

# A New Face at Communications Products Inc.



Bob Wood, W7OAD, has put a new face on the old CPI store as Communications Products, Inc. The changes though, as anyone who visits his store will notice, are more than just a new face.

Volume XLIII Issue 10, November 1999



## The MICROVOLT

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## Prologue

The Utah Amateur Radio Club was organized under its present name in 1927, although its beginnings may date back as early as 1909. In 1928, it became affiliated with the American Radio Relay League (club #1602) and is a non-profit organization under the laws of Utah. It holds a club station license with the call W7SP, a memorial call for Leonard (Zim) Zimmerman, an amateur radio pioneer in the Salt Lake City Area.

*Meetings:* The club meets each month except July and August. The meetings are held on the first Thursday of the month at 7:30 PM in the Doxey-Hatch Medical Building located at 1255 East 3900 South in Holladay, across the street from St. Marks Hospital.

*Membership:* Club membership is open to anyone interested in amateur radio; a current license is not required. Dues are \$15 per year, including a *Microvolt* subscription. *The Microvolt* and membership cannot be separated. Those living at the same address as a member who has paid \$15 may obtain a membership without a *Microvolt* subscription for \$9. Send dues to the Club Secretary: Russell Smith, KC7ZDZ, 2493 South 17th East, Salt Lake City, UT 84109 ARRL membership renewals should specify ARRL Club #1602.

*Contributions:* Monetary contributions are gladly accepted. Send directly to the Club Treasurer: Chuck Johnson, 1612 W. 4915 S., Taylorsville, UT 84123-4244. For in kind contributions, please contact any board member to make appropriate arrangements.

*Repeaters:* UARC maintains the following repeaters: 146.62 (-), 146.76(-), and 449.10. The repeaters are administered by the UARC Repeater Committee. Comments and questions may be directed to any Committee member. The Lake Mountain repeater 146.76(-) has Autopatch facilities on both the Orem exchange (covering Santaquin to Lehi) and the Salt lake City exchange (covering Draper to Layton). The 449.10 repeater has autopatch facilities into Salt Lake City only. Due to the volume of traffic, only mobiles should use this autopatch. Autopatch use is open to all visitors to our area and to all club members. Non members who wish to use the Autopatch are encouraged to help with the cost of maintaining the equipment by joining the club.

*Ham Hot-Line:* The Utah Amateur Radio Club (UARC) has a Ham Hotline, 583-3002. Information regarding Amateur Radio can be obtained, including club information, testing, meeting information, and membership information. If no one answers leave your name, telephone number and a short message on the answering machine and your call will be returned.

*Publication:* *The Microvolt* is the official publication of the club. Deadline for submissions to the *Microvolt* is the 10th of each month prior to publication. Submissions by email are preferred (bbergen@xmission.com), but other means including diskettes and typewritten submissions can be mailed directly to: Bruce Bergen, 3543 Fieldstone Cir., SLC, UT 84121. All submissions are welcome but what is printed and how it is edited are the responsibility of the Editor and the UARC board. Reprints are allowed with proper credits to *The Microvolt*, UARC, and authors. Changes in mailing address should be communicated to the Club Secretary: Russell Smith, KC7ZDZ, 2493 South 17th East, Salt Lake City, UT 84109. □

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## Contents

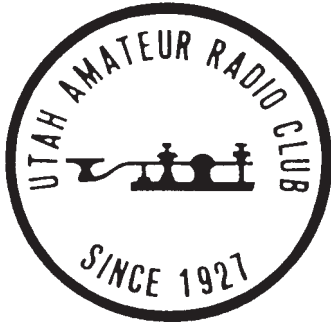
Prologue	2
UARC 1999 Board & Committees	2
QST From the Prez	3
Featured Member of the Month	4
Those Mysterious Transforms IV	5
Borderline Amateur Radio Club	6
The 10 Meter "No Name Net"	6
Norther Utah Technical Society (NUTS)	7
Tigger's Corner	7
Amateur Radio "Community Site" eHAM.NET is On-Line	8
Solving Telephone therefore Interference- Helpful Hints and Suggestions	9
Bell Rotor History	10
Test Schedule	11
A Blast from the Past	11
November Meeting: Homebrew Night	12
Ham Hot-Line	12
USPS Statement of Ownership, Management, and Circulation	12

For late breaking news listen to the UARC Information Net Sundays at 21:00 on 146.62 or set your browser to:  
[www.xmission.com/~uarc/announce.html](http://www.xmission.com/~uarc/announce.html) □

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# The Microvolt

The Official Publication of the Utah Amateur Radio Club, Salt Lake City, Utah

Volume XLIII, Issue 10, November 1999



Photo: Ron Speils, KC7MYS

## QST From the Prez

I have had the great privilege of working for the same company for the last thirty years. During that time there have been many changes. Employees have retired, resign, moved, terminated, and been promoted. Changes have improved the company, the morale of the employees, the company's progress and future. New personnel, managers, officers, and employees bring new ideas, new policies, new programs, and new membership. Even though I have been an employee of the same company for so many years, I have had many different positions, responsibilities, assignments, and have been involved in almost every aspect of the company. Doing the same thing over and over again can be non-productive for the company, the membership or customer, and yourself.

So it is with UARC. When I first got my license I did not know hardly anyone except those voices on the radio. I joined UARC and went to the meetings and started to meet people. That same year I was asked if I would be willing to serve as program chairman. It was a great chance to meet new people and to get

involved. I also improved my knowledge and skills in amateur radio. After two years serving as program chairman, I knew that I should not run for that position again. In not running, new members got a chance to serve, meet new people, make new friends, and learn themselves. However, I did run for Secretary, so I learned new things also.

Changes are needed and improve any organization. The club is only as good as its membership. If someone new volunteers to do something and brings new ideas to the club to improve it. New members bring new programs, new ideas, and new membership. Make your membership in UARC worthwhile and get involved. You will learn and grow. The club will grow and your enthusiasm for this hobby will grow.

Thank you.

73 - Gary Openshaw, KC7AWU □

## Help Wanted



## Featured Member of The Month



Photo: Ron Spellis, KC7MYS

Bob Wood, W7OAD, proprietor of our local "Candy Store."

This month we are featuring Bob Wood W7OAD. There is an interesting story about this call sign. Bob obtained his current call sign purely by accident. His original call sign, N7OAD, was assigned when, in 1988, he received his general license.

About a year ago, when Bob bought the ham store CPI, it seems that he had many inquires from costumers on how to obtain a vanity call sign. Bob, thinking he would help these people out went to the Internet, filled out the vanity call sign form, with the intention of printing it and giving it out as an example. He decided to use the call W7OAD for his example. He filled out the on-line form only to discover it couldn't be printed, and that in fact it had been submitted to the FCC as a valid application in the process. Bob decided he better go for it and send in the money.

Besides, he said, W7OAD makes a good CW call, CW being his favorite mode. He has even been guilty of running mobile CW. He really likes HF, and you will rarely hear him on 2 meters. He told me he tries to avoid getting on 2 meters, because people will ask him if he has certain items at the ham store and he can't answer and still be compliant with the rules governing amateur radio.

There is another interesting facet to this story. It just so happens that the call, W7OAD, at one time in the '50s belonged to Marvin Zitting, W7MR. In fact, when Marv had a QSO with Bob he remarked that he had a strange feeling that he was talking to himself.

Bob was first interested in amateur radio when he was fourteen years old, in 1966, and came very close to

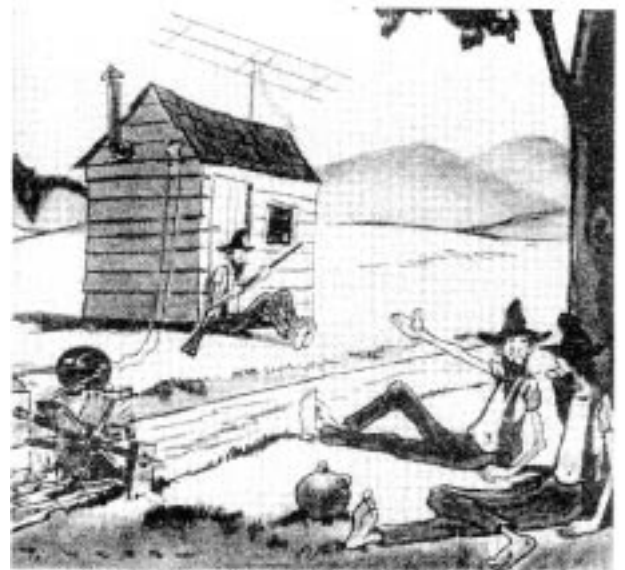
getting his license but the price of the equipment stopped him. At that time there was very little activity on two meters and HF equipment was relatively expensive, at least it seemed so to the fourteen year old.

As a member of UARC and the VHF society, Bob tries to encourage others to upgrade and to diversify their activities in amateur radio. He said it is a shame that so many people work so hard to get their first license only then to just disappear.

Bob, and his wife of eighteen years, Mollie, have seventeen year old twins, Robbie and Katie.. His son, Robbie, KD7GHG, just received his technician license a month ago. Mollie and their daughter Katie are working hard on getting their licenses. The pressure is intense, since both of them work in the store. Bob is so excited to have a ham family.

For 10 years Bob has been selling real estate, but when he heard that Previn was seriously interested in selling the radio store, he became very excited about getting into the business of selling amateur equipment. His goal now is to make Communications Products, the only ham store in Utah, a great store, a place where any ham or prospective ham will love to come to shop or just visit. He came to the swapmeet in September to put his "best foot forward" and to get the word out about what his store has to offer. Communication Products of course features not only ham equipment but also pagers and cellular phones and he also accepts trade-ins.

73 N7HVF Linda Reeder



"EVER SINCE HE GOT THEM NEW G-E CAPACITORS HE WON'T LET NOBODY NEAR THE SHACK."

## Those Mysterious Transforms IV – Digital Signal Processing Pizzazz with the z Transform

### The Not-So-Hidden Agenda.

Past articles used a Morse code filter example to illustrate the application of Fourier and Laplace transforms for improving the quality of a signal in the presence of noise. The not-so-hidden agenda was to show how root science and mathematics contribute to solving such problems. Additional math concepts, in the form of z transforms, can carry this example right into the pizzazz of the computer age. Again, I hope that spending a little time on the derivation (not *just* the results) will prick some folks into doing more studying (it did me!). So, before we get to our example, let's work on the z transform. (We'll just scratch the surface!)

### The z Transform.

The following discussion builds in information already given in earlier articles (you did carefully save them, didn't you?). Consider a time-varying function  $g(t)$  which has a Laplace transform expressed as  $L[g(t)] = G(s)$ . Furthermore, presume that  $g(t)$  is active (non-zero) only for positive time. Thus, multiplying it by the unit step function  $u(t)$  does not change it. Then suppose that the function is delayed in time by an amount  $T$ . This new delayed function can be expressed as  $g(t-T)u(t-T)$ , or redefined with a dummy variable  $\Delta$ , it may be given as  $g(\Delta)u(\Delta)$ . It is possible to take the Laplace transform of  $g(\Delta)u(\Delta)$  in the same manner demonstrated in earlier writings. Doing all of this yields the following important result:

$$1) L[g(t-T)] = e^{-sT}G(s)$$

In other words, the Laplace transform of a function that has been delayed by a time  $T$  is simply the Laplace transform of the non-delayed function, except the result is multiplied by  $e^{-sT}$ . Next, define an operator  $z$  as:

$$2A) z = e^{sT}$$

Then

$$2B) z^{-1} = e^{-sT}$$

$$2C) z^{-n} = (e^{-sT})^n$$

Equation 2C provides a delay of  $nT$  time periods rather than just one period of  $T$  time as in equation 2B.

Consider what can be done with an equation that is already written in terms of a Laplace transform (for example, our Morse code filter from prior articles was expressed as a Laplace transform). First, one can rewrite equation 2A, solving for  $s$  as a function of  $z$ , then substitute this into the Laplace expression under consideration so that it contains only  $z$  terms. At this point we say we are in the "z domain" instead of the "s domain." (As a note, many real-world engineering problems allow one to start out directly in the z domain, rather than migrate from the s domain, but this is beyond the scope of this writing.) Second, one can manipulate the  $z$  terms into a  $z^{-1}$  form. Third, realizing that  $z^{-n}$  simply implies a delay of  $nT$  seconds (equations 2B and 2C), one can rewrite the expression in terms of time sequenced calculations that are exactly what computers do very easily.

Manipulating equation 2A for friendly computer application requires some thought (for example, taking the natural log isn't productive, and the infinite series  $z = e^{sT} = 1 + sT + (sT)^2/2! + (sT)^3/3! + \dots$  has no closed form solution). Equation 3 is an approximate solution called the Tustin formula, which tends to preserve magnitude integrity (as opposed to phase integrity). This will have to do:

$$3) s \approx (2/T)(z-1)/(z+1)$$

### Applying z Transform Technology to our Morse Code Filter Example.

The Laplace equation for the Morse code bandpass filter analyzed in earlier articles is repeated in equation 4A. To make algebraic manipulation more simple, a version is also presented in equation 4B that uses coefficients  $k_1$ ,  $k_2$ , and  $k_3$ . These can relate back to the more physical values of gain ( $k$ ), frequency ( $f_c$ ) and bandwidth ( $B_w$ ) in the original equation. Note that  $G_{BP}(s)$  is restated as  $V_{out}(s)/V_{in}(s)$ , the output voltage over the input voltage.

$$4A) G_{BP}(s) = \{s2\pi kB_w\} / \{s^2 + s2\pi B_w + [2\pi f_c]^2\}$$

$$4B) G_{BP}(s) = V_{out}(s)/V_{in}(s) = \{sk_1\} / \{s^2 + sk_2 + k_3\}$$

Substituting equation 3 into equation 4B, recognizing that we now have  $G_{BP}(z)$ , and rearranging yields equation 5A. We again simplify notation by rewriting the coefficients as  $k_4$ ,  $k_5$ ,  $k_6$ , and  $k_7$  in equation 5B.

$$5A) z^2 V_{out} = \{z^2(2k_1/T)V_{in} - (2k_1/T)V_{in} - z[2k_3 - 2(2/T)^2]V_{out} - [(2/T)^2 + k_2 - k_3]V_{out}\} / \{(2/T)^2 + 2k_2/T + k_3\}$$

$$5B) z^2 V_{out} = \{z^2 k_4 V_{in} - k_4 V_{in} - z k_5 V_{out} - k_6 V_{out}\} / \{k_7\}$$

With algebra trickery, multiply both sides of equation 5B by the  $z^{-2}$  operator, eliminating the  $z$  and  $z^2$  terms.

$$6) V_{out} = \{k_4 V_{in} - z^2 k_4 V_{in} - z^{-1} k_5 V_{out} - z^{-2} k_6 V_{out}\} / \{k_7\}$$

Recall from equation 2C that  $z^{-1}$  and  $z^{-2}$  operators represent the signal at a delay of time  $T$  and  $2T$ , respectively. If a system is sampled every  $T$  seconds and if the present time is defined as  $t$ , then the following statements are true for  $V_{out}$  (similar statements are true for  $V_{in}$ ):

7A) Absence of a  $z$  term:  $V_{out}$  at the present sample time  $t$ , expressed as  $V_{out}(t)$

7B)  $z^{-1}$  multiplier:  $V_{out}$  at the last prior sample time  $t-1$ , expressed as  $V_{out}(t-1)$

7C)  $z^{-2}$  multiplier:  $V_{out}$  at the second to last sample time  $t-2$ , expressed as  $V_{out}(t-2)$

Applying the notions of equations 7A through 7C for both  $V_{in}$  and  $V_{out}$  to equation 6 gives:

$$8) V_{out}(t) = [k_4/k_7] \{V_{in}(t) - V_{in}(t-2)\} - [k_5/k_7] V_{out}(t-1) - [k_6/k_7] V_{out}(t-2)$$

A computer *just loves* to execute calculations like those in equation 8. One must merely save off the previously known values of  $V_{in}$  and  $V_{out}$  that were used in the last two previous calculations, and reuse them in this current calculation. At the next sample time, there is a new  $V_{in}(t)$  and  $V_{out}(t)$ , and therefore a new  $V_{in}(t-1)$ ,  $V_{in}(t-2)$ ,  $V_{out}(t-1)$  and  $V_{out}(t-2)$ . This type of calculation is called recursion. By relating  $K_4$  through  $k_7$  back to our example bandpass filter tuned to 800 Hz with a bandwidth of, say, 50 Hz, we end up with a digitally processed version of the filter that we designed earlier using analog parts. The data presented to the computer must be a digitized version of the audio output of the receiver (in our example, a Morse code signal set at 800 Hz, complete with background noise and other code signals in the background that are off frequency). The sample rate for the analog to digital converter has a value of  $1/T$  seconds. This needs to be a fairly large number compared to the audio bandwidth coming from the receiver – perhaps 50 kHz for  $1/T$  such that  $T = 1/50,000 = .00002$  seconds. Using filter bandwidth and center frequency as stated above, and a gain of 1, the constants  $k_4$  through  $k_7$  can be calculated and a final formula is given in equation 9 below. Equations 4A, 4B, 5A, 5B, and 8 are used to achieve this final result.

$$9) V_{out}(t) = 0.003124 \{V_{in}(t) - V_{in}(t-2)\} + 1.983703 V_{out}(t-1) - 0.991851 V_{out}(t-2)$$

### A Caution.

I have not actually tried to build up this digital filter (it is too much trouble – the analog version I presented in an earlier article works great, and is a more elegant solution!). I might have made an error here in all of this messy arithmetic. The principles are, however, illustrated. I hope you enjoyed thinking some about digital signal processing. As you can guess, there is a lot more to it than "just" what has been shown here.

Steve Curtis - AB7LF

## Borderline Amateur Radio Club (BARC)

Borderline Amateur Radio Club (BARC) based in the Uintah Basin operates repeaters located in North Eastern Utah. The club repeaters are Blue Mtn. 147.100 (wide coverage), Grizzly Mtn. 147.040 (linked full time with the SDARC repeaters), and the Duchesne rpt. 147.260. Other local repeaters are the Tabby Mtn. 147.240 (wide coverage linked with 147.140 machine covering the Wastach front), Roosevelt rpt. 145.490 (linked full time with the SDARC repeaters), and Blue Mtn. 449.950 (pl 114.8). All VHF repeaters follow the state band plan and are pl toned for 136.5. The club holds a weekly net on Monday evenings 2100 hr. (Mtn. time) on the 147.100 rpt. Contact person - Jay Hansen/KA7BPB email [ka7bpb@ubtanet.com](mailto:ka7bpb@ubtanet.com). Club home page can be found at <http://eccso.com/barc/>.

Chandler Fisher - W7BYU

## The 10 Meter "No Name Net"

The 10 Meter "No Name Net" is being held each Wednesday on 28.313 at 2100 Hours local time. The intent of this net is for the enjoyment of the hobby, learning from each other and to utilize the 10 meter band. All are welcome, especially those who are new to HF and those more experienced amateurs who are willing to share their experiences and 'know-how'. See you on Wednesday nights at 2100 local on 28.313.

73 de KC7RAF - Hall Blankenship

## Northern Utah Technical Society

*Editors Note: This information comes from Wade Lake (KA7NCW) who represents the Northern Utah Technical Society -(NUTS) for short :-)*

I thought I'd drop you a line and let you know about a few repeaters that belong to society members. My repeater 447.150-, no PL, resides in Clearfield and covers Salt Lake, Davis, Weber, Tooele, and most of Box Elder, some of Cache, and even gets into Utah county a little. It is totally open for all amateur use!!

Rob Pectol -KK7AV's repeater resides in Clinton and covers roughly the same Area as mine. Robs repeater is on 447.050 negative offset with a 114.8 pl tone. His Repeater is linked to Rob Holt's Repeater (another society member who also belongs to the RMRA) Rob Holt, N7ZPF's Repeater, 443.400+, 114.8 PL tone, now resides in Sandy. this linked system offers extended coverage for Rob Pectol's -KK7AV's IC-706 Remote Base which carries the Beehive 40 Meter Traffic Net every day at 12:30 PM. as well as offering access to HF, 6, and 2 meters.

Lynn Walker -N7TOP (who is also heavily involved with OARC -Ogden Amateur Radio Club) and Vance Hunt, KC7SUM, have a dual site system: with one on Promontory peak and the other on Powder Mountain - both offering wide area coverage. Powder mountain giving great coverage to the east side of northern Utah and north into the Cache Valley with a VHF Repeater (KC7SUM) 145.470-, 123.0 PL tone, a UHF repeater 447.775-, 123.0 tone, and the site also has a VHF Remote base. Their Promontory sites feature the 449.775-, 123.0 PL tone, the 145.410-, 123.0 PL tone and a 2m and 70cm remote base system Promontory covers all of the Wasatch front very well. -these two sites are almost always linked up.

I also have future plans (this spring, we already have the freq coordinated and the "rocks" and the repeater) to put up a 6 meter repeater input 52.010 output 53.010 (no PL yet) in cooperation with the UBET club (Thiokol). This will eventually be hard linked to my 447.150 Machine. Well, that's a mouthful -hope I haven't bored you to death. We are a friendly group of guys and would love to have any ham make use of the systems listed here!!

Wade - KA7NCWChandler/W7BYU

## Tigger's Corner

I was asked recently, why anyone would want to become a ham operator in today's modern world? Radio seems so old fashioned and quaint compared to today's technology. The Internet has opened up an entirely new universe of communication possibilities, where anyone, license free, can access information, or thru chat-rooms, talk with another person anywhere in the world.

This made me re-think my hobby in a different context, not having a computer, (until recently), I hadn't given it a lot of this kind of thought. What did ham radio mean to me? What did it have to offer that I couldn't do elsewhere without a license?.

I began to reflect on my many past experiences that involved ham radio, and something became apparent, it wasn't the radios themselves, or even the operation/repair/homebrewing that came to the forefront in my mind. I began to realize that the hobby of hamming had resulted in my having a close-knit, large circle of friends, it was the people that mattered, not the radios.

Ham radio is a hobby that, by it's very nature, results in communication on a personal level, whether its with one other person, or a whole group at once. I started to think of how I participated in my hobby, and how I used the radios.

Working in the land mobile two way industry, I get to "ham" eight hours a day. I love my job, they pay me to do what I'd do on my own time free of charge. But the downside to this is that when I get home at the end of the day, I don't want to do more "radio stuff". I'd rather hop on the Suzuki and "fly" up a canyon somewhere. I usually take a handi with me, and see what can be accessed from the top, but it isn't my primary reason for the trip.

This got me thinking, I didn't chase DX, or ragchew like I once did. The radios had become less of a "toy", and more of a "tool" for me. The hobby, and the radios I used had become my "link", so to speak, to my friends. Those of you who've known me a while, know I like to go out to a nice dinner on Saturday nights, and for that, various two meter repeaters serve as the meeting place for a large, (and open to anyone who wants to join us), "dinner group". This social aspect of the hobby is where I feel ham radio fills a niche in my life.

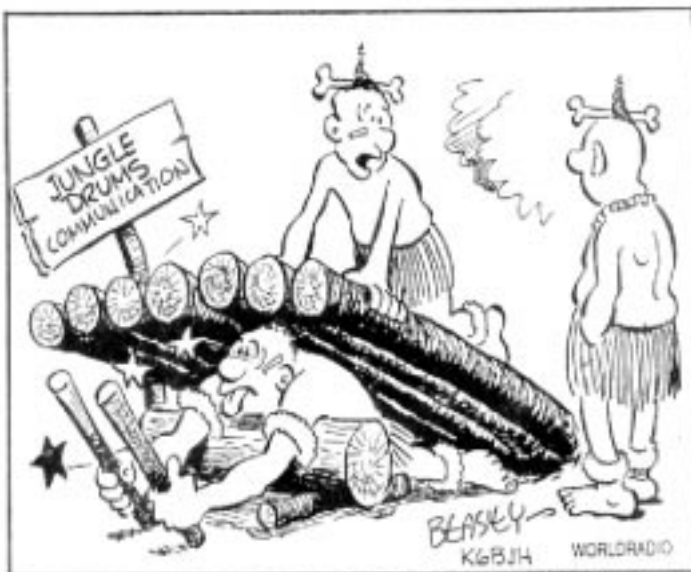
## Amateur Radio "Community Site" eHAM.NET is On-Line

I wouldn't know any of my closest friends now if it hadn't been for this hobby, and when my poor health was putting me in the hospital repeatedly, it was several very understanding friends that helped me by staying with me, (by radio). The radios kept me in touch with all of them while I was bedridden for a while, I would have gone "stir crazy" if it hadn't been for the lifeline of ham radio. (My hospital roommates didn't like me much though, my Yaesu interfered with the television sets.)

In all I've come to the conclusion that there isn't any other more "personal" form of "one-to-one" communication that works as well as ham radio. Certainly, there are more convenient and somewhat more reliable modes of sending a message, but there's a big difference between sending a message, and actually "communicating", getting to know the potential friend behind every new RF contact. There's a personal warmth that just can't be duplicated by any other form of "communication".

There are as many different ways of looking at this hobby of ours, as there are hams. I hope all of you will find a "niche" within it that increases your enjoyment as I have.

Cya, John - KA7TGR.



HE SAID HE THOUGHT HE COULD GET OUT BETTER IF HE HAD A LOWER ANGLE OF RADIATION. SO ----

Dubbed an Amateur Radio "community site," eHam.net, debuted September 2 at <http://www.eHam.net>. "eHam.net can best be described as a community of ham radio operators from all over the world," said Bill Fisher, W4AN, one of the amateurs behind the new site. He says the site is--among other things--aimed at giving hams a place to share ideas through a chat program, as well as to contribute news, buy and sell, take practice exams, see equipment reviews, and get propagation information and DX spots.

eHam.net includes a call sign server. Users will be able to add an e-mail address, Web site address, personal biography, and picture. Search tools will allow users to find community members with the same ham radio interests. The site also includes an unlimited number of real-time chat rooms.

eHam.net also offers free ads to buy, sell or swap on-line. The eHam.net "Detective" search tool lets users find ham radio information on the Web. "We have indexed all of the archived mailing lists at [contesting.com](http://contesting.com), [qth.net](http://qth.net), and others to provide you with one place to search for answers to your questions," Fisher said.

The site also lets users view DX spots from all over the world and locate QSL managers quickly. A "Friends Remembered" department lets hams post reminiscences of Silent Keys. The site also includes various Amateur Radio-related links. The site includes news items from the ARRL and other sources.

In addition to Fisher, others behind eHam.net include Randy Thompson, K5ZD, Garth Hitchens, KG7GA, and Trey Garlough, N5KO.

The ARRL Letter  
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September 10, 1999



## Solving Telephone RF Interference - Helpful Hints and Suggestions

With the increasing popularity of complex and computer-aided home telephone units manufactured by numerous companies worldwide comes a corresponding increase in both the quantity and severity of telephone interference caused by local radio broadcast transmitters. The new telephones, both domestic and imported, are the most susceptible and delicate ever built, and few manufacturers of the devices have given much consideration or effort to designs which include resistance to RFI and other forms of electromagnetic interference.

Making matters worse is the fact that ground terminal connections for telephones are rarely available at the location of an extension telephone, and telephone wiring is all unshielded and exposed.

Telephone interference is caused by radio signals produced in the immediate vicinity that are intercepted by the mass of telephone wiring in the home and outside on telephone company elevated wiring. Signals enter the phone on different conductors, working their way through phone circuits and causing current flow, resulting in voice distortion or noise.

Most telephone interference can be remedied by the simple installation of a telephone filter that plugs simply into the rear of the phone. These devices are designed to insert a choking effect, or loss at radio frequencies, into the phone wiring. They have no effect on the telephone operation. About the only realistic way to resolve phone interference short of making internal circuitry changes to the phone is by choking the RF signals before they enter.

There are two ports of entry that interfering signals can enter a phone unit. The first, and most common, is through the house wiring and into the telephone set directly as mentioned above. The second is through the handset cord (cord attaching the handset to the phone body). In nearly all cases a telephone line filter will be part of the solution to eliminate the interference. But in cases where the line filter is not completely effective another small filter device in the handset lead may be needed to bring back quiet enjoyment of the unit. An easy way to judge for yourself if the handset cord is suspect is to make a short handset cord about 6-12 inches long with the cord and tools available at most radio parts stores. If

the interference is not present when the short cord is used to connect the handset with the phone body then the handset cord will probably have to have it's own filter installed. If the phone has a speaker then simply disconnect the handset cord and run the test with the internal speaker (and a line filter installed).

If a line filter and handset filter are both installed and interference persists, then it's time to recognize that the telephone itself is inherently hypersensitive to external electromagnetic fields. Possible cures are replacement of the phone with a different type or brand, or internal circuitry modifications done by a local technician. Generally in our experience the worst offenders of telephone interference susceptibility are AT&T and Panasonic manufactured units. The best performers are built by Radio Shack / Tandy.

If you go shopping for phone filters obtain a unit with at least 30db measured attenuation in the HF range, (3 to 30 Mhz. ). If the filter manufacturer doesn't publish his figures, shop elsewhere. And get one that is designed to prevent BOTH common mode and differential mode interference.

For the most part telephone interference is the easiest type of interference to deal with, but sometimes it can be insidious. Don't be afraid to experiment with different combinations of filters, phone locations, or lead lengths to seek a final conclusion.

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## Bell Rotor History

*From the Web pages of Craig Henderson-N8DJB, C.E.O. of Rotor Doctor. This appeared in the August-September 1999 edition of the "LOG", the newsletter of the West Park Radiops, Glenn Williams-AF8C Editor.*

The general line of bell rotors was developed at Cornell-Dubilier Electronics about 1950, starting with the TR-2 and TR-4 series of rotators designed for the newly popular directional TV antennas. As Ham Radio antennas became larger and larger during the 50's, the need for larger rotators became evident. So sometime about 1956, work started on a heavier design with a separate brake feature to keep the antennas from windmilling.

The Ham-M was the result of beefing up considerably the TV rotator design with stronger, heavier gears, the wedge brake, and an improved south-centered meter marked in degrees from 0 to 360. The first Ham-M's, series I and 2, debuted in November, 1957 and used a wiring format that was different and not compatible with later units.

Ham-M series 3 showed up late in 1959 after numerous complaints about the wiring, meter flutter and the backward scale. Series 3 revised wiring DOES MATCH the current models. There is an improved grounding system for the meter feedback circuit, and a north-centered scale. Ham-M's continued until 1974 through Series 4 and 5 with minor improvements in reliability.

HAM-2 or HAM-II debuted around 1974-1975. Aside from rumors, the most logical explanation for the change was a reworked design for the separate brake control because as antennas continued to grow in size, the instant stopping feature of the older style was causing more and more breakdowns. The rotator units were the same. The new control was larger, therefore lending itself nicely to later options, Early Ham-II control covers were two shades of brown; later model covers were black and white. Both controls had a gold faceplate and three plastic levers for direction control, along with front-mounted calibration and on/off switches.

HAM-3 or HAM-III came out in the spring of 1977 to fulfill the needs of contesters and other big-guns whose antennas continued to get yet larger. The wedge brake style which had served so well for

almost 20 years was being overloaded more and more often by monoband yagis with boom lengths larger than the average tri-bander. The pointed steel brake wedge evolved into being squared off on the end. A new brake housing design was built to match. This was an incredible improvement, and is still being used. Also at that time, the control was modernized internally with a printed circuit board to replace the old point-to-point wiring style. A disc pre-brake was also added to the motor to stop coasting.

HAM-4 or HAM-IV came soon after the Ham-3, about January 1979, because all these new larger antennas tended to break the die-cast ring gear used until then. The improvement consisted of making the ring gear out of low-grade stainless steel machined to match other gears and the main casting. The other most noticeable change was the switch to black plastic covers on the control unit, with a black faceplate.

Other changes within the next few years included changing the old rotary on/off switch to a toggle switch and redesigning the indication potentiometer to improve the grounding for more reliable meter indication.

In 1981, TELEX-HYGAIN bought the rotator portion of CDE and continued to build the worlds most popular rotators, the Ham-4, T2X, and several smaller models. However, as the years progressed, the material in the brake wedge somehow changed, and problems started to develop (such as broken wedges) in 1985. Late in 1987, C.A.T.S. produced some hardened steel wedges and Hygain followed suit in November of 1988. This was the last major change to date on this series and its popularity continues.

Starting in September 1977, CDE produced a restyled unit commonly called the T2X or TailTwister. It used much heavier castings, was painted a flat black color, and contained an extra row of ball bearings located at the bottom of the a thicker brake casting. Therefore, the T2X rotator will support heavier antennas, and is much more tolerant of side thrust when pipe-mounted with a lower adapter. Originally, the T2X had a specially-made wedge that was much different than the smaller models, but this proved to be a problem. After several different designs the whole brake assembly was changed in 1984 to a similar, but not identical system like the Ham-4. One point worth mentioning is that all internal components such as the motor and all gears are the same as the HAM4. This is

not widely known. The only other change from the HAM-4 is the use of LED indicators in the control for showing activation of the brake and direction levers.

## Examination Schedule for November

11/03/99 (Wed.) Farmington  
 Marc Uhrey, AB7PL  
 Phone (H) 771-0105 (W) 536-4782

11/10/99 (Wed.) Mantua  
 Contact: Niko Takahashi, AA7OL  
 Phone: (435) 753-9544

11/17/99 (Wed.) Provo  
 Contact: Steve Whitehead, NV7V  
 Phone: (H) 465-3983 (W) 225-5200

11/26/99 (Fri.) Vernal  
 Contact: Karl Swain, KJ7ZQ  
 Phone: (435) 789-3164

11/30/99\* (Tues.) Salt Lake City  
 Contact: Eugene McWherter, N7OVT  
 Phone: 484-6355

\*Only Novice and Technician elements (1A, 2, and 3A) given at this session.

For more detail either call the contact or checkout the information on our web page  
<http://www.xmission.com/~uarc>

## A Blast from the Past

You may recognize the second of these minutes from March 12, 1931, since they were published in the October issue of *The Microvolt*. The obvious reason that they appear again this month is because we now have another set of minutes also purporting to report on a totally different meeting of UARC on March 12, 1931. Curious - they are both signed by W. D. Green, UARC Secretary-Treasurer, but as far as I can determine he is the only person mentioned in both meetings. This would be a little early for human cloning, so there are two possible explanations. First, perhaps both meetings were indeed held on the same date and Mr. Green rushed from 3018 South Highland Drive to 412 South 4<sup>th</sup> West and took the minutes at both meetings; and second, and I must admit in a

more serious vein, a more likely scenario, that the wrong date was attached to one or the other.

Bruce - KI7OM

March 12, 1931.  
Salt Lake City.

The regular meeting of the Utah Amateur Radio Club was held at the home of Leonard Walker, 3018 Highland Drive. The minutes of the last meeting were read and approved. Mr. Stearns introduced Mr. Laskey of K D Y L and of the U. S. Naval Reserve. Mr. Laskey was an old amateur with the Colorado Wireless Association "CWA" in the rotary spark days. Mr. Laskey outlined in detail the purpose of the Naval Reserve going into detail of its working and furnished application blanks for those who desired to enlist.

Mr. Carman gave a very interesting paper on 5 meter receivers and transmitters going into detail of some of his experiments in this work.

After enjoyable refreshments the meeting adjourned.

W D Green  
Secy-Treas.

Document Scanning: Alan Seyboldt, N7OI

Salt Lake City March 12, 1931.

The regular meeting of the Utah Amateur Radio Club was held at the home of Ed Hardley 412 South 4th West. The minutes of the last meeting were read and approved.

A short discussion of the Low Power Contest followed which closed for the 40 meter band at midnight on March 12th.

Mr. Carter was appointed chairman of the Code Practice School and enlisted several students immediately.

Mr. Giles presented his paper on "The Electron Theory" in a very interesting and comprehensive manner. A lively discussion followed in which Mr. Hardley and Mr. Vogeler took a prominent part.

Mr. Carman announced that he hoped to have news that Mr. Johnson and Mr. Irvine would present their photographs of transmitted radio signal for the next meeting.

After refreshments the meeting adjourned.

W D Green Secy-Treas.

Document Scanning: Alan Seyboldt, N7OI

## November Meeting: Homebrew Night

It's that time of year again: November 4 is UARC's annual homebrew night!

The November meeting will be devoted to showing off everyone's newly home-constructed amateur radio equipment. If you have built anything recently that can be used in some phase of amateur radio, bring it along to show off. It can be a transmitter for your own newly invented mode that will revolutionize communications, or it can just be something that makes life a little easier around the shack. Keyers, amplifiers, QRP transmitters, VHF converters and transverters, phone patches, and power supplies are examples of popular homebrew projects. So, whatever you've been working on this year, bring it along and show everyone what you've done.

We will have the inimitable John Bradshaw, KA7TGR, to be master of equipment and watching others do likewise.

Each person with an item to display will get a few minutes to show off what he has done. If your 160-meter beer-can beam is a little too large to bring to the meeting, just document it well with pictures and diagrams. In any case, be prepared to share all the memorable moments of designing, building, and debugging. Or, at least, all the ones that will fit into about three minutes.

In addition, the ever-popular "Fred, the book lady" (KI7KM) will be there with the latest ARRL books. Greg Smith, KD7APZ, will be available to help you sign up for ARRL membership or renew your existing membership. There will be a chance to meet the people you've met on the air and find out what they really look like.

To finish it all off there will be a choice of "Dime Limes" or "meetings after the meeting" that occur over pizza or other edibles. Don't miss it!

## Ham Hot-Line

The Utah Amateur Radio Club (UARC) has a Ham Hotline, 583-3002. Information regarding Amateur Radio can be obtained, including club information, testing, meeting information, and membership information. Leave your name, telephone number and a short message on the answering machine if no one answers and your call will be returned.

United States Postal Service

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