

# WAVES

Chattanooga Amateur Radio Club P.O. Box 23121 Chattanooga TN 37422 <http://w4am.org>

June 2010  
Volume 22, Issue 06

**CLUB MEETING Thursday June 3. Program is “bring your APRS tracker for Show and tell”. Power supply with Anderson Power Pole will be available. You supply antenna if you want to demonstrate.**

## The Amateur's Code of Conduct

### The Radio Amateur is

**CONSIDERATE...**never knowingly operates in such a way as to lessen the pleasure of others.

**LOYAL...**offers loyalty, encouragement and support to other amateurs, local clubs, and the American Radio Relay League, through which Amateur Radio in the United States is represented nationally and internationally.

**PROGRESSIVE...**with knowledge abreast of science, a well-built and efficient station and operation above reproach.

**FRIENDLY...**slow and patient operating when requested; friendly advice and counsel to the beginner; kindly assistance, cooperation and consideration for the interests of others. These are the hallmarks of the amateur spirit.

**BALANCED...**radio is an avocation, never interfering with duties owed to family, job, school or community.

**PATRIOTIC...**station and skill always ready for service to country and community.

*--The original Amateur's Code of Conduct was written by Paul M. Segal, W9EEA, in 1928.*

TAG Skywarn Tuesday Night 8 PM 146.610

Emergency Services Thursday night 8 PM 146.790

CARC Sunday night net 9 PM 146.790

Chattanooga Amateur Radio Club Regular Meeting 5/6/2010

Officers present: Mark Rose, Rick Curtis, Jim Knight, Susan Miller, Jim Bowman  
Directors present: Tom Cash, Ben Timmerman, Tom Wolfe, Susan Miller, Bill Dobbs

7:00 pm

Mark began the meeting by appointing a new a financial committee. Members of the new committee are Ben Timmerman, Tom Wolfe, Robert Berman and Rick Curtis. Jim Knight is chairman of the Financial Committee.

Mark wants the new committee to discuss Hamfest expenses and upcoming expenses to fix the 61 repeater. A motion was made to replace all the equipment on the repeater, motion was seconded and passed. Financial Committee will find prices on the equipment needed.

Mark asked if everyone is getting their Waves.

A motion was made to accept the minutes as printed in the Waves. Motion was seconded and passed.

After the minutes were accepted as written, Jack Green says he did not say " Jack Green is checking on where the Red Cross wants to put their radios."(as written in the May Waves) This sentence is being corrected to read , "Jack Green said the 800 Radios are for the Red Cross volunteers and employees and he will talk to Red Cross personnel to see where they want to put them."

The 800 radios are not with the Red Cross any more and Jack Green is working to get them back for Red Cross.

Jim Knight gave the treasurers report:

Checking account: \$ 9435.63

Hamfest account     9605.98

Total     \$19041.61

Lowell Bennington reported (via Jim Knight) that we need to maintain our 99N form to keep our tax exempt status.

Our radio room at the Red Cross building is almost finished. It's looking very nice. Needs some radios now. Loyd reported that he has talked with the city about putting up our antennas. We will need to draw a diagram, accompanied with a large descriptive explanation so that the City Commission can vote on it.

A motion was made and seconded to give Mark Rose's dad the extra sheets of plywood left from the construction in the radio room. Thanks from all of us to Mark's dad for all his donated work in the radio room.

Jim Knight received a DVD from Gail Boots on the Special Olympics. If anyone would like to watch it please contact Jim.

Tour De Cure could still use some volunteers. Contact Ben Timmerman.

Rick Curtis gave a fun program on packing a "Go-Box".

Charlie Curle has spent some time in the hospital. He is now home and needs our prayers and well wishes .

Jack Green gave a little talk on respect.

Meeting was dismissed.

The next CARC meeting will be on June 3, 2010 at 7:00 at the Red Cross building on McCallie Avenue. The Board of Directors will meet on May 19, 2010 at 6:00@ Ryan's on Hixson Pike.

Respectfully submitted'  
V. Susan Miller, KI4RZJ  
CARC Recording Secretary

## International Phonetics

Most of us know the phonetics used for our own call sign very well but when we hear another call sign phonetically or give one phonetically, we sometimes hesitate and really have to think twice before understanding or getting it correct. Maybe a little verbal practice would help resolve this issue.

<b>A</b> Alfa	<b>J</b> Juliet	<b>S</b> Sierra
<b>B</b> Bravo	<b>K</b> Kilo	<b>T</b> Tango
<b>C</b> Charlie	<b>L</b> Lima	<b>U</b> Uniform
<b>D</b> Delta	<b>M</b> Mike	<b>V</b> Victor
<b>E</b> Echo	<b>N</b> November	<b>W</b> Whiskey
<b>F</b> Foxtrot	<b>O</b> Oscar	<b>X</b> X-Ray
<b>G</b> Golf	<b>P</b> Papa	<b>Y</b> Yankee
<b>H</b> Hotel	<b>Q</b> Quebec	<b>Z</b> Zulu
<b>I</b> India	<b>R</b> Romeo	

Using these internationally accepted phonetics is not to say that our own made-up phonetics are not permissible on the local repeaters when talking with our everyday friends. One of my favorites that I often hear is "Another Day For Fun." What can you make with your call?

## WHAT ARE OSCILLATOR BASICS?

Some people regard the design of RF Oscillators and oscillator basics in particular, to be something akin to a "black art" and after many years of swearing at "cranky" oscillators I'm not all too sure they are all that wrong. I suggest you ensure you remember this old saying:

"Amplifiers oscillate and oscillators amplify" - unknown

### INTRODUCTION TO OSCILLATOR BASICS

When I was a kid, yes I can remember back to the late 1940's, we collected all manner of junk. Cool was anything remotely electrical and, of course bicycle dynamos, lamps or motors were even "extra cool".

We as precious little seven year olds conceived - all budding nuclear physicists that we were - of this real smart idea, obviously nobody had ever thought of this before.

"Why don't we connect a motor to a generator, so the motor drives the generator, providing electricity for the motor, which continues to drive the generator and it'll go on, and on, and on for a hundred years and we'll become rich and world famous!"

Of course we had no concept of frictional losses (I think that's right) way back then. Nor had the words "perpetual motion" passed our ears.

The whole point of that little story is to crudely demonstrate the principle of how an oscillator works. If you can follow that childishly naive concept then you will kill them in this.

### PRINCIPLES OF OSCILLATOR OPERATION

Every oscillator has at least one active device (smarties don't complicate matters for me - just read on) be it a transistor or even the old valve. This active device and, for this tutorial we'll stick to the humble transistor, acts as an amplifier. There is nothing flash about that. For this first part of the discussion we will confine ourselves to LC Oscillators or oscillator basics and I'll keep the maths to an absolute minimum.

At turn on, when power is first applied, random noise is generated within our active device and then amplified. This noise is fed back positively through frequency selective circuits to the input where it is amplified again and so on, a bit like my childhood project.

Ultimately a state of equilibrium is reached where the losses in the circuit are made good by consuming power from the power supply and the frequency of oscillation is determined by the external components, be they inductors and capacitors (L.C.) or a crystal. The amount of positive feedback to sustain oscillation is also determined by external components.

## HARTLEY OSCILLATOR

I decided to use the [Hartley Oscillator](#) for the simple reason it's my favourite. Recently it was discussed that your favourite oscillator was likely the one which worked best for you and I think that is quite true. So here it is in it's most simplified form.

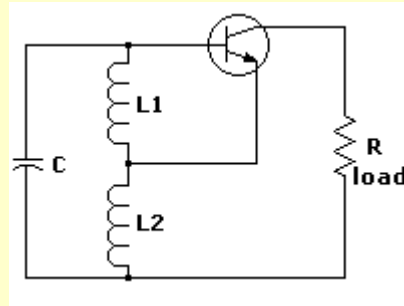


Figure 1 - schematic of a hartley oscillator

## Colpitts Oscillator

The basic Colpitts oscillator circuit look like this and you will see some similarities.

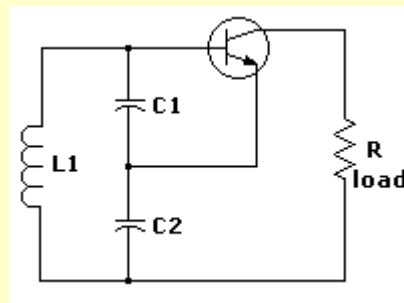


Figure 2 - schematic of a collpitts oscillator

If you consider positive feedback is applied to compensate for the losses in the tuned circuit, the amplifier and feedback circuit create a negative resistor. When  $Z_1$  and  $Z_2$  are capacitive, the impedance across the capacitors can be estimated from a formula I won't lay on you here because it includes beta,  $h_{ie}$ , as well as  $X_{C1}$  and  $X_{C2}$ . Suffice to say it can be shown that the input impedance is a negative resistor in series with  $C_1$  and  $C_2$ . And the frequency is in accordance with:

$$f_0 = \frac{1}{2\pi [LC_1C_2 / (C_1 + C_2)]^{1/2}}$$

Figure 3 - formula - colpitts oscillator

## FREQUENCY OR PHASE STABILITY OF AN OSCILLATOR

Frequency or phase stability of an oscillator is customarily considered in the long term stability case where frequency changes are measured over minutes, hours, days even years. Of interest here are the effects of the components changes, with ambient conditions, on the frequency of oscillation. These might be caused by changes in the input voltage, variations in temperature, humidity and ageing of our components.

Never underestimate the effects of these variations on the frequency of [operation](#). I've gone nuts working on so called precision designs, with precision components, where the frequency wandered at random over several kilohertz over several minutes. Needless to say I'd "messed up".

Short term stability is also of great interest and, again I could lay some real heavy maths on you but I won't. I'll simply say it can be mathematically proven that the higher the circuit Q, the higher this stability factor becomes. The higher the circuit Q, the better the ability the tuned circuit can filter out undesired harmonics **AND** noise.

## REDUCING PHASE NOISE IN OSCILLATORS

1. Maximize the Qu of the resonator.
2. Maximize reactive energy by means of a high RF voltage across the resonator. Use a low LC ratio.
3. Avoid device saturation and try to use anti parallel (back to back) [tuning diodes](#).
4. Choose your active device with the lowest NF (noise figure).
5. Choose a device with low flicker noise, this can be reduced by RF feedback. A bipolar transistor with an unby-passed emitter resistor of 10 to 30 ohms can improve flicker noise by as much as 40 dB. - see [emitter degeneration](#)
6. The output circuits should be isolated from the oscillator circuit and take as little power as possible.

## EFFECTS OF AMBIENT CHANGES ON STABILITY IN OSCILLATORS

A frequency change of a few tens of hertz back and forth over a couple of minutes would mean nothing to an entertainment receiver designed for the FM [Radio](#) band. Such a drift in an otherwise contest grade receiver designed to receive CW (morse code) would be intolerable. It's a question of relativity.

## MINIMIZING FREQUENCY DRIFT IN OSCILLATORS

These are random and not in any particular order.

1. Isolate the oscillator from succeeding stages with a [well designed buffer stage](#) followed by a stage of amplification. Large signals can often then be reduced by a 3 or 6 dB attenuator which also has the benefit of presenting a well defined load impedance to the amplifier. If the stage is feeding a mixer, as is most often the case, then another benefit is the mixer (you are using double balanced mixers?), also see a source impedance of 50 ohms.
2. Ensure the mechanical stability of your oscillator is such that mechanical vibration can have no effect on components, especially those frequency determining components.
3. Supply the oscillator with a clean well regulated supply. If using varactor tuning, doubly ensure the tuning DC voltage is as clean as possible, a few hundred micro volts of noise can be imposed on the oscillator signal. Use back to back diodes for the variable element. Air variables are hard to come by although they offer far superior Q figures. DC tuning tends to be more versatile.
4. Minimize circuit changes from ambient variations by using NPO capacitors, polystyrene are dearer but excellent, silvered mica in my opinion are not what many people believe and are highly over rated.
5. The inductor should be air wound on a coil form with a configuration to maximize Qu. If you must use a toroid, where possible try to use the 6 type as it offers the best Q. Sometimes, for other reasons you might have to use a slug tuned form.
6. Parallel a number of smaller value NPO capacitors rather than using one large one in frequency determining components. For trimmers try and use an air variable. Keep an eye out for small value N750, N1500 capacitors, < 15 pF, when available and are found to be dirt cheap. These are sometimes useful in taming drift in an oscillator.
7. Bipolar or FETS for active device seems to be a matter of personal preference and I've seen some ferocious arguments over that one. Consensus seems to come down in favour of FETS. Me, I'm a bipolar man because FETS hate me pure and simple.

### **Dit- a diddle dot dit.**

[A friend forwarded this interesting story. Source unknown. de Tom N4KG](#)

[Back when the telegraph was the fastest method of long-distance communication, a young man applied for a job as a Morse Code operator. Answering an ad in the newspaper, he went to the office address that was listed. When he arrived, he entered a large, busy office filled with noise and clatter, including the sound of the telegraph in the background. A sign on the receptionist's counter instructed job applicants to fill out a form and wait until they were summoned to enter the inner office.](#)

The young man filled out his form and sat down with the seven other applicants in the waiting area. After a few minutes, the young man stood up, crossed the room to the door of the inner office, and walked right in. Naturally the other applicants perked up, wondering what was going on. They muttered among themselves that they hadn't heard any summons yet.

They assumed that the young man who went into the office made a mistake and would be disqualified. Within a few minutes, however, the employer escorted the young man out of the office and said to the other applicants, "Gentlemen, thank you very much for coming, but the job has just been filled." The other applicants began grumbling to each other, and one spoke up saying, "Wait a minute, I don't understand. He was the last to come in, and we never even got a chance to be interviewed. Yet he got the job. That's not fair!"

The employer said, "I'm sorry, but the last several minutes while you've been sitting here, the telegraph has been ticking out the following message in Morse Code: 'If you understand this message, then come right in. The job is yours.'" None of you heard it or understood it. This young man did. The job is his.

CW IS!

