operates from 12 volts d.c. and draws only 40 ma. These modest power requirements suggest that it could be operated for long periods from a flashlight-cell battery pack, an important consideration during portable and emergency operations.

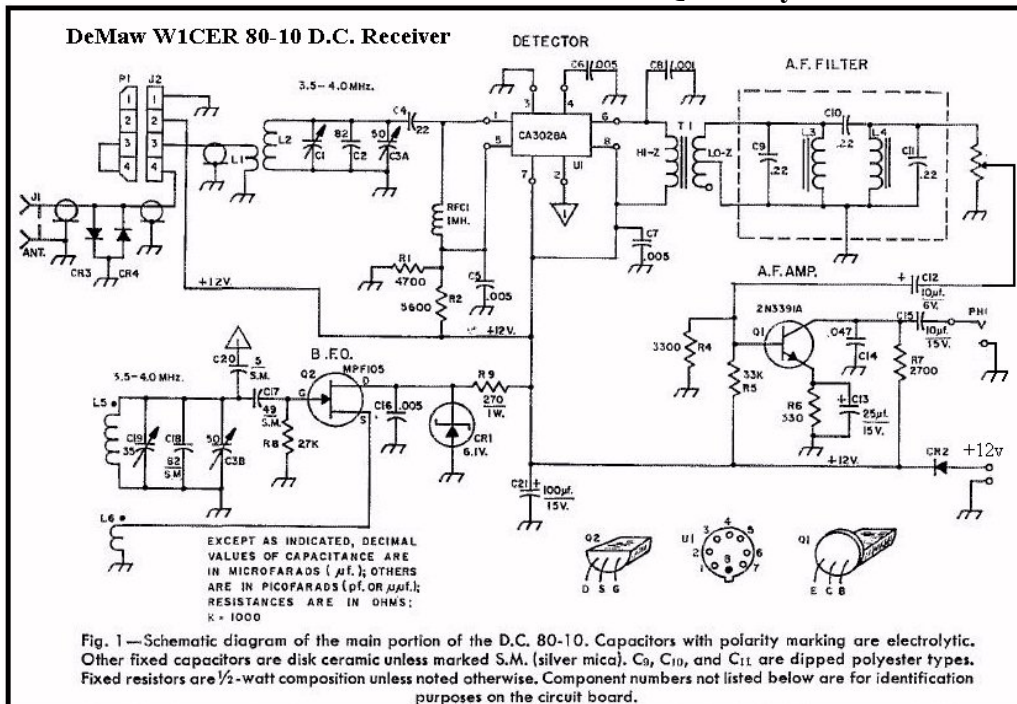
A 0.3- $\mu$ v. c.w. signal can be detected easily on all of the ham bands covered by the receiver. Ample audio output is available to drive high-impedance phones to a comfortable listening level, on weak signals. Since there is no warm-up drift after approximately 10 seconds, good stability can be expected. A 2.5-kHz. toroidal audio filter provides suitable selectivity for copying a.m. and s.s.b. signals, even when the bands are crowded. Though the receiver operates nicely on c.w., additional audio selectivity could be added “outboard” by those who desire a narrower passband.



Front view of the direct conversion receiver. The panel is finished in machine gray spray paint. The two controls are main tuning and audio gain.

A quick price analysis showed that the main section of the receiver costs approximately \$26, minus the circuit board, if all components are

QST May 1969



not complicated, but required additional stages including an a.g.c. circuit. The multiband receiver would have been a rather large undertaking for a beginner and required one

etched p.c.b. for the local oscillator stage. Building the receiver would have resulted in a detailed understanding of principles underlying an effective solid state receiver.

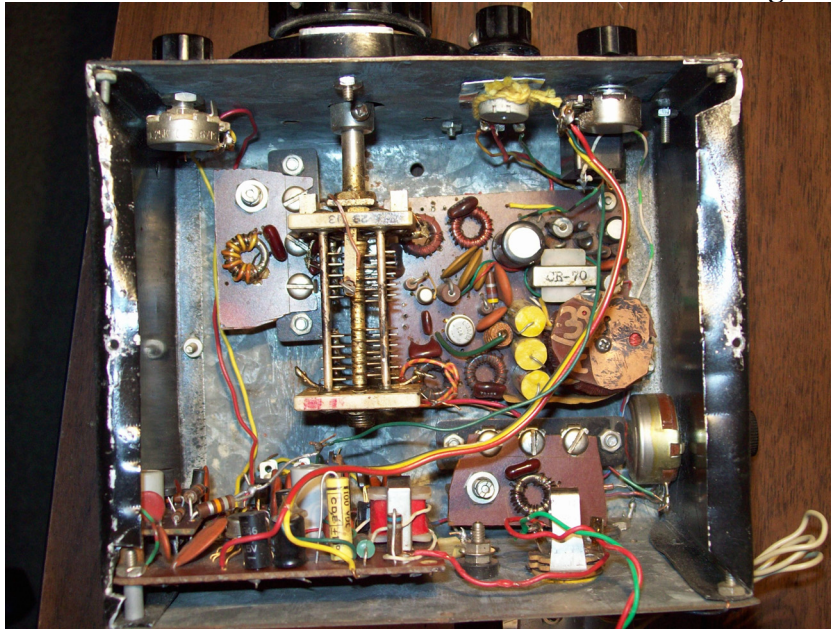
DeMaw followed up in the May 1969 **QST** with his “80-10 D.C. Receiver” design which only employed two transistors and one Integrated Circuit, the now venerable CA3028A balanced product detector chip which saw many years of receiver use. The “80-10” utilised a Hartley oscillator v.f.o. for frequency flexibility which would work well from 160 meters up to 10 meters with the proper coils/capacitors at L5-L6. This receiver was the “break-thru” for me into the all-transistor world of portable QRP, although what I ended up with eventually was as portable as the Index QRP+, give or take a few ounces. But I was not mountaineer or hiker so a bit of weight and size was no hindrance. I had learned earlier about etching printed circuit boards so I designed a 2.5” x 3” p.c.b. for my receiver.

The audio circuitry occupied the right half of the board, given the audio transformer T1 and the stacked pair of 88mh toroids (L3, L4), associated filter capacitors C9-10-11, and 10uf coupling capacitor C12 (electrolytics were still big and tall), and C13 added bulk to the section as well (see right half of p.c.b. in top-view photo of my DC 80-10 below).

The original p.c.b. design mounted the pair of toroids for each band (40 and 20 meters) at the top and bottom left corners of the p.c.b. connected to the oscillator MPF105 and the IC CA3028A via an off-board DPDT band-switch. That was OK for a while, but I wanted the multiband capability and that meant some kind of “plug-in / socket” arrangement as had been in use for a half-century, but a system using toroids instead of coils on coil forms and actual sockets. In the old days (slight before then), screw terminal strips were very common, and I saw a connection method that anticipated the Wayne Burdick’s use of computer card end connectors in the NORCAL Sierra by a quarter century. His system is better. I designed a screw-on module with three mounting slots that fit the screw-on terminals and had room for a toroid + fixed capacitor + variable capacitor (see **Close-up of Dual Section Capacitor below**). It took two screw-on p.c.b.’s per band (oscillator and mixer), but it proved to be a highly stable approach even on the high bands.

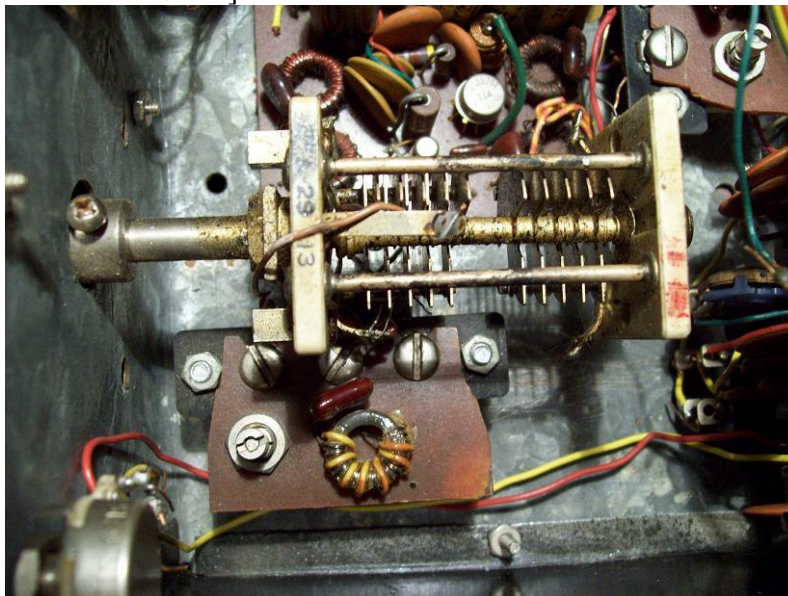
One feature of DeMaw’s circuit was that the oscillator and antenna input circuits were tuned to peak together for best sensitivity by use of the dual-section ~50pf variable capacitor (C3A, C3B) to track the two circuits together across each band. Once the variable capacitor on the input module was peaked on a frequency, its peak would follow the oscillator frequency. The receiver was a very good performer except the lack of sharp selectivity and the just adequate audio output into hi-Z headphones. But Hayward came to the rescue with his “An RC-Active Audio Filter for CW” **QST** May, 1970. I built up a 3” x 3” p.c.b. with a four transistor active filter which was great on improving selectivity but at the top of the rankings for generating internal noise! I built up a cabinet for the p.c.b.’s and controls out of fairly heavy galvanized tin metal sheet for ducting – it was strong and no way to get 90° bends, but the black crackle paint added a real touch of class. I even splurged on a 3-inch vernier dial – I wasn’t that poor kid who had to beg,

**K8EEG (W0RSP)'s Final Combination of Circuits in  
DeMaw's DC 80-10 Direct Conversion Receiver Design**



**Close-up of Dual Section Variable and V.F.O. Band Module  
with L5-L6 and Trimmer Capacitor Beneath it.**

[The left edge of the p.c.b. with the two pairs of oscillator toroids and CA3028A is just under the dual section variable.]

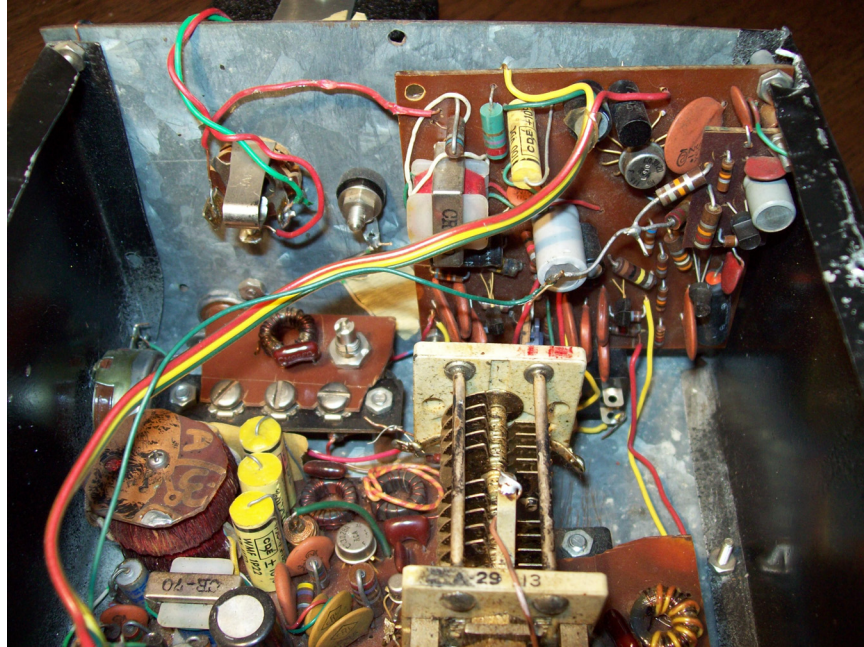


borrow, or steal parts for his first transmitter anymore. I was employed! So, when I set out in a VW bus on Field Day 1970, I was ready for top-spot since I'd strung about 900 feet of copper coated steel electrical fence wire up about 50 feet. Well, the receiver was great – ears aching after a while, but what for all the preparation selecting a perfect site and stringing up the antenna and filling a cooler with ice and liquids like the experts



recommended, I sat there for five hours in that bug-infested field and only worked three of the million stations I'd heard. I never did figure out why. It wasn't the receiver's fault!

**View of Rear Panel with the 3"x 3" RC Active Audio Filter  
with 4 Transistors and a CA3020A IC.**



The stacked 88mh toroids and 3 yellow filter capacitors as well as the audio transformer and 10mf coupling cap are clear on the left half the main p.c.b. Behind it and to the left of the 3"x 3" rear panel RC active filter p.c.b. is the L1-L2 terminal strip for the front-end. Unfortunately, since I last listened with the receiver a couple of years ago, some bypass or coupling capacitor or resistor solder joint has corroded loose and as the gain or bandwidth of the RC active filter is adjusted, it breaks into oscillation. However, the CA3020A puts out a very loud 600Hz tone. Later.

DeMaw had preceded the "DC 80 -10" article with "Some Notes on Solid-State Product Detectors" (*QST*, April, 1969) and followed it with what could be a companion transmitter in "The QRP 80-40 CW Transmitter" (*QST*, June, 1969), then "Once More with QRP" (*QST*, August, 1970, 17-22) which brought together previous circuits and added "modern" transceiver features. The v.f.o. described by DeMaw in the June 1970 issue of *QST* was integrated with the crystal-controlled transceiver circuit described in the March 1970 issue as "Packaged QRP for 3.5 and 7MHz" (25-27) which used the "DC 80-10" receiver along with a solid state transmitter and improved audio amplifier [Note that *QST* already was defining low power as "QRP" instead of "QRPP" with the lowercase "p" to distinguish it from the QRP ARCI's 100-watt definition.] The unit could be driven either by the v.f.o. or the crystal oscillator. An r.f. gain control was added to protect against interference from strong signals.. The "DC 80-10" audio circuit was improved with switchable "sharp" and "broad" bandwidths, an IC preamp, and an HEP593 audio output IC amplifier feeding an 8-Ohm speaker (or phones). A sidetone

# Once More With QRP

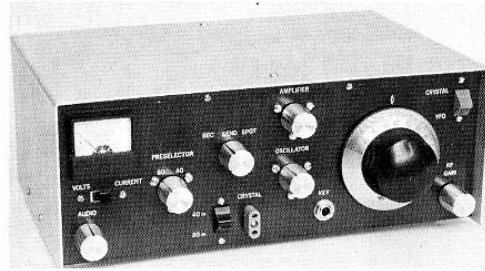
A Modern Low-Power CW Package

QST August 1970 17-22

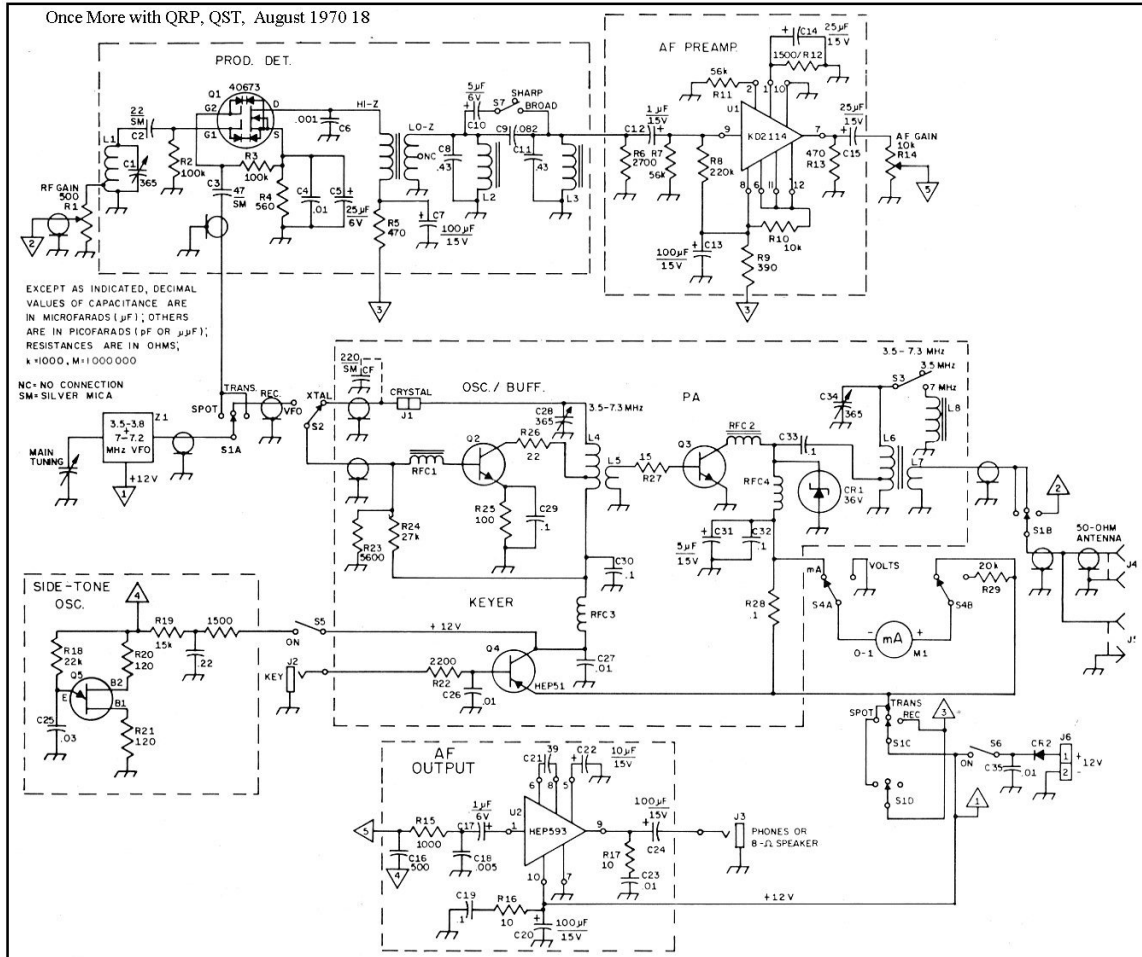
BY DOUG DEMAW, \*WICER

**T**HIS REVISED version of the "Packaged QRP for 3.5 and 7 MHz" (March 1970 QST) offers some operating conveniences that were omitted in the earlier transceiver. It is no secret to the QRP enthusiast that VFO control is often the common denominator required for survival among the higher-power cw stations. This Mark-II model provides for crystal or VFO control, and transmits a chirp-free, clickless signal on both 80 and 40 meters. Dc input power to the PA stage of the transmitter is 2 watts. Output power is on the order of 1 1/2 watts, more than enough to assure plenty of Q5 contacts.

Some circuit changes were made to provide conveniences that were not offered in the earlier transceiver: A sidetone oscillator permits monitoring one's fist; the cw filter is based on the Butterworth concept, and provides two degrees of selectivity; PA collector current and operating voltage is monitored by a panel meter; a bipolar switch is used for keying the transmitter to lessen the chance of clicks.



A homemade aluminum cabinet houses the Mark-II version of the QRP transceiver. Green spray enamel paint is used to decorate the front panel. White press-on decals identify the controls. A National vernier dial is used as the main-tuning control, but other mechanisms can be substituted, such as those found on surplus TU-6 tuning units. The top half of the cabinet is plain aluminum, and was given a grained finish by abrading the surface with emery cloth. It was then soaked in a mild lye bath to obtain a satin finish, and later sprayed with clear lacquer.





oscillator and keying switch (not “keyer”) also were added. A simple method of obtaining transmit frequency offset was discussed, and DeMaw included an optional RIT (Receiver Incremental Tuning) circuit which proves extremely valuable in QRP operation. As yet, the unit is still a combined receiver and transmitter with a switch to select between the two functions – electronic switching (QSK, break-in) was an improvement in the future for QRP.

DeMaw (as Technical Editor) also included another QRP transceiver in the August 1970 issue of **QST** in the “lead” spot on page 11: “A Complete Solid-State Portable for 40 Meters” by Melvin Leibowitz W3KET. The unit used a d.c. receiver with two-pole input filter, the CA2028A product detector feeding the typical 88mh filter terminated in a 3-transistor audio amp. The v.f.o. operated on 3.5MHz and fed a 2N706 frequency doubler which produced the 7MHz signal for amplification in the 2N3053 driver stage. W3KET filed a “QRPP Operating News” report on his results in the August 1970 **THE MILLIWATT**, the same month that his article appeared in **QST** (long lead-time): “I have been working 40 c.w. with 2-5 watts. The rig is a homebrew, transistorized, direct conversion transceiver of my own design. It has a pair of 2N2102’s in the final which will run 10 watts (input) at 25 volts but I keep it down under 5 watts to conserve my nicads. The rig has a built-in calibrator at 7035kc and a unijunction monitor (sidetone). The receiver features 2 degrees of audio selectivity obtained from a filter made from teletype toroids. Sharpest position is only a few hundred cycles wide. Also included in the receiver is a very simple system of incremental tuning which is accomplished by varying the voltage on the oscillator by means of a series potentiometer during receive. Ten-Tec owners [i.e., of the PM-1 v.f.o. modules] might be interested in this scheme. I have not tried very hard to work all states and the count is now at 18. VE1,2,3 have been worked consistently and I have made many contacts at the 1000 miles-per-watt [m.p.w.]. More QRP’rs should use a v.f.o.. It increases the number and consistency of contacts tremendously”(p. 18). Most QRP transmitters were crystal controlled and thus frequency limited.

Doug DeMaw also happened to submit an “Operating News” report in the same issue. I reproduce it here because it is something like the “second coming” of Technical Editor Robert S. Kruse (1XAQ) of the 1920’s in its values and attitudes (see **History of QRP in the U.S., 1924-1960**, Chapter 3 and beyond, for Kruse and L. W. Hatry’s promotion of excellence with QRP vs. the QRO “watt-hogs” and “ether-burners”. Incidentally, Kruse’s call given on p. 39, i.e., “1XAM” is an error. “1XAM” was the call of early QRP pioneer John L. Reinartz – see **QST**, January, 1924, 26-27, for a description of his transmitter and antenna.). DeMaw wrote:

“I have enjoyed reading my first issue of your interesting publication. It is refreshing, indeed, to see some emphasis being placed upon low-power operation. In the QRP world the operator's skill and determination replaces the oft-used brute-force tactics employed by some QRO stations. Here at very lower power levels lies the challenge that first inspired men to engage in the exploration of the radio spectrum. QRP operation can supply the common bond that so often seems to be missing in the QRO stampede. Certainly, courtesy and patience are the requisite virtues of the low power enthusiast. Since your

magazine fosters that concept by the nature of its theme, much good should result.

“I do not think that a specialty magazine has space to spare for petty politics, and I am pleased to see none of that type of rhetoric in your pages. May the trend continue! I hope that you will always regard QRPP objectively. In your editorial in the first issue, you refer to QRP'rs as "the ever-growing lunatic fringe . . . ." I would take issue with you on this, although I presume that you are jesting [*ed. Yes!*] I know a vast number of amateurs that are experimenting with low power. None of them could be classed as fops. To the contrary, most of them seem to be cut from the grade-A flank of the steer. Admittedly some low-power gear is novel, but it takes a sensible and skilled operator to use it effectively once it is built. I am in sympathy with your desire to entice people into trying QRP by starting with a single-transistor oscillator. However, I hope you will not push the simplicity concept too much. In reality, a properly operating two-stage rig is as easy to build and get operating as is a one-lunger. One transistor oscillators like the W7IIL rig [April issue] are ok for teaching a beginner the basics but rigs of this type usually have an inferior note, are very inefficient, and frequently have very high harmonic output. When using a rig of this type, the best practice is to employ a harmonic filter. The QRP rig which I described in the June, 1969, issue of **QST** has a full-wave output tank with a Q of 1. This takes care of harmonics beautifully, and since it has a Q of 1, it will cover the c.w. portion of both 80 & 40m without the necessity of tuning controls. However, any simple QRP transmitter, regardless of which type of collector tank circuit it employs, can be followed by this same type of hookup to get rid of harmonic energy. The above-mentioned full-wave output tank can be built in a minibox and attached to an existing QRP rig as an outboard filter. Since it is a 1-to-1 device, it will work fine in any 50 or 75 ohm transmission line. Halving the values for a 40m filter will give the proper values for a 20 meter version. One of the best technical guides that I can recommend to the solid-state fraternity is **RCA'S POWER CIRCUITS, D.C. TO MICROWAVE**. This is a two-dollar paperback which contains 448 pages of down to earth transistor theory dedicated mainly to low and medium power transmitter design. There is a complete chapter on network design -- the most valuable tool to the designer of solid-state transmitters. The book is available from most supply houses, or directly from RCA [*NB: no longer available*]. Also **THE ARRL RADIO AMATEUR'S HANDBOOK** is heavy on the theory and design of low-power solid state gear, especially the 1970 edition.

“At present, I am active on 80/40 c.w. with a v.f.o. controlled homemade solid-state transceiver described in August, 1970, **QST**, and welcome all contacts, near or far. I QSL 100% on QRP contacts, so if anyone is looking for Connecticut for WAS, look for me around 7050 or 3550kc week nights, 2200gmt to 0200gmt [*ed. Note: GMT = UTC*]. As for results, I don't agree with the statement that one "struggles along with 40% calls/answers on 80/40m". I have a dreadfully poor antenna (end-fed 125ft, 15ft off the ground) and my percentage of replies is closer to 90%. The secret is partially in the operating technique and skill used. I seldom call CQ. The lowest report I have ever received while running about 1 watt was a 449. The average report is 579. I hasten to say, however, that I do not attempt operation in the crowded novice bands.

“Good luck on your efforts with **THE MILLIWATT**. I'm sure I'll enjoy my

subscription. I hope you will be able to get some contributions that treat vhf and uhf QRP as well as some data on ssb, fm, and am QRP gear. The 160 band offers some interesting and challenging possibilities for the QRP'r too!

73, Doug DeMaw W1CER, Technical Editor, QST.”

DeMaw put the full support of the ARRL behind the 5-watt QRP movement and built our technological foundation, teaching and demonstrating the important concepts. It is amazing how similar his attitude is to that championed by Kruse and Hatry at the beginning of the vacuum tube era. DeMaw's tenure at **QST** brought QRP into its full blossoming in the next two decades. But DeMaw's two QRP projects in the August issue of **QST** struck a raw chord in C. F. Rockey W9SCH, Contributing Editor of **THE MILLIWATT**, who was a dedicated “KISS” (keep it simple, stupid!) QRP type.. W9SCH voiced his opinion in the Editorial Lucubrations of the October 1970 issue of **THE MILLIWATT**. In part, he wrote:

“... the practicability of any scheme, in amateur radio, is at once questionable if it involves a sacrifice of simplicity.... Today, amateur radio reaches toward such levels of sophistication that it boggles even the thoughtful amateur.... I ask, gentlemen, is this AMATEUR radio? Even QRPP is feeling this apparent blight, For instance the August, 1970, issue of **QST** contains descriptions of two excellent QRPP transceivers. An examination of the circuitry and designs leaves us with no doubts as to the prospect of their superb performance. My hat is off to Leibowitz & DeMaw for their execution. But there is more machinery in either of these two "simple" units than in an entire amateur station of not so long ago. When QRPP which, we believe, represents the extreme dedication to mind over machinery, becomes this complex, where is the rest of amateur radio going? ...  
C.F.Rockey W9SCH”

Ironically, the Technical Editor of **QST** contributed “Hints for Successful Operation” to the same issue (October 1970, 4-5) of **THE MILLIWATT**! He joined the rest of us and shared his technical expertise as well as experience – he was a QRP operator himself! And he found W9SCH's position untenable since it directly called into question his own efforts at advancing the QRP cause. So he wrote a rejoinder to W9SCH's argument. It appeared as the “Editorial Lucubrations” for the April, 1971, issue of **THE MILLIWATT** (see below). Many of his significant points resonate with where most of us were with respect to designing circuits – he knew what we wanted to learn and, in fact, *needed to learn* in order to construct more efficient, better performing rigs which helped the QRP operator taste the joy of successful QRP operation. We all had been scrounging around the ham mags looking for any kind of clues as to how to make a good rig. We were finding a bit of circuit here, another there, and figuring out, or rather, cut-n-trying it to make it work. That's what DeMaw and Liebowitz were showing us how to do in their transceiver designs. In addition to these articles and his v.f.o. article in the June, 1970, issue of **QST**, he wrote subsequent “practical theory” articles like “How to Tame a Solid-State Transmitter” (**QST**, November, 1971, 29-33) featuring a 4-stage crystal controlled transmitter complete with theory, correcting problems during breadboard development, and a “totally modern” template and parts placement overlay for a p.c. board on which to assemble the transmitter – a new lesson of sorts for QRP'rs. In the

THE MILLIWATT: NATIONAL JOURNAL OF QRPP

. . . devoted to under-five watt amateur radio

April 1971

Vol. II

#2

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## Editorial Lucubrations

I appreciate the vote of confidence given to Mel Leibowitz and me for the QRPP symposium in August 1970 QST as per the October Editorial Lucubrations in The Milliwatt. However, I am slightly surprised, and quite disappointed, in W9SCH's commentary on the complexity of the two transceivers which appeared in that issue of QST. I'd like to add my views to this discussion.

I seriously doubt that oversimplification of any piece of ham gear is in keeping with the purpose of amateur radio. Perhaps OM Rockey missed the point somewhere along the way, that amateurs are expected to contribute to the advancement of the art--the whole justification for our being privileged to hold FCC licenses. Sophistication offers operating conveniences that enable us to carry out our QRPP work with greater effectiveness, thus making better operators of those who use modern gear. The day of the one-tube or one-transistor oscillator should be buried in the nostalgic past. . . unless, of course, some outstanding technique is miraculously developed to minimize chirp, poor efficiency, and high harmonic output levels. We, as amateurs, are obligated by law to transmit clean signals. Purity of emission is also a moral obligation that any conscientious amateur should strive for.

Simplified gear is excellent for the cutting of teeth in this rewarding pastime of ours, and I would encourage this to permit beginners to experiment and learn the techniques of electronic design and application. However, the mark of a true radio amateur is the curiosity about new concepts, and the burning desire to forge ahead to greater plateaus of technical achievement and knowledge. This cannot come to pass by an apathetic approach to QRPP (or QRO for that matter) operation. Learn by doing if need be, but for your own sake and the sake of amateur radio try to advance beyond beginning levels of sophistication.

The circuits used in the two August QST articles, to speak directly to the point, are quite basic in all respects, and incorporate added operating frills which can be left out by those who wish to save money and effort. The VFO's can be eliminated, or the crystal-control feature can be scrapped. The same goes for other features: for example, either rig will perform without the sidetone monitor, which is merely an added convenience. What else is shown in either circuit that makes the equipment so dreadfully complicated. If we do not show young hams how to build the various accessories that are incorporated into these two rigs, how can we expect them to learn? It takes but fractional brain-power to look at circuits such as we described and decide that many avenues for cost-cutting and simplification are open to those wishing to duplicate the equipment, and from my personal knowledge in this matter, there have been several hundred copies of these transceivers built. Someone must believe that modern techniques are important to amateur radio. A VFO is one of the most important tools available to the QRPP operator, and he who does not use one is always going to be low man on the QRPP WAS list.

My point simply is this: let's not discourage any of our readers from learning new ways of executing old practices. In QRPP work we are greatly aided by receiver selectivity (even when using simple receiver circuits), VFO control, and in general, flexibility. Articles describing seemingly complex QRPP gear can certainly serve as "idea articles" and provide intellectual stimulation.

Doug DeMaw W1CER

November, 1974, issue of **QST** (22-26, 34), DeMaw added to his series with “More Basics on Solid-State Transmitter Design”, which featured a 3-stage v.f.o. with an MPF102 FET oscillator on 1.8-1.9 MHz, an MPF102 buffer, and a 2N2222 buffer-amp with filtered output of about 50mw into 50 ohms. The 3-stage transmitter featured a pushpull final with a pair of 2N5320’s (rated at 10 watts!), and incorporated relay-switching for full-breakin QSK and muting with an external receiver. Earlier, Wes Hayward W7ZOI paved the way for moving up from the typical 1-2 watts than most designs provided with his “Increased Power for the Solid-State Transmitter” (**QST**, May, 1972, 19-22) which used a 2N3950 putting out about 24 watts of r.f. with a Vcc of 24 volts. We QRP’rs were thereby introduced to the radically low input and output impedances of solid state amplifier stages – 3 Ohms in and 5 Ohms out, say what???. He included a simple impedance bridge circuit for use in adjusting the input T-network. I borrowed it and used it with two other simple test circuits in my subsequent article “Power Amplifier Development with Your Transistors: Simple Test Equipment and Methods for Making-Do with Devices on Hand, on Frequencies You Want to Use,” which appeared in **QST**, May, 1976, 25-28, and was republished in **QRP CLASSICS: The Best QRP Projects from QST and the ARRL Handbook** (1990), 259-261.

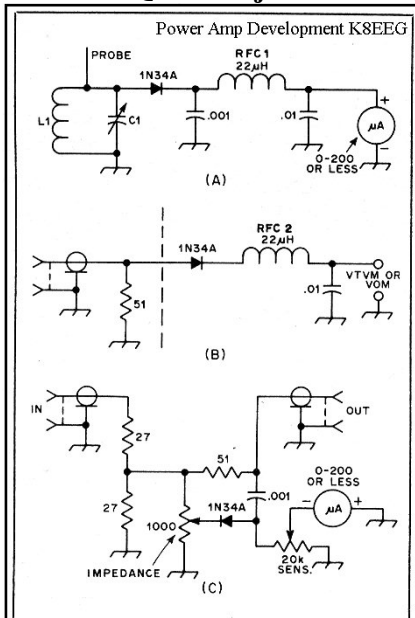


Fig. 2 – Simple test equipment used in optimizing the solid-state amplifier includes a wavemeter, A, a power-output indicator, B, and a variable impedance bridge, C. Values of L1 and C1 depend on the band being checked. Parts designations are for text reference.

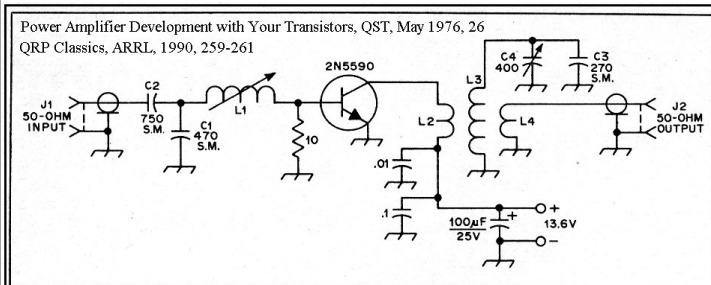
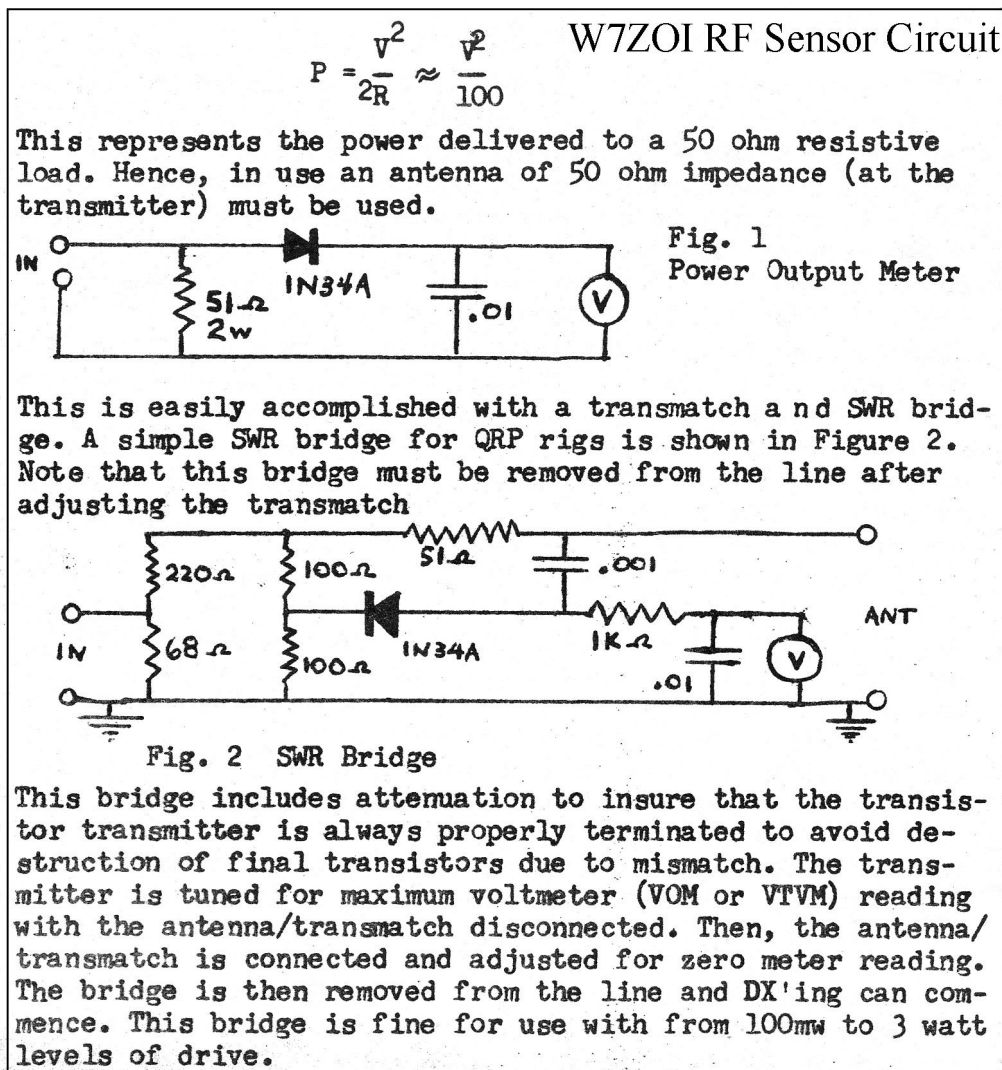


Fig. 1 – Schematic diagram and parts information for the K8EEG 40-meter amplifier. Capacitor values not otherwise marked are in pF. Some parts are numbered for text reference only. All grounds should be made directly to the transistor emitter strip. C1, C2 – Final values given; can be made variable as with C3-C4, for experimental purposes.  
 C4 – 400-pF miniature trimmer. Small broadcast-type capacitors suitable for low-power applications. See text.  
 L1 – 9 turns No. 22 enamel, closewound on 1/4-inch dia. slug-tuned form.  
 L2 – 2.5 turns No. 22 enamel, closewound on Amidon T-50-2 toroid core.  
 L3 – 13 turns, spaced to occupy entire core of L2.  
 L4 – 4.5 turns, spaced over 1/3 of core. In using the toroidal circuit for interstage coupling, make L1 1 to 2 turns for 10- to 40-ohm collector load impedance, and 4 turns for 40 to 80 ohms.

Also, DeMaw introduced the Breune R.F. Bridge for SWR and/or power measurements in the h.f. range (**QST**, December, 1969), an instrument which QRP’rs adopted immediately and produced many variations using the basic circuit .

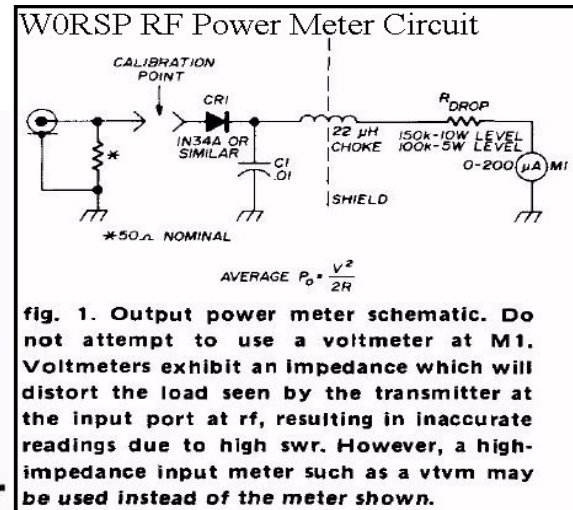
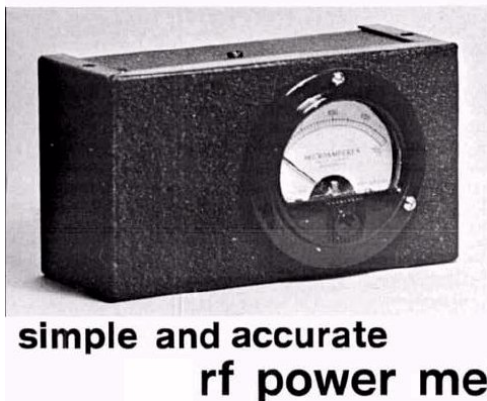
Another fundamental shift in hands-on practice as well as theory was introduced in Wes Hayward W7ZOI’s article “Output Power as the Basis of Comparison” in the August, 1970, issue of **THE MILLIWATT** (7-10): Hayward began with the reference to a 1940 QSO “between W6EAK in Los Angeles and Denver with 7 milliwatts *input*

resulting in a record 118,000 miles-per-watt (**Radio Magazine**, June, 1940, 79), and made the point: "While equipment and devices have evolved significantly in the last 30 years, the methods used by the QRP'r have not, unfortunately, changed much. Specifically, transmitter input power is still the typical measure of the transmitter effectiveness." Hayward suggested that we QRP'rs use *output power* as the standard of comparison because of the wide variation in the *efficiencies* attained by different circuits and rigs. For instance, the then-typical single transistor transmitter could be expected to be in the range of 10-20%, while a rig "such as DeMaw's QRP 80-10 (**QST**, June, 1969) exhibited an output amplifier efficiency of 60% or more." The general impression that measuring output power was difficult was in Hayward's words, "totally false", and he presented a simple sensing circuit which fed a VTVM or VOM meter. As he explained: "The capacitor will charge up to the peak RF voltage. Hence the power across the load resistor (51 ohms) is easily calculated as:

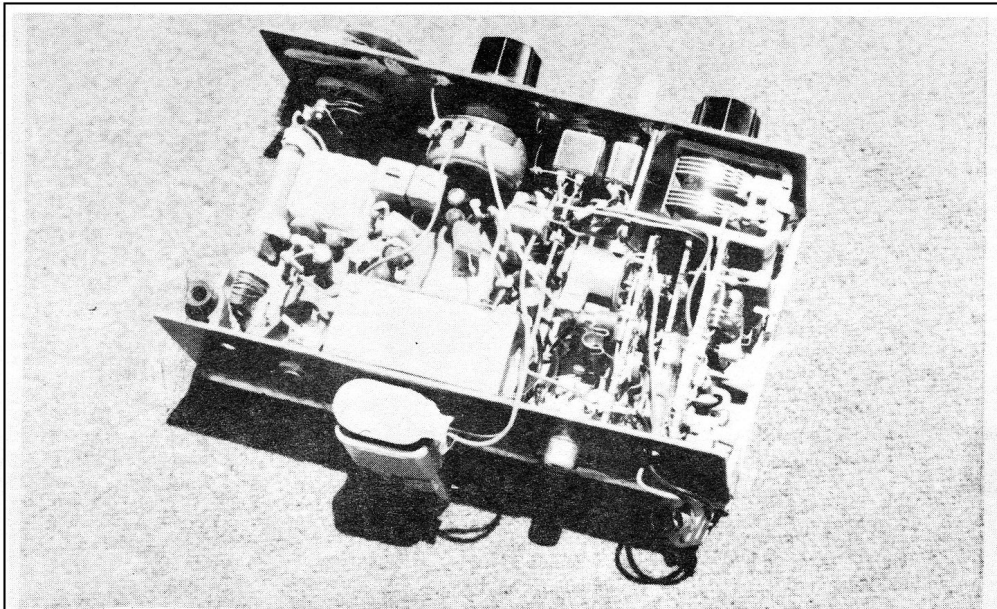




The impedance of standard VTVM and VOM devices is extremely high compared to the 50-ohm load resistor, so it does not affect the accuracy of the reading. While Hayward does not comment, the beauty of the simple circuit is that it can be accurately calibrated using a known d.c. voltage source (battery) at the input terminals of his circuit, or at the “CALIBRATION POINT” in my circuit below (from **HAM RADIO**, October, 1973, 26-29).

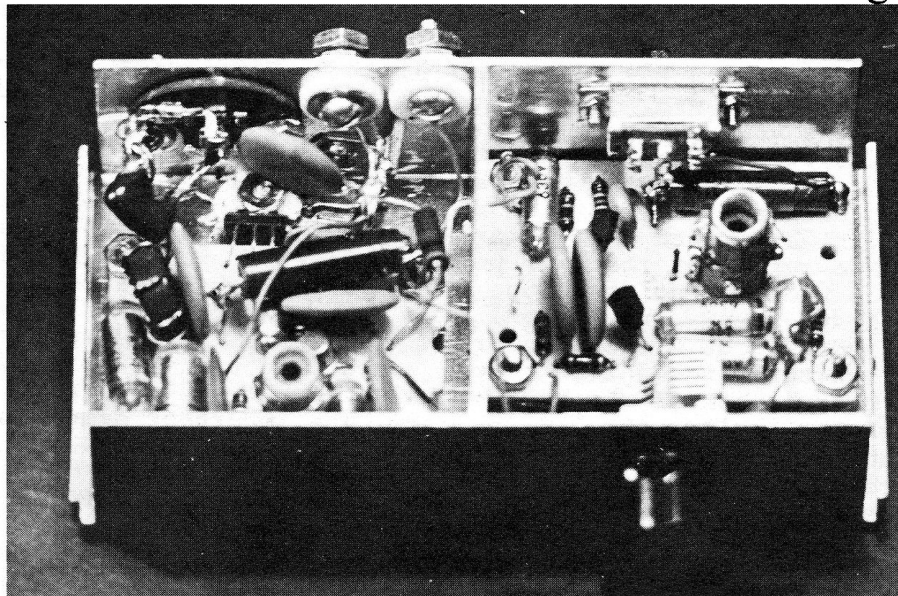


The accuracy will reflect the accuracy of VTVM/VOM used to measure the d.c. source voltage. The voltage drop across the 1N34A germanium diode is automatically taken into consideration when the readings on the very sensitive 0-200ua meter are cross-referenced to the calibration voltage. Using the exact value of the load resistor **R**, the voltages can be calculated from the desired powers in watts (i.e., 10w, 8w, 6w, 5w, 4w etc = 31.93 volts, 28.5v, 24.7v, 22.5v, 20.17v for the specific resistor and 1N34A diode in my unit) using the formula:  $V = SQRT(P_o * 2R)$ . The dummy load **R** can be any combination of paralleled resistors (or a single resistor) that provides close to 50 ohms. It must be isolated from the diode side of the enclosure by a 22uh or similar r.f. choke – otherwise, at powers above about 300 milliwatts, the r.f. field inside the enclosure will upset the meter accuracy. The **R-drop** resistor is selected for the range of r.f. power to be measured end the sensitivity of the meter. A lab grade instrument will result. It can be used to calibrate an in-line Breune SWR meter in watts (see DeMaw, “In-Line RF Power Metering,” **QST**, Dec. 1969, 11). However, the sensing circuit can be haywired on the spot for quick comparative adjustment measurements using a VTVM/VOM. Again, I scrounged a circuit from DeMaw or Hayward and added a bit to come up with a valuable QRP instrument. I am still blown away by the fact that these two outstanding hams, or in Ward Silver N0AX’s words (himself the 2008 Dayton Hamvention Radio Amateur of the Year), “Titans of amateur radio,” were contributing their knowledge to a fledgling bunch of QRP operators looking for answers in **THE MILLIWATT**. Other readers also submitted the circuits they had been working on -- the first six issues (1970) contained seven such transmitter designs. The 1971 set contained 13 transmitters; 1972 had 9; 1973 had 5, including the two-transistor “Sucrets Special QRPP Rig” which ended eventually in the ALTOIDS generation; 1974 just four, but these were multi-stage rigs such as WA6ZHT’s superhet, v.f.o. controlled 160 meter transceiver shown below – the 9-volt battery gives a size reference; and the three issues of 1975 had one rig each.



Top-rear view of WA6ZHT rig. r-l, VFO tuning capacitor front right, VFO board, shield between VFO and transmitter board, next is transmitter board; BFO and T/R switch front panel, volume control, and receiver tuning capacitor left end of volume control, and receiver tuning capacitor left end of front panel. BC receiver board left half of chassis.

### MFJ V.F.O & TX Modules in "Giant Flea" Rig



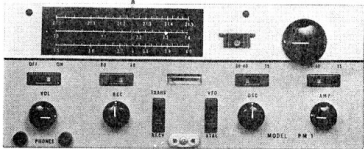
Front angle view. Shows VFO ON-OFF, Key, B+, and ANT JACK. Bolt mounting final transistor tab to box is visible between ANT and B+ post. 68pf T-R capacitor and diodes just above output toroid. Outside ANT JACK mounting screw is insulated from box, has a solder lug, and serves to connect receiver to antenna through solid-state T-R switch.



MFJ had begun producing v.f.o. and transmitter modules among its growing list of products, including audio filters and c.w. keyers. These two factory-assembled modules just begged to be combined into a tiny QRP transmitter. They fit almost perfectly into a commercially available chassis box – the finished product is shown on the cover of the June 1975 issue of **THE MILLIWATT** where a postage stamp at the left front edge showed the relative size of the unit which was called “THE GIANT FLEA” (see above). The ON-OFF switch is on the right rear panel and the v.f.o. miniature tuning capacitor at the right side of the front panel. It was one of those “perfect fit” off-the-shelf rigs. I wonder how many MFJ would have sold if the enclosure and p.c.b.’s had been assembled as a ready-to-go unit.

As noted above, Ten-Tec had designed four modules that were combined into the first commercial QRP transceiver ever, the **PM-1**, and the TX1 module, although crystal controlled, it could be driven by a v.f.o. for 80/40/15 meter output. I could not resist – a couple of modifications made operation on 20 meters also possible. The v.f.o. was a challenge. So I designed an FET v.f.o. for all four bands, with a 5-pole rotary switch for band changing (i.e., four bands plus crystal option). Two stages of buffering were needed for isolation from the amplifier and along with zener diode regulation, chirp and clicks were eliminated. It was stable enough on 15 meters to make QSO’s.

## TEN-TEC QRP TRANSCEIVERS – KEYERS



Basic PM1 modules, tuning dial, instructions for bread board mounting and inter-connecting. Modules completely wired.

Model MR1 ..... \$29.95

### TEN-TEC POWER-MITE TRANSCEIVERS

A completely wired CW transceiver designed for the 40-80 meter bands with a General Class or higher license.

It can also be crystal controlled on 80, 40, and 15 meters for Novice operation. The model AC-3 converter is used for reception on 15 meters. Switching and space are available.

The modules listed are mounted on a sturdy, aluminum chassis. The PM1 is supplied as an open chassis. Front panel controls: On-Off, Transmit-Receive, Volume, Receiver Resonate, VFO-Crystal, 80-40, 80-40-15, Oscillator Tuning, Final Resonate. A meter is provided for ease of tuning.

The Power-Mite is versatile. It will enable a Novice to get on the air at modest cost. It is ideal for emergency work where size, weight and low power consumption are important. Many Old-Timers are finding it an entrance to the challenging world of QRP. It, of course, can be used to drive a higher power linear when it is desired.

Model PM1 ..... **\$49.95**  
 Model PM2—Fully cased ..... **\$54.95**

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MX1 Synchrondyne detector-converter. Uses dual gate MOSFET for high performance. Selectivity 1 KHz.  
**\$7.95**



AA1 IC audio amplifier. 100 db gain. Response shaped 200-2500 Hz. Drives high impedance headphones.  
**\$7.95**



VO1 40-80 meter oscillator-buffer. 2 volts output. Designed for use with MX1 or TX1.  
**\$7.95**



TX1 Crystal oscillator and power amplifier for 40-80 meters. Requires 12 VDC, 250 m.a. supply. Toroidal coils.  
**\$7.95**

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### QRP SWR Bridge



Low power SWR Meter. Usable from 1/2 to 250 watts.  
**\$14.95**

### Antenna Tuner



Low power antenna tuner. Matches random length twin lead or open line fed antennas.  
**\$8.95**

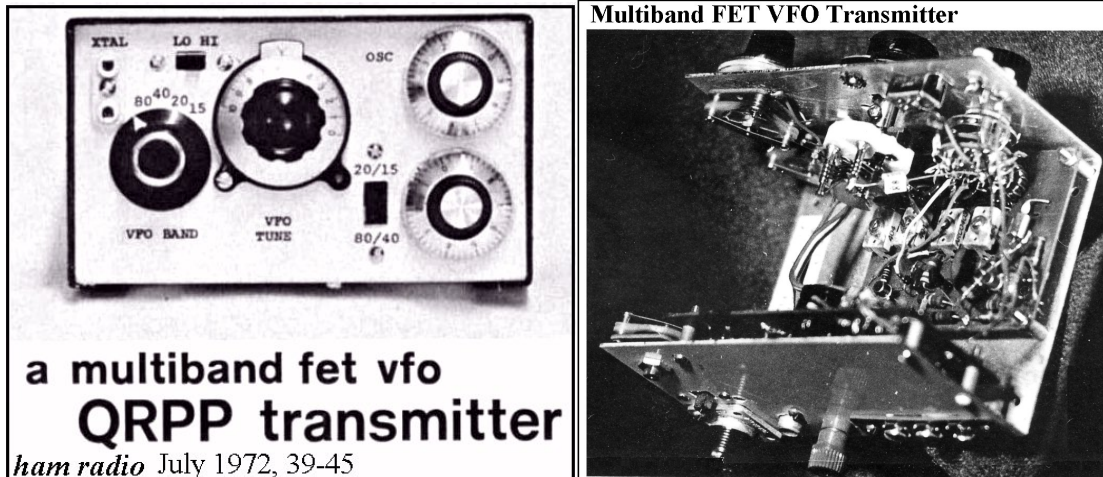
### Accessories

AC1 Convenience kit for MR1. Amplifier current meter, antenna switch, knob and connector.  
**\$7.95**

AC2 Oscillator monitor or side-tone. 8 ohm output. For speaker or phones. 6 VDC @ 50 m.a.  
**\$5.95**

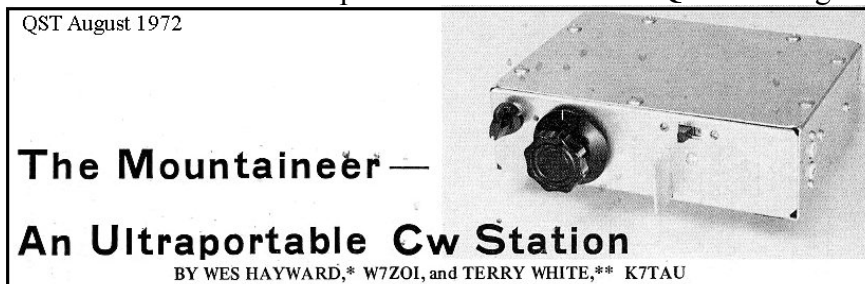
AC3 Converts 21 MHz band to 3.5 Mhz. Free running injection oscillator. Dual gate MOSFET. 12 VDC @ 8 m.a.  
**\$8.95**

The 80/40/20/15 transmitter was housed in a small 5” x 4.5” x 3” enclosure (see below). Note the AC3 21-to-3.5MHz conversion oscillator permitting 21MHz reception in the ad.

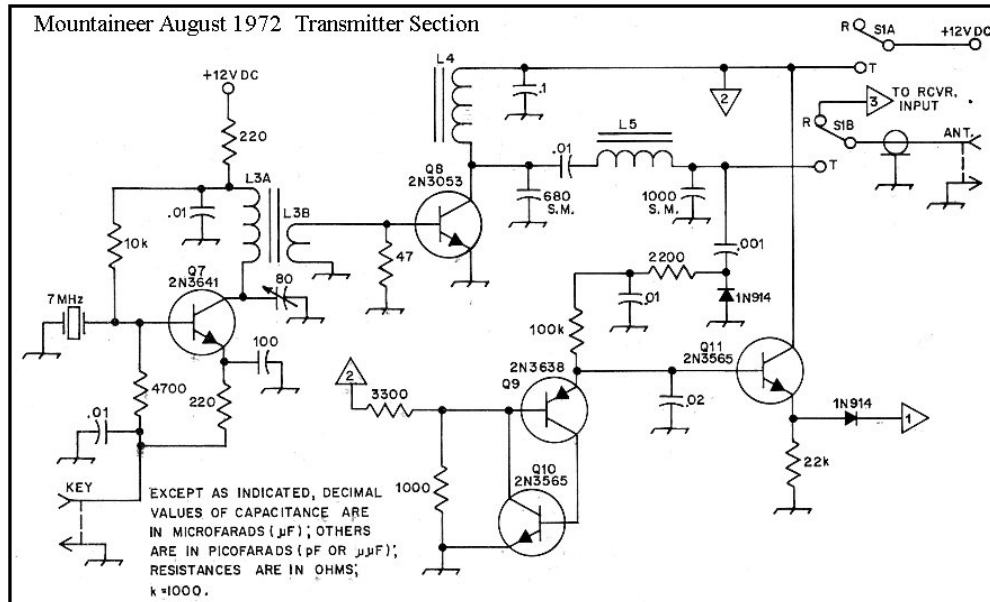


The Ten-Tec TX1 transmitter board is mounted on the rear panel, where the B+ connector and PL259 coax socket is at the left bottom corner. The v.f.o. pc. board is mounted right front where the four ARCO404 v.f.o. frequency set capacitor (white rectangles) are behind the barely discernible T-50-2 toroid oscillator inductors. The 5-pole rotary switch is above the v.f.o. The small APC v.f.o. frequency tuning capacitor is front center, and the TX1 oscillator/driver and final subminiature 365pf tuning capacitors are left front. An aluminum housing shielded the v.f.o. from the TX1 and r.f. leads during operation.

The association of low power with tiny transistors naturally suggested miniaturization. Add to that hiking and backpacking and camping atop some peak and you have Wes Hayward W7ZOI and his followers. He led the miniaturization movement with his article “The Mountaineer – An Ultraportable CW Station” in *QST* for August 1972 (23).



He began with: “A Review of *QST* for the last decade turns up a surprisingly large number of solid-state QRP transmitters and companion direct-conversion receivers, many of these being described as suitable for portable operation. This usually means the gear can operate from a battery pack, often a sufficient requirement for ‘portability’. While most QRP activity does indeed originate from a comfortable home-station environment, it is not unusual today to find a low-power addict precariously perched upon an isolated mountaintop with earphones under his parka hood and a small transceiver on a stump....” Still happens – check out WG0AT’s videos on *YouTube* sometime! And the SATA movement. The d.c. receiver was close to his earlier design (1968) seen above, but the addition of Q6 completely muted the three-stage audio amplifier during key-down periods, a very significant improvement, and the audio amplifier was designed to perform as an active filter (Hayward, “An RC Active Audio Filter for CW, *QST*, May, 1970). The transmitter was a simple crystal controlled two-transistor design. Hayward’s next design

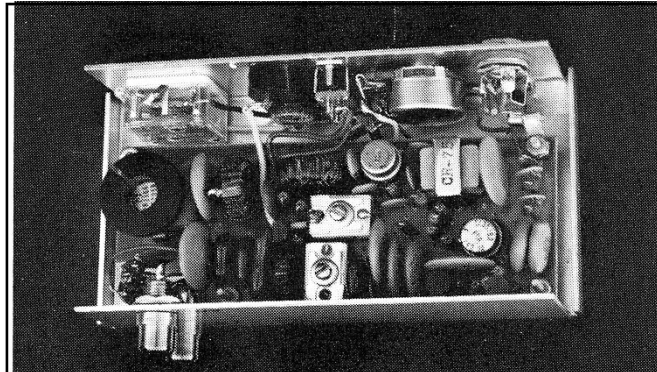


aimed at further miniaturization in “The Micromountaineer” (*QST*, August, 1973, 11-13, 45) at some reduction of sophistication by eliminating the receiver v.f.o. stage and settling for crystal control on the theory that if the transmitter’s frequency range is limited to the crystal frequency, there is no point in having a receiver that has a wide tuning range. But his articles motivated others to shot for the most in the least size.

Howard Batie W7BBX started with his “Mark II 7MHz CW Transceiver” (*THE MILLIWATT*, December, 1973, 10-14; February, 1974, 10-18) a full-feature QRP transceiver with all the bells and whistles of the “big store-bought rigs” (like QSK, RIT, Sidetone, internal Keyer etc.). The Mark II was a “big” little rig. He then joined the W7ZOI cadre in *HAM RADIO* (August, 1973, 16-21) with “Miniature 7-MHz Transceiver: Project shrink—a Quality Recipe for a Pocket Portable” (or **QRPP** for short – get it?) The direct conversion receiver section used the standard CA3028A as the product detector, but the major innovation was the use of a CA2018A’s internal discrete transistors as audio preamp, another as the audio amplifier, and the remaining one as a sidetone oscillator, with a muting switch arrangement during transmission. Hi-Z phones were still used. The B+ was keyed directly. The transmitter input powers were 1.35w @ 9v, 2.3w @ 12v, 32.w @ 15v, and 3.9w @ 18v. Transmitter frequency offset was

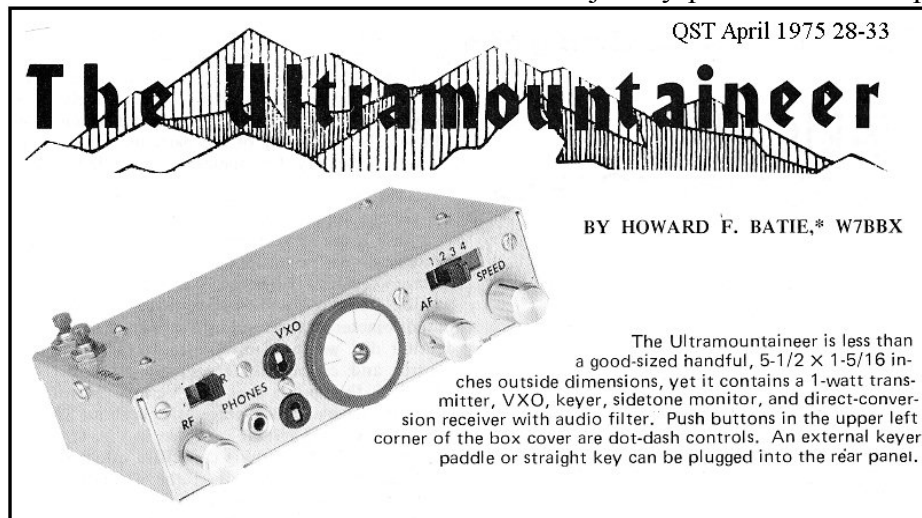


achieved by switching in a 7uh coil in series with the VXO crystal. VXO range was about 4KHz, depending upon the activity level of the crystal.

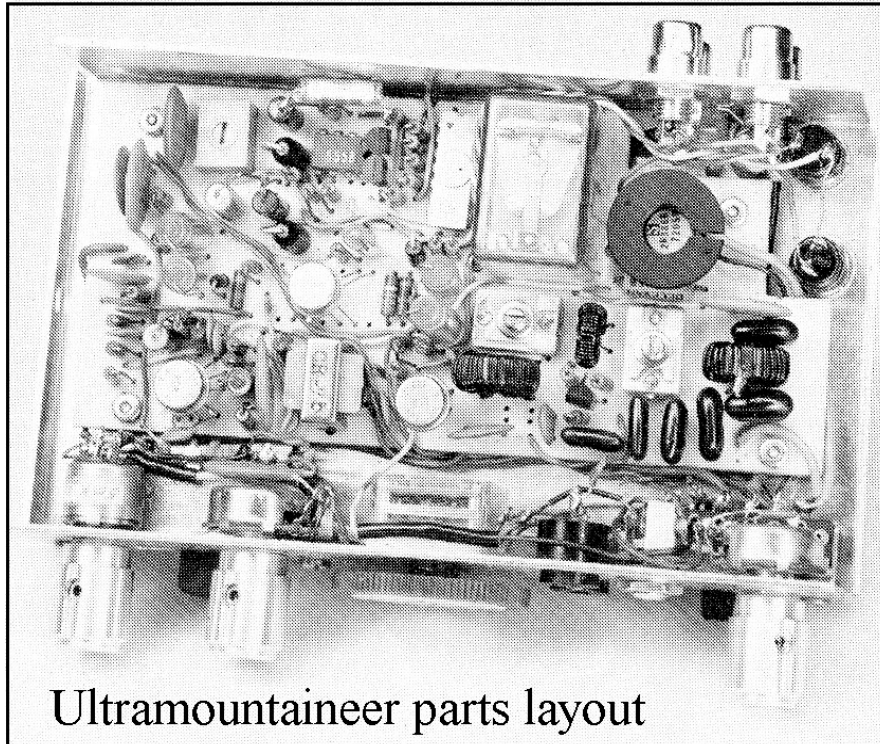


**Component layout for the 7-MHz transceiver. In this photograph the transmitter output transistor is to the left, the receiver input circuit to the right.**

Batie's next project, "The Ultramountaineer" (QST, April 1975, 28-33) pushed the limit of size vs. features as can be seen in the description in the photo below. The internal keyer, a W7ZOI design, provided a 10-30wpm and could be operated with two fingers manipulating the pair of momentary-contact switches mounted on the top, or by an external paddle. The keyer controlled the T/R circuitry via a relay approach which eliminated common problems such as chirps, thumps, or chatter. The receiver incorporated a two-stage RC active audio filter using a uA747 IC; very narrow bandwidths of 110Hz and 180Hz could be selected or just by-passed for wide open audio.



I think this was a first since the rest of the ultra-portable designs had at best the typical 88mH toroid audio filters which were very wide and mainly served to eliminate very high frequency sounds. The rig still used Hi-Z 2000-ohm phones (it was 1975). Both r.f. and audio gain controls were included and added to the unit's sophistication. The VXO covered a typical range of 2-5KHz. Output power at +12v was about 1 watt. Batie took special pains to limit the current consumption of the various sections since battery drain is a key consideration in portable operation. The r.f. output amplifier pulled only 170ma – very economical figure! At the time MFJ Enterprises supplied a 2.25" x 4.86" p.c. board for \$5.75. Batie had published "Hi-Density PC Boards Made Easy" in the July 1973 QST.



Ultramountaineer parts layout

Ultimately, the transition to Batie's and other QRP'rs almost-minature solid-state rigs was the fruition of the efforts by Doug DeMaw W1CER/W1FB and Wes Hayward W7ZOI to introduction radio amateurs to the new solid-state technology. That technology, like the brand-new vacuum tube technology of the early 1920's, was very different in fundamental ways from its predecessor and required new ways of thinking. The final product was their classic book **Solid State Design for the Radio Amateur** published in 1977 (and again in 1986). It was 256 pages packed with design theory and practice as well as bench experience and suggestions, all written in the friendly prose that made laymen like myself more comfortable with the idea of actually using formulae to design stuff like matching networks and biasing schemes. My original copy has two colors – the black print and the red underlining and marginal notes and circling of sections of circuits. I never wrote in my 1986 second edition (not for sale). Ward Silver N0AX, QST's "Hands-on Radio" column (see note above), did a special "not-hands-on" column in the September, 2011, issue (59-60) titled "Words to Watch For", a review of books that are classics and found their way into his library. Of DeMaw and Hayward's book, he wrote: "Copies of that book are worth their weight in gold amongst homebrewers such as the low power (QRP) community." Ward attempts in his columns (up to "Experiment 108" by January 2012) to bring the theory down to our layman's level in well-designed "lab experiments" which invite readers to "try it and see how it works," so naturally he would appreciate W1FB's and W7ZOI's similar efforts. Interestingly, what with the complexity of modern solid state transceivers, QRP is probably the area where most of the homebrewing is done these days.

Other developments further enhanced QRP activity in the U.S. during the '70's. As noted in the Ten-Tec ad shown above with its offering of the **PM-1** QRP transceiver and the



four modules, the growing interest in QRP led to commercial ventures. It appears that Ten-Tec was the first company with the **PM-1**. As can be seen in the ad, the PM-1 front panel design had a weak point – the frequency slide rule dial for 80, 40, and 15 meters was very clean but the dial pointer was exposed in front of the panel. Otherwise, the craftsmanship that Ten-Tec became known for was in evidence in this first QRP transceiver as well as the **AC-5** tuner and other accessories. But the PM-1 actually was prologue to the real Ten-Tec drama being developed. In the April 1971 **MILLIWATT**, Jack Burchfield K4DCD submitted the following “Operating News Report”.

de. . .K4DCD, Jack Bruchfield, 7609 Konda Dr., Knoxville, TN 37920.  
(Feb., 1971)

Enjoy The Milliwatt very much. I've always enjoyed the challenge of low power and find quite a few QRPP stations on the air now. Until lately, and in reading The Milliwatt, I find that most of the QRPP activity is on CW. SSB is conspicuous by its absence both on the air and in your magazine. There have been a few who have implied QRPP SSB operation, but nothing definite reported. I have talked with two hams who have tried QRPP SSB and recently I gave it a try. I'm including my results in case some of your readers are interested in QRPP SSB.

Starting in mid-December, I built a solid state SSB transceiver running 1 watt PEP and worked the following stations:  
20 meters--WA9PZV, 58; WAØVZR, 56; WØSJE, 59; W5JVL, 59; K4YQR, 55; W9HNX, 58; W2FWK, 54; K2SER, 57; WB2EZR, 54. 40 meters--W9CTT, 57; W4MVQ, 59; W4FGD, 56; K4ZNI, 57. 10 meters--WA7ASA, 44; K6CUF, 52.

I added a final amplifier for 3-5 watts PEP and worked the following: 20 meters--W2DJK, 54/5; W2DXX, 59; 15 meters--W6BH, 57; VE6OT, 52/3; W6QUC, 53; 10 meters--WB6QZH, 54; DL9SN, 54; HC1GI, 54/5; VE6WW, 56; K25FL, 59+; YS1WPE, 58. The antenna for 20/15/10 was a TH6DX up 50 ft, and a 136 ft longwire up 80 ft on 40 meters.

Some observations: I find that the 3-5 five watts is a definite improvement over 1 watt. With 3 watts I could even break QSO's on 10 meters and work DX. When 10 meters is open, it's the best QRPP band. Well, that's about it. Let's try to get more QRPP SSB on the air to show what can be done!

\* \* \* \* \*

April 1971

Burchfield was one of the two founders of Ten-Tec, and their development and marketing strategy for establishing a new company and producer of military and amateur radio gear gradually unfolded. The base was the modules, the PM-1 integration of those modules into a functional transceiver, and the accessory units. Notice the description of the rig in the above operating report: solid state, SSB transceiver, 1 watt PEP output, then a 3-5 watts final amplifier, no doubt a linear design, and mention of QSO's on 40, 20, 15, and 10 meters. So, we were imagining a multiband SSB transceiver, presumably with the big rig bells and whistles – QSK, and obviously a superhet receiver section with crystal filter and shaped bandpass for SSB at least. As far as I know, such a QRP design had not appeared in **QST** or other mags yet. The comparison of the 1-watt exciter vs. the 3-5-watt amplifier made an obvious point – for better results, go several dB above 1 watt and work DX on 10 meters! Too good to be true. But no mention of c.w.! Of course, at that point in time many of us were still not entirely convinced that 1 watt of c.w. could lead to an enjoyable radio experience, let alone trying it on s.s.b.! As yet, this Operating News Report sounded like a personal project to try out QRP SSB to show that it was feasible. **THE MILLIWATT** had published a couple of other such “dream” rigs such as Arnold Seipel W2NEP's “W2NEP Extra-Special Transceiver 80-10 Meters 7-Watt Output” which included all the bells and whistles (regulated 12v supply, sidetone oscillator, timed-sequence keyer, S-Meter, diode T/R switching QSK, superhet receiver with crystal

filter, heterodyned crystal oscillator plus mixer for reception and transmit, plus a crystal oscillator for variable 10KHz offset (RIT) and a couple other features (non-construction article describing the actual transceiver, April, 1971, 8-9).

The Ten-Tec MX-1, VO-1 and TX-1 modules created some interest among QRP homebrewer's. In **HAM RADIO**, April, 1972, 32-34, Vladimir N. Gercke K6BIJ's published an article "Improved Selectivity for Direct-Conversion Receivers" which detailed front-end modifications as well as audio filtering. C. F. Rockey W9SCH imagined that the Ten-Tec modules could be integrated into a transceiver for 80, 40, 20, and 15 meters, but as Burchfield had pointed out, that would be difficult. In his article "Transceiving on 80-15 meters with the Ten-Tec Modules" (**THE MILLIWATT**, December, 1972, 8-10), Rockey described a system for transceiver operation. The main problem was that for 15 meter reception with the MX-1 receiver module, a receiving converter circuit (the AC-3 module) was required to get it to receive on 15 meters although the TX-1 transmitter module already had tapped inductors that could operate on those four bands, although modifications could improve efficiency on the high bands. As noted above, my solution for a 4-band transmitter was to drive it with a 4-band v.f.o. and receive on a separate receiver. Rockey also noted the need for a v.f.o. such as the VO-1 module, but a version that could be used on all four bands for both receiving and transmitting with T/R switching. The solution was to use a frequency multiplier stage which developed v.f.o. output on 20 and 15 meters for both transmit and receive functions. Several switches had to be flipped, so no QSK yet. But then again, QSK was still kind of new back then, although T/R boxes driven by relays activated by an r.f. sensor had begun to implement QSK in new commercial transceivers. ***But the main point is that the Ten-Tec full page paid ad shown above made the publication of the first issue of THE MILLIWATT in its offset printed booklet form!***

In the second issue of **THE MILLIWATT** (April, 1970, 3-5) Mike Czuhajewski WA8MCQ "finally broke down and purchased the four module set (MR-1, \$30, about \$180 in 2012 figures)". This yielded an 80-40 meter station which could be crystal or v.f.o. controlled. The IC audio amp provided 100dB gain and drive a small speaker with adequate volume. Mike's assessment: "In a word, it is 'fantastic', it just has to be heard in order to be believed!" The v.f.o. with 2-volt output on 80 and 40 meters received similar praise as long as solid wiring strategy was used. He briefly listed the prices and specs of the **PM-1**, **PM-2**, and **PM-3** which included break-in (QSK) keying.

In the meantime, QRP began "happening" in **CQ MAGAZINE**. John Attaway K4IIF was the DX Editor and columnist, and had joined the QRP ARCI in August, 1970, and subscribed to **THE MILLIWATT** as well. He made a first reference to QRP in his DX column for June, 1971 (74) with a section titled "QRP – QRPP News". Three awards were mentioned. First, the KM/W, 1000 miles per watt award certificate (still input power and 100 watts). Second, the WAS-QRPP certificate was issued at the 20, 30, 40, 45, and 50 state levels with confirmed contacts, and a special endorsement when all contacts were two-way QRPP with both stations running 5 watts input or less, and a special endorsement when the applicant was running less than one watt input for all contacts. Recall that award was WA8MCQ's innovation in the club's award



program. Third, the club's DXCC-QRP award was given for the 100-watt power level. However, half of the short paragraph read: "In addition, **MILLIWATT** magazine maintains a QRPP Honor Roll for countries worked using very low power. For the latter write Ade Weiss, K8EEG/0, Meckling, SD 57044." This provided additional international recognition for real QRP in **CQ**'s DX column as well as in DeMaw's **QST**.

K4IIF continued coverage in a very complementary and significant manner in the August, 1972 (73), issue of **CQ**. He provided a list of monthly publications that he received which were valuable sources of information for his column as well as DX'ers in general. The list included: (1) *FEARL News*: The voice of the Far East Auxiliary Radio Operators. (2) the *Florida DX Club Report*. (3) *160 Meter DX Bulletin*: The most complete source of 160 meter DX news available. It is published during the fall, winter, and spring months by Stewart Perry, W1BB. (Non-160 meter and newbie readers will not recognize W1BB – he was *the* 160 meter DX'er of all time and still is the legendary foundation of 160 meter DX work). (4) *QUAX*: published in the UK and the "only newsletter devoted entirely to the 28 mHz band." (5) *Southern California DX Club Bulletin* by W6EJJ. (6) *The Dixer*: Available only to members of the Northern California DX Club. (7) And ending this prestigious list was: *The Milliwatt*: Devoted exclusively to 'under 5-watt amateur radio.' Maintains a list of country totals of QRPP operators. News items to Adrian Weiss, K8EEG/1, Editor, 117 Central, Acton, MA 01720." Earlier, I had placed an ad in the April 1971 issue of **CQ** (96) which read:

The only authoritative QRPP Handbook: **THE MILLIWATT: NATIONAL JOURNAL OF QRPP**. 125 pages, 10 QRPP transmitters, 2 receivers, accessories; Operating News, Log Selections, QRPP WAS/DXCC standings; articles on technical subjects for the QRPP operator. Volume 1, \$4.00. SASE for table of contents. Ade Weiss, K8EEG/0, THE MILLIWATT, Meckling, S. D. 57044.

and again in the August 1973 issue with "3 years jam-packed with QRP" added. By the end, 41 transmitters had appeared in **THE MILLIWATT**. In the May, 1973, **CQ**, K4IIL once again gave recognition to QRP following W1BB's *160 Meter DX Bulletin*:

Special interest publications of great value include the *160 Meter DX Bulletin* (W1BB, Editor), 36 Pleasant St., Winthrop, MA 021-52; *The Milliwatt* (K8EEG/0, Editor), devoted to under 5 watt operation, c/o Wes Mattox, 1444 Front St., Binghamton, N.Y. 13901; and *QUAX* (G3DME, Editor), emphasizing 10 meter band operations, Southview Road, Crowborough, Sussex, England.

and listed the top DXCC operators as seen in **THE MILLIWATT**'s DXCC Standings: K4IIL's support of **THE MILLIWATT** and QRP DX'ing apparently was shared with

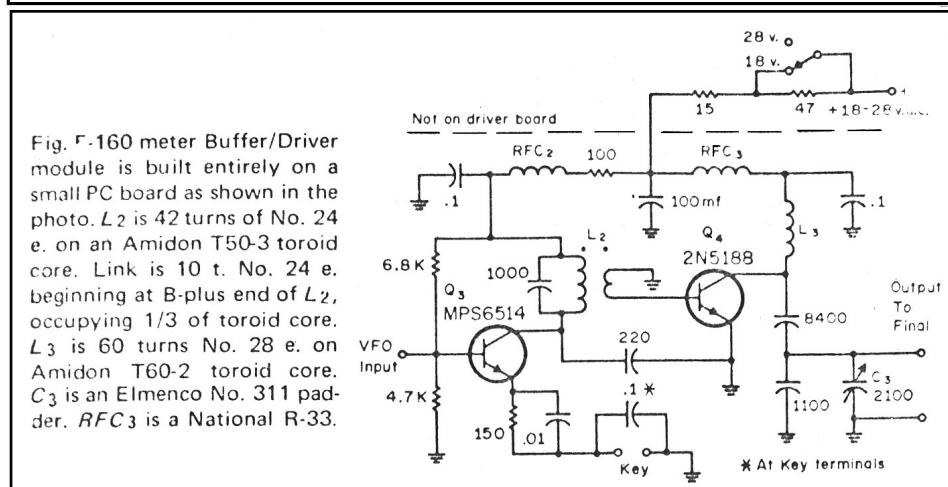
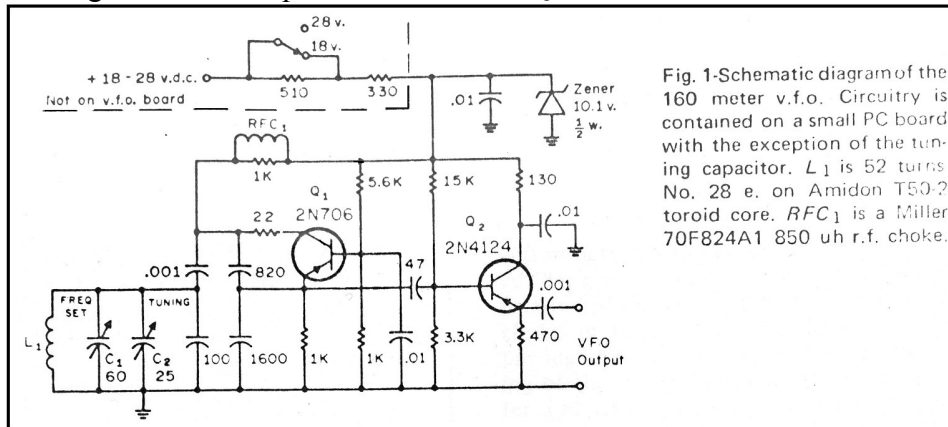
**QRPP Leaders:** Top DXers among the very low power enthusiasts are the following: K4OCE, 148 countries (5 watts); K4FS, 102 countries (5 watts); W4VNE, 76 countries (1 watt); W5TVW, 66 countries (5 watts); WB4WRF, 65 countries (10 watts); WØQZR, 54 countries (2 watts); and WA8DDI, 50 countries (1 watt).

Publisher Richard A. Ross K2MGA and Editor Alan Dorhoffer K2EEK. Ross and Dorhoffer worked most of the big hamfests after they took over **CQ** from Wayne Green, (who then founded **73 MAGAZINE** and published just about everything that was submitted to him.) and were being asked about QRP, i.e., why were they not publishing some articles since DeMaw had taken the lead and QRP was becoming popular.

Ross and Dorhoffer were aware of **THE MILLIWATT** as I had sent them several early issues for publicity purposes. I had done an antenna article (“An Optimum-Performance Array for 160, 40, and 20 Meters,” September, 1971) which was not specifically QRP but all the results mentioned were achieved with 5 watts or under. It basically was an **8JK** in Inverted-Vee configuration for 40 and 20, and a top-loaded vertical for 160. So, the main point was that it produced very good results with QRP. They liked the piece and invited further material more directly about QRP. Since I had jettisoned the old Globe Champ (my only 160 meter transmitter) earlier and needed a new rig for 160, it seemed like a good opportunity to apply DeMaw and Hayward’s tips about designing and building QRP rigs. The product appeared in “Design Notes on a Moderate Power Solid State Transmitter for 1.8MHz” which appeared in the November, 1971, **CQ** (18-25). One item that neither DeMaw nor Hayward mentioned was the potential problems involved in the use of high-ft high-gain (*beta*) VHF/UHF amplifier transistors down on 1.8MHz.!

The first set-back was trying to use a 2N4124 device (100Mhz ft) as an oscillator. As seen below, I ended up using a good old standby – the 2N706 – for a strong solid Colpitts oscillator and kept the 2N4124 in the buffer stage. The v.f.o. could be keyed without chirp due to the zener diode regulation of the B+ voltage. Note the high B+ voltages used back then – the 13.6/12-volt standard was not yet universal. Both the v.f.o. and driver stages could be switched between the 18 volt and 28 volt supply voltage. Another switch allowed the oscillator to be run continuously or turned off during receive periods. The buffer/driver stage developed 1 watt output at 28 volts on the 2N5188, a popular amplifier device (see below). The final amplifier was a real problem due to the fact that data about amplifier transistor dynamic characteristics was not available. So, the formulae for calculating input and output networks did not work because non-engineers did not have numbers to use! Also, many of the available devices would evaporate almost instantly if operated under mismatched conditions – either input or output. Finally, the Texas Instrument TI487 proved to be the most durable but it would break into self-oscillation at the slightest instigation! So it took a lot of experimentation to finally tame the amplifier stage! The output network ended up being a double-pi half-wave terminated in a 2.5mh r.f. choke (to prevent self-oscillation from feed-back via the ground loop) and a 3-section (365pf each) variable capacitor in parallel with the center capacitor pi-

network center capacitor – this provided a bit of flexibility in matching to the antenna. It did well during routine 160 operation and two CQ WW 160 contests.



But there was a lot to learn! First, in the August, 1970 issue (p. 51) of **QST**, DeMaw had announced the development of “balanced emitter” amplifier transistors at Motorola. The internal structure was an innovation – the device consisted of many monolithic transistors in parallel, each with its own emitter resistor, and the whole group of resistors effectively in parallel, thereby creating a very low and very stable input impedance and protection against thermal-runaway (i.e., extremely rapid build-up of heat and puncturing of the collector-emitter junction). The data sheets were available for design formulae. The Editorial Lucubrations in the August 1972 issue of **THE MILLIWATT** (pp. 2-5) described the new devices, included specs for 13 devices along with 18 diagrams showing curves for the parallel input resistance and capacitance, and parallel output capacitance. A valuable reference was K7QWR’s paper in **QST** for March, 1972 describing a 3-30MHz linear amplifier: “This article is a wealth of information about the design of such power amplifiers, and includes by far the most complete information on the construction and use of broadband toroid transformers in the hf spectrum that has yet come to light.” The data sheets published in the **Motorola Semiconductor Library** (which I managed to acquire at a somewhat high cost) were made available from **THE MILLIWATT** for an SASE (for newbies: means Self Addressed Stamped Envelope – sort of like sending an email with your address in it). Tri-Tek Inc. and S & R Enterprises in Phoenix AZ were the sources for the devices. The numbering of the new

devices ran from 2N5589 to 2N5646, and most were available in 12-volt (note!) or 28-volt brands and up to 60 watts continuous dissipation. WOW! In 1970, I had predicted that it would be about five years before they would be. So in 1972 *after* building the 160 meter transmitter, I was finally able to purchase a 2N5590, 20-watt, 12-volt device for a new final amplifier to replace the old TI487. It cost only \$5.00 (about \$22 in 2011 value)! Not bad. In the new final configuration shown below, the v.f.o dial is at left, the 11-position L-network switch at center, and the white tuning knob for the 3-section tuning capacitor at right.

**160 Meter Transmitter in Final 1975 Configuration.**



Second, W7ZOI had given us the Z-bridge circuit for use in adjusting input and output networks (see above). Life couldn't be better – 2N5590, \$5.00, Z-bridge, 12 volts Vcc, device data sheets, square-root programmable calculator. The new amplifier input network values were calculated and the W7ZOI Z-bridge used to adjust for maximum “feed-through” of the driver voltage to the 2N5590 collector. The output pi-network was replaced with an old standby: a primary winding spread over the toroid core, with collector and output links at each end. A 60pf variable capacitor permitted peaking across the 25kHz range of the v.f.o. The 3-section variable was left in place and it then suggested a new application. I had usually operated on 160 meters with end-fed longwires (1900 feet, 1300 feet, 650 feet etc.), and a built-in L-network antenna tuner seemed to be a very desirable component. Sufficient room was available for the new final amplifier p.c.b. and heatsink and an eleven-position rotary switch (see below). Two T-68-2 toroids (44 turns each) in series were mounted on the switch with a total of 10 taps amounting to a total inductance of 24uh when all sections were switched in. The circuits are shown below. However, in the published article, “A Solid State 13 Watt R.F. Amplifier for 1.8MHz” (CQ, January, 1976, 25-27, 74), the graphic artist mis-labeled the L-network capacitor as “100pf” and “triple section broadcast variable”. The new rig worked like a charm and had no problems with various antennas.



**Notebook Page Showing Final 1975 Design of the Final Amplifier and L-Network Antenna Tuner for 160 Meters.**

tl 24 = 53t T-68-2

output link

12µH

365 + 270 - 365

W S2 in, L1 adds 12µH to total, & Switching L2 begins w. 1µH & goes up to 12µH. Total = 24µH

Will give 1µH steps to 24µH

3) Output indicator? SWR Bridge inserted → Lnet = output link

→ L2a = 42t or 10µH 7taps.

Final Test out. Input L not pecked but backed off.

12Vcc low drive = 5w. (couple #3 + cap Δ) hi-drive = 10w.

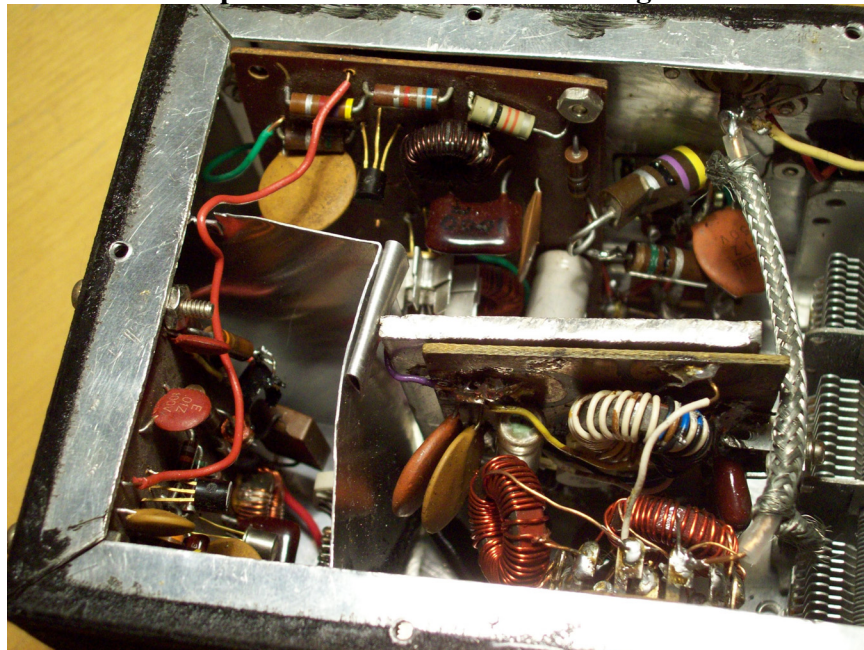
13.5Vcc Low - 7.2w #2 1:1 Cap. Keying veers to chirpy because of Rdrop to driver.

Final Ckt

L1 = 38t #28 T-50-2

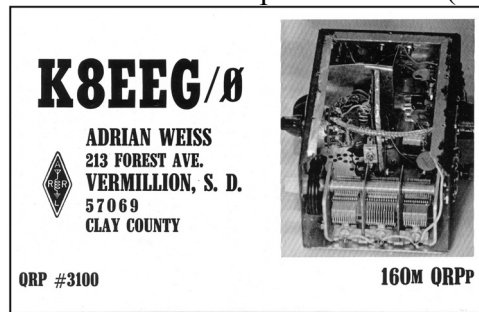
L2 = 4t L3 = 24t #22 plaster L4 = 7t T-68-2

**Close-up of P.C. Boards of 1975 Configuration.**



The v.f.o. p.c.b. is enclosed by a shield box at the front left, where the metal 2N706 oscillator is barely visible behind the front panel, with the 2N4124 buffer where the red output lead leaves the p.c.b. on the way to the buffer/driver p.c.b. which is mounted on

the left rear panel with the MPS6514 buffer and inductance below the three resistors, and the heatsink fins on the 2N5188 driver barely visible below (ZOOM in). The final r.f. amplifier p.c.b and 3/16-inch thick aluminum heatsink are mounted at bottom center; the white-brown wire toroid winding is L3. The 2N5590 is not visible. The white lead from the right top edge of the p.c.b. is the amplifier output connection to the swiper of the 11-pole switch on which the two T-68-2 toroids and taps are mounted. The shielded lead connects the output to the SO239 antenna socket at the rear panel. The left edge of the capacitor fins are hidden by the right panel. The photo I used on my 160 meter QSL card shows the capacitor and more detail in the amplifier section (ZOOM in).



Meanwhile, the **big event of 1971 and QRP** had occurred – the appearance of the **Ten-Tec Argonaut 505** on the market. The first *publicized use* of it I’ve seen was in the June 1972 Field Day Trophy results in **THE MILLIWATT** for October, 1972 (inside front cover). Only six logs were submitted in this new award program. The report read: “WB8FGZ took his XYL of two weeks along as logger, using an Argonaut. Totaled 52 QSO’s x 4 power multiplier x 1.5 battery power multiplier +150 points bonus = 440 (total points). Probably would have won the trophy except for the romance involved – only comment: ‘Best camping trip ever!’.” I’m sure that other QRP’rs had purchased the Argonaut after its introduction, but there was no WEB and QRP-L to tell everyone else right away. K4FW included a page of his log along with details for my review in **THE MILLIWATT** (December, 1971).

In the November, 1971, issue of **CQ**, Jack Burchfield K4DCD and Albert Kahn K4FW published a long introduction to the concept of the **Argonaut 505** as explained in the opening frame below, “The Second Coming of the Argonaut”. The article contained a block diagram of the stages of the transceiver and illustrated the bilateral signal flow through the crystal filter for both SSB and CW modes. Actual photos of the transceiver showed that it was virtually in the final version. This was the blockbuster for QRP!

#### Simplified Signal-Flow Block Diagram of the Argonaut 505.

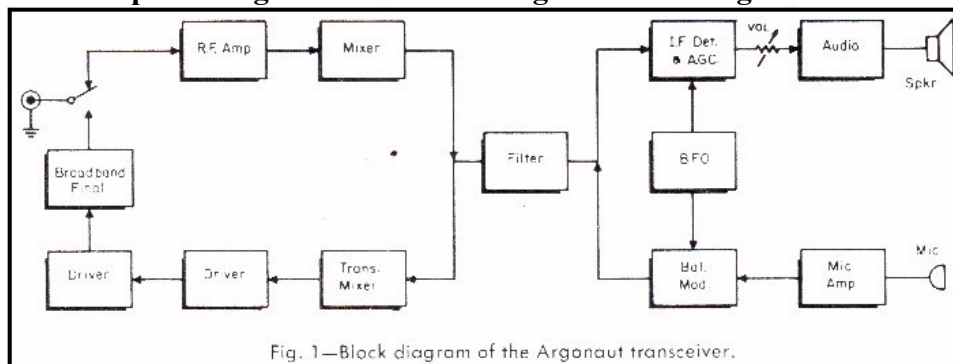


Fig. 1—Block diagram of the Argonaut transceiver.

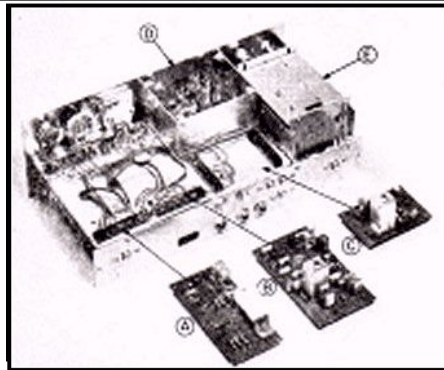


# The Second Coming of the Argonaut

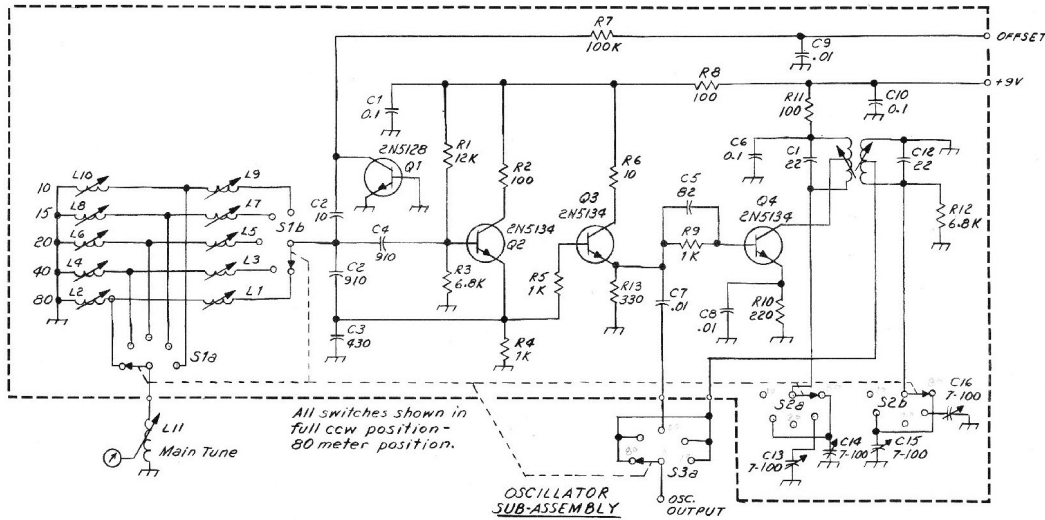
BY JACK BIRCHFIELD,\* K4DCD & ALBERT KAHN,† K4FW

*Long-time readers of CQ will recall the original "SSB Argonaut" built by W6AVA for W6UOU in 1957 and sent around the world in an effort to give many DX stations an opportunity to put their country on the air with the then-new mode of s.s.b. It is fitting, therefore, that a new low-power portable s.s.b. rig under development at Ten-Tec, Inc. should also be dubbed the Argonaut. The following article describes the development of the rig from an engineering and design standpoint. Note that this is not a review. The product will not be available for testing for a few more months, but we felt that there was strong reader interest in the thinking that goes into the eventual release of a new piece of gear.*

**CQ November 1971**



One photo struck a chord – the **Argonaut 505** circuitry was built on a bunch of (8) modules! Recall the modular concept manifested in the **PM-1**, **PM-2**, **PM-3** and **RX-1**. The emphasis on SSB capability – heard about that before in K4DCD's April, 1971, Operating News Report! So this is where Ten-Tec Inc. was headed from the beginning! The **Argonaut 505** was not so significant just because it was a fully-featured QRP transceiver – it had innovative engineering as well to make it all possible. To my thinking, the permeability-tuned v.f.o. circuit and its innovative combinations of inductances to produce 500KHz coverage on 80-15 meters and full band coverage on 28MHz with a single bandswitch position (other new transceivers used up to four bandswitch positions to cover the same range). The circuit was not as simple as it seems. First note the system of wiring the permeability tuned inductance L11 in series with each band inductor (L1, L3, L5, L9) and in parallel with its series-to-ground companion inductor (L2, L4, L6, L8, L10). The various combinations are slug-tuned in tandem to adjust the frequency tuning range and the low-end frequency of the oscillator which are different on all four bands. The basic oscillator frequency (5.0 – 5.5MHz) is used as the injection frequency only on 20 meters. The Q4 multiplier provides X2 and X3 outputs from slightly different ranges for the other bands. The output is mixed in the 9MHz i.f. to the transceiver output frequency. Since the band inductances are independent of each other (one set switched in at a time), re-adjustment of one band does not affect the range and low-frequency settings on other bands. Since the frequency change is done by the



permeability tuned L11 and the different band ranges are fairly close, a linear tuning rate is achieved across the 500KHz spread for all bands except 10 meters. The only problem is that the tuning slugs in the inductances can (rarely) “stick” so that increasing the torque of the tuning hex driver actually splits the slug which is then “frozen” into place and non-adjustable. The solution is replacement of that inductance. So care has to be taken during the adjustment process. The concept is simple, but the implementation is rather complex.

Tuning is accomplished by varying the inductance of L11. The proper frequencies are obtained by changing the basic oscillator frequency and by using the correct multiple. Table I shows the basic frequency, multiple and injection frequency.

TABLE I	BAND	BASIC FREQUENCY MHz	MULTIPLE	INJECTION FREQUENCY MHz
	80	6.250-6.500	X2	12.5-13.0
	40	5.333-5.500	X3	16.0-16.5
	20	5.000-5.500	X1	5.0- 5.5
	15	6.000-6.250	X2	12.0-12.5
	10	6.333-7.000	X3	19.0-21.0

The basic frequencies for all bands are close together. Therefore, the linearity of tuning is maintained on all bands. The frequency range and band edge can be adjusted with coils L1 through L10. For instance, on 80 meters, to increase the tuning range, increase the inductance of L2 (move bottom slug CCW) and decrease the inductance of L1 (move top slug CCW). To decrease the range the procedure is reversed (move both slugs CW). The same procedure holds for 40 through 10 meters. All coils L1 through L10 are located beneath the openings in the top cover.

The only “drawback” of the Argonaut series is its 4-pole crystal filter which is wide enough for high-quality s.s.b. generation but too wide for contest c.w. operation (like the FT817 and IC703!). Strong close-in adjacent signals within the passband can cause audio interference and make copy difficult. As Dan Tomcik K4OU of Ten-Tec explained in a 1980 letter, “the Argonaut was never meant to be a contest rig, as you know, but it seems that more and more hams are using it for just that purpose. So the four pole filter was a way to keep costs in line, and our owners rarely complain about the selectivity.” However, the placement of the a.g.c. circuit prevents thumping, desensitization and cross-modulation usually associated with c.w. reception through a wide s.s.b. filter. I modified my new 505 by working a switchable (in/out) MFJ 4-pole audio filter (no longer available) into the post-AGC insertion point. The crystal filter kept out the unwanted sideband signals outside its 2.4KHz passband, and the MFJ CWF-2 audio filter with bandwidths of 180Hz, 110Hz, and 80Hz made the 505 into a single-signal receiver with a superb selectivity. Switching the filter in during a c.w. DX contest with KW’s all over the place produces a seemingly “dead band” except for the weak DX signal! But Ten-Tec

did not expect anyone to try to win DX contests with the Argonaut, so they did not go beyond the crystal s.s.b. passband. Wrong assumption! I still use mine in contests, and it  
**Argonaut 505 Ad in CQ MAGAZINE (December, 1971, 49).**

**introducing  
the  
Argonaut.**



The Argonaut is for every ham.  
 A transceiver that operates  
 on an AC pack or lantern battery.  
 Covers Amateur bands 80-10, SSB and CW.

A little bored with high power? Substitute skill for brute force and thrill to the challenge of conquering distance with a few but potent watts.

Operate the Argonaut anywhere. Slip it into a suitcase when traveling (it occupies less than 1/5 cubic foot). Enjoy it in a motel, campgrounds, on the beach or patio, or carry it as a backpack when hiking.

Sailing? Tie down the mainsheet and enjoy a QSO. Flying? Keep in contact with the world. Motoring in a car, camper or trailer? Go mobile without tedious installation.

The Argonaut is more than just fun. It is always ready for the serious business of providing emergency communication when commercial power fails. It augments one of the great public services of Amateur Radio.

The Argonaut is for every ham.  
 The Argonaut is for you.

<b>Argonaut Price</b>	<b>\$288.00</b>
<b>AC Power Supply</b>	<b>\$ 24.95</b>
<b>Microphone, EV PTT</b>	<b>\$ 17.00</b>

**SPECIFICATIONS**

**GENERAL:** Frequency range in MHz: 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.0-30.0. 9 MHz crystal filter. 2.5 kHz bandwidth 1.7 shape factor at 6/50 dB. Automatic side-band selection, reversible. Completely solid state. All circuits permeability tuned. Tuning rate approximately 25 kHz per revolution. Size: HWD 4½" x 13" x 7". Weight approximately 5 lbs.

**RECEIVER:** Sensitivity less than ½ uv for 10 dB S + N/N. Backlash less than 50 Hz. S-meter. AGC fast attack, slow delay. CW side tone. Incremental tuning. Separate af and rf gain controls. Frequency response 300-3000 Hz. Distortion less than 2%. Built-in speaker. Drift less than 100 Hz. Dial accuracy ±5 kHz (slightly more in 28 MHz).

**TRANSMITTER:** Power input: 5 watts PEP SSB, 5 watts CW. Output circuit: broad band 50-75 ohm impedance. Actuation: Press-to-talk. Full break-in for CW. Built-in SWR bridge. Integral TVI filter. Drift less than 100 Hz.

TEN-TEC dealers will have Argonauts in stock soon. If there is no dealer in your area, order direct and include \$2.00 for shipping. Tennessee residents, add 3½% sales tax).

**TEN-TEC, INC.**  
 SEVIERVILLE, TENNESSEE 37862

is impressive to hear the beautiful Ten-Tec audio (always the best) collapse into a single c.w. tone (see "Improving CW Selectivity in the Argonaut," *CQ*, January, 1977, 47-49, 78; and WA0TXJ/9, "Adding the MFJ CWF-3 Filter in the Argonaut," *MILLIWATT*,

Feb. 1974, 9-10)! When the 509 appeared, Tec-Tec had designed a matching accessory – the **Model 208-A**, an adjustable c.w. peak/notch filter unit to mate with the 509. “The Second Coming of the Argonaut” was followed by an introductory ad (December, 1971) with a great advertising “pitch” and, more importantly, a summary of the 505’s specs and features (see above). It had everything that the big rigs had!

The Control Board module integrates the functions of the seven plug-in modular boards and chassis-mounted stages with various transistor switching circuits and a relay for the antenna. The r.f. front-end assembly was innovative to say the least. The receiver’s tuned-circuit inductances as well as the transmitter’s buffer and driver inductances are permeability tuned by mounting the adjustable slugs on a plate which is raised and lowered on rails (slugs moved in and out of the coils) by a geared knob labeled “RESONATE” on the front panel. The ARCO404 capacitors (20 total, or 4 each for 5 bands) are mounted on underside chassis brackets. They are adjusted in combination with the setting of the “RESONATE” knob and band-switch selection of each of the five bands (80-10 meters). So the single knob peaks both the receiver r.f. input and output and transmitter buffer and driver output circuits! The only tune-up required because of the broadband transmitter r.f. linear amplifier is the adjustment of the “RESONATE” knob to either peak the input signal strength audio or the power output for the selected band as indicated on the SWR bridge meter (also functions as an S-Meter!) at the right top of the front panel. The sensitivity of the meter is adjustable. Even now, when I open up the 505, I study the system in amazement – I have this mental quirk that makes me think “I wish I had thought-up that idea myself.” Ditto for the oscillator system noted above. When moving from the low end c.w. portion of a band to the high-end s.s.b. portion (like on 15 meters), a bit of touch-up of the “RESONATE” control repeaks the whole rig. The Receiver Incremental Tuning (RIT) circuit is activated by a “push-pull” switched tuning-potentiometer. The “RF GAIN” control on the front panel provides a 20-25dB adjustment range. The c.w. drive control is located on the rear panel and permits adjusting the transmit output level from full to zero (but very inconvenient!). Good for QRP “how low can you go” tests but not for signal purity or efficiency. In general, the r.f. power output of the 505 is usually above 2 watts, but not by much.

By the time the **QST** published the “New Equipment” report on the Argonaut 505 by Edward P. Tilton W1HDQ, a legendary contributing editor reaching back to the later 1930’s, in the November, 1972 issue (52-54, 88), Ten-Tec had come up with a new full-page ad challenging the notion that, since the 505 was only a QRP rig, the price was too high to “make sense.” Tilton’s comment that “The PTO is the heart of the tuning system, for both transmitting and receiving functions. Unlike some devices that serve these ends, the Ten-Tec tuner is quite simple, mechanically and electrically” seems to be contradicted by the next statement that typical transceivers use a v.f.o. that covers a single range. I never have figured out what he was thinking about as to the definition of “simple”. Table 1 likewise seems a bit out of the “simple” range. Whatever. Tilton was a (or more precisely, “*the*”) pioneer of VHF operation and wrote a column for several decades, so I can understand his comment: “Even the undersigned (i.e., W1HDQ), with little interest in hf gear as such, can see many uses for the 505. Obviously it would be a fine starting point for coverage of higher bands (VHF) with transverter accessories.”



Nonetheless, he could appreciate features like full break-in as being “a great aid in QRP work.” He reminded readers that learning to achieve efficiency and to operate very effectively could result from sacrificing high power for QRP. His final analysis was that the unit was well designed and the Argonaut had the features which make operating convenient and comfortable.

**The “Economics of the Argonaut 505” Ad in QST, 1972.**

## Does a 5 watt transceiver at \$288 make sense?



You be the judge.

It opens a whole new world of excitement and fun in Amateur Radio. We think you will find QRP a welcome change from high power in these days of push-button operation.

Five watts is about 2½ “S”-units below 150 watts for identical conditions. When skip is favorable and QRM light you almost forget you are using low power.

The diminutive size (1/5 cubic foot) makes it ideal for operation in a motel, camp or trailer, or mobile in your car, boat or plane. Power it with any 12 volt battery or optional AC pack. Operate on SSB or CW on any ham band from 3.5 to 30 MHz.

The Argonaut will be a faithful companion for many years to come. This \$288 may be your best investment in Ham Radio in a long time—perhaps ever!

TEN-TEC products are sold by selected dealers. If one is in your trading area, by all means patronize him. It will help you and Amateur Radio. However, if it is more convenient, send your order directly to us. Include \$2.00 for shipping. (Tennessee residents include 5% sales tax). Write for catalog.	<table style="border: none; width: 100%;"> <tr> <td>Argonaut .....</td> <td style="text-align: right;">\$288.00</td> </tr> <tr> <td>AC Power Supply .....</td> <td style="text-align: right;">24.95</td> </tr> <tr> <td>Microphone .....</td> <td style="text-align: right;">17.00</td> </tr> <tr> <td>KR 5 Electronic Keyer .....</td> <td style="text-align: right;">34.95</td> </tr> </table>	Argonaut .....	\$288.00	AC Power Supply .....	24.95	Microphone .....	17.00	KR 5 Electronic Keyer .....	34.95
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Ten-Tec took another step in 1972 – introducing a companion linear amplifier Model 405 to mate with the Argonaut 505. Strictly not QRP, but it added a dimension of flexibility to the Argonaut concept. The full-page ad in the November, 1972, CQ ad contained full descriptions of both the 505 and 405 and the price list. The 505 was \$288, the 405 was **Argonaut 505 and Linear Amplifier 405 in CQ MAGAZINE (January, 1973).**

## The Argonaut has a stalwart new companion—a Solid State Linear!



<p><b>Model 505 Argonaut</b> A Complete Low Power Transceiver, 10-80 Meters</p>	<p><b>Model 405 Linear</b> For Medium Power, 10-80 Meters</p>
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\$149, the Model 50 power supply for both was \$49, the Model 210 supply for the 505 alone was \$29.95, the microphone Model was \$17, and the KR-5/605 keyer was \$34.95. (In terms of the Annual Average Consumer Price Index showing relative values for 1971 vs. 2012, the 505 = \$1566, the 405 = \$810, the Model 50 = \$266. Seems hard to believe ... but the shipping for the 505 was only \$2.00!) One interesting aspect of Ten-Tec's development was that, as Burchfield commented, in their location in TN, the absence of a high-tech labor force required that everyone be trained from scratch.

The January, 1973 *CQ* ad had a new "spin" on the two units (see cropped ad below) Ten-Tec continued to run the "companions" ad as well as the single 505 ad until the switch to the Argonaut 509 occurred in 1975. (In the meantime, the Triton had gone through several stages --Triton IV by 1976). Ten-Tec's marketing strategy for the 509 is interesting. Rather than make a big fuss with trumpets and drums etc., Ten-Tec just "sneaked" the subtle announcement of the 509 into the "companions" ad in the September, 1975, *CQ* and left it up to the reader to detect the introduction of the 509. It was just "The Argonaut" that had "become a *Classic* in QRPP", not the 505 or 509.

**Argonaut 509 and Linear Amplifier 405 in *CQ* MAGAZINE (September, 1975)**

**The Argonaut has become a *Classic* in QRPP**

**Argonaut 509**      **Model 405 Linear**

The sustained demand and the enthusiastic comments from happy Argonaut owners are music to our ears. We designed this portable pair to be fun, and your response tells us that it's just what you've been looking for. The Argonaut and its companion, the 405 Linear, are here to stay—thanks to you.

Argonaut, Model 509 .....	\$329.00
Linear, 100 Watt, Model 405 .....	159.00
External CW Filter, Model 208 .....	29.00
Power Supply for 509 only, Model 210 .....	27.50
Power Supply for 509 and 405, Model 251 .....	79.00

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September, 1975 • *CQ* • 83

The 509 was featured in the ad in *CQ* for December, 1975, where readers were invited to join the "Argonaut Club". The text in the reproduction below is "fuzzy" but zoom to 150% to be able to read the second-to-last line: "Join more than two thousand fellow members with Argo fun. Your membership awaits you at most ham dealers." At the time, **THE MILLIWATT** had 800+ subscribers (the QRP ARCI active membership was about 400). So, a heck of a lot more Argonauts were out there than **MILLIWATT** subscribers! What we could have done with 2000 subscribers! As I noted in my delayed review and test report, the 509 was not just a cosmetic improvement of the 505 which it matched exactly in appearance (see "*CQ* Reviews: The Ten-Tec Argonaut 509 QRPP S.S.B./C.W. Transceiver," *CQ*, July, 1978, 26-29, where the half-page ad concept appeared on p. 29 with "two thousand" revised to simply "thousands of fellow members"). It included several fundamental improvements in circuit design, particularly

**Argonaut 509 Ad in CQ MAGAZINE (December, 1975, 62).**

*An invitation to join*  
**"The Argonaut Club"**



**Argonaut 509**

Tired of push-button QSOs? Then the excitement of Argonauting is for you! A challenge? Of course. The test of an operator? Perhaps. But above all it is the thrill of working the world with five watts. The club is exclusive but if you enjoy the spirit of conquering distance with lower power, you are "in". There are no dues — just \$329.00, the price of an Argonaut. Join more than two thousand fellow members with Argo fun. Your membership awaits you at most ham dealers.

**Argonaut 509 \$329.00**

<p><b>SPECIFICATIONS:</b></p> <p>Five bands, 3.5-30 MHz. SSB and CW modes. Fully solid state. Permeability tuning. Instant break-in. Instant band change. Built-in SWR bridge. S-Meter. WWV internal speaker. Direct frequency readout. Receiver offset tuning. Five watts input. Automatic sideband selection. Plug-in circuit boards. 1<math>\mu</math> vV receiver sensitivity. 12-14 VDC or AC pack power. Weight 6 pounds. Size HWD: 4<math>\frac{1}{2}</math>" x 13" x 7"</p>	<p><b>ACCESSORIES:</b></p> <p>Model 205—Antenna Tuner ..... \$ 9.95 Model 206—100 kHz Crystal ..... \$26.95 Calibrator ..... \$29.00 Model 208—CW Filter ..... \$27.50 Model 210—One Ampere Power Supply ..... \$27.50 Model 215P—Ceramic Microphone ..... \$29.50 Model KR5-A—Keyer ..... \$38.50</p>
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For further information, write:

**TEN-TEC**  
SEVIERVILLE, TENNESSEE 37863  
EXPORT: 5715 LINCOLN AVE.  
CHICAGO, ILLINOIS, 60646

in the transmitter section. The addition of the Model 208 CW Filter was a very significant improvement although not within the 509 itself, as is the case with the Model 205 (previously the Model AC-5 which I acquired earlier but sold, and then recently reacquired one on eBay) antenna tuner.

But before summarizing the improvements in the 509, we have to detour through one of the most inexplicable fiascos in the history of QRP. The **Argonaut 505** came out at the end of 1971 after the four modules and the **PM-1**, **PM-2**, and **PM-3** series. For unknown reasons, Heathkit decided to enter the QRP market with the **HW-7**, apparently in competition with the PM series (price about the same: ~\$70). It was reviewed in **QST** for January, 1973. As one reviewer commented, it definitely had a more "professional" appearance with the enclosed three-band dial (the PM-1 dial pointer was outside the topless case on the front panel) and large tuning knob with a 6:1 vernier, the two-part case, the attractive front panel including a meter, a line of four push-button band/crystal switches, an a.f. gain control, and the receiver preselector. Oddly enough, Heathkit gave it a "DX spin" with the DL8KO and other DX QSL's on the logbook. It is not clear whether the log entries are DX QSO's or not. However that may be, the HW-7 was definitely not a DX'er's dream rig! One reviewer commented "it is probably the case that the HW-7 was put on the market before it was fully tested" because of the many flaws it exhibited, such as "The dial marking rubbed off in a matter of days from contact with the inside of the dial window ... The sidetone oscillator sounded as if it was having trouble "getting started," and inaccuracies in the schematic (Heathkit? really?) made trouble-

**Heathkit HW-7 Ad in CQ MAGAZINE (October, 1972).**

shooting and repair difficult. There was no transmit offset, so users often found themselves stepping up the band in 700Hz steps when retuning to receive each other after transmitting. There was no RIT, but neither did the PM series have RIT. The unit was hopelessly prone to microphonics, AC hum, and AM band interference. The HW-7 v.f.o. covered the roughly 200KHz portions of 40, 20, and 15 meters, with a push-button switch to change to crystal control. The need for three-dial scales was due to the fact that the basic 7MHz oscillator signal was multiplied X2 and X3 for 14Mhz and 21MHz, so the spread was different on each band. Input power ranged between 2-3 watts. The v.f.o. lacked a voltage regulator so chirpy keying was common. The antenna relay was noisy. A more recent HW-7 reviewer commented that the receiver in the HW-7 "sucked canal water." WA8MCQ added "Those who have operated HW-7s know that he was being kind" (see WA8MCQ's article "Better Ears for the HW-7" at <http://www.gsl.net/kk4kf/hw7-ears.html>). Word got around rapidly, and given the state of QRP at the time (experimentation and modification), the HW-7 became one of top 2 "most modified" rigs of all time! But its successor, the **HW-8**, lived up to the Heathkit reputation (see later discussion). It seems that the primary reason for whatever success the HW-7 had in a market dominated by the Argonaut 505 was price. It was about 25% of what a 505 cost, and you got about 3% of what the 505 was!

After describing the design of the Argonaut 505 in "The Seconding Coming of the Argonaut," Burchfield and Kahn ended with the hope that "the Argonaut will expand the horizons of amateur radio". Neither expected the massive impact that the Argonaut would have had on the burgeoning QRP movement and the revelations that high power was not necessary for an enjoyable operating experience or for working DXCC with simple antennas! Dick Ross and Al Dorhoffer understood the appeal and popularity of QRP as a growing segment of amateur radio and Al called me in early autumn of 1973 and raised



BY ADRIAN WEISS,\* K8EEG

**B**EEN hearing a lot of QRPP signals on the air lately? You probably have, because QRPP is the "in" thing and the bands are crawling these days with minitransmitters. QRO types will wonder what all these guys get out of running a couple of hundred milliwatts or a couple of watts that they don't get out of running a hundred or a thousand watts. After all, that makes hamming a lot more difficult, doesn't it? What's the point of operating QRPP? Well, this column will try to fill you in on what you have been missing if you haven't tried the QRPP "way of life."

Most of the new recruits to the QRPP ranks are drawn from the QRO gang, and perhaps a few of their comments will reveal what this QRPP thing is all about.

When he first got "bitten" by the QRPP bug, K6GKU wrote: "Since I was licensed in 1954, I have always looked for the part of hamming that would provide the greatest sense of achievement. QRPP operation has and continues to rate very high at this station. . . ." In about a year of QRPP operation, K6GKU worked over 40 countries—mostly on SSB with 2.5 watts output—and qualified for the difficult ZL-73 Award, which requires QSO's with 50 ZL stations in a single year. And his experience isn't extraordinary by any means!

Or K4ADT: "Am really bitten by the QRPP bug and my interest in ham radio is the highest since 1954 when I was a Novice. My Swan MKII linear and TR-4C are now sitting idle on my desk—I built an HW-7 a few weeks ago and then bought a Ten-Tec Argonaut last Friday and put it on the air over the weekend. I went out in the rain Friday to repair my Delta Loop beam and didn't get the Argonaut on the air till Sunday. Well, you will probably believe this, but I

can hardly believe that it even happened to me! I worked EA5, HA1, ON5, PY8, XE1, DK1, KH6, and KL7 with the QRPP rig the very first day! And at home today during lunch, I worked another HA1, YU1, and ZSI—and you think I'm not hooked on QRPP? And one month later: "Now up to 43 countries with the Argonaut. Am selling the regular QRO rig here, so will be using only the Argonaut from now on."

And then a philosophical comment from K8IKO: "QRPP is the focus of one of the most hopeful and constructive developments in my 39 years in ham radio. The adoption of low power, simple equipment, and careful, thoughtful operating as a "way of life" by many hams in the face of the general trend to appliance operating and "plug-in-and-play" kilowatts is the most wholesome trend I have seen in many years."

There you have it from the fellows themselves. Indeed, QRPP is providing a badly needed revitalization of the amateur radio experience for thousands of hams worldwide. Very low power operation is many things to many people. There's the challenge of working the world with no more than a rig powered by a lantern battery. There's the amazement that such low power can go so far. There's the thrill that comes with each new QRPP contact—and believe me, the thrill never wears off! That's not all there is to it, of course. We'll try to present the various facets of what QRPP operation has to offer by regularly including comments such as the above in this column. We invite you to add your thoughts and experiences.

#### Trying Out QRPP

If you're convinced that it's worth a try at least, how does one go about getting into QRPP operation? What are the operating techniques that ensure success once you've taken away the power advantage of a 500 or 1000 watt transmitter? The subject of the technical section of this first column is directed at the first question, and we'll get to operating techniques in later columns.

Perhaps the easiest way of getting a QRPP signal on the air is to purchase the superb TenTec Argonaut, a state-of-the-art, all band, s.s.b./c.w. transceiver with about 2-3 watts output on all bands. This rig has been used by many hams since it appeared, all with excellent results. However, putting this amount of cash down on the barrel (\$288.00, very reasonable for the quality of

\*213 Forest Ave., Vermillion, SD 57069



the subject of a monthly QRP column in **CQ** – would I do it, what would it cover, what about running short of material, and other such editorial concerns as well as his own excitement about QRP. The first column appeared in November, 1973, issue.

Attenuation (db)	R <sub>1</sub> -R <sub>3</sub> (ohms)	R <sub>2</sub> (ohms)
3	8.4	142.
6	16.6	66.9
9	23.8	40.6
12	29.8	26.8
15	34.9	18.4
18	38.8	12.8
21	41.8	8.9
24	44.0	6.3

Table I—Resistor values vs. attenuation.

the rig) may not be every ham's idea of "trying something out." TenTec also produces the "PM" series of transceivers for under \$75.00. These use the direct conversion receiver technique and several-stage transmitters with v.f.o. control, a must for QRPP operation. The Heath HW-7 is a neat QRPP rig and should provide much excitement after it is assembled.

Better yet, the regular QRO station transmitter can be used for QRPP operation without modifications, either temporarily or permanently. Several methods follow.

1. *Decrease Drive To The Final.* This approach is explained in detail by W2NZ in the excellent, "must-reading" article "The Song of the Flea," *CQ*, March, 1973, p. 41. It is simplicity itself. The transmitter is first tuned for maximum output. The DRIVE or AUDIO GAIN control is then backed off until the output drops to five watts or under. A word of caution here. The use of this method in some s.s.b. transceivers will upset the bias balance that is critical for linear operation of the final. Unacceptable signal distortion will result on s.s.b., and on c.w. if the rig uses the audio-keying method of

$$\text{Dissip. } R_1 = \frac{P_{in}}{5} \quad \text{Dissip. } R_2 = \frac{P_{in}}{4}$$

$$\text{Dissip. } R_3 = \frac{P_{in}}{10}$$

Power In (watts)	Power Dissipation (watts)		
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>
50	10	12.5	5
70	14	18.	7
80	16	20.	8
90	18	22.5	9
100	20	25.	10

Table II—Power dissipation requirements for T attenuators.

generating c.w. The technique will be useful for all the standard 180-watt-PEP-and-under rigs. However, it may not be possible to use it with a higher power transceiver such as the Galaxy GT550. Try it, and if it works, fine!

2. *Remove The Final Tube.* This approach requires a very slight modification of the transceiver. The objective is to simply bypass the final stage amplifier, and connect the output of the driver stage directly to the pi network output system. To accomplish this, the final tube(s) are removed from their sockets, the B+ lead is disconnected, and the output lead from the driver stage connected directly to the output pi network. Most driver stages produce around five watts output—the probable level can be easily determined by checking the *Handbook* for the plate dissipation ratings of the driver tube.

3. *Symmetrical Resistive RF Pad.* The obvious advantage of this technique is that the transceiver operates at the conditions for which it was designed in terms of power output and biasing. A symmetrical T resistive pad is inserted between the output of the rig and the antenna, and dissipates a chosen amount of the output power. It's a waste, for sure, but that makes no difference if you don't want the power in the first place. The design of a T pad for your particular setup is not difficult if the following steps are followed and the data given in the charts is used.

First determine the amount of power attenuation desired to lower the output of your rig to the 5 watt or under level. A 3 db power reduction is equivalent to cutting the power in half. Hence, if you want to reduce 80 watts output to five watts output, the following 3 db reductions are necessary: 80-40 watts = 3 db, 40-20 watts = 3 db, 20-10 watts = 3 db, and 10-5 watts = 3 db. The total reduction is the sum of the individual reductions, or 12 db total in this case. Table I gives the proper resistances for R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> of the circuit of fig. 1 for several levels of power reduction. Select the proper values.

Next determine the power dissipation required of each of the resistors. Table II shows the formula for arriving at this dissipation factor, and provides calculated values.

Since the T pad can use only non-inductive resistors, this limits us to the use of 2



watt composition types that are readily available (NB: wire-wound resistors such as the "Brown Devil" type *will not work*). And so, we must resort to using groups of 2 watt resistors in parallel to arrive at practical results. Simply divide the dissipation of Table II by 2 to arrive at the number of 2 watt resistors needed in each leg of the T pad.

Next, we must determine the actual resistance of the paralleled resistors that will yield the desired value of resistance in each leg. The general formula for calculating resistances in parallel is:

$$R = \frac{1}{\frac{1}{r} \times N}$$

where  $R$  is the desired final resistance,  $r$  is the value of the resistors in parallel (all must be the same value), and  $N$  is the number of resistors required for the power dissipation involved. The formula can be transposed for our purposes thus:

$$\frac{1}{r} = \frac{1}{R \times N} \text{ or } r = R \times N$$

An example will make this all clear. We want to drop 80 watts to five watts output, so a 12 db reduction is needed. From Table I,  $R_1$  and  $R_3 = 29.8$  ohms,  $R_2 = 26.8$  ohms. Round off to 30 and 27 ohms. From Table II,  $R_1$  must dissipate 16 watts,  $R_2$  20 watts, and  $R_3$  8 watts. Hence we must use eight 2 watt resistors for  $R_1$ , ten 2 watt resistors for  $R_2$ , and four 2 watt resistors for  $R_3$ . Using the formula above ( $r = R \times N$ ), we find that  $R_1$  can be made of eight 240 ohm 2 watt resistors,  $R_2$  of ten 270 ohm resistors, and  $R_3$  of four 30 ohm resistors<sup>1</sup>. The final design for the 80 to 5 watt pad is shown in fig. 2. In construction, leads should be kept as short as possible. It is not necessary that the exact figures be achieved in practice, since 3 db is the minimum significant factor as far as signal levels on the air are concerned. That leaves us with a pretty large leeway for error.

You should have some idea of your output power before starting the design of a T pad. The figures above are designed for 50 ohms input and output and will not change the impedance presented to the feedline. Generally, it can be assumed that the modern transceiver puts out about 45-55% of input, and you can proceed on the basis

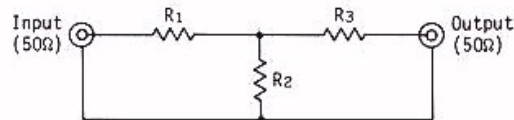


Fig. 1—The basic T-attenuator. Values may be determined from Table I.

of that assumption, unless you have a power output meter that will give you a more accurate indication. Several QRPP operators that I know of have simply used the T pad instead of buying a whole new rig—and the QRO rig is around if you need it in a pinch.

In our next column, we will discuss the various methods of measuring r.f. power output. The standard in QRPP operation is *output* power, since this is the only measure of the important power factor—that which the rig delivers to the antenna.

Also in our next column we'll talk about the most coveted and most difficult awards ever offered—QRPP DXCC and Milliwatt DXCC. We're out of space, but there's a lot more to come. You are invited to help make this column a success by submitting operating reports and comments, schematics, construction projects, operating hints, questions. We'll oblige all. Hope you find the column enjoyable and interesting, and if you do, drop our Editor a card to that effect.

73, Ade, K8EEG

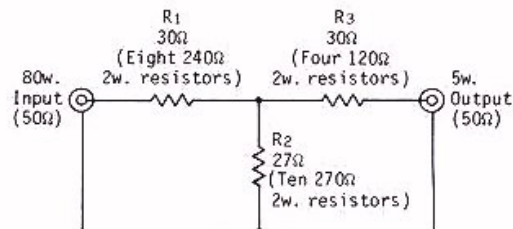


Fig. 2—Using the information of Tables I and II, here is a practical T-attenuator which will produce 5 watts output with 80 watts input while maintaining 50 ohm input and output impedances.

#### CQ'S DIAL-A-PROP

For the latest up to the minute propagation forecasts and special contest predictions call 516-883-6223 any time day or night for a recorded message on conditions.

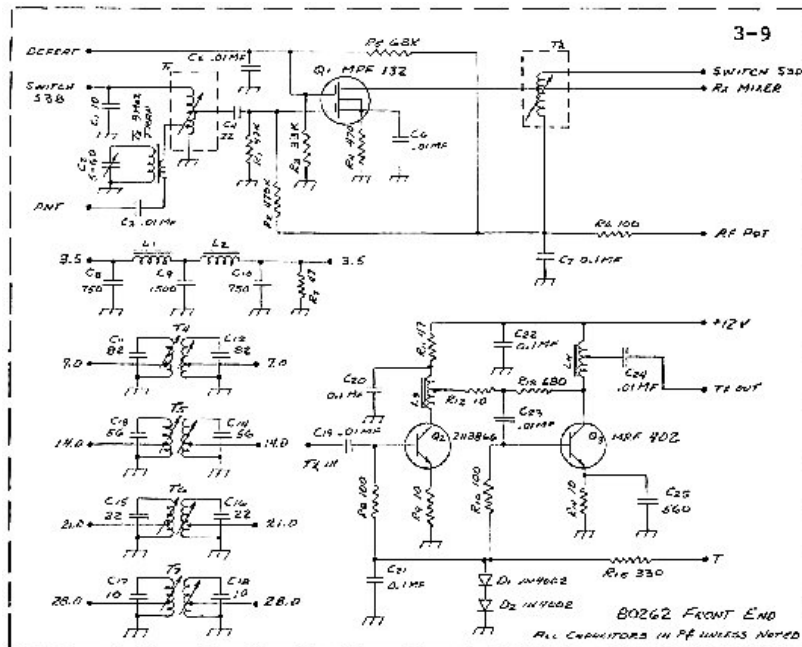
The new QRP Column was a hit immediately and remained so for about two decades during which about 185 columns appeared and the QRP movement had grown beyond our fondest dreams! A long list of DXCC MILLIWATT and DXCC QRPp trophies had been awarded (see [www.QRPdxPropagationAntennas.com](http://www.QRPdxPropagationAntennas.com)), Field Day trophies had been going to individual and club winners and the 5-watt QRP ARCI had taken over the piggy-back ARRL Field Day event. And QRP sections eventually had appeared in all the major contests, including DX contests! QRP had become an international “global” movement with tens of thousands of operators.

To return the Argonaut 509, by the time the 509 appeared, there were about 2000 505's in operation. It could compete with other cutting-edge solid state transceivers in everything except in regard to power, weight, and size. It's portability was a key attraction. The same front-end rack-on-rails for peaking the receiver sensitivity remained, and the a.g.c. figure of 6dB/100dB input signal variation made operation and audio quality comfortable. Again, no cross-modulation or desensitization in the presence of very strong signals (signal generator in passband) was detectable. A significant improvement in the 509 was the addition of access to a point prior to the a.g.c. voltage deriving circuit through a six-prong plug on the rear panel (see photo below) designed to mate with the new Model 208A adjustable audio filter; an alternate audio filter such as an MFJ CWF3 or CFW3 could be inserted via the correct pins of the plug. Either filter clipped the output from the i.f. four-pole crystal filter to a very narrow width, thereby eliminating undesired, close-by signals from reaching the a.g.c. circuitry. In combination with a c.w. narrow audio filter, the best a.g.c. protection against strong signals is running the r.f. gain at a minimum level needed to copy weak to moderate signals. The frequency and volume of the sidetone oscillator can be adjusted to the operator's preference by a pair of trimmer potentiometers on the audio p.c. board. However, a major change in front-panel controls resulted in the “DRIVE” control in the 509 being moved from the rear panel (see below) to the place occupied by the “SENSITIVITY” control in the 505. This was a major improvement in operational functionality. Instead of a potentiometer to adjust the sensitivity of the SWR/S-Meter, a fixed R14 680-ohms resistor replaced the 505's potentiometer, but this was a mixed blessing. The sensitivity of the SWR bridge was fixed to a full-swing at the output of the rig at the factory, which did not leave any flexibility. The simple “fix” was to replace the fixed-value R14 with a new 2.5K-ohms pot which could be mounted on the rear panel (see below). The main tuning knob dial has improved readout accuracy with large ticks at tens and small ticks in-between on the 0-100 dial scale.

The major changes occurred in the transmitter section. The s.s.b. generator remained unchanged except for an improved half-lattice four-pole crystal filter with a 6dB passband of 2.4 KHz and a 1.7: shape factor at the 6/50dB points. It is perhaps a decent compromise filter for c.w./s.s.b operation but adequate for all situations except when a 599+20dB interfering signal is fed into the filter. Next, the transmit mixer stage shares a p.c. board with the receiver mixer. The 505's CA3053 mixer chip was changed to an MC1496P IC in a double-balanced mixer configuration. As a result, the driving signal from the transmit mixer and its odd harmonics are suppressed in the output as well as other undesired products from the s.s.b. generator. The significant change in the front-end

circuitry and p.b. board is the conversion of the buffer and driver stages to a broadband design using untuned toroid transformers for interstage matching as seen in the schematic below.

### Argonaut 509 Receive/Transmit Mixer with Broadband Buffer & Driver Stages.



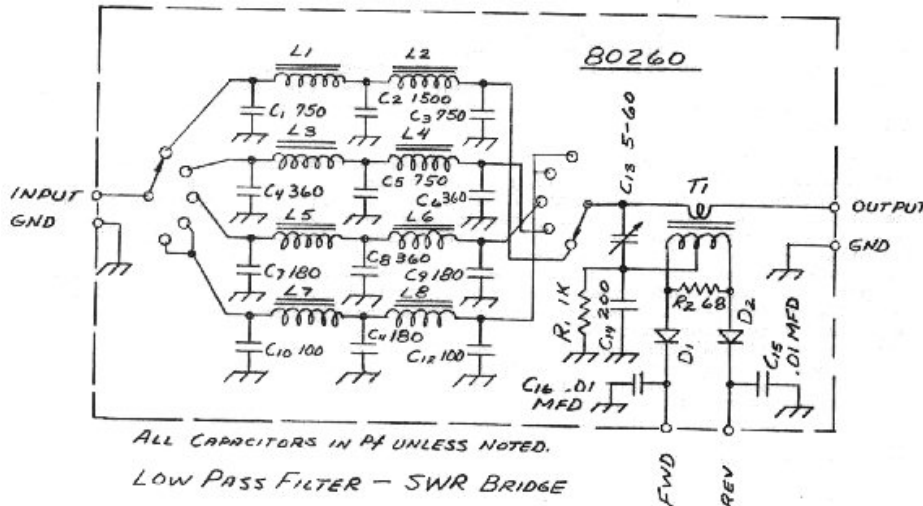
What is unclear in the partial schematic is the fact that the input signal from the transmit mixer is passed through a filter for each band on its way to the buffer stage. A half-wave pi-network is employed on 80 meters, and on 40-10 meters, a double-tuned over-coupled transformer (one slug for each winding plus a fixed capacitor). The transformers are adjusted for a peak at both ends of the band so that a relatively constant drive level is achieved on all bands. The half-wave filter and transformers provide about 30-40dB rejection of unwanted mixing signals and other products. Two wafers on the bandswitch (a new design with silver-plated double contacts which eliminates the intermittency problem sometimes encountered in the 505) connect the output of the transmit mixer to the “TX in” input to the buffer stage. The output from the front-end buffer/driver stages are routed to the r.f. amplifier which remains essentially the same as in the 505 except that a pair of PT3647 transistors designed for broadband applications replaced the 505’s 2N2631’s.

The major change in r.f. amplifier design replaced the 505’s four single pinet output filters (one for both 15 and 10 meters) with more effective half-wave filters (see below) which were moved onto a newly designed SWR Bridge p.c. board. The Breune SWR Bridge remained the same except for the fixed resistor R14 noted above. With  $V_{cc}=13.6v$ , minimum output is at the 2-watt level, although it is possible to raise the “DRIVE” level to produce output in excess of 4 watts on some bands without deterioration of signal purity. Measurements showed an important improvement in oscillator frequency stability in the 509. Finally, I had replaced the RIT tuning knob on my 505 and tried it on the 509 with the same results – more precision was possible. There was some criticism of the s.s.b. clipping audio quality of the 509, but I did not have a good mike so it was no problem for a c.w. operator (Larry East, WIHUE, described a



mod to make it sound better in a **QQ** article in about 1995). Overall, I felt that the improvements made the 509 worth the increased price tag of \$369, and that it was worth \$29 to get the Model 208 CW Filter as well. If one comes up in very good condition for a reasonable price (<\$275) on eBay, think about it – unless there is a 515 at a close price.

#### Argonaut 509 R.F. Amplifier Half-Wave Output Filters on SWR P.C. Board.



#### Rear Panel of the Argonaut 505 with Various Controls & Connectors.



Note the “ACCESSORIES” six-pin plug/socket lower left for the c.w. filter beneath the “AUDIO” and “MIC” ¼” sockets. Note Ten-Tec’s use of RCA plugs/sockets instead of the typical SO239/PL259 coax connectors. The “DRIVE” control has been moved to the front panel but a lot of vacant space is left for mounting a new “SENSITIVITY” pot. By 1978, one ad stated that 7,500 Ten-Tec transceivers were in operation around the world, primarily Argonauts and Triton’s. A comparison of the 509 and Triton IV reveals many similarities in circuit design and construction although the Triton IV has an eight-pole crystal filter in the s.s.b. generator circuit. (So does my 515 ... see below). By the time it was replaced by the Argonaut 515 (late 1981), almost **5000** 509’s were produced! The 515 was discontinued after a production run of about 800 units.

The next very important development in the commercial QRP arena was Heathkit’s introduction of the **HW-8** in late 1975? (the date of the copyright of the Manual). I have been unable to determine the exact dates of the copyright and/or first “production lot.” An April, 1976, Heath Service Bulletin refers to a “chirp” problem caused by the fact that the switching diodes are apparently not isolating the not-used band circuits

completely in the heterodyne oscillator. A different diode providing better isolation would be used: "Second production lot will have the 56-56 diode." The implication is that the first production run had not been exhausted as of April, 1976. In late 1976, Heath supplied CQ with an HW-8 kit for me to build, test, and produce a report, which appeared in the May, 1977, issue: "CQ Reviews: The Heath HW-8 QRP Transceiver," (32-37, 80).

***This month Ade Weiss not only reviews the Heath HW-8 but also answers many of the questions you have sent in concerning this QRP transceiver.***

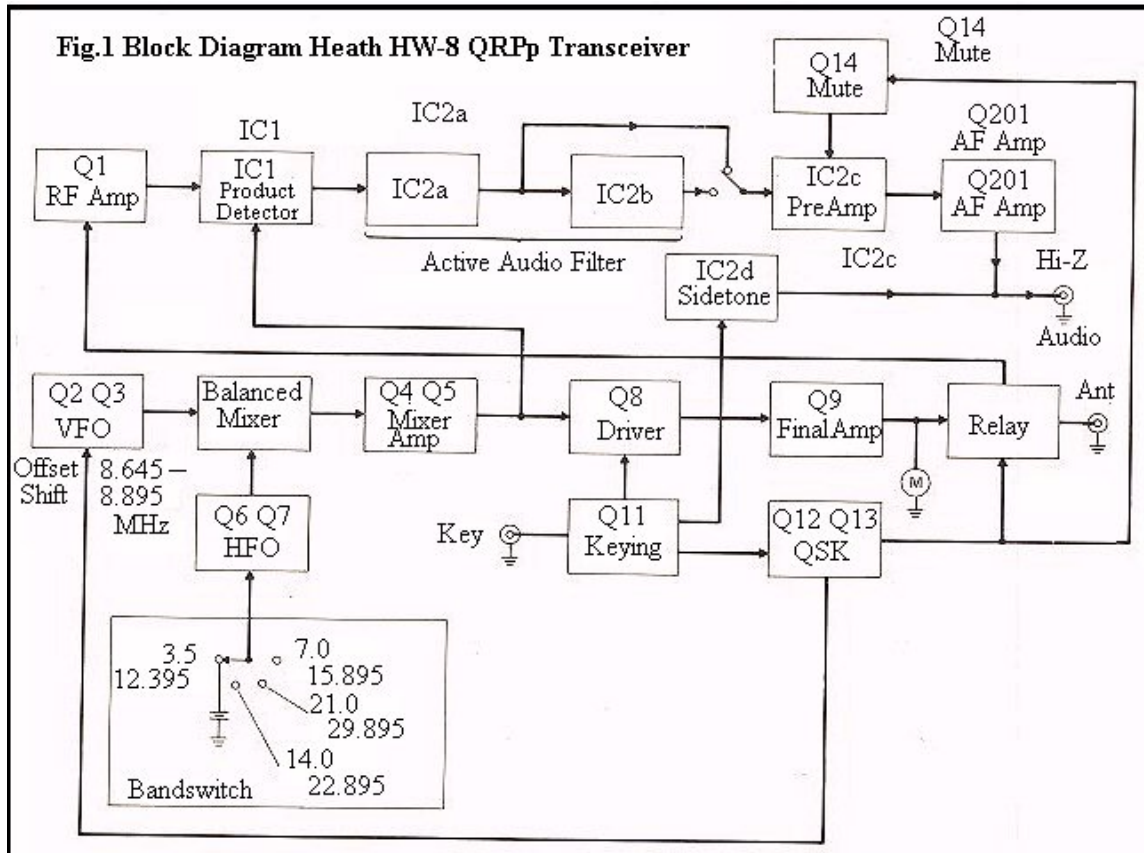
**CQ Reviews:**

## **The Heath HW-8 QRP Transceiver**

BY ADRIAN WEISS\*, K8EEG/0

The r.f. output on 40, 20, and 15 meters was within specs and clean with harmonics down a minimum of 34dB on the Tektronix 1401A Spectrum Analyzer with very few impurities. However, as my report noted, "3.5 MHz output was rich in harmonics spread out every 4 MHz or so from 26-60 Mhz, and from 90-150 MHz. Many were only 24 dB or so below the fundamental." In some cases, only 6dB down. Experimentation showed that careful tweaking of the output loading capacitor C303 improved the signal in the high range, but a TVI filter was recommended for the low range. A call to Al Dorhoffer at CQ about the problem led to a request from Heath to immediately return the unit for inspection. They verified the problem and apparently changed the values of the 80 meter output network. (In a letter of January 28, 1977, a Technical Consultant noted that the Engineer responsible for the HW-8 said that the output filter design was computer-generated for the SB-104 and incorporated into the HW-8. He had to have been referring to the driver stage network design, not the high-power final!) The only other problem was the faulty sidetone section of the IC2 audio processor and was cured by connecting a 25mf electrolytic from the IC2, pin 12, end of R73 to ground. This was the first occurrence of the problem according to Heath. The HW-8 represents the "simple direct conversion rig" come of age, as should be apparent in the block diagram. All the more that the design needed was a Receiver Incremental Tuning system to complement the built-in QSK, muting, sidetone, two stages of active audio filtering (IC2a-b), relay switching, and advanced heterodyne local oscillator with extensive temperature compensation resulting in v.f.o operating on a single range with excellent stability and virtually no drift after 10 minutes turn-on. One important consideration with regard to a kit is the ease of assembly and the time involved. The HW-8 was designed to be assembled on a single large p.c. board with a minimum of jumpers and few off-board connecting leads. As can be seen, there are a lot of parts in the design! After all, this rig operates on four bands! Of course, the Wilderness Sierra is more complex and much better performing and could fit in the HW-8 case with a lot of room to spare, but the nine band modules require an extra case! The HW-8 required 16.5 hours for assembly, and another hour for alignment and the first QSO! The manual is outstanding Heath stuff – huge blow-up fold-outs and the usual illustrated step-by-step, so one did not have to risk blindness in building it.





The receiver section has a preselector r.f. amplifier stage with r.f. gain control and link coupled to a L/C tuned coupling circuit feeding the MOSFET amplifier. The gain is excellent, except on 15 meters with components as delivered. The 80, 40, and 20 meter bands exhibited measured sensitivities of 0.19uv for a detectable signal around the noise level and 0.3uv would produce a Q5-readable signal in the phones, but a 10uv signal was required on 15 meters! Obviously something was wrong with the stock configuration. Nothing was defective and a modification to the input link for L4 made an 0.5uv signal locatable and made an 1uv signal clearly readable. The antenna input link to L4 was simply increased to 3.5 turns. The process involved melting the wax on the toroid with the soldering tip, then both ends of the link carefully removed from the two terminals next to the red dot and removed from the coil form. A new link of 3.5 turns of #28 wire was soldered into place. This is by far the most significant mod to the HW-8's original design. With the mod in place and everything aligned, I wrote: "During the test period, I was continually impressed with its usable sensitivity. I was consistently able to copy DX stations on 80 and 40 meters (with the Hy-Gain 14AVS trap vertical) from many parts of the world, including Europe, Africa, S. America, VK-ZL, and an FO8 on 80 meters." Conditions must have been great! [Last night, 1/18/2012, EA3 plus a couple of other DX were heard Q5 on 40m - didn't call them.] Tuning is smooth without backlash due to the Jackson Brothers 1:6 vernier mechanism (a classic) producing a tuning ratio of 50 KHz per half-turn revolution of the 1.5-inch knob with a 250KHz range. The actual tuning capacitor was an "embedded time bomb" in many cases where, after several months or years, the rotor plates just plain fell off the shaft. Hence, in considering purchasing a unit,

either critically inspect the tuning capacitor or ask for a clear close-up photo – I’ve seen one with plates glued back into place – probably making no electrical contact and hence useless. A second long-term deterioration issue was detected by Mike Czuhajewski WA8MCQ back in 1990 – toroid sets were found to “go bad” and drop the r.f. output below 0.5 watt or so on the affected bands – usually 80 and 40 meters. The article appeared in the **QRP QUARTERLY** for October, 1992 (see also a summary discussion at: <http://www.qsl.net/kk4kf/hw8score1.html>).

One “vintage” drawback is the 1000-ohm audio output impedance but this is easily solved by inserting a 1200:8 ratio audio transformer across the output of the off-board audio amplifier board (Q201). Actually, since it is a p.c. board module mounted on the side panel, an even better approach is to toss it out and replace it with an IC low-Z output audio and maybe add a couple stages of filtering (see my mods articles). An additional feature is the adjustable QSK delay which can be adjusting for rapid or slow attack depending upon the operator’s preference. Slow delay keeps the T/R relay closed until a series of letters ended. Less relay-klack. When a very strong shortwave broadcast station was somewhere in the vicinity, the cross-modulation could usually be eliminated by reducing the r.f. gain to a suitable level and repeaking the “PRESELECTOR” control.

Overall, the transmitter section is straight-forward – a mixer amplifier feeding the driver and final amplifier. The “LOADING” capacitor permits peaking output into a given antenna. R.f. power outputs were measured as follows with 13.4Vcc: 3.5 Mhz = 2.0w; 7 MHz = 1.8w; 14.0 Mhz = 1.6w; and 21 MHz = 1.2 watts. The power levels were sufficient to regularly work DX on the high bands and have a fairly good QSO/calls ratio on 40 and 80 meters – depending upon the antenna and propagation conditions. To my mind, the HW-8 was so good that it had to be modified to an even higher perfection! Sooo... I went ahead with some improvements in the August, 1977, issue (48-52):

**Part I: 15 meter receiver improvement, cw filter, SWR/wattmeter, and pilot light modifications.**

**Super Modified HW-8  
Contest Machine**

BY ADRIAN WEISS\*, K8EEG

and continued with more in the October, 1977, issue (62-65, 85-87):

**Part II: Receiver Incremental Tuning (RIT) and loudspeaker modifications for the HW-8.**

**Super Modified HW-8  
Contest Machine**

PART II: Conclusion  
BY ADRIAN WEISS\*, K8EEG

Sometimes mistakes slipped by, hence the following page-length (cropped) item in the January, 1981, issue of **CQ**. Incidentally, only use Motorola or TI or other high-quality

FET devices (no Rat-Shack cheapies). *[HW-8 QSO AH6V at 1906, Jan. 19, 2012, 15m!]*

# QRP

a monthly feature by  
ADRIAN WEISS, K8EEG

THE ART OF VERY LOW POWER OPERATING

## HW-8 R.I.T. P.C. Board Clarifications

The original p.c. board template published in the "Super Modified HW-8 Contest Machine" (August, October, 1977) showed only the foil connections for components, and omitted the groundfoil pattern. A corrected p.c. template appeared in May, 1978, *QRP*, p. 8. It is reproduced in this column, since demand for it has continued unabated since the original article appeared. Apparently hundreds of duplicates of the R.I.T. circuit have been incorporated into HW-8's with success. Since a few problems have cropped up, it might be worth mentioning them here. First off, several problems (2 instances) were traced to the use of unmarked "cheapie" transistors as Q1-Q2. Trouble-shooting indicated that the voltages given in the original article were not being achieved. This resulted from low gain (beta) of the "cheapie" devices. A standard

slug) to produce a downward movement in frequency. Very little adjustment of L9 was necessary in cases requiring it.

Finally, as noted in the original review of the HW-8 in the May, 1977 issue of *QRP*, early production runs of the HW-8 used a seriously defective main tuning capacitor—in fact, several of these were so defective that they actually "fell apart" after a short period of use. There have been several reports of frequency instability and inability to achieve a proper dial calibration spread with early HW-8's. These flaws almost invariably trace to a defective main tuning capacitor (C302). If this capacitor is functioning appropriately, the HW-8 shows a very good dial calibration spread ( $\pm 3.5$  kHz), and excellent frequency stability. If you experience this problem, request a

### WORSP's Super Modified HW-8 Contest Machine



Two of the modifications can be seen from this external view. At the right upper corner, a new black knob is at the right edge of the dial window, beside the "PRESELECTOR" KNOB. It is the Receiver Incremental Tuning knob on the potentiometer mounted on the inside of the front panel. The RIT circuit adds approximately 10pf to the v.f.o. circuit, resulting in an upward frequency shift of about +200Hz. So, the original transmit shift of -750Hz is summed with +200Hz, producing a total shift of only -550Hz. With the white line of the knob pointing at about one o'clock to produce a roughly 700Hz audio tone, the transmit frequency will shift to zero beat with the incoming signal so that the other operator will copy. However, since this is a direct-conversion receiver, the operator must make certain that the HW-8 is *above* the zero-beat frequency; otherwise, if it is *below* the zero-beat frequency, the transmit frequency will actually be -700Hz of the audio tone plus -700Hz RIT down-shift, or about 1400Hz *below* the desired signal. On the top just above the vertical dial marker can be seen a small red push-button switch. This is the "SPOT" switch which is used to set the transmit frequency to zero-beat with the

incoming signal. When the "SPOT" switch is pressed the v.f.o shifts the same amount as when the TX voltage is applied during transmit, while the red push-button knob allows the receiver to be tuned around as per the operator's preference. The RIT p.c. board shown above is mounted on the frame of the main tuning capacitor. Just to the rear of the "SPOT" switch, a pair of screw-heads and a diamond shape of holes can be seen – this is the new built-in speaker location and mounting. What is not apparent in the photo is a major addition, namely, the use of the original "RELATIVE POWER" meter with a new in-line Breune Wattmeter/SWR Bridge. The "SELECTIVITY" switch SW302 is replaced with a four-position unit. One section is used for selecting the two original settings plus the new CWF3 filter. A second section is used to select FORWARD or REFLECTED POWER (not labeled). The wattmeter/swr bridge is inactive in the third and fourth switch positions. The other mods are all internal and the articles have photos and drawings of them. Overall, this modified HW-8 is still competitive in DX contests on the high bands after taking into account the ~3 dB differential vs. 5-watt output rigs. One neat aspect of the 250KHz bandspread is the ability to wander up into low sections of the s.s.b. parts of the bands. Incidentally, the MFJ CWF3 filter is no longer available, but the circuit can be built rather easily. (See "HW-8 Mods Revisited: How to Build Your own CWF-3 Audio Filter," *CQ*, October, 1982; see also "Improving C.W. Selectivity in the Argonaut," *CQ*, January, 1977. [*HW-8 QSO T32AU*, 1/20/2012, 0552, on **40 meters!!!**] [*For what it is worth in terms of QRP history, Fred Bonavita, W5QJM (SK), assessed the value and impact of the above HW-8 articles in introducing his first edition of THE HOT WATER HANDBOOK ... BEING A COLLECTION OF ARTICLES ON THE MODIFICATIONS OF THE HEATH HW8 QRP CW TRANSCEIVER (1985): "Much of the credit for the interest and enthusiasm for the HW-8 goes to Adrian Weiss, W0RSP, the QRP Editor of CQ MAGAZINE. His famous series of articles on turning the HW-8 into a "Super Contest Machine" started many of us as fans of the rig and is still very much in demand. It remains a must reading if one is to modify the HW-8 to the fullest and reap maximum benefits from it. Even more important is the fact that many of the mods in this collection are based on Ade's work and, to an extent, pre-supposes modifications he urges have been made. No attempt is made here to reprint his major conversion articles... Rather, this anthology picks up where Ade left off." Fred then plugs the bound copies of the articles that I used to sell to support the "famous MILLIWATT trophy program" i.e., the one-watt and five-watt DXCC trophies as well as those offered for Field Day. ]*

The appearance of the **Argonaut 515** in 1980 was the final big commercial development in the 5-watt QRP world. One very noticeable change was the black paint that replaced the tan of the 505 and 509. I immediately coined the new name "Black Magic Argonaut" and tried to use it in the title of my test report but Al Dorhoffer believed that the title should be the actual designation from the manufacturer. So much for Shakespearean spurts in *CQ*! But Ten-Tec was definitely not trying to sell more Argonauts by changing colors. The v.f.o. and heterodyne oscillator circuitry underwent a major change. As described above, the 505 and 509 v.f.o. used a permeability tuned main inductance in combination with a series and a parallel inductance to establish the low-end of the frequency range and the spread of the range each frequency band. Juggling the top and bottom slugs of each inductance could be a tedious procedure if one had to be replaced or needed serious realignment. Nonetheless, the stability of the 509 v.f.o. was excellent. A single crystal was used in the heterodyne oscillator. In the 515, the permeability-tuned v.f.o. operates in only a single range from 5.0 to 5.5MHz with no need for the alignment



of multiple sets of inductances. Instead, the correct frequency crystal to produce the frequency range for each band is bandswitched. The end result is greater simplicity but perhaps a two-bits higher price for the crystals. The page in the manual describing the v.f.o. / mixer circuit unintentionally revealed the source of the “new improved” design, where #2 step in the alignment process reads: “Set the BAND switch on the TRITON to 14.0 MHz....” The end result was a shock-resistant, rock-solid v.f.o. Due to problems with the sometimes intermittent ground contact of the shaft of the permeability tuned inductance, it is left “floating” ungrounded in the 515 so touching the metal dial on the knob results in some “hand-capacity” effects. Warm-up drift was measured at 50Hz after the first 30 minutes, then 20Hz per hour. A second major change was the addition of a four-position rotary switch for four heterodyne crystals for the four 10 meter segments. Two crystals were stock, and the two for 29.0-30.0MHz were optional. The new system required that a second dial scale for 0.5 – 0.6 – 0.5 – 0.8 – 0.9 – 1.0 (representing the 100KHz steps) be added to the original 0 - 0.1 - 0.2 - 0.3 - 0.4 - 0.5 to cover the extra ranges on 10 meters. The receiver sensitivity is improved by the substitution of a MC1494P IC for the 505’s and 509’s MPF132 in the receiver mixer. After measurements (listed in the report), I noted that the “The receiver section sensitivity and noise figure compares with the best of them.” However, the increased performance of the receiver was somewhat undercut by the continued use of a compromise s.s.b. 4-pole crystal filter on c.w., where close-in very strong signals on the unwanted sideband were detectable with respect to the noise floor. The addition of the new Model 208-A c.w peak/notch filter virtually eliminated the problem when the r.f gain is backed off and the a.f. gain used to control the strength of the audible signal. The dial accuracy is excellent on the 1KHz per tick scale on the knob, which is also larger than the 505 or 509’s. The tuning ratio is about 20KHz per rotation of the knob. Another refinement was a gear accessible under the front panel that permitted adjustment of the position of the dial pointer. The r.f. gain control over-rides the a.g.c. circuitry at about the 50% point of its rotation. It should be kept below this level in situations where rapid QSK is desired as in a c.w. contest. Otherwise, the default slow-decay typical of s.s.b. operation blanks the first letters(s) of the responding station’s call or exchange.

The transmitter circuit is essentially unchanged except for the use of the Motorola MRF476 r.f. power transistors in place of the TRW PT3647 used in the final amplifier of the 509. Individual halfwave two-section pi network output filters are bandswitched for 80—20 meters, while a single filter is used for both 15 and 10 meters. The filters are designed for the final amplifier collector impedance produced at maximum r.f. output with  $V_{cc} = 13.6$  volts. The test report includes a table showing the deleterious effect of lowering r.f. output power while the  $V_{cc}$  remains constant. Signal purity deteriorates and harmonics as well as hash occur. For example, full r.f. output on 3.5MHz was measured as 6.26 watts with a collector current  $I_{ce}$  of 1.1 amps, yielding a collector impedance of 14.6. The halfwave filter is designed to raise that figure to somewhere above 50 ohms at the middle capacitor of the filter, and back down to 50 ohms at the antenna. If the output power is dropped (decrease “DRIVE” level) to 1 watt with  $V_{cc}$  still at 13.6 volts, the collector impedance rises to 92.7 ohms, a serious mismatch to the filter input impedance. In addition to signal impurity, the efficiency (including the harmonics’ power) drops from 41.8% to 21.2%. The point is: either decrease power by decreasing  $V_{cc}$ , or by



inserting a resistive attenuator which dissipate the difference between full possible r.f. output power and the desired lower level. (The output powers for the other bands were measured at: 7MHz = 6.16 watts; 14MHz = 4.1 watts; 21MHz = 5.97 watts; 28Mhz = 4.39 watts.)

Overall, the “Black Magic Argonaut” is a fine transceiver with the c.w. filter installed. It is even better on c.w. if an 8-pole crystal filter is substituted for the stock 4-pole. In the “QRP” column in **WORLDRADIO** for August, 1985, long-time QRP’r Fred Bonavita, W5QJM (SK), described his adaptation to the 515 of the approach described by Steven E. Mann, N4EY, in an article in the September, 1981, issue of **QST**. The approach was suggested by Dan Tomcik, K4OU, Ten-Tec engineer. The filters that were available for the Triton were too large and simply did not fit the 515. However, the OMNI-C Model 218 8-pole 1.8KHz filter was a perfect “fit”, and required only minor modifications for insertion into the 515, and permitted narrowed s.s.b. as well as c.w. performance in which there is no noticeable unwanted sideband. For c.w. only contest operation, the Ten-Tec OMNI-C Model 217 (500Hz) or Model 219 (250Hz) filter boards were then available. Maybe some are out there somewhere!

#### WORSP’s “Black Magic” Argonaut 515 in Mobile Travel Box with AC-5 ATU



The “mobile travel box” was built specifically to fit the 515 station into the space between the front seat and dashboard on the transmission hump of my 1966 Pontiac

*Although this project won't qualify you for a featured role on "This Old House," it will produce a neat and functional means of transporting and using your QRP gear.*

## **Tote 'n Talk How To Build A Portable Operating Setup For QRPers**

BY ADRIAN WEISS\*, WØRSP    CQ, December, 1988, 60-66

Tempest. The 515 was vertical face-up with the fold-down front resting on the front seat liked a shelf with the key and log on it. The power and antenna cables were attached through the rear panel at floor level. The Ten-Tec companion power supply is mounted vertical at the left side of the box, with the Model 208-A peak/notch audio filter on the shelf directly above. The MFJ CMOS Keyer is at the center of the shelf, but the elegant English-made single arm paddle at the right side of the drop-down front was used instead of the keyer's crude built-in paddle arm. The unit fit in the open space beside the keyer when the front was closed. Of course, the "Black Magic Argonaut 515" occupies most of the bottom shelf. The station was intended for use on an eight month cruise to FL to escape the SD blizzards and travel to the many hamfests in FL during the winter and spring as well as to Dayton in April. With the Hustler antennas, many QSO's on all bands filled the long hours on the road especially at night. The two red LED's to the right and left (2 o'clock, 10 o'clock) of the main knob let me know whether the RIT was active or not and whether the output power was above about 2 watts. When I moved into a place, I'd haul the box in, put it on the table and hook up the a.c. power supply. Just outside of Hernando, FL, on one of my bike rides, I noticed flashes of blue and white showing in the roadside grass. It turned out to be cheap stranded fiberglass 1/8" line, and I followed it to the beginning and then wound it all up. It was about 400 feet long and worked quite well hung over a 90-foot tree to anchor one end of a 300-foot longwire, cut it off, and the same use at the far end. EU pile-ups on 80 meters with the 515 – crazy! But also a QSO with Rocky W9SCH loading his bed springs as an antenna on 80 meters! The construction details of the box (end-product covered with brown nagahyde matching my dashboard covering) are given in **CQ MAGAZINE**.

While the commercial sector was supplying transceivers exhibited advancing technology focused upon top performance and the DeMaw-Hayward group were packing more functions and flexibility into portable miniaturized transceivers for "serious" activities like hiking and mountaineering, Brice Anderson W9PNE introduced us to the plain old "good fun" possibilities of getting thrills from operating simple transistor rigs like his "Screts Special QRPP Rig," a two-stage crystal-controlled transmitter that developed 150 milliwatts r.f. output with a 9-volt transistor battery and a bit more at 12 volts. It was built in a **SURETS** tin box – the popular mint of the 1970's. The tins were replaced with plastic types in the late 1970's, and I bought the last five absolutely mint condition **SURETS** tins at the 1998 Dayton Hamvention. By then, the **ALTOIDS** rage had spread and continued, so my plan of offering these unique history-laden tins as doorprizes at a sequence of Dayton QRP Hamventions was discarded simply because nobody except a few of us old timers would appreciate the magnitude and importance of the prizes!



## W9PNE's Famous "SUCRETS SPECIAL QRPP Rig"

the  
**Milliwatt:** **QRPP**

← K →

DEVOTED EXCLUSIVELY TO UNDER FIVE-WATT AMATEUR RADIO

VOL IV No. 2 April 1973

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*MILLIWATT FIELD DAY TROPHY COMING!!!		

DeMaw also saw the attractiveness of a simple project that could provide a great deal of satisfaction that accompanies "workin'em with somethin ya built yerself". The **TUNA-TIN 2** was duplicated by thousands of QRP'rs, and in fact, modern reproductions in kit form have been available.

## Build A Tuna-Tin 2

QST, May, 1976, 14

Ham radio lost its kick? Go QRP with this weekend-project transmitter! WAS with a 40-meter half-watter? You betcha!

By Doug DeMaw,\* W1CER

**W**orkshop weekenders, take heart. Not all building projects are complex, time consuming and costly. The Tuna-Tin 2 is meant as a short-term, go-together-easy assembly for the ham with a yen to tinker. Inspiration for this item came during a food shopping assignment. While staring at all of the metal food containers, recollections of those days when amateurs prided themselves for utilizing cake and bread tins as chassis came to the fore. Lots of good equipment was built on make-do foundations, and it didn't look ugly. But during recent years a trend has developed toward commercial gear with its status appeal, and the workshop activities of many have become the lesser part

substitutes for the popular 2N2222A device. That left six spares for the rig or for use in other projects. The important characteristics for the transistors are (should you want to try substitutes) a maximum collector voltage of 30 or more, a gain ( $H_{fe}$ ) of at least 100, and a maximum frequency ( $f_T$ ) of 100 MHz or higher. Also, the transistors should have a dissipation rating of 500 mW or more.

Resistors for the circuit were already on hand, but new ones could have been purchased singly or in an assortment. Circuit-board material is also in supply at Radio Shack, so a sheet was added to the shopping bag. The tiny send-receive toggle switch is a mite expensive. The

As noted earlier, I had started my "design" career with the 160-meter transmitter described above, then went on to the **GIANT FLEA** by assembling the MFJ v.f.o. and transmitter modules into a small case with 2.5 watts r.f. output on 40 meters (see above photos). That was followed by "A Multiband FET VFO Transmitter" employing the Ten-



Tec TX-1 module as described earlier. Then came a “Solid State VFO Transmitter for 7-



14MHz” in three parts, ending with a 2N5589 final amplifier capable of 15 watts r.f. output at 13.6 volts Vcc. (CQ, November, 1977 – January 1978). Next came “The QRP-420XC 4-20 Watt Transceiver for 7 & 14MHz” with a direct conversion receiver including r.f. and a.f. gain controls, several stages of audio filtering and a highly stable



Seiler v.f.o., using a higher power 2N5590 final (**CQ**, September & October 1978), then a rig the same size as the **GIANT FLEA** but packing more wallop with v.f.o. control -- "The Viking-5: A 5 Watt Solid-State Transmitter for 3.5 & 7MHz" (**CQ**, February & April, 1979). The series culminated in a miniaturized transceiver employing a 2N5589 final, a direct conversion receiver with transmit offset and QSK operation. The entire **VIKING 3x5** 20-meter portable station, including the design notes, the Hi-Z single headphone, a miniature L-network designed to tune the endfed halfwave wire on the spool with the sinker for tossing the line over a tree, a #47 bulb with clip-leads for inserting between the rig and antenna for tuning the antenna, and the miniature key made from a microswitch that was held by the left hand and was keyed by the right index finger, was featured on the cover of **CQ** and I know of several that were built.. It was my CB550 "camping tour" transceiver and I wrote in **HISTORY OF QRP IN THE US, 1924-1960** about working a UA1 from my tent the first night out! What a thrill!! I added a two stage audio filter and LM386 in about 2001 enabling the use of 8-ohm phones or speaker. It was a tight fit! The cover was great PR for 5-watt QRP. But the January, 1976, cover





had provided even more attractive PR for QRP. When **THE MILLIWATT** announced the **DXCC QRPP** and **DXCC MILLIWATT** Trophy Programs, our guess was that it might be impossible but we and K4IIF kept the world informed about the progress of the top contenders. To our (i.e., “my” -- since I was supposed to be the first!) surprise, Robert Rosier **K4OCE** delivered his package of 100 bonafide QSL’s and log in June, 1971, as well as the specifics of his equipment, r.f. output measuring technique and instruments, and signed affidavit that it was all true (back then we just had faith in the QRP gang). Naturally, the QSL’s could not be faked. His **DXCC QRPP #1** trophy was impressive and appropriately displayed but not on the cover of **CQ**. Sanford Sandowsky **W2GRR** started from scratch and delivered his materials in June, 1975. Diane (5’ 7”) cheerfully displayed the **DXCC QRPP #2** trophy (note the relative sizes). Once the applications began building up, the trophy size was reduced by about 7-inches. Still BIG to match the achievement! The complete list of **MILLIWATT DXCC QRPP AND DXCC MILLIWATT TROPHIES** can be seen at:

[www.qrpdpropagationantennas.com](http://www.qrpdpropagationantennas.com)

Trophies were being awarded also for the QRPP Field Day piggy-backing on the ARRL FD contest, but quite a bit smaller than the DXCC trophies.

In addition, QRP activities had increased significantly in the first few years of **THE MILLIWATT**’s publication. By 1973, for instance, a QRPP QSO Party produced the following results:

Results: <u>Third Annual (1973) QRPP QSO Party</u>							
K8EEG/Ø	.5/2/5w	82938	SD	W9GF	4w	2340	WIS
W4VNE	1.8w	74800	VA	W4ZRJ	5w	2145	VA
W5JLY	1.8w	38540	TX	VE3JO	4.5	2015	ONT
W5TVW	3w	18630	LA	WØDSP	1.8w	1760	IA
W2UAC	1.8w	18170	NY	W2JDC	2w	1620	NJ
K8BHG	3w	15150	WVA	W7ZC	5w	1120	UT
WB2CMO	2w	14400	NJ	WAØYED	1.8w	900	COLO
W2AXZ	2w	12420	NJ	W1ECH	3w	765	CT
W4KFB	2/3w	11900	KY	WA1MBK	3w	525	CT
W7IBL	2w	9620	ORE	WA6BQI	1.8w	500	CA
W3TOS	3/5w	9190	MD	W6JEO	3w	360	CA
WB5BOT	2w	9030	NM	WA7VVS	2w	240	AZ
W2NCI	3w	8855	NY	W2IP	2w	140	NY
WN7VNG	2w	8820	WA	Following entries over QRPP level:			
W4AWS	4.5w	7958	FLA	W8GP	10w	4140	MI
W4QN	1.9w	7700	FLA	W8HZA	60w	2940	WVA
W8PCS	1w	7360	OH	W3FLA	50w	1525	PA
PAØGG	2w	6720	NETH	VE2PJ	10w	884	QUE
K4FS/m4	1w	5270	FLA	WB8NTY	90w	300	OH
W9YH	2/5w	4700	ILL	W8IBX	200w	252	MI
W7JKG	2w	4550	WA	WB9MBH	10w	232	ILL
WA3RJS	2w	4200	MD	W3HKS	120w	156	PA
WB2JNE	.45/2/4w	4095	NY				
WØMHK	2/3w	3040	IA				

Earl Lawler W5JLY  
Contest Chairman

\* \* \* \* \*

I think this was before I acquired a GEM QUAD, so the K8EEG/0 score was with simple antennas and the “bamboo poles varnished and wrapped with tin-foil” close-spaced two element 20m yagi. It was an improvement over my first 3-QSO FD outing in 1970 in a mesquite wetland area. The QRP ARCI Spring Party in April, 1973, created a new boundary that eventually would change the club years later – the QRPP activity level.

Results: QRP ARC I Spring QSO Party (April, 1973)

Call	Score	Power	Call	Score	Power	Call	Score	Power
K8EEG/Ø	41552	5/1w	W9GF	2784	5w	VE3EHN	320	5w
WB2LYB	27186	100w	VE3OJ	2520	5w	WB4RDM	296	2w
WA9QJW/9	12768	5w	K8BHG	2475	2w	WN3SCP	252	70w
W4KFB	9438	3w	K6GKU	2115	5w	KH6EBQ	216	20w
W8CINN	7470	70w	W3FLA	1998	50w	K4IKG	210	2w
WA4RUO	6732	5w	WN2EOO	1984	15w	WBØJQA	172	30/12/2.5
W8VDP	5580	3w	W8WGJ	1677	2w	W6NJG	120	3w
K1QFD	5148	10w	W3ARK	1584	75w	WAØYED	120	2w
VP2LAW	4794	60w	WA2ICB	1368	2w	WN4CFC	108	75w
K4JO	4554	5w	WØAV	1170	3w	K4ZGB/4	66	260w
W2AXZ	4473	3w	W4ZRJ	946	5w	WØHAW/6	42	140w
W4QN	4161	4w	WB5BOT/7	900	5w	WB8HSL	32	1w
KP4DJ	4080	50w	W5JLY	861	50w	K7UWT	28	15w
WØIYP	3840	1w	W3HKS	819	75w	WN8MRS	12	2w
W8RJF	3696	15w	WB2SXD	810	75w	WB8NTY	9	90w
W8HZA	3321	75w	WA1HYN	584	50w			
WA3RJS	3033	75w	WA3EFH	468	5w			

This amounts to about 300% increase in activity over any previous QRP ARC I operating activity. Especially noteworthy is the extent of QRPP operation--27 stations total.

The "Operating News" section in **THE MILLIWATT** served the same function as the WEB QRP-L list today, except it was one-sided. In every issue a half-dozen or more QRP'rs shared their experiences and discoveries. Some had a humorous slant like Fred Merkel's tragic experience in getting a "QSL" from Alaska that did not count for WAS QRPP (in August, 1973, issue):

de. . .WA7UKP, Fred Merkel, Rt 3 Box 88, Mohawk, ORE 97477.

Just a note to let you know that you don't need a KW to get FCC attention. I dropped a little low on 40 meters one night and the Anchorage, ALASKA FCC office copied me loud and clear in the Extra Class segment. Too bad their notice won't count as a new state! Hi!! I have 17 states now with five watts since working KH6. I don't get as much time on as I'd like. I will be operating /VE7 for several days at the end of July.

\* \* \* \* \*

In the same issue, Robert Rose, K6GKU, Head, Naval Ionospheric Assessment Systems, reported on his "standings" with 2.5 watts r.f. output to the antenna: "I have just sent in my application for **QRPP WAS** as QSL #50 finally arrived from Idaho. I also finished up the requirements and sent off for the **ZL-73 Award**. The latter requires 50 ZL QSO's in one year. Current DX score is 40 countries worked and 32 confirmed. 90% of all contacts are made on s.s.b. and I spend much time chasing new states on each band. Perhaps **5BWAS-QRPP** is possible.... Strange happenings: worked W7MXM, 14.2MHz, s.s.b., 4-1 back-scatter! I needed Idaho and heard ZL3GG working W7MXM so I broke the ZL to work the Idaho station. When I turned the antenna to the W7, he was gone. His signal peaked on a bearing of 230 degrees when I swung the antenna back around to the ZL. I worked this strange three-way QSO from 0455-0522Z on May 23 (1973) when much short skip was noted. I was 5-4 in ZL." Strange indeed. The next Operating News report was from K8EEG/0 about a similar strange QSO with a ZL. It remains one of the "peak" QRP experiences of my life:

de. . .K8EEG/Ø, Ade Weiss, 213 Forest, Vermillion, SD 57069.

Thought I would horn in on the usual proceedings to share a spectacular experience with the boys. During March-April-May I worked quite a list of DX stations on 20 meters with 4 watts output to a homebrew 2 element yagi up about 40ft. I hope to add to K6GKU's observations on 20 meter conditions at some future time, once I've had time to compile my notes. But to the big experience. I was tuning around 20 at about 0200Z the morning of April 24. Heard a pileup on an otherwise dead band, and determined that ZM2AFZ was at the bottom of it. On a lark I gave a quick 2x2 call after he signed, and sure enough he came back to me while the rest of the pack was still calling. He mentioned that he picked my four watts out of about a dozen callers. Well, when I informed on the first go-around that I was running only four watts, he began to get excited, firing the usual line of questions. When I mentioned that he was #58 since the first of the year, he really got excited. He just couldn't believe that my four watts was pounding into New Zealand like that. Well, the crowd stood by listening, probably in shame and humiliation, at the cherished DX station gabbing with a crummy little QRPP signal. I'm not normally a spiteful person, but believe me, it is a beautiful sense of pride and accomplishment knowing that half the ham world is out there just waiting for the nitwit QRPP guy to get out of the way so the KW's can resume blasting their way through (it happened once with a KX6 on 15 meters--he asked me to QSY to 10 because he needed SD for WAS, and the poor wolfpack was left with not so much as a morsel or tidbit). And so the QSO continued for some twenty minutes, when ZM2AFZ asked if I'd like to QSY to the phone band to hear a tape-playback of my part in the QSO. And so we QSY'd. And WOW. There's nothing in ham radio to compare to it. There I was, sitting in SD with my peanut whistle, there he was in New Zealand with his recording from the wall speaker, and by God if my little four watt signal wasn't rocking the very foundations of his shack. The signal strength was just incredible. I never really believed personally that so little power could put such a loud signal into anyplace--let alone New Zealand! How I can I explain my feelings during this whole tape-playback thing? I'd have to be a Shakespeare at least. All I can say is that I sat there grinning like a cheshire cat or something, floating on a real "high", and all my years in ham radio, with all the thrills and triumphs, sort of came back into memory--like working a KC4 on 40 meters in the middle of a pileup running 20 watts--and everything just hung there. A moment of utter joy and amazement that hung in its own psychic reality. It was a spiritual experience if anything. Like "I been to the mountain and seen the burnin' bush" as the spiritual says. It was Mt. Sinai, Mt. Olympus, and Parnassus all rolled up into one. What else can I say to describe it? I suppose Keats had the same thing in mind when he noted that "Truth is beauty, and beauty is Truth; and that is all you need to know." I only wish that every QRPP'r could have a similar experience. Be there, and you might!!!

\* \* \* \* \*

The tremendous growth of QRP is recorded in **THE MILLIWATT** and the **CQ QRP Column** for the 1970's. QRP rigs capable of battery operation freed the QRP'r from the a.c. mains needed for QRO work. Operating from previously unthinkable locations became a common reality – and an irresistible enticement! A regular trip could be turned

into a DXpedition with a rig that fit in a briefcase (or smaller!). Motels changed from weary stop-overs to exciting new operating sites capitalizing upon whatever antenna opportunity was present. Interstate rest-stops likewise had tables and trees. Kids were guaranteed trouble! There were the real outdoor types also. **THE MILLIWATT** ran the detailed original story of the QRP mountaineering expeditions by Dick Simpson W6JTH and John Gregenkemper WA6VBA in "Recollections on Field Day 1974" (October, 1974, 1-4) on Mt. Shasta at the 13,850-foot level just below the 14,000-foot summit as **W6JTH and WA6VBA Mt. Shasta Camp Site (13,850-ft) for FD 1974.**



seen here. The pole is the east support of the 40-20-15 meter trap dipole with the feedline at the right. The wind increased all night to a low level blizzard so that the tent was in danger of ripping apart. While it was still dark W6JTH and WA6VBA had to exit and anchor it in the dark. Talk about roughing it! Of course, there was the good side of it, given the fact that "the panoramic spectacle from the top of Mt. Shasta is unsurpassed." The rig was a converted HW-7 with the new receiver section ala' DeMaw's **QST** article. The difficulty zerobeating stations led to WA6VBA's RIT modification published in the July, 1975, issue of **QST**. 40 meters was be most reliable band, but 20 and 15 meters were miserable, amounting to four QSO's per band. A total of 93 QSO's were made (85 on 40 meters), a doubling of the 1973 Field Day score! That was a great achievement since "the roar of blowing tent fabric drowned out even the strongest signals with full volume on the HW-7." Their next article about another trip up a mountain



appeared in **QST** for July, 1976 (“QRP – Mountaineering Style: QRP plus the great outdoors – a therapeutic adventure / pastime!”, 54-57) which footnoted two of DeMaw’s DXpeditions (Barbados and the Caymans – 94F and lite cloud cover?) and Contributing Editor Wes Mattox K6EIL/2’s “QRPP and the Backpacker” from **THE MILLIWATT** (August, 1972). W6JTH and WA6VBA’s **QST** article covers the practical aspects of operating QRP from several different types of locations. Very interesting insights! Overall, **THE MILLIWATT** published 194 “Operating News” reports by QRP’rs plus several articles about specific outings like QRP in a rowboat! Reports on the QRPP Field Day contest appeared yearly along with the trophy winners and scores. The number of entrants steadily increased as did the top score. After the first two years, in came Todd Olson W0IYP’s phenomenal run of about 439 QSO’s! From a group of loners we became an informed, united community of operators enjoying various aspects of QRP.

Results: Milliwatt Field Day Trophy 1974				
Stand- ing	Station	Number of QSR's	Power Mult.	Score
1.	W0IYP/ W0ZHN	439	4	2784
2.	WA3HBT	248	4	1638
3.	K1GAX	152	4&5	1120.5
4.	W5TVW	151	4	1056
5.	K8EEG/ø	120	4	870
6.	WA5WYO	103	4	768
7.	W8NDG	76	5	720
8.	W6JTH WA6VBA	93	4	708
9.	K6GKU	115	4	690
10.	WB9LKC	68	5	660
11.	WN8OSM	91	4	546
12.	WB5IOG	49	5	517.5
13.	VE3ECJ	55	4	480
14.	W9PNE	50	4	450
15.	WA2TLQ	72	4	432
16.	K4BNI	60	4	360
17.	WA2KTW	38	4	228
18.	WN3UDS	3	5	172.5

Scoring: QSO's × power multiplier (× 4 under 5w out, × 5 under 1w out) × 1.5 battery power + 150 bonus for complete portable setup away from home shack.

November, 1974 • CQ • 39

One project undertaken by **THE MILLIWATT** was of inestimable value in 1973. It was termed “The Cumulative QRPP Bibliography,” a list of articles relevant to QRP operation that had appeared in: **HAM RADIO** from 1968-1973 (researched by Jim Wilson WB0JXY); **POPULAR ELECTRONICS** from 1954-1972 (by Joseph Haluska W4ZRJ); **CQ MAGAZINE** from January, 1956 to February, 1965 (by Wallace Mitchell W6JCF/3); **CQ MAGAZINE** from July, 1967 to October, 1973 (by K8EEG); **QST** from August 1956 to 1973 running to about massive 225 articles including the DeMaw and Hayward papers mentioned above and then more (by Corwin Butler K5INC). The Cumulative Bibliography (**THE MILLIWATT**, October, 1973, 2-22) is still extremely valuable for the period of solid-state development as well as articles about low power

rigs, test equipment, antennas and transmission lines, c.w. and s.s.b topics, and so on. Many of the queries about such topics have frequently been raised on the **QRP-L** but most of the time, no one is even aware of the fact that well-researched papers have provided documented lab work and field experiments providing the actual answers. For instance, is stranded wire better as a radiator than solid wire of the same diameter? The actual answer was published in a Bureau of Standards document in 1929. One aspect of QRP seems a bit discouraging for writers and researchers – QRP'rs seem inclined more toward making and playing with toys than understanding why they work. So a lot of opinions are expressed but very few provide data of field experimentation to back them up. Luckily, some list members like “Doc Megacycle” (Jim Duffey) and WE6W provide the measurements and results. About five months later, the same question pops up. One interesting aspect of the long list of previous papers is the revelation of how much has “been done before,” like Paul Lee and the “optimum” vertical height of 43 feet for multiple band operation. Or Jerry Sevick about very short verticals and groundplanes. The fact that **QST** is available from the very first issue on the ARRL WEB site; and the entire run of **CQ MAGAZINE** is accessible at <http://hamcall.net>; the first 10 pages are free, but a minimal fee gets a month of access. I suppose I'm preaching to the choir about this, assuming that only QRP “readers” will have read this at all.

The first US genuine 5-watt QRP club was founded in Michigan in 1978 after **THE MILLIWATT** died. Ralph Burch **W8LCU** (a **MILLIWATT** subscriber) founded the **MICHIGAN QRP CLUB** in January 1978 and published its quarterly newsletter **THE FIVE-WATTER** with news and circuits, much like **THE MILLIWATT** in content and format. It also designed and produced a shoulder-patch with the club logo, and initiated a QRP NET on 3535KHz for short skip on 80 meters so MI QRP'rs had a good chance at checking in. The club was (and still is) held together by the monthly Saturday brunch



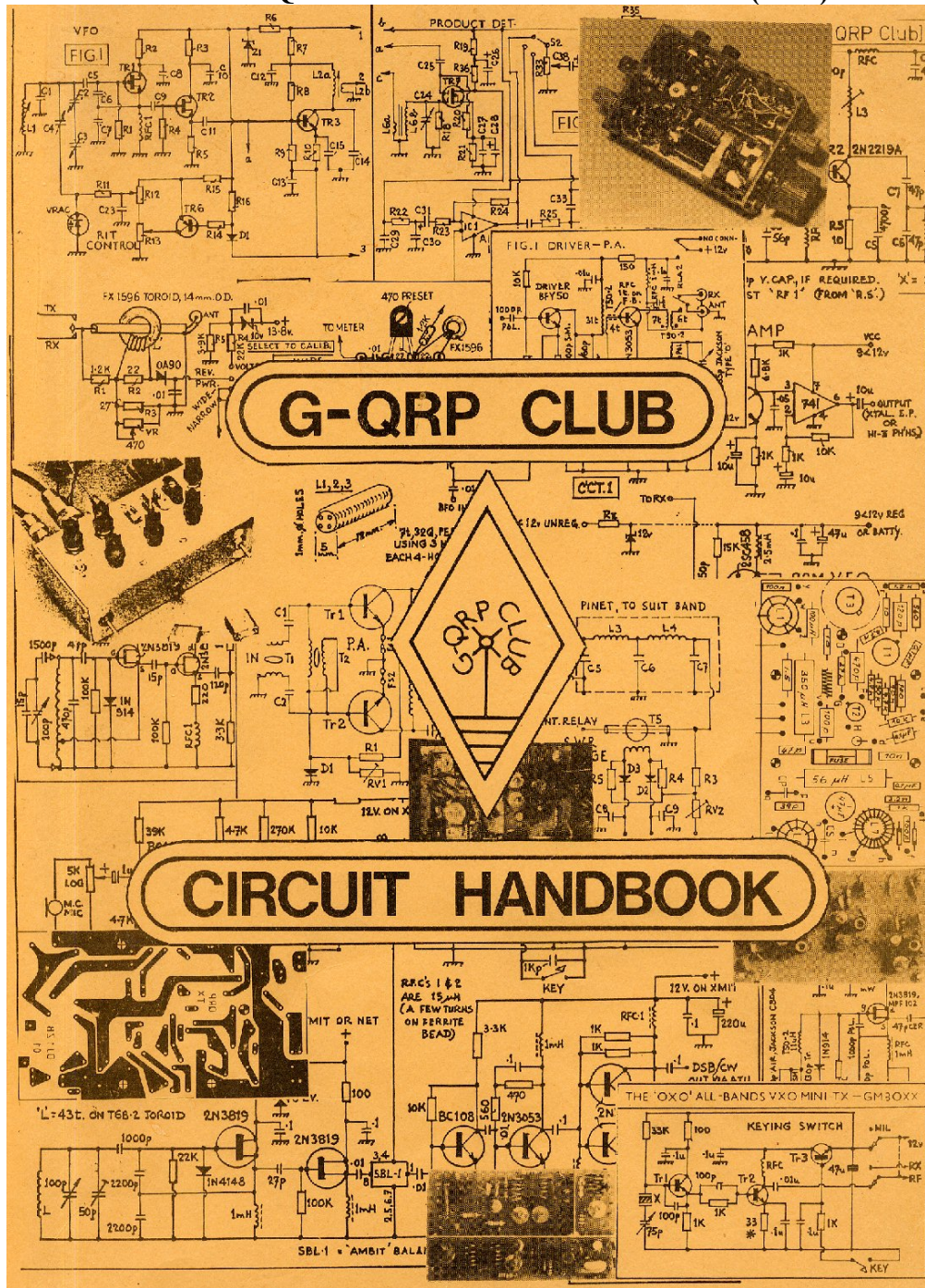
– which I envied, but now I have my own brunches in AZ with the AZSQRPIons' monthly meetings at Fuddruckers! Earlier, Rev. George Dobbs **G3RJV** founded the **G-QRP Club** in the fall of 1974 with about 30 subscribers (see “QRPP Club Initiated in England,” **MILLIWATT**, Dec. 1974, 14), enrolled the 1000<sup>th</sup> member by December 1980, and by 1984 was mailing to 3000 radio amateurs around the world! The quarterly journal **SPRAT** emphasizes design, circuits, and project construction rather than operating and quickly became the international treasure trove of homebrew projects. In 1982, G3RJV, aided by Chris Page G4BUE (a multiple **MILLIWATT DXCC** and **QRPP DXCC** trophies holder) and Mac McNeill G3FCK, collected the circuit designs

and project articles published in **SPRAT** from 1974-82 into a huge 100 page book. (Check the G-QRP CLUB WEB site for availability. G3RJV currently [2011] has a circuitry book published by **CQ MAGAZINE** that will certainly be worth the price!) Liason with G3RJV led to the appointment of A.D. "Gus" Taylor G8PG (SK) as the foreign official of **THE MILLIWATT DXCC TROPHY Program** to facilitate the processing of packages of 100 QSL's with each application and to minimize the risk of loss of the irreplaceable **DXCC** evidence. By 1984, 88 mail transactions succeeded through either W0RSP or G8PG without a single lost package! A club was also organized in Hawaii but it seems to have faded. The **CQC** club in CO did not become an organized club for many years, but like the **MI-QRPC**, its existence grew out of the regular meetings of QRP'rs and their shared interests and combined efforts such as Field Day. These few clubs carried the QRP torch until the QRP ARCI was transformed into a genuine 5-watt organization in 1981. QRP groups formed in Austin and Dallas as well as other areas of the US; mostly informal in nature, these fostered the spread of QRP and organized forums at ARRL regional events and other hamfests. For instance, Ron Moorefield **W8ILC** of **DXCC MILLIWATT 300 DXCC Trophy #1** fame belongs in the **QRP Hall of Fame** not merely for his incredible under 1-watt s.s.b. achievement but because, as a member of the Program Committee of the Dayton Hamvention, he initiated the inclusion of a QRP Forum in the mid-1970's. The 1974 **Field Day Trophy** (see "Results" above) was presented to Todd Olson W0IYP at the 1975 Dayton Hamvention QRP Forum – and now there is the **FDIM!** At the same time, Ross and Dorhoffer at **CQ MAGAZINE** were enhancing its support for QRP by being on the verge of adding a separate QRP section to the **CQ WW DX CONTEST!** The heavy traffic of QRP'rs at the **CQ** booth at Dayton had a definite impact on them, and they got me to come to Dayton yearly to work the booth. It was a great time for me – from faceless letters in "Operating News" submissions to the actual real QRP operators excitedly talking about their experiences face-to-face. By the late 1980's, a floor of the Belton Inn housed QRP forum attendees and a big 11<sup>th</sup>-floor conference room was needed to handle the crowd courtesy of the efforts of Jim Fitton W1FMR.

In the meantime while the grassroots genuine QRP movement grew in the US, G3RJV occasionally took potshots at the US club's interpretation of "QRP" as 100 watts. *And we cheered everytime he did.* It took a while for the **G-QRPC** to turn to the output power standard even after I took W7ZOI's original circuit of a wattmeter in **THE MILLIWATT** and wrote it up for **SPRAT**. A four-member committee was convened (or so the rumor goes) to test the accuracy of the W7ZOI circuit ala' my homebrewing approach – the accuracy was found to be within something like a half-percent as measured on a 10,000-pounds sterling professional r.f. meter (made in the UK, of course). Then the **G-QRPC** accepted the output power standard, and the whole QRP world was at one! In contrast, when I wrote up the r.f. probe and wattmeter for the **QRP QUARTERLY**, Editor (from October 1980) Pete Spotts N1ABS skipped the committee part and just published it in the January 1981 issue (see below), the issue in which President Thom Davis K8IF formally announced the change of the club's definition of QRP to 5 watts r.f. output and his acceptance of the **World QRP Federation's** invitation to become part of the genuine QRP world in 1981.

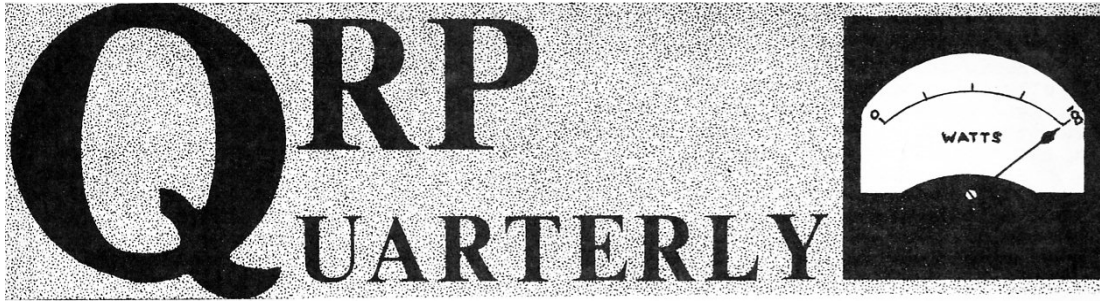


### G3RJV's G-QRP CLUB CIRCUIT HANDBOOK (1982)





#### Part 4. The QRP Takeover of the 100-watt QRP ARCI.



Before the QRP takeover of the 100-watt **QRP-ARCI** occurred in late 1980, the newsletter was headed by a logo consisting of a 2-inch square meter with the needle pinned at the 100-watt tick-mark (see above). Previously, the logo was simply a QRP with a 5/8-inch “Q”, at the top of which “100” was inscribed, and a needle inside the “Q” pointing at the “100.” The change to the huge 100-watt meter made the focus of the club obvious, and was “a kick in the face” to genuine QRP’ers. The takeover followed a complicated path during its three year process. The following “history” interweaves documentary evidence found in several sources including personal correspondence.

**Mike WA8MCQ.** Somewhere around 1977 or so, Thom Davis, **K8IF** (ex-WB2TEN, a long time true-QRP stalwart) was president of the QRP ARCI and he proposed that it abandon the 100-watt focus and convert itself into a true QRP club, at the five-watt level. Naturally this raised howls of protest from the Old Guard, but over a year or so he managed to slowly and diplomatically pull it off. The new focus of the QRP ARCI became “true QRP” and all vestiges of the 100-watt limit were eventually eliminated. The club was now dedicated to people who loved playing with flea power, although they could “legally” run higher power at any time, for any reason whatsoever (DX, nets, traffic work, ragchewing, etc). (I neglected to mention earlier that members had to sign a pledge that they would NEVER run more than 100 watts for any reason except, I believe, true emergency situations. The pledge had been a sore point with a number of people who were interested in QRP but were turned off by the pledge.) I didn’t return to ham radio until 1986, and was overjoyed to find that the QRP ARCI was now a QRP club! I started writing for the **QRP QUARTERLY** in 1988 or so, and still do. I missed out on all the fun of the fight to turn it into a real QRP club, though Danny Gingel K3TKS and many others were there and can tell stories about it. While K6JSS founded a club that bore the name “QRP ARCI”, we have **K8IF**, Thom Davis, to thank for its conversion into a “true QRP” club and we all owe him a tremendous debt for that. Ade Weiss W0RSP used to write a regular QRP column for **CQ MAGAZINE**, and in 1983 he wrote an excellent piece about Tom’s work in making the QRP ARCI into what it is today. I asked **CQ** for permission to reprint it; somehow it took three years from the time I got the permission until it appeared in print (that’s another story) but it finally appeared, in the October 1995 issue of the **QRP QUARTERLY** (pages 6-7).

## QRP ARCI HISTORY

# HOW THE QRP ARCI BECAME A QRP CLUB

By Adrian Weiss, W0RSP

*Reprinted from the May 1983 issue of CQ Magazine, with permission. (From the W0RSP QRP column, originally "K8IF Steps Down".)*

*Editorial Two-Cents Worth: People joining the QRP ARCI today think that it was always a flea-power club, but that's not the case, even though the QRP Quarterly is well past it's 30th anniversary. The club was founded in 1961 by the late K6JSS with the goal of reducing QRM on the bands by voluntarily reducing power input to a lower level, selected as 100 watts input. (The amateur world used input rather than output power until relatively recently.) While that was a noble and worthwhile purpose, and everyone involved with the Club back then had the best of intentions and motives, there were many who heard the term "QRP" and signed up, only to drift off when they learned that it wasn't a flea-power club.*

*Having joined in 1967, I was only too well aware of the purpose of the Club in those days. I was one of the very small minority who ran QRP as we know it today, 5 watts and under. Unfortunately, I went QRT when I joined USAF in 1970, not becoming active in ham radio for another 16 years, so I missed all the fun Ade describes here. When I became active again in 1986 I was overjoyed to find that the "QRP Club" had turned into a real QRP club. Here, then, is some historical perspective for our newer members, reprinted from the days when Ade had a QRP column in CQ magazine. --WA8MCQ*

About eight years ago, I met Tom Davis, K8IF, on the old Milliwatt 80 meter QRP Net. I was struck by his dedication to QRP even then. He'd be the first guy to QNI with his little signal from the east coast, at that time signing WB2TEN, and he'd be the last guy hanging around after the net session, so we ended up having long ragchews about QRP afterwards. After The Milliwatt [see sidebar] ceased publication and its nets were discontinued, Tom jumped into the gap, scheduling and NCSing nets on 80 and 40 meters, and then on 20. He hung in there alone for about two years, sometimes the only one who showed up, and it was a rough, lonely struggle for quite a while until a few other QRP devotees took over some of the NCS duties and QNI's began increasing. I don't know exactly how it happened, because my complimentary copy of the QRP Quarterly stopped coming for a while and by the time I began receiving it again, Tom had been elected President of the QRP

ARCI club. I hadn't heard from him for quite a while, but I have ever since, and we've become good buddies. Those are fond memories of early experiences that we shared.

This note is about Tom's critical role as a leader on the US QRP scene. He provided the vision and drive and diplomacy necessary for switching the QRP ARCI onto a real QRP track. When Tom took over, the QRP ARCI defined QRP as 100 watts input, required prospective members to sign a "pledge" that they would never exceed 100 watts input, and made all club awards, except two, for operating at the 100 watt level. [Those two were the 1000 Miles Per Watt award and the WAS/QRPp for working at least 20 states with 5 watts or less. I personally proposed and created the latter award while I was on the QRP ARCI Board of Directors in the late 1960's, while the "KMW" had already been around for a few years. --WA8MCQ] The clubs leadership essentially saw real QRP--5 watts output and below--as irrelevant to club policy and direction. I don't want to sound critical of the old leadership because those guys were dedicated and expended a great deal of effort in keeping the QRP ARCI alive in a world of QRO amplifiers. However, they lacked the vision and flexibility for change, and eventually most of us real QRP types would become disenchanted with a 100 watt organization calling itself a QRP club and refusing to recognize reality--that QRP had long since come to mean under 5 watt output operation around the world.

I was always impressed with Tom's positive attitude. I'd "read the writing on the wall" back in 1969 and started The Milliwatt because of frustration with the club's old-guard stance. Not so with Tom. He looked at it differently. He'd say, "Well, it's the US QRP club and the only one we've got, so why not turn it around to represent the real QRPers interests." I'd always respond negatively about the old-guard Board of Directors and the futility of trying, but he didn't agree. He went to work, figuring that most of the club's active members were 5 watt output types and that the Board should represent their interests. He was right, of course, but it took years of hard work to produce the desired results.

The process was complex, but Tom handled it very diplomatically and within established channels. He beat the bushes for new Board candidates and had them write up "position papers" for the newsletter prior to Board elections, and he urged members to vote. The complexion of the Board slowly began to change.

Tom opened the question of "100 watts input vs 5 watts output" in an editorial, and a heated discussion followed in several newsletters. Of course, I fueled the fires just a wee bit with a broadside attack on the 100 watts input dinosaur. Tom

felt the time was right, and he took a straw-poll of the membership via the newsletter to see what the membership wanted. The poll produced overwhelming support for the 5 watt output direction. Of course, the board dismissed the poll as invalid and non-binding, but Tom had the Board where he wanted it--faced with such results, the Board logically could not refuse to submit to a real binding vote. And it turned out as expected--overwhelmingly in favor of the 5 watt output definition of QRP for club purposes. The Constitution had to be changed, and Tom very diplomatically dealt with the Board, insisting on the new 5 watt guideline and letting them have the remaining 100 watt guidelines.

There were still other barriers: club awards for 100 watt achievement, club contests with 100 watt categories competing with 5 watt and under types for certificates, and worst of all, the "pledge". The "pledge" had turned

away many prospective and current members after they got to thinking about it. In some cases, this problem wasn't a "who needs 'em" type. When notables such as **Wes Hayward, W7ZOI**, and **Doug DeMaw, W1FB**, were turned off by the outdated "pledge", the club lost two individuals who, I believe, have been solely responsible for attention to QRP from the ARRL! A QRP club can't afford to be at odds with two guys who have done so much for QRP in the US!

Tom hung in there and eventually, after about four years of effort, removed all traces of the club's 100 watt input vintage. By 1981, the QRP ARCI was a genuine 5 watt output QRP organization from top to bottom. Frankly, I didn't think Tom

could pull it off. But he did, and his contribution to QRP in this country is *i n e s t i m a b l e* and far-reaching. I'm sure that in five years or so new QRPers will join the QRP ARCI, overjoyed to find an organization in existence which represents their particular interest in amateur radio, and they'll assume that it was always that way. I want to make certain that some older QRP operator who has read this tribute will set them straight and tell them, "You have **K8IF** to thank for that because it wasn't always that way."

Unfortunately, Tom couldn't enjoy being President of the organization that he worked so hard to bring into existence. An increase in workload cut deeply into his time. Then, too, Tom had been seeing a Pennsylvania lady (that's where I'm from) whom he'd met years earlier during his wild life as a rock musician on the road, and when several of us had dinner with him at Dayton in 1981, we sensed that something serious was in the air, although Tom didn't exactly admit it. Well, he finally married her after much cogitation and

trepidation and is happy that he did. So, being married and setting up a home takes a lot of time, too, and I'm pleased that Tom is excited by it all. I know he missed the action and phone calls and decisions associated with his stint as president of the QRP ARCI, but he's done his share for QRP. I'm sure we all will miss him, but we all wish him well with a "thank you".

### The Milliwatt, National Journal of QRPp

I was already publishing "QRP/8", an 8th call district QRP ARCI newsletter which contained a section devoted to true QRP. Ade found out about it and quickly convinced me that we should devote it entirely to true QRP, since there was a very definite demand for that; indeed, the majority of subscribers at that point were from outside the 8th district and were getting it solely for the QRP content. At his suggestion we changed the name and format, calling it **The Milliwatt**, subtitled "**The National Journal of QRPp**" (his names), and Ade began publishing it at the University of South Dakota.

I remained on the editorial staff for 4 issues, at which time I ran off to join the Air Force, an attractive alternative to being drafted into the Army while Viet Nam was still hot. (Some of my articles continued to appear in later issues.) Ade continued to publish **The Milliwatt** until the middle of 1975. Although he credits me in both his QRP books with giving him his start in QRP publishing, he did virtually all the work for the vast majority of its life. (In these days when it seems like there's a computer/word processor and laser printer in virtually every house in the country, you have to really admire the fact that Ade put out a bimonthly publication of 16 and more pages for 5 and a half years using just a typewriter.)

To this day the **Milliwatt** remains legendary as a pioneering QRP publication, and has many excellent technical articles which have withstood the test of time. It contained a good deal of QRP operating reports and philosophy which simply was not available elsewhere. Those 33 issues contain a number of names and calls which are still active in QRP today. (By the way, since 1992 I have reprinted the entire run of **The Milliwatt** 3 times, the last time in conjunction with **Bill Kelsey, N8ET**, and may do another batch some day. Keep an eye on the **Quarterly** for an announcement.) --**WA8MCQ**

--qrp--

**WORSP.** Ultimately, the takeover began when a QRP'r, Bill Dickerson, **WA2JOC**, winner of **QRPP DXCC Trophy #10**, took over the editorship in 1977. Bill, Sandy Blaize W5TVW, Mayford Flynn WB4ZOJ, and Joe Szempias W8JKB were the QRP'rs on the 11-member BoD. Bill got the ball rolling in two steps. First, he turned the club newsletter into a 5-watt QRP forum by running news from genuine QRP'rs. For example, the January 1978 issue contained 7 pages of member news, including reports by WB9HPV, WA3TNJ, K6GKU, W6JTH, WA6DKD, WA6YPE, WA2ICK, KH6JHS, WB0RSW, WB0GRJ, VE1BQQ, W9SCH, W3CMI, W6PQZ, WB4ZOJ, and W8JKB, many recognizable as former **MILLIWATT** contributors. Articles by QRP'rs WA3ZXX/5, W9SCH, and x rounded out the genuine QRP offerings. Several QRP'rs called for lowering the power limit. **W8ILC, who should be in the Hall of Fame**, reported **180 countries with 1-watt s.s.b.** In the midst of 5-watt QRP reports about all the DX being worked, one QRO type asked at the end of his brag: "What type of person wants to jump into a pile-up for EI2, VR2, 9J2, or an IG9 while using less than 100 watts input? I am proud to be that kind of person." Stark contrast. Totally defused focus.

The genuine QRP'rs reports had an impact on founder of the 100-watt club Harry Blomquist **K6JSS**, who wrote:

"For lo! these many years I have noted club members doing marvelous things with 5 watts or less. But, after 20 years of building my own gear I finally had to buy, getting an Argonaut. After a month's use of two watts output, and getting one contact each ten tries, I bowed to those QRPP giants; and went out and bought a 50-watt linear."

A different crowd, those "QRPP giants" doing "marvelous things". But it was the active crowd. The results of the QSO Parties showed that. In the 1977 Fall event results appeared entries from 63 QRP'rs and 23 QRO'rs. The Spring 1978 event produced **89** QRP and **36** QRO entries. Fall 1978 showed **70** QRP and **40** QRO entries. QRP'rs were in the overwhelming majority. The newsletter continued to bulge with reports from QRP'rs.

The second and biggest step was taken when Bill began poking the hornet's nest in the October 1978 **QRP QUARTERLY** by raising the question: "do QRP QSO's initiated with QRO really count as QRP contacts?" He followed up in the January 1979 issue by reporting that he was up to 132 countries with his Argonaut, and then whacked the hornet's nest with a full swing:

"As one whose major interest is DX, I would be embarrassed to categorize a 100watt contact as QRP to a DX station on the air. However, there is no question that the 100 watt limit for joining the QRP ARCI attracts a number of hams who might otherwise not become exposed to QRP/ QRPP. If one is serious about low power, 100 watts is simply not QRP for the vast majority of hams. Therefore, I propose that the QRP ARCI lower the maximum power allowed by full members to TEN watts input. OK GANG -- WHAT DO YOU THINK?"



That began the battle for the club. Within the news section, **MILLIWATT** subscriber Mac McCullough, W4VNE/ W8LZK, made the point:

“The only problem is that perhaps it is now “after the fact” since I think that the QRP ARCI dragged its feet too long and let those of us who have been interested for years in what a watt or so would do, get more interested in Ade Weiss and his **MILLIWATT**. That is now past history but the awards have already been made through Ade and there is no real achievement goal left except to collect more paper for the shack’s wall.”

The rest of the 11 pages of news, typically, was almost entirely about real QRP.

But Bill’s editorial ignited an explosion of controversy in the April issue. More importantly, out of nowhere, Thom Davis **K8IF**, who had been running the QRPP nets, was elected President of the QRP ARCI. His sole purpose in becoming president was to transform the QRP ARCI into a 5-watt club. So, Tom, Bill and I put our heads together on the strategy.

The main concern was to avoid panicking the 100-watt types into action. This would leave the field open for the normally active 5-watt types. In the April issue, then, Bill clarified the point that his personal opinion about a ten-watt limit in the previous issue was not to be “construed as being anti-QRP ARCI”, and closed by quoting W8JKB’s reminder that club policy is decided by a vote of the BoD. That was a 6 to 5 QRO balance, and a 2/3 majority was needed. He commented that, judging from the deluge of replies he’d gotten, “common agreement about the club’s power limit is unobtainable”. In other words, without saying it, it will have to be either 100 watts or 5 watts. Bill selected the replies to the power limit question to quiet the fears of the 100-watt crowd -- most expressed the theme “5 watts can be fun, but let’s keep it at 100 watts” for various reasons.

Among these, **K6JSS** laconically noted that:

“the newsletter indicates a revived interest in changing the club level to 10 watts maximum. My records and memories say this is the fifth time... I see nothing to be gained by going to 10 watts.”

In effect, K6JSS was for the fifth time warding off an attempt by the membership to turn his 100-watt club into a real QRP club. As club founder, he was reiterating his position that his definition of QRP was in some way more advantageous or genuine than the 10-watt level (the then-current standard of input power). The fact that **THE MILLIWATT** 1975 subscription list of over 800 QRP’rs worldwide had grown longer in just five years than the 100-watt QRP ARCI newsletter’s 1978 list of 600 seemed to hold no significance in his mind.

My contribution to the plot appeared last in the issue and stood as the “final word”. After pointing out that the QRP ARCI was the only organization in the world to define QRP as 100 watts, I suggested, as we had decided, that the membership be polled, and “if a

majority of the members considers QRP as five watts ... it is time to make a basic change in the club by-laws.” By no means were 100-watt types to be excluded -- an Associate Membership should be created for them. For his part, Thom entirely ignored the power limit issue in introducing himself as the new president, noting only that “1979 may prove to be a tough year and we can all see that.”

Thom let the power limit and input/output issue fade until the July 1980 issue. By that time, everyone thought it had gone away again. In his editorial, he announced a poll on whether input or output should be adopted by the BoD, and the power preference – to be specified on the postcard inserted in the issue. **Only 43 replies** out of a mailing of **600** postcards in the July poll were received by the October 1980 issue. With respect to the input vs. output issue, 58% favored output. However, only 25% favored the 5-watt limit, with 46% undecided and 14% for 100-watts (see below). In the meantime, QRP’rs Ed Lappi WD4LOO and Red Reynolds K5VOL (famous as leader of the IL Field Day team “The Harper Air Hawks” which waged annual battle with the CA “Zuni Loopers Expeditionary Force” for top spot in the **MILLIWATT FD TROPHY** program) had been newly elected to the board along with Pete Spotts, **N1ABS**, the new editor. In reviewing the July poll results in the October 1980 **QRP Quarterly**, Thom noted that “there is a strong feeling among at least half the members of the BoD that the poll is insufficient to reflect the wishes of the membership as a whole.”

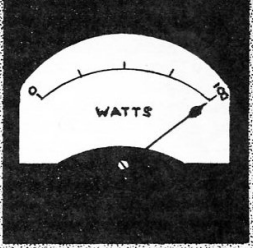
July Poll Results		
<b>INPUT vs. OUTPUT:</b>		
Input	14	32.6%
Output	25	58.1%
Both	4	9.3%
<b>Total</b>	<b>43</b>	<b>100.0%</b>
<b>POWER LIMITATION</b>		
100 in/50 out	6	14.0%
50 in/25 out	3	7.0%
40 in/20 out	1	2.3%
25 in/12.5 out	2	4.6%
10 in/5 out	11	25.6%
undecided	20	46.5%
<b>Total</b>	<b>43</b>	<b>100.0%</b>
*****		

Behind the scenes, Thom had submitted two proposals for changing the by-laws -- output power and the 5-watt limit -- to the BoD. He strategically avoided trying to change the club’s power limit per se, and limited it merely to claims of QRP achievement, that is, “All QRP ARCI Certificates of Achievement will, therefore, be endorsed as ‘QRP - 10-w input’ or ‘QRP - 5w output.’” No endorsement would be carried on 100-w certificates. Despite Tom’s diplomatic approach, one member of the BoD in particular produced a three-page diatribe about the sampling ratio 43/600, impracticality of r.f. output power measurements, QRPP not being his “*cup of tea -- never has been, never will be*”, and closed with a half-page attack on me – “*He’s never been an officer or done nuttin for us!*” and proposed ejecting me from the club because I had used the wrong QRP number during the latest QSO Party, a behind-the-scenes terrorist kind of effort to undermine the club. Needless to say, I responded in kind, with the viciousness knob cranked up all the way. He resigned after the takeover. It was in such an atmosphere of controversy that Thom courageously planted his feet and confronted the opposition head-on. The old 100-watt meter logo (see below) still appeared on the front page of the October 1980

issue, but the rest was real QRP. Thom's editorial in "The President Speaks" column (see below) under the 100-watt logo is a model of rational persuasive argument and stated the predicament precisely in regard to the results of the July 1980 poll:

"While those of us who wish to see a change may find this disappointing, such a vote at this time does not mean that the issue cannot be raised again, either when we get a more widespread response from the membership, or when the composition of the BoD changes to reflect what, at least by the poll results, appears to be the wishes of you, the members."

QRP



QRP Amateur Radio Club International Newsletter
October 1980
Vol. 18, No. 3

**The President Speaks**

By Thom Davis Jr. - K8IF  
QRP ARCI President

I am proud to announce that the QRP ARCI has found a new editor, Pete Spotts, NLABS. Pete stepped forth in our time of need. Let's help him with our support and supply him with newsletter material. We also have two new board members, Ed Lappi - WD4LOO, and Don McBride - WA3ZBJ. All of these gentlemen have some good ideas and some new suggestions--a plus for the club. Ed also has developed an SSB QSO Party for January, 1981. (Details later in this issue.) I'm going to dust off the Mic' for this one!

The results of the poll on power levels and the basis for measuring them are in. You'll see the results at the end of my column. And the findings are at the same time encouraging and disappointing: encouraging because the response exceeded that for the recent election to fill two board vacancies; and discouraging because out of the nearly 600 subscribers to the newsletter, only 43 responded.

While I feel that the response is sufficient to give the board of directors an idea of which way you want us to move on the two issues (on a percentage basis, our poll's "sample" size far exceeds that used by professional polling organizations such as Gallup), there is a strong feeling among at least half the board members that the number of responses to the poll is insufficient to reflect the wishes of the membership as a whole. Therefore, the board may be likely to vote to maintain the club's current power and input designations. A two-thirds majority is required to make such changes.

While those of us who wish to see a change may find this disappointing, such a vote at this time does not mean that the issue cannot be raised again, either when we get a more widespread response from the membership, or when the composition of the board changes to reflect what, at least by the poll results, appears to be the wishes of you, the members.

Either way, it is incumbent upon you to respond to calls for your opinion--and your vote--if you wish to see changes made in club policy, or if you don't wish to see such changes made. In the absence of your active participation in the decision-making process, the board's best intentions are reduced to "flying by the seat of our pants" in making decisions based on our perception of what the membership wants, without hard numbers to back up those perceptions.

If you find a situation where the membership has clearly voiced its preference, and the board votes in the opposite direction, it is then time to change the composition of the board when the next election rolls around.

Frankly, member participation in the last board election was microscopic! Two names were on the ballot. And out of nearly 600 newsletter subscribers, only 14, yep, 14, voted. And of those 14, eight or nine were directors!

Part of the reason for such a low "voter turn-out", I think, was a lack of prior discussion in the newsletter about these candidates and their positions on the issues confronting this club. This is going to change. Rather than being presented only with the names of strangers for whom you are being asked to vote, the ballots for an election to fill board vacancies will be accompanied by a separate story about the candidates, especially their stands

After a discussion of the importance of “voter turn-out” which appears above, he announced that the membership would be polled again and the results announced in the January 1981 issue. I don't have an actual copy of the October 1980 poll form because I pulled the page and filled it out and sent it in immediately. Page 11 (and therefore 12

<p>on the issues confronting the club. Hopefully, this will give you a better basis from which to make your decision. Moreover, when we take surveys, the questions will be more specific, giving you something more to respond to than a general request for your opinion on this or that subject.</p> <p>Beyond these procedural changes, the rest is up to you. The only way you can make your feelings known are through the polls and the board elections.</p> <p>Hence, we are going to take the power/input-output survey "one more time." You'll find the questionnaire on the last page of this issue of the newsletter. Please take a couple of minutes and fill it out and mail it back.</p>	<p>Your cooperation is important, because there are other questions we must deal with. Is the QRP ARCI a recognized "QRP" organization under current definitions? Does QRP get the recognition it deserves? I believe QRP operators have gained some ground in the last 10 years. But there still is a lot of ground to cover. This is obvious when you're on 7.060 or 14.060 and you still get clobbered by four or five QRO stations! Apparently, they do not realize that many QRPers use these frequencies. Or perhaps they don't even recognize QRP operators. Now is the time for QRP ARCI to pick up where it left off. What do you think? Write the editor, myself, or the board. We're listening!!</p>
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also) is missing from my copy as a result. But the questions are implied by the categories referenced in the poll results in the January 1981 issue (see below). The new poll produced the desired results. Of **221 replies**, **33%** favored the 5-watt level, and **23%** favored the 10-watt level. Only **28%** favored the higher power levels.

***** OCTOBER POLL RESULTS *****		
Input	82	37.1%
Output	125	56.6%
No pref.	12	5.4%
Disqual.	2	0.9%
100 watts	41	18.6%
75 watts	2	0.9%
50 watts	21	9.5%
(Continued next page)		
25 watts	20	9.0%
15 watts	6	2.7%
10 watts	51	23.1%
5 watts	74	33.5%
No pref.	4	1.8%
Disqual.	2	0.9%
Awards plus membership req.	61	27.6%
Awards plus 100 watt limit	91	41.2%
Awards plus no pwr limit	62	28.1%
No pref.	5	2.3%
Disqual.	2	0.9%
*****		

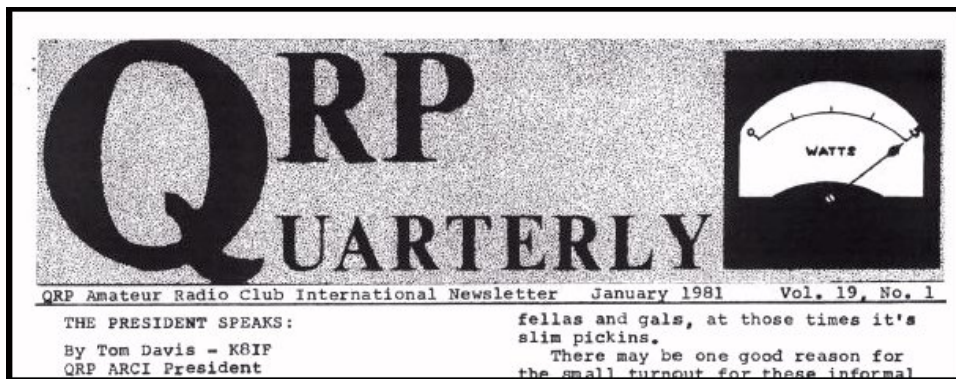
Editor Pete Spotts had the job of celebrating the coup that the October poll had successfully executed while Thom remained cool, calm, unemotional and above the fray in his comments. In fact, he merely noted that “the membership responded admirably to two questionnaires in 1980, and the club's board of directors have tackled perhaps the most difficult questions concerning club policy in years!” -- a *gross understatement for the monumental changes that resulted from the questionnaires – a 5-watt output QRP club!* Then he nonchalantly continued his column by addressing the “serious” problem of low turn-outs for the QSO parties and NETS, ending with a complicated 13 line schedule for the NETS! As if that belonged in the same column as the take-over of the 100-watt



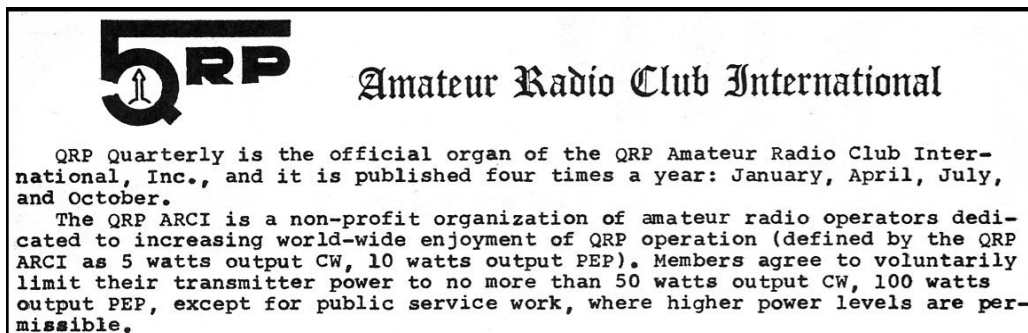
club! Smooth. But on page 11, Spotts complimented the members in slightly different terms for their participation in the poll:

By the way, your response to the poll in the October issue was magnificent! As Prez Tom mentioned in his column, your recommendations for the most part were adopted. A full list of the results of the poll will appear at the end of this column. Your participation in the poll gives the officers great hope that you'll take a few minutes out at the end of reading this issue and elect one new member of the board of directors from the three people who have been nominated. The nominees, some information about them, and the ballot, appear elsewhere in this issue.

Thom's editorial on the first page appeared under the club logo in which the meter maximum had been changed from 100 watts to 5 watts but he did not comment on that.



Thom delayed discussion of the changes until page 3, but heading the list of club officers and the definition of the mission of the QRP ARCI on page 2 was the newly designed club logo with the left waist of the “Q” sliced out and the “Q” turned into the “5” and the new club definition of QRP “as 5 watts output CW, 10 watts output PEP.”



But so far, no direct reference to that change – it finally came on page 3 where Thom rewrote the by-laws in lawyer-like fashion (see below). He called attention to “our liberal ‘grandfather clauses’ – all the awards previously issued on the basis of input power will remain valid. The new rules will not apply until June 1, 1981, when new applications will be first accepted. He explained that “We (i.e., BoD) feel these changes

There are more changes in store for us in 1981. The most important of these have been encouraged through the questionnaires and implemented by the board of directors.

1. Henceforth, our standard on all power measurements will be output. A voluntary limit for club membership remains, but has been changed to 50 watts output CW, 100 watts output SSB.

2. Our club definition of QRP power levels is 5 watts output CW, 10 watts output PEP for SSB.

3. All club QRP awards will be issued at the power levels in #2 only. The exception is the QRP 25 award (and endorsements), which is a club-based award that will be issued for power levels up to the club limit.

4. New applications for Associate Member status no longer will be accepted. All current associate members may retain that status if they wish, or upgrade to Full Member status.

5. The club logo will be modified to reflect the change in QRP power level definition.

are positive. Now we have a specific, written agreement on a definition of QRP. In addition, we remain unique because we incorporate a power limit as a membership requirement." He continued by announcing that the 5-watt QRP ARCI had been invited to join the rest of the QRP world by **THE WORLD QRP FEDERATION**, not a huge organization but comprised of the existing genuine QRP clubs:

We feel these changes are positive. Now we have a specific, written agreement on a definition of QRP. In addition, we remain unique because we incorporate a power limit as a membership requirement. Other clubs do not. Thereby, we weed out the "part-time" QRPers.

The timing on these changes could not have been better! The club recently received an invitation to join the World QRP Federation. This is an organization representing QRP interests world-wide through a committee of representatives of each of several clubs: DL-AGCW, G-QRP Club, MI-QRP, and SCAG (the Scandinavian countries.) Exchanging journals, information, and suggestions on behalf of the QRP cause are some of the WQF's objectives, as well as improving inter-club communications. And guess what else... encouraging the use of QRP as 10 watts DC input or 5 watts output!

On behalf of the club, I've accepted their invitation and have inquired as to the appeal for an international QRP field day for July, 1981. Details still are being drawn up at this time, but the feelings are good, and the potential exists for at least a dry run in 1981.  
(Please turn to Page 10)

The new ingeniously designed “small” logo introduced in the January 1981 (see above) issue was a graphics triumph. By breaking the waist of the “Q” at the left, adding a vertical stroke and then the extended horizontal stroke, the “Q” was transformed into both a “Q” and a “5”. The upward pointing arrow in effect was inside the maximum power of 5 watts. We lost a real unique aesthetic dimension when this logo all of a sudden was almost smothered in the surprise appearance of the current K6JSS logo without membership involvement (as far as I know). Alas! The question remained: where did the “5/Q-RP” logo come from?

At this point in assembling this history, I had incorporated all the material that I had about the take-over period. But in the July 1980 “The President Speaks” column (p. 1), Thom Davis announced:

“However, the most important item I must relay to you is the Editorship. We will need an Editor to fill the unexpired term ... or else there may not be an October N/L etc. HELP!”

The other items included trying the output vs. input standard for the 1981 Milliwatt Field Day contest, and then he announced the October poll and enclosed reply postcards.

It occurred to me that, since Pete Spotts and I were corresponding about my new propagation book (2011), I could send him a copy of the history and ask him to “fill in the blanks” in my narrative from his own memories and records of assuming the Editorship beginning with the October 1980 **QRP QUARTERLY**. On 07-14-2011, I wrote:

“Hi again: If this file gets through, check it out and add whatever you have in your records for the October ‘80 poll to Jan. ‘81 **QQ** period. I assume that you and Thom saw the trend in the poll replies, started putting together the Jan 81 **QQ** while circulating the numbers to the BoD for a vote on the primary issues. How did it actually happen? Thanks, 72, Ade **WORSP**.”

**Pete Spotts NIABS** replied:

“Whoa! There’s a blast from the past. Did those jog memories, although probably not the most helpful kind given your goals here! I have to thank my long-suffering wife of four years (at the time) for the hours spent at the dining-room table once a quarter, collating pages, folding and stapling the issues, then adding postage and mailing labels. I was about five years into my career at the Christian Science Monitor and had been closely watching how our graphic artists produced art for the newspaper. Much of what they used was available at an art-supply store in Needham, Mass., where we lived at the time. I tried to feed their techniques, however imperfectly, into the graphics for the **QRP Quarterly**.”

A bit of background, Ade: I was first licensed as a novice, WB1BUP, in 1977. A year and a brand new **Tempo 1** later, I was inadvertently introduced to QRP by my Elmer, the late Jim Hatherly, WA1TBY. He was a die-hard CW operator who had been a radio operator

in the merchant marine during World War 2. During a talk he gave one night in 1978 at the Wellesley Amateur Radio Society, he extolled the virtues of CW and spoke of the difference in communications efficiency between CW and SSB. Bear in mind that his station consisted of Drake twins. Still, he said -- as best as I can recall -- that 5 watts CW would deliver as much information as 100 watts sideband, all other things being equal. That was an eye-opener. I looked at my relatively new **Tempo 1**, bid it adieu, and ordered and built an **HW-8** (which I still have, although it needs work). With the exception of a brief time out to play with a **Century 21**, I was QRP 24/7/365 after that and probably joined QRP ARCI sometime between 1979 and 1980, maybe a bit earlier.

As for what Thom, **K8IF**, was up to during my stint as editor? Truth to tell, I feel I had little to do with the politics underway behind the scenes, other than to agree that 100 watts was not QRP. Also, as a partial excuse, about the time Tom got married, our first child came along. My editorship ended, and the ham-radio gear went into the closet for a 23-year stay. So my recollection of that period is pretty fuzzy.

In any event, I inherited the **QUARTERLY** when the club was still at the 100-watt power limit. That led to the odd-scaled meter to which you refer; it was part of a new editor's redesign [i.e., me]. I was keenly aware of the debate. But we hadn't yet crossed the Rubicon. My own experience as a QRPer put me squarely in the 5-watt camp. (Were we *all* relatively young turks? I notice from QRZ.com that Thom was born in 1951, as was I.) Being a relative newbie to the club (#4174), I figured I had my hands full keeping the publication going. But you can bet I was as happy as the cliché-abused clam to present the club with the new logo once the members had spoken. It had been kicking around in my head for some time as the QRP definition debate went on in the **Quarterly's** pages. Thom and I must have had some conversation, perhaps by phone, about using the new logo, but I don't recall it specifically. Typically, he'd send his quarterly message, and beyond that, we had few or no exchanges about other content in any given issue.

If I remember correctly, the new "Q/5-RP" logo appeared on the Page 2 masthead first because the rest of the issue (January 1981) had been put to bed. Remember (as you well do, given your work on the **MILLIWATT** -- [**WORSP: AMEN BROTHER!**]), these issues were made with loving hands at home. All of my page layout/typsetting/composition started with pages typed in columnar strips, the strips and any illustrations cut out and spray-tacked onto flats I designed, then I hand-carried the flats to a printer about two blocks from where my wife and I lived. The Masthead logo was the easiest to change on the fly, given the looming deadline for getting that issue into the mail. So the best I could muster at the moment was some white-out and an India-ink pen to turn the "100" into a "5" on the meter on the page 1 logo. [**WORSP. Take a close look at the "5" tick mark on the scale of the old meter-logo on the January 1981 masthead meter at 150% and note that it has clearly been inked-in very carefully. Nonetheless, the "5" is too large as the top horizontal cross bleeds onto the black frame of the scale. The "100" on the October 1980 meter is half the height of the "5" and leaves white space between itself and the meter frame. In the final analysis, a very good job of forgery!**]



The page 1 flag with the new “Q/5-RP” logo was more involved to produce and so probably waited until the following issue to debut. [NOTE: *Actually, it was not introduced until the January 1984 issue, until which the modified 5-watt meter masthead continued on the covers while the “Q/5-RP” logo continued to head page 2 which stated the nature and mission of the club and listed the officers and BoD. As can be seen in the reproduction below, the “Q/5-RP” flag is visually clean and, a real Madison Ave “branding”.*] And while you express some dismay at the evolution of the logo since then, you can imagine my pleasant surprise when, after reactivating my radio gear around 2006 and looking up the club on the web, the “5-RP” still formed the core of the current logo. That alone was worth the price of renewing a long-lapsed membership! :-) And I’m grateful to the powers that be for granting me the use of my original number, despite



January, 1984 - Volume XXII - Number 1

Journal of the QRP Amateur Radio Club, International

\* \* \* \* \* *in this issue* \* \* \* \* \*

*New Experimenters Corner* \* \* \* \* \* *QRP ARCI New Officers*  
*Houston QRP Forum* \* \* \* \* \* *Homebrew Competition Announced*  
*October QSO Party Results* \* \* \* \* \* *QRP ARCI Centerfold?*



**Ed Lappi, WD4LOO steps down as QRP ARCI Secretary/Treasurer**  
(see story on page 15)

my long absence. As for adding K6JSS’s call to the logo, I’m a bit less concerned about it. It’s a nice nod to a ham whose heart was in the right place, even if his power level was off by about 13 dB. And, oh, those hours spent reproducing circuit diagrams with a felt-tip pen and electronics-drafting template! I just wish I’d saved my issues from that period! With best regards, Pete.”

**WORSP.** I thank Pete profusely for his contribution to the cause then as Editor and now as provider of the above information. If anything, this "history" will give Pete Spotts the credit he deserves for designing the "Q/5-RP" logo.

One major obstacle to the shift to the output power standard was the supposed difficulty of measuring r.f. power. Many of the old **MILLIWATT** veterans knew and used the simple circuits published by Wes Hayward W7ZOI in **THE MILLIWATT** in the early 1970's. We'd been using the circuits since then. So, as part of our effort to eliminate difficulties in measurements occasioned by the change to output power, I had written an article for the right time, whenever it came. Editor Pete Spotts N1ABS placed a "A PEEK INSIDE" table of contents in the first column of page 1 – a new phenomenon.

from the  
BREADBOARD

(FIG. 1)

(FIG. 2)

(FIG. 3)

$R_T = R_3 \times 1.414$   
 $R_T - R_3 = R_1 + R_2$   
 EXAMPLE FOR VTVM  
 W/10 MEG INPUT Z:  
 $R_T = 10 \times 1.414 = 14.14 \text{ MEG}$   
 $R_1 + R_2 = 14.14 - 10 = 4.14 \text{ MEG}$   
 SO USE 3.3 MEG AND 820 K $\Omega$   
 FOR R1 AND R2 (4.12 MEG TOTAL).  
 MEASURE ACTUAL R1+R2 UNTIL  
 DESIRED VALUE IS OBTAINED.

AC PEAK IN

(FIG. 4)

**MEASURING RF OUTPUT POWER**  
 By Adrian Weiss  
 WORSP

For the average amateur, the basic approach to measuring RF output power is to convert that AC quantity to a DC form, and then measure the DC. In general, we are speaking of measurements of "average" power rather than "peak" power, although the same techniques apply to the measurement of both.

The measurement of average output power from a voice-actuated SSB transmitter is beyond the capabilities of those lacking access to a sophisticated laboratory set-up. In the following, two instruments and their application are discussed.

**RF POWER WATTMETER:** Figure 1 shows the circuit of a simple, easily calibrated RF output power wattmeter that can be used in conjunction with an external VTVM/FETVM/DVM or with an internal microammeter or millammeter.

The theory of operation is quite simple. The circuit senses AC peak voltage. When an AC or RF signal is placed across the load (R1), a voltage representing the AC peak level is rectified through D1, and it charges

capacitor C1 to that peak level. That voltage is then measured, and the following formula is used to calculate the average output power of the signal:

$$P_{OAV} = \frac{(E_{pkDC})^2}{2 \times \text{value of } R_1}$$

Measurement of the peak voltage at C1 can be made using an external VTVM, FETVM, or DVM exhibiting an input impedance of several megohms or more. Or the builder can install a microammeter or millammeter in the circuit. However, a voltmeter cannot be used in conjunction with the circuit because of a voltmeter's low input impedance; it will disturb the impedance relationships in the circuit. Likewise, a "cheapie" VOM also is likely to provide inaccurate, unreliable readings.

The circuitry for a self-contained meter consists of RFC1, the series dropping resistor R2, and the meter. RFC 1 isolates the meter from the dummy load (R 1) at RF, while R2 is chosen to produce full-scale meter deflection at the desired upper watts limit. If an external instrument is used instead of an internal meter, measurements should be taken at the meter end of RFC 1, and the dummy

4

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When he received the r.f probe and wattmeter article for the **QRP QUARTERLY**, Spotts skipped the **G-QRPC** committee part and just went ahead published it in the January 1981 issue (pp. 4-6; see above), the issue in which President Thom Davis K8IF formally announced the change of the club's definition of QRP to 5 watts r.f. output. His approach in "easing the readers" into the actual statement of changes presented on page 3 was a stroke of rhetorical genius, now that I think about it.

Nonetheless, the changes brought about by Thom Davis K8IF, Bill Dickenson and Peter Spotts, his editors during his tenure, led to a long sequence of talented, devoted, hard-working individuals because of whom the QRP ARCI and the **QRP QUARTERLY** have continued to prosper and improve non-stop. I've watched the whole process across the years and have always been amazed at it. And then the WEB happened, and the same story is true of the WEB site. It is as good as any out there, and better than even the ARRL's in my humble opinion. QRP has a way of inspiring people in their ham radio activities regardless of the specific focus – operating, contesting, building, trying new ideas such as SDR and WSPR and digital modes and the CUBE and so on. I believe that is due to the simple fact that, as C.F. Rockey W9SCH was accustomed to saying, "QRP puts the operator back into amateur radio" because knowledge is needed to replace the loss of 20dB or more when running 5 watts and under.

At the Dayton 1981 QRP gathering (**FDIM** was many years in the future), Thom announced at dinner to Red K5VOL, me, and a couple other QRP'rs that he was getting married and he did not know how much time he'd have for the club. We all moaned -- his innocent boyish smile told us what to expect. He didn't have a clue. For us, that "I do" surely would translate into "I'm out of here." But look around you now *[at the Banquet]* and sense that QRP ARCI group-identity. Thom Davis K8IF made this happen and he's here in spirit. He also belongs both in the Hall of Fame [1998] and in your understanding of why you want to be here and why you belong here. And he ought to be in the club logo along with the founder of the 100-watt club.

#### Part IV. The Long-Term Results of the Take-over on QRP Worldwide

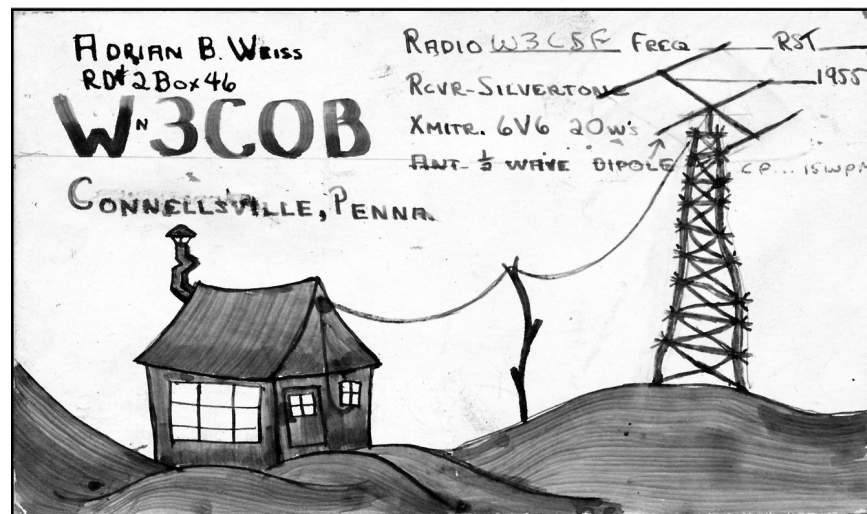
[NOTE: When I presented this "history" as the 1998 FDIM Banquet Speech, I opened with: *"Let me begin by explaining the rationale behind this talk. In fact, it applies to more than just that -- it is about why Dayton is so important to us, why the Four Days in May QRP extravaganza has burgeoned into what it is, why this banquet is held every year, why select QRP'rs are inducted in the HoF, and why someone gets up and gives a speech which everyone hopes is brief and to the point. Usually most speakers will make that a promise -- not me -- the doors have been locked, so hunker down for the duration! Kidding of course! But, back to the rationale."*

Psychologists tell us that group-identification is essential for a personal sense of well-being. The individual who identifies with no specific group is indeed unfortunate: self-esteem, the sense of belonging, the sense of a shared set of values and activities, the opportunity to be instantly accepted and included upon arriving -- all these aspects of experience are lacking to such an individual. The formation of clubs based on shared interests has long been a social method of providing a source of group-identity.

Individuals join clubs for a variety of reasons, and their expectations and degrees of involvement vary accordingly. As far as we're concerned, we QRP'rs have told similar stories over the years about finding our way into QRP and this club. Several common themes thread their way thru our accounts: they all boil down to discovering that a large number of hams are actually out there using QRP and having a ball.

Many have been attracted to QRP by reading about the underlying philosophy and experience in books and articles -- there probably has never been a boring, unenthusiastic piece about QRP to appear in print. The excitement exhibited by QRP writers inevitably strikes a note with some readers. The challenge of working the world with a few watts, doing battle with the QRO Goliaths and winning, as most of us know, produces a rare kind of exquisite satisfaction -- I've tried many times to find just the right terms to describe it. Several years ago a book, then the movie, carried a title that hits home for me: "The Unbearable Lightness of Being". Many of you know this feeling -- it is an excitement and sense of awe and disbelief that is almost painful. I felt that as a kid, **WN3COB**, working CA in the wee hours after slipping down into the basement when I felt the coast was clear and the parents definitely asleep (1955-56). I felt it in the late 60's

**WORSP's Novice WN3COB QSL Card Design** – Created while waiting for my first Novice QSO! None were sent out because of the time involved in making the QSL on a cardboard wrapper from a Palmolive bar of soap. And no QSO's for a long time!



when I built my first transistor rigs, not having much of an idea of what made them work. That they did work was part of the disbelief. Working around the east coast with 1-watt double sideband on 160 to a pair of 2E26's was simply incredible to me. During the 80's



while on research trips to England, this time carrying miniaturized transceivers that I had designed and using antennas slung out of windows, the same feeling was there. It still is - - most recently in my love-affair with a 30m SST transceiver by Wayne Burdick N6KR marketed by "QRP Bob" Dyer K6KK of Wilderness Radio (1998).

Let me pause to comment on this important development in QRP. For many, the promise of being able to build our own minirigs was the allurements that led us out of the world of powerful complex computerized QRO transceivers. It's not that a little QRP transceiver is all that simple, but at least an average QRP'er has an outside chance of figuring it out and fixing it. And there's always an enthusiastic QRP Elmer off-frequency to help out if it doesn't work. The world of QRP kits that has developed in the past decade makes building a rig so much easier than in the old days.

Back when we started up **THE MILLIWATT**, followed by the **G-QRPC** and **MI-QRPC**, the main challenge was finding QRP circuits to publish so as to encourage homebrewing. The **G-QRPC**'s journal **SPRAT** was devoted primarily to publishing homebrew circuits from the start and initiated the concept of the club kit project with **GM3OXX**'s famous "Oner", then came the "Twoer". Behind the kits were the designers.

Ultimately, it is impossible to tell the designers like Wayne Burdick N6KR of **ELECRAFT**, Doug DeMaw W1CER/W1FB (SK) Technical Editor of **QST**, Wes Hayward W7ZOI, Roy Lewallen W7EL of **EZNEC**, Rev. George Dobbs G3RJV, John Liebenrood K7RO, Joe Stivec VE7TX, Dave Benson NN1G, Steve "Melt-Solder" Weber KD1JV and others how much enjoyment they have contributed to our lives. If your QRP'ing has been enhanced by their work -- drop them a line and let them know -- they get little else out of the effort they put into designing and developing rigs.

Likewise, the club kit distribution projects by **NORCAL**, the **New England QRP Club**, the **Knightlights Club**, **Colorado QRP Club**, **Columbus QRP Club**, **ARIZONA SCORPions** and others have constituted a massive contribution to the growth of QRP by dedicated QRP'rs who want to spread the joy. I still can't quite fathom the amount of effort that has gone into these projects.

I'll never forget reading Doug Hendricks KI6DS's editorial in **QRPP** which announced that all 1000 kits in the current **NORCAL** project were gone, and noted in passing that the project required the sorting of 100,000 parts into kits! Which of us has ever owned or even seen a total of 100,000 parts? How many of us have looked at a circuit with 92 parts, mentally calculated the amount of time it will take to search for and order the parts, lay out and etch a p.c.b., and then say "looks like a fun rig, but I don't have the time..." This group of dedicated QRP'rs has eliminated that obstacle to experiencing **THE JOY OF QRP** that comes from making QSO's with a rig that you have constructed from a kit.

[NOTE: Banquet Speech: *So, I think we should give all these named and unnamed QRP soldiers a hearty round of applause!. The QRP movement is greatly indebted to all of you.---*]

Another group of dedicated QRP'rs ought to be recognized -- those who commit time and financial resources to searching for and making available the parts and kits for those of us

who want to homebrew our rigs. We're familiar with them -- Dan's Small Parts, Small Wonder Labs, Oak Hills Research, Embedded Research, Far Circuits, Jade Products, EMTECH, Radio Devices, Whiterook Radio, and Wilderness Radio. When we see one of their ads or browse their WEB pages for information on products, we have to keep one idea sharply focused as we chose and reject. We're numbed into a market-place insensitivity by the avalanche of commercial ads that buffet us every day, everywhere we look or listen. But behind each of these QRP ads is a QRP'r who has to be committed to the QRP cause, who cannot possibly be in it to make a lot of money.

In this context, one story of joining a QRP club is especially touching to me in a personal way. Along with his order for **THE JOY OF QRP** and **THE HISTORY OF QRP**, Bob Dyer K6KK of Wilderness Radio noted that he'd read the local library's copy of **THE JOY OF QRP** many times, and that he was "overjoyed" that I'd reprinted it. He confided:

"I consider your book a large influence in my decision to become a QRP-DXer. (I worked all states in 6 months, and have now worked 152 countries with 5 watts or less). Little did I realize what a profound change your book and ham radio would make in my life. Shortly after becoming KD6VIO, I met Doug Hendricks, Jim Cates, and Wayne Burdick. I got involved with the **NORCAL** Club -- I'm member #8. For the last two years I've been making my living as the owner of Wilderness Radio..."

I'm sure Bob's story is typical of many in the basic process -- some QRP enthusiast, me in this case, lit a fire that enticed a new ham into the QRP ranks, and that newcomer is now passing on the torch and in his own way advancing the cause, spreading **THE JOY OF QRP**. The important point here is: when you're looking at the QRP commercial ads, just remember that, if you scratch the surface, what you'll see is a Bob Dyer whether it's Wilderness Radio or Dan's Small Parts or Oak Hills Research or the other companies. These ventures are built on dedication and the desire to contribute to the QRP cause, not on the profit motive of the marketplace. I'm sure you'll all agree that these guys deserve a healthy round of applause.

And if you're teeter-tottering about whether to buy the Wilderness Radio or the Embedded Research kit, buy them both! The Fourth Commandment of QRP applies here: "Thou shalt never have too many QRP rigs!" Am I right?

At this point in my life (1998), I'm looking down a short tunnel at retirement (NB: done deal 2008). There isn't much excitement to look forward to professionally. So, more than ever before, I am getting to appreciate how really important the thrill of QRP is in my life. I know that, in ten years or twenty years, our QRP rigs may be a bit different, but finishing up a rig and working other QRP'rs and DX will always produce that "Unbearable Lightness of Being" feeling. I don't expect the circumstances or results to be the same as with the 30m **SST** -- when I fired it up and worked **P40J** and **3D2KT** right off, I couldn't believe it! I had never even heard a **3D2** before, and I'd just worked one! Pardon my french, but I kept on listening to him and excitedly repeating "Holy Shit, a **3D2!** Wow!" for a while. And I had to run upstairs and shake the XYL awake to tell her

about it. Like she cared enough about **3D2**'s and **SST**'s and 30 meters to welcome being shocked out of a deep sleep at 0100, with the alarm set for 0600! But sometimes the excitement is so intense a guy just has to tell someone about it, awake or not! You know what I'm talking about? How many of you have had this same irrepressible need? Let's see a show of hands...

We all know that the sharing is ever so much more satisfying if the other person is awake, interested, and better yet, impressed! And only another QRP'r fits that list of qualifications. That's where our QRP ARCI and the other QRP Clubs come in. The end result of having all these QRP clubs is that we share a strong sense of group-identity. Each of you -- glance around and all you see are more QRP'rs like yourself -- wall to wall QRP'rs! In the words of Joe Cocker at Woodstock, "Wow! Hey man, like, this must be Heaven!" You may not personally know the QRP'rs sitting at the next table, but you know that you belong with them and with all the rest of us. Isn't this sense of group identity special?

How many times have you been in some other kind of group, like at a boring department meeting, silently wishing it was a bunch of QRP'rs so you could really enjoy yourself and feel that sense of belonging? I certainly have on many occasions. My identity as a QRP'er is a very important value in my life. Every tower and yagi, every wire, and most of the tall trees that I see in the world remind me that I'm a QRP'r at heart.

I suspect that the same applies to many of you. The existence of QRP clubs makes this group-identity possible. Without the clubs and the activities that they sponsor, we'd all be a bunch of QRP operators pursuing our hobby in isolation except for the occasional two-way QRP contact that lets us know that there are others out there like ourselves, different from the rest of the world's hams. Perhaps abnormal, wierd, a lunatic fringe, but in any event, not belonging. A very lonely kind of hobby indeed. For those of you who haven't been around long enough to remember, that is precisely the situation that QRP'rs found themselves in during the 1960's before the QRP movement crystallized. You can't appreciate the magnitude of what has happened to provide you with your QRP group-identity unless you know what it was like before Mike Czuhajewski WA8MCQ started up the "QRPP Corner" in the July 1969 issue of his QRP/8 newsletter. In short, you have to know the history of QRP to appreciate what QRP is today and what you actually belong to. That's why I wrote **HISTORY OF QRP in the US 1924-60** -- to give QRP'rs a historical tradition that stretches back to the beginning of ham radio. Incidentally, I still have 500 copies left after a decade (far fewer now in 2011!). That means that a lot of QRP'rs don't know about our historical tradition reaching back to the first vacuum tube rigs in the 1920's and the ideals we follow.

End of FDIM 1998 Banquet Speech



[Final Assessment of the **WORSP** Banquet Speech: "*Weiss has a problem with his self image. We all got a dose of that at Dayton in 1998 when he spoke at the QRP Dinner. It's just self-promotional stuff. Not much to be done about it unless I get really pissed. If I do it won't be real pretty.*"]

**P.S.** I don't have the time, so I will float an idea in case someone wants to volunteer for the job. This QRP ARCI history lacks some important historical information, especially a list of the presidents and **QQ** editors following Thom Davis, Dickerson, and Spotts. FDIM did not materialize out of no where! For instance, do you know who the president was who first rented the 11<sup>th</sup>-floor conference room in the long-gone Belton Inn in downtown Dayton, and proceeded to string up an 80-meter Inverted Vee so that QRP'rs could get on the air during the festivities and social meetings! Do you know who contacted the Belton Inn station from Pasadena CA on 20m in about 1990 with an HW-8 and a skimpy dipole up about 15 feet and was told by the Belton Inn operator that he had the QSL's for 5-Band QRPp DXCC? Who wrote the following to **CQ**'s "Letters to the Editor" sometime in 1976 or slightly after: "Now there's an elf out there in the wilds of the Dakota's who has almost single-handedly made QRP a way of life for thousands of Amateurs. His name is Ade Weiss, K8EEG/0, and a more gung-ho QRPer you're unlikely to find. Between his writing for **CQ** and editing the QRP journal "*The Milliwatt*", Ade somehow finds time to be an Associate Professor at the University of South Dakota. Not bad for a guy who looks like Rip Van Winkle as a boy. Congratulations, Ade, on the new Assoc. Professorship, and for making QRP what it is today."? When Eric and Wayne were demonstrating their new portable transceiver with a name beginning in a "K" at the conference room of the Ramada Inn south of Dayton, with the rig near the inside wall opposite a whole wall of windows facing roughly north-east, and they got a couple of QRZ's out of a UA6, who was it who suggested that, if the "K" rig was really portable, why can't they just move it over to the windows and try from there. Did it work? What did Bob Dyer "award" to a well-known QRP author at the **NORCAL** fest in 1999 or thereabouts? In short, there is so much QRP ARCI history sitting out there that it could fill a couple of books. The above list would be a good place to begin. Then a list of the FDIM QRP Forum speeches would be valuable and should be easy to assemble. A current list of QRP clubs also should be easy. And anything else that is relevant. The neat thing about the WEB and etexts like this is that there is no space limit. So, I don't consider this job done, but the rest of the page is empty at the moment, waiting....



## MILLIWATT DXCC QRPP AND MILLIWATT Trophy Program

In the early days of the “modern” QRP movement back in 1970 when Mike Czuhajewski WA8MCQ and I started up **The Milliwatt: National Journal of QRPP**, we knew nothing about the great QRP movement at the very dawn of modern vacuum tube ham radio in the 1920’s, when the ARRL and QST editors like Robert S. Kruse (*IXAQ*) and L.W. Hatry (*IOX*) applauded the pioneering achievements of hams working increasingly longer distances with receiving type tubes hardly running hundreds of milliwatts output and in fact denigrated and ridiculed the “watt-hogs” and “ether-burners” using “5-watters” at power levels that made the cathodes glow bright orange until they vaporized (read their stories in my **History of QRP in the U.S., 1920-1964** and be amazed and inspired!). We hoped we could get enough QRO types to drop their power to under five watts, try solid-state rigs following the design leads of Doug DeMaw W1CER (ARRL *QST* Technical Editor) and Wes Hayward W7ZOI, and see if QRP was a viable mode. We started up an 80 meter NET (trannies with an “Ft” high enough to work on 20m were hard to come by and went bye-bye very quickly!) and were astounded with QNI’s from both coasts and KP4! The big question was: will QRP cross the oceans too and work DX? To find the answer, I started up the **MILLIWATT DXCC TROPHY Program** using the ARRL’s own rules and the requirement for bonafide QSL verification of every claimed contact with a DX entity on its list. A couple of months later, Robert Rosier K4OCE’s application and stack of QSL’s showed up at the Post Office, and darned if he didn’t get *my* #1 DXCC trophy! In fact, I did not get one until #58 – behind a long parade of other QRP DX’rs. Now, there can be absolutely no doubt that QRP DX’ing can be a regular mode of QRP operation with a reasonable expectation of success.

Before **The Milliwatt DXCC Trophy Program** was phased out in 1989, 85 5-watt trophies and 10 DXCC-200 plaques had been awarded. 13 less-than-1-watt trophies and 1 DXCC 200 Plaque had been awarded. Ron Moorefield, W8ILC, had first qualified for the 1-watt **MILLIWATT DXCC Trophy**, then the 200 country plaque, and finally the 300 country **Trophy** -- all with an under-1-watt s.s.b. **Argonaut 505** modified and certified by TenTec! Randy Rand AA2U was awarded the only 5-band 5-watt DXCC Trophy, but since then, he has worked DXCC on the WARC bands as well.

To memorialize the fantastic achievements of these QRP DX’rs, the final list of awards is given below.

**MILLIWATT DXCC QRPp and DXCC MILLIWATT Trophy List**

- #1 **K4OCE** Robert Rosier 12/71 (currently 329 confirmed)
- #2 **W2GRR** Sanford Sandowsky 6/75
- #3 **K8MF0** Don Karvonen 2/76
- #4 **W6PQZ** John K Akiyama 4/76 SSB#1
- #5 **N2AA** Eugene Walsh 5/76
- #6 **0A8V** Paul Wyse 5/77
- #7 **WA6SOV** Lee Williams 7/77
- #8 **G4BUE** Christopher Page 11/78
- #9 **OE1ZGA** Tom Gabbert 3/79
- #10 **WA2JOC** Wm. W Dickerson 3/79
- #11 **WBSIGU** Howard G Hawkins 7/79
- #12 **VEIBQQ** Leon Fitzgerald 11/79
- #13 **W6YVK** Everett D Willis 2/80 SSB#2
- #14 **K4RUG** Charles Hoffman 3/80 SSB#3
- #15 **W1PWK** Richard M Vacca 3/80
- #16 **WA2JOC** Wm. W. Dickerson 3/80 SSB#4, Both Modes #1
- #17 **VE5JQ** John Dudley 3/80
- #18 **N0AJZ** Lanny C Rather 4/80 SSB#5
- #19 **K0CDJ** William P Wilson 5/80
- #20 **OK1DKW** Petr Doudera 6/80
- #21 **SM5CCT** Bengt Eriksson 6/80
- #22 **SM0GMG** Lars Mohlin 7/80
- #23 **WA4LOF** Richard E Schier 7/80
- #24 **KH6HC** Tatsuro Suzuki 7/80
- #25 **GM3RFR** Samuel S S Polson 8/80
- #26 **K4TWJ** Dave Ingram 9/80
- #27 **K8DU** Al Bhar 9/80
- #28 **K1MNR** Ronald D Morais 1/81 SSB#7 (see #53)
- #29 **VK7NRT** Rai Taylor 2/81
- #30 **AB0X** Michael Crabtree 3/81
- #31 **WB9OAR** Dan Reimer 6/81 SSB#8
- #32 **K2OQA** Edward A Borow Jr 6/81 SSB#9, All 10 Meters
- #33 **KB3PD** Richard Phillips 7/81 SSB#10
- #34 **AB0M** C L "Vern" Lang 7/81
- #35 **WA0VBW** Randal M Shirbroun 9/81
- #36 **KM8X** Chris Hethorn 10/81
- #37 **WB8CTC** Joe McCready 11/81 SSB#11
- #38 **KB9JJ** Matt Teicher 12/81
- #39 **N0ZA** Ross Harrell 12/81
- #40 **W9PNE** Brice Anderson 2/82 Half-Century of QRP Contributions
- #41 **GM4ELV** Daibhidh Dhuglas 5/82
- #42 **AD2Y** Michael Akiki 5/82
- #43 **CX7BBB** Antonio Villano 6/82
- #44 **VK4SS** Alan Shawsmith 7/82

- #45 **WB4SXX** Bill Meacham 10/82
- #46 **KK9Q** Michael Wendland 10/82 SSB#12
- #47 **KH6CP** Zachary Lau 12/82
- #48 **JA6VZB** Toshi Moriyama 1/83
- #49 **N8CQA** L T "Buck" Switzer 1/83 (SK)
- #50 **WB9WIC** Lawrence Schulman 4/83
- #51 **AA2U** Randy Rand (son) 4/83
- #52 **K2RF** Henry T Rand 4/83
- #53 **KF1H** Ronald D Morais 5/83 Both Modes #2
- #54 **NN4Q** Sam Burgin 5/83
- #55 **OE1SBA** Bruno Settinger 6/83 SSB#13
- #56 **KH60A** J Dean Paterson 6/83
- #57 **NIBZG** Fred Sterner 7/83 SSB#14, All 10 Meters #2
- #58 **W0RSP** Adrian Weiss 8/83
- #59 **W6SKQ** Robert E Spidell 9/83 (SK)
- #60 **VK3RF** Raymond F Miller 10/83 SSB#15
- #61 **WB2IPX** Les Shattuck 10/83
- #62 **NF4Z** E Stuart Greg 11/83
- #63 **K9PNG** James H Jones 12/83
- #64 **KR2Q** Douglas Zwiebel 4/84
- #65 **G4JFN** Robert Hudson 5/84 CW
- #66 **WA9FWO** Frank Kalor 8/84 CW
- #67 **ON4QX** Louis Th. Barge 10/84
- #68 **KF4S** Gary L. Murphy 1/85 SSB#16
- #69 **KT1H** Brad Hutton 3/85
- #70 **CT4CH** Bengt G Johansson SSB#17 5/85
- #71 **KA3CRC** Thomas R Schmitz 5/85
- #72 **K2CL** Charles H Lloyd 8/85 CW
- #73 **NN4Q** Sam Burgin 1/86 SSB#18
- #74 **EA2SN** Jon Iza 5/86 SSB#19
- #75 **G8PG** A D "Gus" Taylor 6/86
- #76 **OK2BMA** Pavel Cunderla 12/86 CW
- #77 **OK1DKR** Rudolf Kaderabek 1/88 CW
- #79 **GM4YLN** C Grierson 5/88 CW
- #80 **SM0DJZ** Jan Hallenberg 6/88
- #81 **KA1GPG** Jim Kueppers 6/88
- #82 **KV4B** Richard D Wilson 11/88
- #83 **NF5Y** Herb Spivey 11/88 CW
- #84 **KR0O** Jeff Elson 7/89
- #85 **G3IJV** R D Harvey 8/89 CW

**5 BAND DXCC QRPp Trophy**

- #1 **AA2U** Randy Rand 5/89

**DXCC 200 QRPp Plaque Awards**

- #1 **N2AA** Eugene Walsh 12/78

- #2 **G4BUE** Christopher Page 12/80
- #3 **WA4LOF** Richard E Schier 5/81
- #4 **WA6SOV** Lee Williams 6/82
- #5 **WB8IGU** Howard G Hawkins 12/82
- #6 **WA0VBW** Randal M Shirbroun 5/84
- #7 **NN4Q** Sam Burgin 1/86
- #8 **AA2U** Randy Rand 4/89
- #9 **KR2Q** Douglas Zweibel 4/89
- #10 **SM0DJZ** Jan Hallenberg 3/91

**DXCC MILLIWATT (under 1 watt) Trophy Awards**

- #1 **W8ILC** Ronald Moorefield 6/78 SSB#1
- #2 **GM3OXX** George Burt 12/78
- #3 **G4BUE** Christopher Page 12/79
- #4 **KI4W** Margaret Williams 2/80
- #5 **W4IV** Wm Montgomery Jr 11/81
- #6 **EA8EY** A Montero Martin 4/83
- #7 **JA1MCU** Jiro Manaka 4/83
- #8 **GM4ELV** Daibhidi Dhuglas S/83
- #9 **KH6CP** Zachary Lau 10/84
- #10 **OKIDKW** Petr Doudera 5/86 CW
- #11 **N6QR** Adam A Mentis 5/87 CW
- #12 **G4JFN** Robert Hudson 2/88 CW CW
- #13 **AA2U** Randy Rand 4/89

**DXCC 200 MILLIWATT Plaque**

- #1 **W8ILC** Ronald Moorefield 4/80 SSB#1
- #2 **GM3OXX** George Burt 3/88 CW

**DXCC 300 MILLIWATT Trophy Award**

- #1 **W8ILC RONALD MOOREFIELD** 2/84 All SSB#1 (currently 327 cconfirmed)  
[**NU4B** reports 273/275 7/2011]





### Adrian Weiss W0RSP's Books

*The Joy of ORP: Strategy for Success*, Milliwatt Books (1985), 158 pages.

*The History of QRP in the U.S., 1924-1960*, Milliwatt Books (1987), 201 pages.

*Ionospheric Propagation, Transmission Lines, and Antennas for the QRP DX'r*, Milliwatt QRP Books (2011), PDF Format CD, 351 pages.

#### Selected Articles (Unless noted, items appeared in *CQ: The Radio Amateur's Journal*)

- "An Optimum Performance Array for 160, 40 and 20 Meters" (September, 1971)
- "A Multiband FET VFO Transmitter", **ham radio** (July, 1972) ,
- "Design Notes for a Moderate-Power Solid State Transmitter for 1.8MHz" (Nov., 1972)
- "A Simple and Accurate R.F. Output Meter", **ham radio** (Oct., 1973)
- "Measuring Output Power" (November, 1973)
- "Techniques of Lowering Output Power" (December, 1973)
- "An In-Line Wattmeter and S.W.R. Bridge" (January, 1974)
- "The Direct Conversion Receiver: Operational Characteristics" (March, 1974)
- "Receive-Transmit Frequency Relationship in Direct Conversion Receivers and Incremental Tuning Techniques" (April, 1974)
- "A 40dB Broadband Solid State Amplifier", **ham radio** (May, 1974) "
- "The D.C. Receiver: Front-End Selectivity: Principles and Techniques" (June, 1974)
- "D.C. Receiver Input Tuned Circuits and Techniques" (September, 1974)
- "Achieving Selectivity in the Audio Channel" (October, 1974)
- "Efficiency in the Antenna System" (November, 1974)
- "Antenna Height and Performance" (December, 1974)
- "Optimum Antenna Performance" (January, 1975)
- "Putting the Wire in the Sky" (February, 1975)
- "Solid State VFO Design Notes" (March, 1975)
- "Solid State VFO Design Notes (Part II)" (April, 1975)
- "Solid State Driver & Final Design Notes" (May, 1975)
- "The 'Giant Flea' QRPp Transmitter" (July, 1975)
- "VFO Switching with PIN Diodes" (August, 1975)
- "Putting the MFJ Modules on 80 Meters" (October, 1975)
- "Applications for Iron Powder/Ferrite Toroids and Beads" (November, 1975)
- "Getting the \$Z\*& Thing to Work: Common Gear as Test Instruments" (Dec., 1975)
- "A Solid State 13 Watt R.F. Amplifier for 1.8MHz" (January, 1976)
- "Getting the Thing to Work (Part II): Homebrew Techniques" (March, 1976)
- "Getting the Thing to Work (Part III): Current Loops and Bypassing" (April, 1976)
- "Getting the Thing to Work (Part IV): Minor Current Loops" (May, 1976)
- "An Economical Two Element Yagi for 14MHz" (June, 1976)
- "Getting the Thing to Work (Part V): Major & Minor Current Loop Completion  
(July, 1976)
- "Getting the Thing to Work (Part VI): Major R.F. Loop Considerations" (Sept, 1976)
- "Power Amplifier Development with Your Transistors", **QST: Journal of the**

**American Radio Relay League** (May, 1976)

- "Improving C.W. Selectivity in the Argonaut" (January, 1977)  
 "The W9SCH Solid State 80 Meter Transceiver" (March, 1977)  
 "The Silk-Purse In-Line Wattmeter" (May, 1977)  
 "Coherent C.W. -- The C.W. of the Future (Part I)" (June, 1977)  
 "Coherent C.W. -- The C.W. of the Future (Part II)" (July, 1977)  
 "Super-Modified HW-8 Contest Machine (Part I): Receiver Sensitivity Improvement, Audio Filter, S.W.R/Wattmeter" (August, 1977)  
 "Super-Modified HW-8 (Part II): Receiver Incremental Tuning, Loudspeaker" (October, 1977)  
 "Solid State VFO Transmitter for 7-14MHz (Part I): 1 Watt Exciter" (November, 1977)  
 "Solid State VFO Transmitter for 7-14MHz (Part II): 7MHz Seiler VFO" (Dec., 1977)  
 "Solid State VFO Transmitter for 7-14MHz (Part III): 15 Watt Final (January, 1978)  
 "Antenna Height vs. Performance" (May, 1978)  
 "The QRP-420XC 4-20 Watt Transceiver for 7-14MHz (Part 1)" (September, 1978)  
 "The QRP-420XC 4-20 Watt Transceiver for 7-14MHz (Part 2)" (October, 1978)  
 "The Viking-5: A 5 Watt Solid-State Transmitter for 3.5 & 7MHz" (February, 1979)  
 "A Solid-State 3.5-7MHz VFO for the Viking-5 Transmitter" (April, 1979)  
 "R.F. Output Power Measurements (Part I)" (June, 1979)  
 "R.F. Output Power Measurements (Part II)" (July, 1979)  
 "Input vs. Output Power Standards and Techniques of Measuring R.F. Output Power" **SPRAT** (Quarterly of the British QRP Association), (Summer, 1979); and **QRP Quarterly** (QRP Amateur Radio Club International, Spring, 1981)  
 "A Two-Band VFO for 80 and 40 Meters" (November, 1979)  
 "The LM317 & LM350 In Adjustable, Regulated, High-Current D.C. Supplies" (Apr 1980)  
 "The Viking 3X5: A Solid-State 4 Watt VFO Transceiver for 20 Meters" (Part I) (May, 1980)  
 "The Viking 3X5: A Solid-State 4 Watt VFO Transceiver for 20 Meters" (Part II) (August, 1980)  
 "Viking 3X5 Clarifications" (December, 1980)  
 "More on the HW-8 Modifications" (January, 1981)  
 "HW-8 Mods Revisited: How to Build Your Own CWF-3 Audio Filter" (Oct. 1982)  
 "Power Amplifier Development with Your Transistors" **QST: Journal of the American Radio Relay League** (May, 1976), reprinted in **QRP Classics**, (ARRL 1990)

**Test Reports**

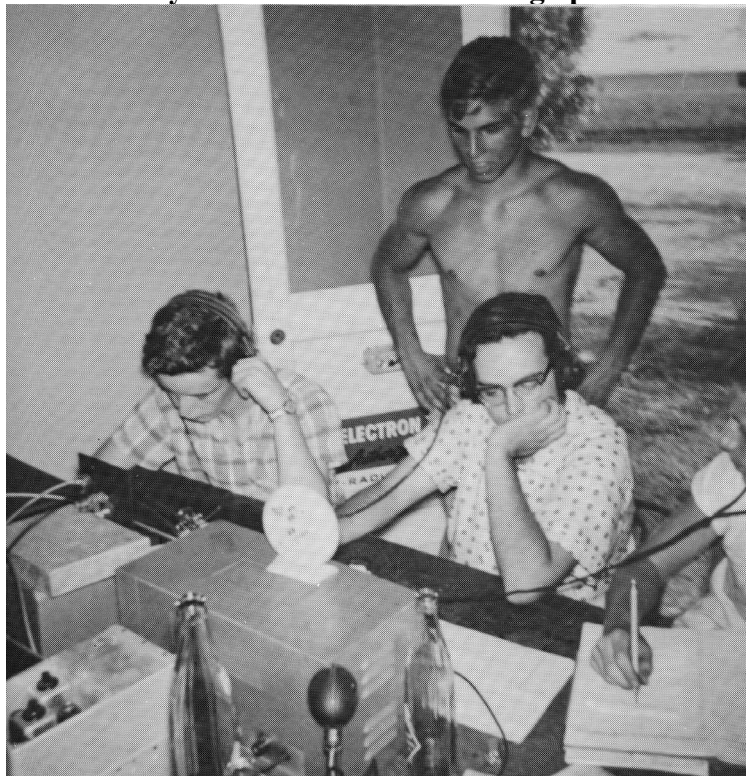
- "CQ Reviews: The Heath HW-8 QRPp Transceiver" (May, 1977)  
 "CQ Reviews: The Ten-Tec Argonaut 509 S.S.B./C.W. Transceiver" (July, 1978)  
 "CQ Reviews: 2000DM Digital Multimeter" (May, 1979)  
 "CQ Reviews: The Atlas 110-S QRP Transceiver" (December, 1979)  
 "CQ Reviews: The TEDCO Model-1 80 Meter QRP Transceiver" (August, 1980)  
 "CQ Reviews: The Triplett Model 7000 Universal Counter" (August, 1981)  
 (Reprinted by Triplett Inc. with permission of author, October, 1981)  
 "CQ Reviews: The Argonaut 515 C.W./S.S.B. Transceiver: Latest Evolution of a Concept" (December, 1981)

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**Field Day 1959: K8EEG Shirtless in standing row.**



**Field Day 1959: K8EEG Overseeing operations.**



## EPILOGUE

*Now these our revels are ended as the past wastes into insubstantial mist.*

**WORSP Retro-ARRL-DX-Contest February 18-19, 2012**

**Operating Position with 1973 Argonaut 505**



The Argonaut 505 (1973 model) holds center-stage in the operating position at right end of the desk. A cassette is under the main tuning knob to provide a bit of the upward tilt for easier reading of knobs etc. The on-off switch for the MFJ CWF-3 audio filter is between and above the AF Gain knob and MODE knob and the right bottom of the 505 panel. At the left of the 505 is the logbook with two columns per page, 28 entries per column. At 150% ZOOM the UTC/LST time clock at the left edge of the top of the 505 is clear, and the Altoids tin beside the black speaker grill (right rear corner of the top of the 505) houses an ELECRAFT (Wilderness Radio?) keyer module. Just to the right of the 505 is a homebrew paddle made from a black paper-clamp and piece of wood and a couple of screws; the assembly is masking-taped to table top for feather-touch keying. An MFJ-941-C ATU is at the right bottom corner of the photo (tuning circuit bypassed by feedline but inline SWR bridge functioning). LED flashlight above and next to MFJ-041-C. The high-current D.C. supply is at the top right corner of the desk (described in "The LM317 & LM350 in Adjustable, Regulated, High-



Current D.C. Supplies,” CQ MAGAZINE (April, 1980), and in JOY OF QRP: STRATEGY FOR SUCCESS (1985, pp. 93-99). Two Wilderness Sierra band modules (orange labels) are atop the power supply, and at its bottom right corner can be seen an Altoids mini-tin (red-white) housing the famous AZSQRPIons LED Bruene SWR Bridge. Barely visible directly under the supply is a 3-position coax bandswitch. On the wall at the right is part of the photo of W0RSP’s 20-foot 1952 day-sailer yacht with double-planked white pine hull from N. Minnesota. It is in a barn in S.D. while I am here in AZ. Something has to happen – and it probably won’t be a new lake nearby in AZ! On the back wall are two pages from my CD book IONOSPHERIC PROPAGATION, TRANSMISSION LINES, AND ANTENNAS FOR THE QRP DX’R. The left page is the schematic of my balanced tuner used with 300-ohm ladder line to feed the 40-meter dipole.

2-18 104\_2-4/57

48  
40+7+1

2-15-12	1823 PJ4/K5KG	15	2-18-12	0653 TISM	ATT? 40
2-16-12	0532 ZDR!!	40	0701 XEZX	KW	40
2-16-12	0538 PZ5RO	40	0705 DF9ZP	100	40
2-16-12	0517-2 KH7Y	40	0716 JRIAB	KW	40
2-17-12	2018 6V7S servec	15	0718 JAZYBK	KW	40
2-17-12	2333 J04BOW	15	0727 TOSX	F KW	40
2-17-12	2349 R5	15	0730 EDST	EA KW	40
2-18-12	0440 EISE	KW 40	0732 V31RR	NN	40
2-18-12	0451 CR3L	40	0738 JFINHD	KW	40
2-18	0452 TISW	KW 40	0741 COZJD	100	40
2-18	0457 PJ4X	K 40	0742 6YZT	KW	40
2-18	0513 V2SAA	100 40	1234 JATBME	KW	40
0518	EASYU	K 40	1235 JAXMS	100	40
0520	PJ2T	K 40	1237 NP4Z	4NT 4M 40	
0526	OM7M	K 40	1241 VPSOU	ATT 40	
0531	KLZR	K 40	1250 JAYRA	K 40	
0546	IR4M	500 40	1251 KH6/AA4V	500 40	
0551	RWPCWA	KW 40	1253 ZFZAM	K 40	
0554	CR3A	KW 40	1303 JE1ZWT	K 40	
0556	6V7S	500 40	1930 TF3W	ICV 15	
0609	RWCFMA	KW 40	1945 KP2MM	V10670 K 15	
0617	K176 LC	KW 40	2006 KLTG	K 15	
0619	BPSY	BA 100 40	2009 TISW	K 15	
0620	EABOM	ATT 40	2011 HOD2A	HC K 15	
0630	VP9/W6PHATT	40	2143 JFISQC	K 15	
0642	ECTCW	700 40	2204 JR210B	K 15	
0647	OKIZ	KW 40	2205 JN4MMOK	K 15	
0652	KH7X	KW 40	2208 JRIAB	K 15	
			2209 KL7B	WV K 15	

-7 (24)

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For the contest, my Wilderness **SIERRA** at 5 watts was used on 40 meters. The **ARGONAUT 505** at about 2.2 watts output was used on 20-15-10 meters. The 40 meter dipole is mounted Inverted-Vee fashion on a 40-foot HEXBEAM telescoping fiberglass pole (apex at 40 feet, ends at about 25 feet). Note in the above page the 0556Z QSO with **6V7S** on 40!!! WOW!!!

106 Q's

2-18-12					
2213	KH6LC	KW 15	0031	JH1EAQ	TST 15
2214	ZD8	Z K 15	0041	KL2R	KW 15
2218	TJ1YAJ	KW 15	0048	JO1WKO	K 15
2219	JH3AII	KW 15	0050	RZØCWN	K 15
2224	RUØFM	KW 15	0055	AL9A	KW 15
2227	JA6ZPR	KW 15	0056	ØHØX	U
2228	XEICT	100 15	0058	TJ1YAJ	K 15
2231	JR1MQT	KW 15	0059	JAZAXB	150 15
2234	JM7LRQ	SO 15	0100	JRØVSE	K 15
2241	JG1AVO	200 15	0102	JE1NHØ	K 15
2244	T1SN	MN 15	0105	JH3ZFL	1500 15
2247	JA3YBK	KW 15	0409	WH6R	K 20
2248	ØHØA	KW 15	0411	RUØFM	K 20
2253	JA7IC	KW 15	0413	KH6LC	K 20
2259	JA1YPA	KW 15	0420	RØØMC	K 20
2304	CW5W	KW 15	0424	JF1SQC	K 20
2311	RAØFF	KW 15	0436	JHØINP	K 20
2320	V3LTP	KW 15	0438	UA9PM	K 20
2322	PJ2T	K 15	0439	PJ4X	K 20
2326	JATACM	K 15	0442	VP2mm	100 20
2332	JE7JDL	K 15	0445	RWØCWA	K 20
2341	6Y2T	500 15	0454	UN9LW	K 20
2346	JH85LS	500 15	0503	UW3UØU	K 20
2358	KH7X	K 15	0518	RG3K	ØU K 20
239-2012	ØHØX	ALAND IS. K 15	0522	UZØU	AG K 20
0001			0525	ØHØX	K 20
0002	RWØCWA	K 15	0527	RF4M	K 20
0026	JATNVF	K 15	0544	V31OT	K 20
0029	ØHØZ	ALAND IS. K 15			

SIERRA (40)

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The amazing 20-meter run (bottom half, right column) long after dark to JA's and Asiatic Russia was amazing – the best opening on 20 in perhaps 6

years. The coverage included the Carribean as well as EU Russia and other EU stations.

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2-20-108-16-69

2-19-12 0610 T51YAS K 40	SIERRA	2237 JRΦETA 100 15
0615 WH6R K 40		2239(HC 2) W7SE SE 15
0623 V31WW K 40		2252 RΦFA KW 15
0625 KP2MM V12UW 15 12 40		2256 JA2AXB 150 15
0626 PS2T PY K 40		2257 KH6GW 600 15
0631 HK3TU ATT 40		2259 JA7FTR K 15
0635 RΦFA AS X 40		2304 JE1CKA KW 15
1938 CE1/KTCA K 10		2309 JAZCUS 100 15
1944 T68/WΦR 100 10	ARGO	2312 TK4ΦOK 100 15
1945 6Y2T 500 10		2313 JA9CWS 500 15
2011 LU5FC KW 10		2322 WP3A OKAPE ATT 15
2015 V31TP K 10		2335 JR3NZC KW 15
2019 J39BS 100 10	GREENHORN	2339 JAI BJ1 100 15
2029 PY2YU KW 10		2345 JH3CUL 100 15
2047 LU6UO 400 10		2348 JK3H2P 100 15
2052 LU8EOT ATT 10		2351 JR4GPA 100 15
2125 KL7RA 50K 15		2354 H#K3R 100 15
2130 PJ4X (KUT) KW 15		2-20-12 1900-12 P25R0 15
2137 HPIWW KW 15		2120 YN9SU 15
2141 LU1D2 500 15		2-20-12 2240 PP8ZAC 15
2146 JR1BTG 100 15		2337 CO8LY 15
2200 JA2FJP KW 15		23345 DU3/NΦΦM 15
2203 KP2MM K 15		2-21-12 0218 HCZ/WTSE 15
2211 PS2T K 15		
2214 FY5KE FEB GUINER K 15		
2230 JH4UYB K 15		
2233 JS3CTQ K 15		
2235 JG1AVO 200 15		

Overall, I worked 150 QSO's, with 48 on 40 meters, 16 on 20 meters, 77 on 15 meters, and 9 on 10 meters. If conditions hold at this low level for the rest of the cycle, I won't complain! Give DX'ing a try – patience, call, call, call, call, and there is a chance!