

# Kilowatter

The voice of the KW Amateur Radio Club

March 2007

Since 1922

Kitchener-Waterloo Amateur Radio Club  
133 Weber St. N. Suite #3-138  
Waterloo, Ontario  
N2J 3G9

EDITOR: Dennis Tabbert VA3DLT  
PHONE: 463-9641  
email: va3dlt@rac.ca  
Web site: <http://www.kwarc.org>

## MONDAY'S MEETING

**Date:** Monday March 5th 2007  
**Time:** 7:30pm  
**Place:** RCAF Wing 404 Club. End of Dutton Dr. Waterloo. Off Weber St. N  
**Topic:** VE3WFR presents Wind and Solar Power for the Home and Cottage

## UPCOMING EVENTS

<a href="#">Peel Amature Radio Club and the Mississauga Amateur Radio Club</a> Saturday, March 31, 2007, Brampton ON	<a href="#">IARC Eleventh Annual Flea Market</a> Iroquois Amateur Radio Club Saturday, April 7, 2007, Iroquois ON
<a href="#">Durham Region Hamfest (31st Annual)</a> North Shore ARC & South Pickering ARC Saturday, April 21, 2007, Whitby ON	<a href="#">23rd Annual Smiths Falls Amateur Radio Flea Market</a> Rideau Lakes Amateur Radio Club inc. Saturday, May 12, 2007, Smiths Falls ON
<a href="#">Ottawa Amateur Radio Club 11th Annual Hamfest</a> Ottawa Amateur Radio Club, Inc Saturday, September 1, 2007, Ottawa (Carp) ON	<a href="#">Hamilton Amateur Radio Club "HAMFEST 2007"</a> Hamilton Amateur Radio Club Saturday, October 13, 2007, Ancaster ON
<a href="#">Annual K.W.A.R.C. Field Day</a> Doon Pioneer Village June 23rd - 24th	<a href="#">Central Ontario Hamfest &amp; Fleamarket</a> Guelph ARC & Kitchener Waterloo ARC June 9, 2007, Fergus ON

### KWARC Directors 2006-7

<b>President</b>	Bob Pelling	VE3XNB	885-9995
<b>Vice President</b>	Dennis Tabbert	VA3DLT	463-9641
<b>Past President</b>	Gord Hayward	VE3EOS	744-7205
<b>Treasurer</b>	Al Macdonald	VA3TET	741-0281
<b>Secretary</b>	Ben Sasiela	VE3ST	748-0445
<b>Director</b>	Tedd Doda	VE3TJD	634-5949
<b>Director</b>	Bill Riddell	VE3WFR	571-9875

### The Executive Committee Chairs

<b>Program</b>	vacant		
<b>Technical</b>	Tedd Doda	VE3TJD	634-5949
<b>Packet</b>	Tedd Doda	VE3TJD	634-5949
<b>Database Mgr</b>	Dave Schwartz	VA3DGS	884-3594
<b>Bulletin Editor</b>	Dennis Tabbert	VA3DLT	463-9641
<b>Edu. Co-Ord</b>	Ron Gimbel	VE3DBD	584-2009
<b>Chief Examiner</b>	Vern Stroud	VE3RVS	743-9342
<b>Auto Patch</b>	Ben Sasiela	VE3ST	748-0445
<b>ARES Manager</b>	Larry Gorman	VE3LGN	884-6782
<b>CANWARN Mgr.</b>	Ben Sasiela	VE3ST	748-0445
<b>QSL Manager</b>	Gord Gibson	VE3NQG	893-5148
<b>Inventory</b>	Ben Sasiela	VE3ST	748-0445
<b>Field Day</b>	vacant		
<b>Webmaster</b>	Dennis Tabbert	VA3DLT	463-9641
<b>Bereavement</b>	Marg Cassel	VE3RE	634-5139
<b>Flea Market</b>	Dennis Tabbert	VA3DLT	463-9641
<b>QCWA Rep</b>	Harold Braun	VE3DWH	884-2388

### KWARC Owned Repeaters/Nodes

Mode	Call	Freq.	PL	patch	Location
Voice	VE3KSR	146.970	131.8		Baden Hill
Voice	VE3RCK	146.865	131.8	Open	Mannheim
Packet	VE3KSR-0	145.010			Baden Hill
Packet	VE3KWQ	145.090			Waterloo
Voice	VE3IXY	224.340	131.8		Mannheim
IRLP	VE3RBM	444.875	131.8		Mannheim
Echolink	VE3SED	53.370	131.8		Baden Hill
Voice	VE3SED	442.200	131.8		Baden Hill
Special Events		147.510			Kitchener

### Other Area Repeaters/Nodes

Mode	Call	Freq.	PL	patch	Location
Voice	VE3ERC	444.700	N		Elmira
Voice	VE3KFM	442.000	Y	open	Kitchener
Voice	VE3RND	145.330	Y		Plattsville
Voice	VE3SWR	146.790	N		Cambridge
IRLP	VE3WFM	147.090	N		Waterloo
Voice	VE3WWW	146.835	N		U of W
Voice	VE3RSS	147.030	N	members	Acton
ULR Link	VE3BHR	447.075	Y		Baden Hill
Voice	VE3RKL	443.850	N		Guelph
Voice	VE3ZMG	145.210	N		Guelph
Packet	VE3VIQ	145.570			Guelph
TCP/IP	VE3MKY	145.570			Guelph
TCP/IP	VE3UOW	145.570			U of W B
Voice	VE3BAY	442.350	Y		Kitchener

## *Pres Sez Bob Pelling VE3VXM President KWARC*



Greetings again

Welcome to the March KILOWATTER. Hopefully the worst of the Winter is now behind us. Daylight Savings Time comes early this year. It starts on Sunday March 11 at 2AM. Remember you set your clocks AHEAD by One Hour.

Also Bonnie has asked me to remind everyone that we need ZEHRS cash register tapes.

The February meeting was cancelled due to the threat of bad weather and in consideration of those that had to drive on the highways instead of just in the city.

Once again I remind everyone that Field Day is coming and we still need a Chairperson to coordinate this event. If you are interested PLEASE contact any member of the Exec and let us know. We also need Band Captains and operators. We will be at Doon again this year, unless someone can give us a suggestion for a better location.

Also once again a reminder about the Flea Market in Fergus. That will be June 9, 2007 at the Centre Wellington SportsPlex.

I received a Thank You Letter from the Food Bank of Waterloo Region thanking us for our donation at Christmas. This year the Club donated 45 lbs of food to the cause. Congratulations and Thank You one and all.

If anyone has any ideas on what we as a Club might be able to do to help celebrate the 100<sup>th</sup> anniversary of Scouting please share your ideas with the Exec. Hopefully we can come up with some ideas to help introduce the Scouting organization to HAM RADIO.

This month's blurb is going to be a little short, as I have had some health problems and in fact spent a few days in St. Mary's Hospital. I am feeling a little better but a little weak.

73 de Bob VE3XNB

### *February Meeting Cancelled*



The February General Meeting of the Kitchener Waterloo Amateur Radio Club was cancelled due to severe weather. Reports during the day from travelers suggested that driving in and around Kitchener was extremely hazardous with blowing strong winds, and drifting snow causing white-outs occasionally, as well as cold temperatures with wind chill factors below -20. After considering the safety of the members, it was decided to declare the meeting cancelled. The web master of the club sent out to club members an e-mailing advisory of the cancellations as well as the executives made periodical announcements on

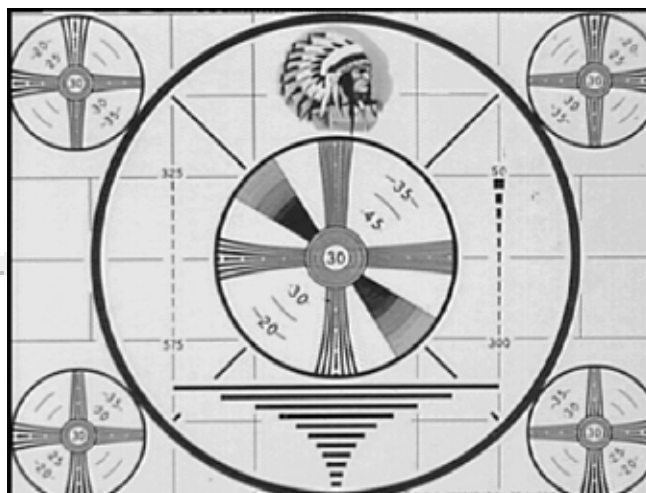
the club repeater VE3KSR of the cancellation. The popular evening scheduled of "show-n-tell" may be rescheduled to a later meeting time permitting. A cancellation sign was posted at the door of the 404 wing also to this affect. The executive express regrets to anyone that was missed of the notification, or did not hear the announcements on the club repeater. Whenever circumstances require changes to the meeting schedule due to weather, members are encouraged to listen on the club owned repeaters for announcements, or check the club's web site prior to any meeting where cancellation notices are posted.

Ben Sasiela

VE3ST

Club Secretary

## *Bill Graham VE3ETK THE 'INDIAN HEAD' TEST PATTERN*



If you are old enough to remember black and white television, then you will surely remember this test pattern which was normally broadcast before and after the end of the broadcast day. Most people thought that it was a card with a camera focused on it, but that was not the case. In fact, the cameras of the day were so fragile that 'looking' at the same picture for more than a few seconds would 'burn' the image into the photo sensitive surface.

This test pattern, also known as the Monoscope, was created electronically, and its purpose was to provide the TV owner or Repairman with a reference to adjust the picture ratio (perfect circle), the focus (fine lines), and brightness/contrast (gray wedges). The TV sets of the time were somewhat less than stable.

The monoscope was really a vacuum tube very much like an oscilloscope, but with a metal plate in place of the phosphor.



On the electronic side of the plate the test pattern was etched in carbon, and as the beam scanned across the plate the carbon presented a varying resistance that could be converted into video. The whole device was built into a 19 inch rack mountable chassis with a set of controls for the station engineers to make fine adjustments.



## MORE ABOUT THE ICONOSCOPE:

I felt that last month's piece about the Iconoscope didn't give a clear idea about how the tube worked, so I'll just add a bit more here to do that.

The circular part of the tube was about 8 inches across, and you can clearly see the plate inside that was coated with selenium particles. If you remember black and white television, you probably remember



selenium rectifiers – they were always painted. That was because selenium (besides being a diode) is light sensitive. When a picture was projected onto the plate the selenium resistance varied, and the electron beam (from the neck of the tube) would produce a variable voltage at the output when it was scanned across the plate, that could be turned into a video signal that matched the projected image.

### [Gord Hayward VE3EOS Boatanchor Rehabilitation - The R392](#)



Before the R390A came to live with me I had been using its little brother, the R392. This is the jeep mounted version built in 1951.

Mine is serial number 498 of the original Collins contract. Its very similar in design to the R390 (non-A version) but there are a few major differences. It's a lot smaller and runs on 28 volts DC.

Unlike the 19 set, there is no dynamotor. Both the filaments and the plates run on 28 volts. Its almost unbelievable that even a 12AU7 will run at that plate voltage, but they do. Other than the tube lineup and the box size the 390 and 392 are very similar, triple conversion and 6 IF stages, all permeability tuned with lots of gears.

I got the 392 at a local flea market for a song - cheap enough that it would be worth the gamble if it didn't work. The first challenge was finding information, but there's lots on the web. The connectors aren't standard (except for the US Signal Corps) but I didn't want to



do any blacksmithing. I've learned that lesson well with the ATR5.

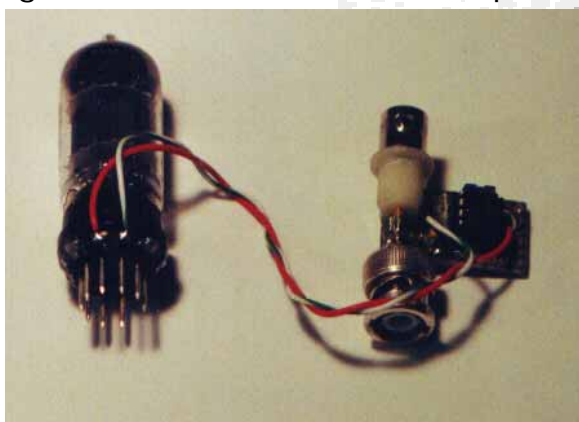
Rather than soldering to the pins or replacing the connector as I've seen in other sets, I used Molex socket inserts to push onto the connector pins. With a bit of heat shrink tubing it looked great.

(Now that I have the real connectors that Kludge is retired.)

When I opened the waterproof case the insides were in pristine condition. The sealed box means that there is never the usual flies and mouse droppings from a set long in less than perfect storage.

Even the tools, two Bristow spline wrenches and two tube pullers, were still there. The gears in the tuning system ran smoothly and since there was no internal power supply with questionable electrolytics, I fired it up. It ran nicely. I did get the bargain of the century with this one.

The first job was calibrating the S-meter. The original wasn't there because radioactive dials aren't being released as surplus by the US government. The originals had radium paint. Radium dials are not a big problem if you NEVER open them. Any paint dust will get you. Its even legal to have a few. The regulations for nuclear materials allow a person to have up to 10 radio-luminous dials. The replacement meter is a 100 uA meter and a series resistor allows its range to be adjusted. I calibrated it so that 10 uA change corresponds to a 20 dB input change. The meter goes down to S6 before it stops reading, which is acceptable.



The IF is brought out after the 5th IF stage for RTTY reception but I wanted to add a product detector. There's an internal cathode follower to isolate the IF feed but it saturated on strong signals.

After going over the cathode follower stage, the saturation was not a failure but due to the design. The second job was to replace the cathode follower with an OP Amp buffer designed to run on the 28 volt supply and to be easily plugged in. I intercepted the 12AU7 tube pins with a 9 pin

adapter and put the circuit in with no modifications to the set as shown in the pictures. One shows the OP-Amp board and the other the board installed in the radio.

The R392 is a great set, only slightly second to the R390A. Although it isn't my main set, it still is operational and is a superb backup unit.

[Central Ontario Hamfest 2007 - June 9<sup>th</sup>](#)

So far, we have volunteers for the following:

Mike Peleschak, Accounting, Flyer and Draw Ticket Production,  
Wrist Band Attainment, Arena rental, and Vendor Contact  
Dennis Tabbert, KWARC Co-Chair, Grand Events table rental,  
Flyers to other hamfests  
Mike Scott, GARC Co-Chair, Pylons, Flyers to other hamfests  
Larry Gorman, Admissions Table  
Linda Willis, Vendor Information Table  
Tedd Doda, Front Lot  
Bob Housser, Back Lot and Tailgate Vendor Admission  
Ben Sasiela, PA System Installation  
Mike Willis, Guelph EMCOMM trailer transportation

Please note that the following jobs are still open:

Door Prizes (maybe Gord VE3NQQ can be talked into this again)  
Direction signs (maybe Norm VA3NDK can be talked into this again)  
Back Security  
Marketing and Advertising.

Also, plan on coming out on Friday June 8th at 6:30pm to help set up for this most financially rewarding event. Please support your club.

For more information, or to volunteer, please call:  
Mike at 624-7352, or Dennis at 463-9641.

[Almac, Sept 21/04](#)  
[Elmira Radio Club](#)  
[The Status of Digital Speech](#)



The first attempt at digital transmissions can be traced back to the ancient Syrian and Chinese. They used a primitive form of semaphore. The Romans used a better form to alert commanders of enemy incursions. Even the North American Indians used smoke signals (a form of digital code) to reliably convey a whole series of coded messages. Modern navies still use flag and light beam semaphore. As you can see,

digitally coded messaging is not a new invention, however, its application to more modern communication practices has extended its use into electromagnetic communications.

The first practical commercial use was the telegraph usually using a proprietary code system using dit's and dah's. As usage increased, a standard was finally recognized – Morse code.

The first radio transmissions were only digital. A spark gap transmitter was manually pulsed with a key using dots and dashes. As transmitters and receivers developed, the obvious evolution to voice occurred and the great commercial radio revolution spun into the forefront. AM modulation – a carrier and the upper and lower side band was used. Although information was conveyed in this fashion, the RF spectrum and energy efficiency were poor. Each side band contained the same information and occupied a bandwidth equal to the max. Modulation frequency. Each side band only used 25 per cent of the radiated power. The carrier gobbled 50 percent of the power and conveyed no information. For local radio stations with high power, this was not a problem. But!! What about the poor amateur?? In the early days, a few watts of power were all that could be managed. How to extend the range??

As you reduce the bandwidth of a transmission, your power density increases. A normal voice transmission would occupy 6 KHz of bandwidth. We will use 1 watt of power. Since we can only use one side band, the useful max. energy is only 0.25 watts (in reality an average power per side band seldom exceed 1/6 of the carrier). This equals a power density of  $0.25/6000 = 0.0000416$ . This number will become more realistic in a moment.

Now for the sake of argument, lets make our 1-watt transmitter into a CW transmitter. A very fast CW operator will never exceed 100 Hz of bandwidth. Since the carrier and the sidebands all carry the information, we can now use one side band, and the carrier power for information conveying. The power density for this transmission equals  $.75/200 = 0.00375$ . That is a power density Improvement of 90 – an 11 db improvement – and this does not account for receiver band width/signal to noise improvements.

CW has an immediate advantage and this did not escape the amateur and many commercial and military users. Additional schemes were applied and more automated systems such as Teletype and telex were introduced. The downside was increased bandwidth.

### *Silly Side Band for voice*

Single side band is a very good way to halve the band width an increase usable power by a factor or 3 since the carrier (50% of the power) and one side band (25% of the power) are no longer used. Using our power density analogy,  $1/3000 = 0.00033$ , approx a 7 fold improvement in power density!!

Lets go back to Voice.

In the early 1900's voice recording became available on cylinders and disks. This form of mass media was popular for almost 100 years with little change in the basic premise. Then along came the CD. To encode enough information onto the CD, a new scheme was needed. It had to eliminate the possibility of damage because of too-many playings, and provide better fidelity, and programming per disk. The answer was to record digitally with a scheme that provided for data redundancy and data compression without sacrificing quality. The modern use of 1 and zero's was put to a non computer commercial use.

Without getting into the "deep" theory of how to create a digital representation of an analog signal, it will be sufficient to say that you need to sample the audio signal at a rate of at least 2X the highest frequency that you want to preserve. If we have a 3KH audio bandwidth, the sample rate would have to be at least 6KH. There is no bandwidth saving here!! However, we are now in the realm of digital, and a series of one's and zero's can be analyzed further, if we can understand what we are looking at.

Understanding speech sounds is critical to how we can reduce the bandwidth of a digital signal. As it turns out, there has been extensive work in the area and is on going. Some of the more important aspects of what was found are as follows:

1. The ear is less sensitive to pitch as the sound level is increased.
2. The ear is less sensitive to pitch changes as the frequency increases.
3. The "loudness range of the ear is limited, and exceeding the upper or lower limits has no value.
4. The duration of sounds under 30 ms have no value for speech.

Keep that in mind and lets review what hams have been doing for some time to improve speech intelligence. Most modern transceivers have speech processors that perform compression – reduce the loud, and increase the soft passages. Used in moderation, this will increase the average power of a signal. Most transceivers also have very good IF bandwidth filters to remove useless high frequency signals and noise. Some even have a limited digital speech processor to further improve intelligence. All of these processes use the analog signal to attain improvements.

### *Digital voice bandwidth compression.*

Early on in the development of digital it became obvious the certain mathematical schemes would aid in the analysis of the data. Fournier analysis became the method of choice because it produced a mathematical output representing frequency and amplitude. Further developments and refinements produced Fast Fournier analysis (FFA) and Damn fast Fournier analysis (DFFF). Needless to say that this is over my head, but the net result was the ability to take advantage of some of our deficiencies, namely our pitch sensitivity. The voice produces a complex array of sounds. But much of the sound energy is redundant and provides an opportunity to eliminate this information and save bandwidth. These mathematical tools let them exploit the ear's characteristics – limit the dynamic range, eliminate similar sounds that are very close together, limit the frequency range, and eliminate all sounds under 30 ms in duration. Further analysis of the sounds allows a tone to be represented by a short command

that describes amplitude and tone. Most schemes now analyze blocks of 30 ms of speech with a digital description. The interesting part of this is that the recovered digital audio sounds similar, but looks different on a scope – the non essential bits were blown away. This field of research is on going for additional compression opportunities.

The European's have developed a new International Digital Audio Broadcasting standard that incorporates much of the above, with Stereo, and quadraphonic capability, messaging, data redundancy, and a scheme that automatically allows the receiver to reduce band width (and fidelity) as conditions deteriorate. Thale systems are in the forefront of this scheme. They have a modified version of this for amateur radio. You may have seen this promoted by the Big guys of amateur radio.

The down side of the Thale scheme is it uses a 3KH bandwidth. This scheme was originally developed to broadcast music so there is a lot of compression overhead not needed for amateur radio.

### *The Down Side*

Bottom line is: There is no amateur standard and individual manufacturers are all trying to promote their products with no regard for standards. Look at what has happened to digital modem technology. We have Amtor, Practor, Hellschriber, and many many more. Each one is an improvement over the other, but there was and is no migration path. It appears that digital voice is headed in the same direction unless guidelines are imposed. The European's have at least started a process, but this really does not apply to amateur radio.

### *Digital Transmission advantages*

There are existing schemes now being experimented with that are for limited bandwidth speech that only occupy 500 hz of bandwidth!!

Uses SSB modulation

Always using full power

Reduced bandwidth

No static – you have a perfect signal, or you don't.

Because it is digital, a well-designed system can predict and look for signal in the noise!

Data redundancy – missing signals can be reconstructed.

Much better signal to noise ratio.

Opportunity for ongoing improvements.

### *It is too soon to buy into this*

