The

Communicator

May/June 2020

SARC

ARRL FIELD DAY 2020

SARC

PUBLICATION CONTACTS

DEPARTMENTS

IN THIS ISSUE

*Kevin VE7ZD gowns up
to perform surgery on a Kenwood*

Tech Topics
*Daniel VE7LCG with four
fabulous projects*

Solder Smoke
*Steve VE7SXM with an easy
end-fed HF antenna*

QRM ---.- .-. --

...from the Editor's Shack

Do you have a photo or bit of SARC news to share? An Interesting link?

Something to sell or something you are looking for?
eMail it to communicator at ve7sar.net for inclusion in this publication.

It has certainly been quite an eventful few weeks since the last Communicator!

After only the third week of our Basic Amateur Radio qualification course we had to tell the students that we could no longer continue due to social distancing. It took an extra week but we moved the whole course on-line and finished it the third week of April, only one week behind the original wrap-up date. Read more about this on page 75.

At the same time we were also wrapping up our CW course, but had not completed administering the final exam. This gave the students some extra practice time, including a CW session after our weekly Tuesday net. Examinations are being given on a one by one basis while maintaining social distancing rules.

One advantage of this whole experience has been an upsurge in net check-ins. Likely we are not alone in this, but our nets have been better attended than they have in recent memory. Keep checking in!

We are also looking at means to offer virtual meetings. The method and mode have not been decided but we will let you know if and when that happens.

Unfortunately our annual fox hunt has been postponed and we will look at rescheduling it for later in the year, once COVID-19 is under control.

The same goes for Field Day. ARRL has provided an update but the situation may change again before the end of June. While we are keen to participate in the event again this year, and defend our previous high scoring, it already looks like any public involvement will be minimal, if at all.

Enjoy this issue, please share any comments via communicator@ve7sar.net

~ John VE7TI
 Communicator Editor

This Month's Issue...

Will we have a Field Day this year and, will it be 'as usual' or something adapted to COVID?

"If it is love that makes the world go round,
it is self-induction that makes electromagnetic waves go round the world!" *~ Oliver Heaviside*

On the Web
ve7sar.net

Between newsletters, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

Click the links below to follow our presence on the web and social media:

SARC Blog
ve7sar.blogspot.ca

Twitter
@ve7sar

FaceBook
SurreyAmateurRadio

Our YouTube Channel
SurreyARC

SARC Photo Albums
Web Albums
or
tinyurl.com/SARCphoto

The Rest Of The Story…

Oliver Heaviside

A forgotten genius

Early Life

Heaviside was born in Camden Town, London. He was a short and red-headed child, and suffered from scarlet fever when young, which left him with a hearing impairment. A small legacy enabled the family to move to a better part of Camden when he was thirteen and he was sent to Camden House Grammar School. He was a good student, placed fifth out of five hundred students in 1865, but his parents could not keep him at school after he was 16, so he continued studying for a year by himself and had no further formal education.

Heaviside's uncle by marriage was Sir Charles Wheatstone (1802–1875), an internationally celebrated expert in telegraphy and electromagnetism, and the original co-inventor of the first commercially successful telegraph in the mid-1830s. Wheatstone took a strong interest in his nephew's education and in 1867 sent him north to work with his own, older brother Arthur, who was managing one of Wheatstone's telegraph companies in Newcastle-upon-Tyne.

Two years later he took a job as a telegraph operator with the Danish Great Northern Telegraph Company laying a cable from Newcastle to Denmark using British contractors. He soon became an electrician. Heaviside continued to study while working, and by the age of 22 he published an article in the prestigious Philosophical Magazine on 'The Best Arrangement of Wheatstone's Bridge for measuring a Given Resistance with a Given Galvanometer and Battery' which received positive comments from physicists who had unsuccessfully tried to solve this algebraic problem, including Sir William Thomson, to whom he gave a copy of the paper, and James Clerk Maxwell. When he published an article on the duplex method of using a telegraph cable, he poked fun at R. S. Culley, the engineer in chief of the Post Office telegraph system, who had been dismissing duplex as impractical. Later in 1873 his application to join the Society of Telegraph Engineers was turned down with the comment that "they didn't want telegraph clerks". This riled Heaviside, who asked Thomson to sponsor him, and along with support of the society's president he was admitted "despite the P.O. snobs".

In 1873 Heaviside had encountered Maxwell's newly published, and later famous, two-volume Treatise on Electricity and Magnetism. In his old age Heaviside recalled:

I remember my first look at the great treatise of Maxwell's when I was a young man… I saw that it was great, greater

and greatest, with prodigious possibilities in its power… I was determined to master the book and set to work. I was very ignorant. I had no knowledge of mathematical analysis (having learned only school algebra and trigonometry which I had largely forgotten) and thus my work was laid out for me. It took me several years before I could understand as much as I possibly could. Then I set Maxwell aside and followed my own course. And I progressed much more quickly… It will be understood that I preach the gospel according to my interpretation of Maxwell.

Undertaking research from home, he helped develop transmission line theory (also known as the "telegrapher's equations"). Heaviside showed mathematically that uniformly distributed inductance in a telegraph line would diminish both attenuation and distortion, and that, if the inductance were great enough and the insulation resistance not too high, the circuit would be distortionless in that currents of all frequencies would have equal speeds of propagation. Heaviside's equations helped further the implementation of the telegraph.

Middle Years

From 1882 to 1902, except for three years, he contributed regular articles to the trade paper The Electrician, which wished to improve its standing, for which he was paid £40 per year. This was hardly enough to live on, but his demands were very small and he was doing what he most wanted to. Between 1883 and 1887 these averaged 2–3 articles per month and these articles later formed the bulk of his Electromagnetic Theory and Electrical Papers.

In 1880, Heaviside researched the skin effect in telegraph transmission lines. That same year he patented, in England, the coaxial cable. In 1884 he recast Maxwell's mathematical analysis from its original cumbersome form (they had already been recast as quaternions) to its modern vector terminology, thereby reducing twelve of the original twenty equations in twenty unknowns down to the four differential equations in two unknowns we now know as Maxwell's equations. The four re-formulated Maxwell's equations describe the nature of electric charges (both static and moving), magnetic fields, and the relationship between the two, namely electromagnetic fields.

In 1887, Heaviside worked with his brother Arthur on a paper entitled "The Bridge System of Telephony". However the paper was blocked by Arthur's superior, William Henry Preece of the Post Office, because part of the proposal was that loading coils (inductors) should be added to telephone and telegraph lines to increase their self-induction and correct the distortion which they suffered. Preece had recently declared self-inductance to be the great enemy of clear transmission. Heaviside was also convinced that Preece was behind the sacking of the editor of The Electrician which brought his long-running series of articles to a halt (until 1891). There was a long history of animosity between Preece and Heaviside. Heaviside considered Preece to be mathematically incompetent, an assessment supported by the biographer Paul J. Nahin: "Preece was a powerful government official, enormously ambitious, and in some remarkable ways, an utter blockhead." Preece's motivations in suppressing Heaviside's work were more to do with protecting Preece's own reputation and avoiding having to admit error than any perceived faults in Heaviside's work.

The importance of Heaviside's work remained undiscovered for some time after publication in The Electrician, and so its rights lay in the public domain. In 1897, AT&T employed one of its own scientists, George A. Campbell, and an external investigator Michael I. Pupin to find some respect in which Heaviside's

Undertaking research from home, he helped develop transmission line theory (also known as the "telegrapher's equations").

work was incomplete or incorrect. Campbell and Pupin extended Heaviside's work, and AT&T filed for patents covering not only their research, but also the technical method of constructing the coils previously invented by Heaviside. AT&T later offered Heaviside money in exchange for his rights; it is possible that the Bell engineers' respect for Heaviside influenced this offer. However, Heaviside refused the offer, declining to accept any money unless the company were to give him full recognition. Heaviside was chronically poor, making his refusal of the offer even more striking.

But this setback had the effect of turning Heaviside's attention towards electromagnetic radiation, and in two papers of 1888 and 1889, he calculated the deformations of electric and magnetic fields surrounding a moving charge, as well as the effects of it entering a denser medium. This included a prediction of what is now known as Cherenkov radiation, and inspired his friend George FitzGerald to suggest what now is known as the Lorentz–FitzGerald contraction.

In 1889, Heaviside first published a correct derivation of the magnetic force on a moving charged particle, which is the magnetic component of what is now called the Lorentz force.

In the late 1880s and early 1890s, Heaviside worked on the concept of electromagnetic mass. Heaviside treated this as material mass, capable of producing the same effects. Wilhelm Wien later verified Heaviside's expression (for low velocities).

In 1891 the British Royal Society recognized Heaviside's contributions to the mathematical description of electromagnetic phenomena by naming him a Fellow of the Royal Society, and the following year devoting more than fifty pages of the Philosophical Transactions of the Society to his vector methods and electromagnetic theory. In 1905 Heaviside was given an honorary doctorate by the University of Göttingen.

Later Years and Views

In 1896, FitzGerald and John Perry obtained a civil list pension of £120 per year for Heaviside, who was now living in Devon, and persuaded him to accept it, after he had rejected other charitable offers from the Royal Society.

In 1902, Heaviside proposed the existence of what is now known as the Kennelly–Heaviside layer of the ionosphere. Heaviside's proposal included means by which radio signals are transmitted around the Earth's curvature. The existence of the ionosphere was confirmed in 1923. The predictions by Heaviside, combined with Planck's radiation theory, probably discouraged further attempts to detect radio waves from the Sun and other astronomical objects. For whatever reason, there seem to have been no attempts for 30 years, until Jansky's development of radio astronomy in 1932.

In later years his behavior became quite eccentric. According to associate B. A. Behrend, he became a recluse who was so averse to meeting people that he delivered the manuscripts of his Electrician papers to a grocery store, where the editors picked them up. Though he had been an active cyclist in his youth, his health seriously declined in his sixth decade. During this time Heaviside would sign letters with the initials "W.O.R.M." after his name. Heaviside also reportedly started painting his fingernails pink and had granite blocks moved into his house for furniture. In 1922, he became the first recipient of the Faraday Medal, which was established that year.

Heaviside died on 3 February 1925, at Torquay in Devon after falling from a ladder, and is buried near the eastern corner of Paignton cemetery. He is buried with his father, Thomas Heaviside (1813–1896) and his mother, Rachel Elizabeth Heaviside. The gravestone was cleaned thanks to an anonymous donor sometime in 2005. Most of his recognition was gained posthumously.
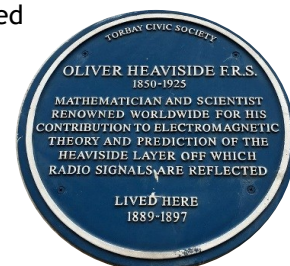
Heaviside Memorial Project

In July 2014, academics at Newcastle University, UK and the Newcastle Electromagnetics Interest Group founded the Heaviside Memorial Project in a bid to fully restore the monument through public subscription. The restored memorial was ceremonially unveiled on 30 August 2014 by Alan Heather, a distant relative of Heaviside. The unveiling was attended by the Mayor of Torbay, the MP for Torbay, an ex-curator of the Science Museum (representing the Institution of Engineering and Technology), the Chairman of the Torbay Civic Society, and delegates from Newcastle University.

Innovations and Discoveries

Heaviside did much to develop and advocate vector methods and vector calculus. Maxwell's formulation of electromagnetism consisted of 20 equations in 20 variables. Heaviside employed the curl and divergence operators of the vector calculus to reformulate 12 of these 20 equations into four equations in four variables (B, E, J, and ρ), the form by which they have been known ever since (see Maxwell's equations). Less well known is that Heaviside's equations and Maxwell's are not exactly the same, and in fact it is easier to modify the former to make them compatible with quantum physics. The possibility of gravitational waves was also discussed by Heaviside using the analogy between the inverse-square law in gravitation and electricity.

He invented the Heaviside step function, using it to calculate the current when an electric circuit is switched on. He was the first to use the unit impulse function now usually known as the Dirac delta function. He invented his operational calculus method for solving linear differential equations. This resembles the currently used Laplace transform method based on the "Bromwich integral" named after Bromwich who devised a rigorous mathematical justification for Heaviside's operator method using contour integration. Heaviside was familiar with the Laplace transform method but considered his own method more direct.

Heaviside developed the transmission line theory (also known as the "telegrapher's equations"), which had the effect of increasing the transmission rate over transatlantic cables by a factor of ten. It originally took ten minutes to transmit each character, and this immediately improved to one character per minute. Closely related to this was his discovery that telephone transmission could be greatly improved by placing electrical inductance in series with the cable. Heaviside also independently discovered the Poynting vector.

Heaviside advanced the idea that the Earth's uppermost atmosphere contained an ionized layer known as the ionosphere; in this regard, he predicted the existence of what later was dubbed the Kennelly-Heaviside layer. In 1947 Edward Victor Appleton received the Nobel Prize in Physics for proving that this layer really existed.

Electromagnetic Terms

Heaviside coined the following terms of art in electromagnetic theory:

- admittance (reciprocal of impedance) (December 1887);

- elastance (reciprocal of permittance, reciprocal of capacitance) (1886);

- conductance (real part of admittance, reciprocal of resistance) (September 1885);

- electret for the electric analogue of a permanent magnet, or, in other words, any substance that exhibits a quasi-permanent electric polarization (e.g. ferroelectric);

- impedance (July 1886);

- inductance (February 1886);

- permeability (September 1885);

- permittance and permittivity (June 1887);

- reluctance (May 1888);

- susceptance (imaginary part of admittance, reciprocal of reactance) (1887).
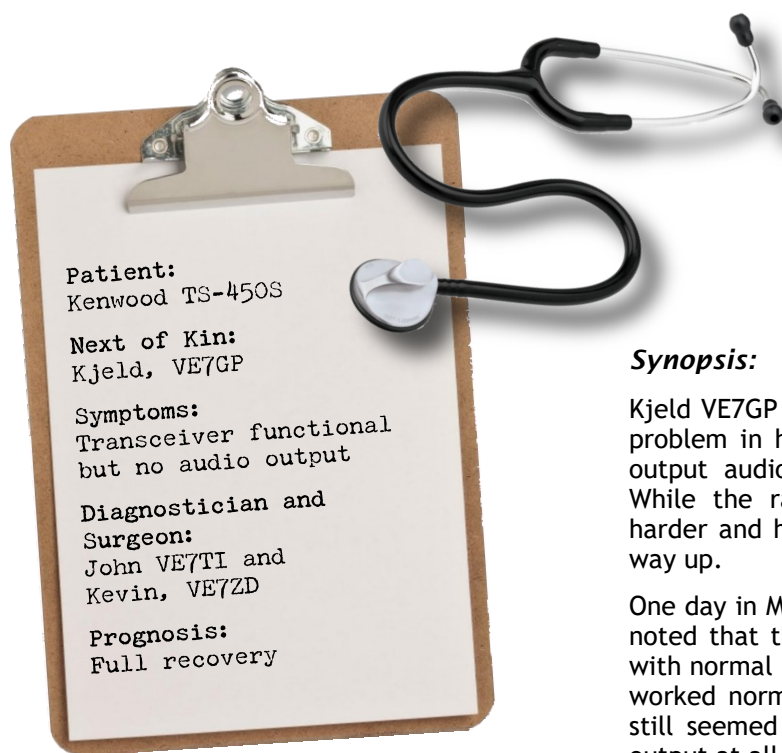
And that is the rest of his story.

Heaviside advanced the idea that the Earth's uppermost atmosphere contained an ionized layer known as the ionosphere

Radio Ramblings I

'Dr.' Kevin McQuiggin VE7ZD/KN7Q

The Case of the Cranky Capacitor

Patient:
Kenwood TS-450S

Next of Kin:
Kjeld, VE7GP

Symptoms:
Transceiver functional
but no audio output

Diagnostician and
Surgeon:
John VE7TI and
Kevin, VE7ZD

Prognosis:
Full recovery

Synopsis:

Kjeld VE7GP approached the Elmer team with a newly developed problem in his "old reliable" Kenwood TS-450S (Figure 1). The output audio had dropped off considerably some months ago. While the radio remained fully functional, the audio became harder and harder to hear, even with the volume turned all the way up.

One day in March, the rig's audio output failed completely. Kjeld noted that the transmit portion of the radio seemed to be fine, with normal power output. Band switching and all other functions worked normally. Kjeld noted that even the "RF Gain" control still seemed to function, but the "AF Gain" produced no audio output at all.

Kjeld decided to contact the Elmering group to see if they could provide any assistance.

Figure 1- Kjeld's Kenwood TS-450S

Triage:

John VE7TI learned of the problem from Kjeld. John did some online research and discovered that this was a common problem with that make and model of transceiver, the Kenwood TS-450S. An electrolytic capacitor, C104, on the rig's main receive board tends to fail and that commonly is the cause of this audio problem. C104 is part of the main signal path for the rig's audio output. When the capacitor fails the audio falls off, and the circuit board can be damaged if the capacitor has leaked.

John found some descriptions of the problem and the repair that has worked for other TS-450S owners, and forwarded these links to Kjeld and Kevin, VE7ZD.

Kevin has a fairly complete electronics shop in his basement, so he agreed to take a look at the rig.

Diagnosis:

Kevin received the sick rig from Kjeld in the first week of March. Kjeld was clearly affected by the illness of his favourite rig and hoped that it could be nursed to a full recovery.

Armed with the online material discovered by John and the TS-450S' schematics, Kevin performed an exploratory "rigectomy" and opened the TS-450S' bottom chassis to expose the main receiver printed circuit board. The rig was cooperative and no anaesthetic was needed.

C104 is a 470 uF (microfarad), 10 volt electrolytic capacitor. It was located on the printed circuit board (PCB) with the help of the online documentation. Kevin deployed his high-power magnifier to get a good look at the part *[see the tip on page11]*.

Sure enough, as per the other owners' reports, the electrolytic capacitor had burst. Electrolytics usually fail gradually rather than all at once. The gradual degradation in the rig's audio behaviour was in keeping with gradual failure of the capacitor.

An ancillary effect of leakage in an electrolytic capacitor can be damage to the associated PCB, as the material inside the capacitor can be corrosive. In this patient the gel that leaked from the capacitor had in fact damaged almost a square centimeter of the board. See Figure 2 *[top right]*.

Cleanup of the PCB and replacement of the failed electrolytic capacitor would be the first step in getting the rig back on its feet. Kevin scrubbed up.

Parts:

Kevin sourced a suitable replacement capacitor for C104 at a local electronic store in Burnaby.
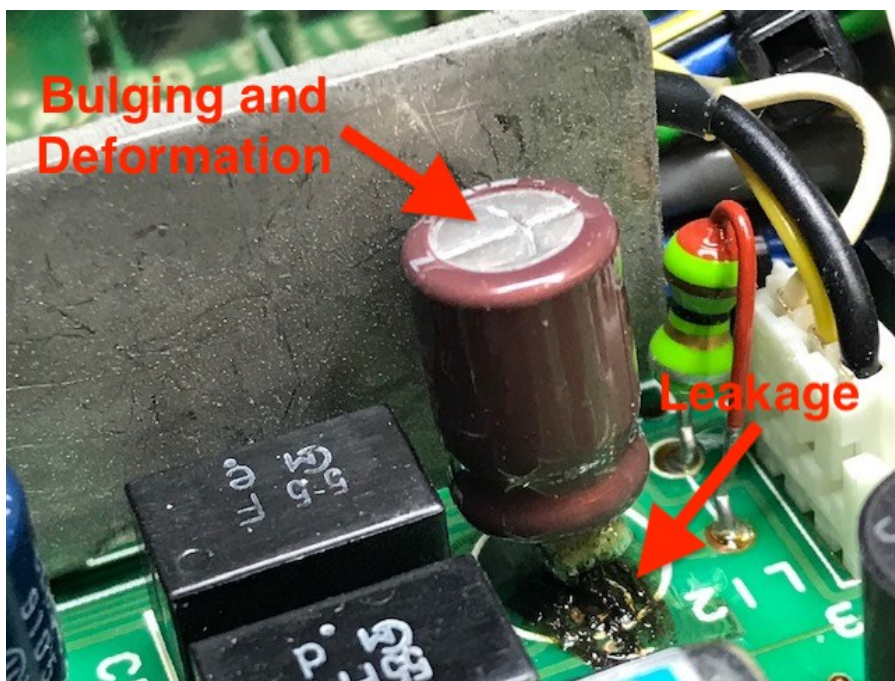

Figure 2 – C104, Showing Bulging and Leakage Onto the PCB

A package of five capacitors was a mere $3.30. Kjeld was clearly going to be able to avoid incurring a major debt.

Surgery:

Kevin prepared the operating room and reassured the rig that all would be well after the surgery. The rig bravely refused any sort of anaesthetic, but did ask that Kevin consume a cold beer after the surgery was completed. Kevin reluctantly agreed to do so.
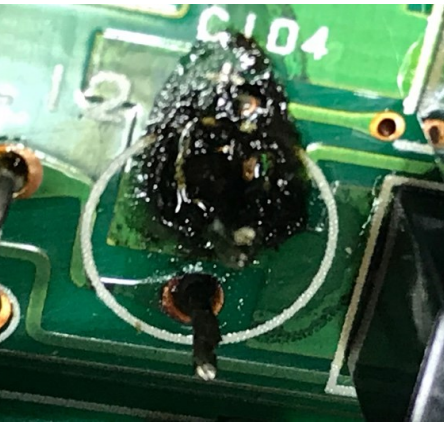

Figure 3 – Receive PCB

Figure 4 – PCB Damage

The ~15x20 cm receive board PCB had to be removed from the rig in order to conduct the repair. This necessitated removal of several screws and disconnection of about 20 connectors that are part of two wiring harnesses which connect the receive board to other parts of the rig.

The location of these connectors and their orientation was recorded (see the tip on the next page), and each connector disconnected gently and very carefully. Kevin did not want to introduce further problems due to damage of the connectors as they were removed. This fairly complex process took about 20 minutes but allowed the receive PCB to be removed from the rig. Figure 3 shows the receive board PCB after extraction from the rig.

C104 was removed from the PCB, and Kevin noted a large area of corrosion under the spot where the capacitor had been mounted. See Figure 4.

The corrosion covered approximately one square centimeter. Kevin used 99-percent isopropyl alcohol to remove the black corrosive material. He also used solder wick to clean up the old solder remaining after the extraction of the old C104.

Upon inspection under a magnifying glass, Kevin noted that the corrosion had damaged two traces on the PCB, cutting one of them: the trace that served as input to C104's positive terminal. This lack of continuity was confirmed using an ohmmeter. The break in the trace was quite small (about 2 mm), so Kevin determined that it could likely be fixed using a purposely-introduced solder bridge to connect the two sides of the broken trace. If this approach failed, a short length of wire would be used to reconnect the break. The other corroded trace was only partially so, and enough copper remained that it should not be a problem.

Documentation Tip:

Smartphones are fantastic devices for documenting state of equipment and connections prior to disassembly and repair. Kevin routinely takes a full set of photographs, and even sometimes shoots videos of gear that is to be disassembled. Photos are invaluable and, in many cases, much better than written notes in determining "what goes where" when the repair is complete and the gear has to be reassembled.

In this case Kevin took about two dozen photos of the receive board PCB in the rig with all connectors attached, including closeups of each of the receive board connectors. These photos were very helpful when the large PCB had to be reinstalled.
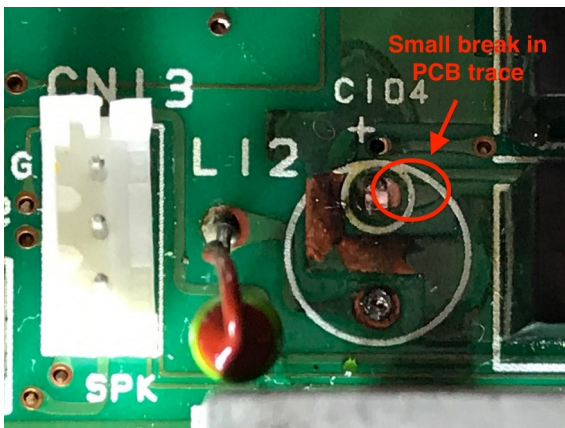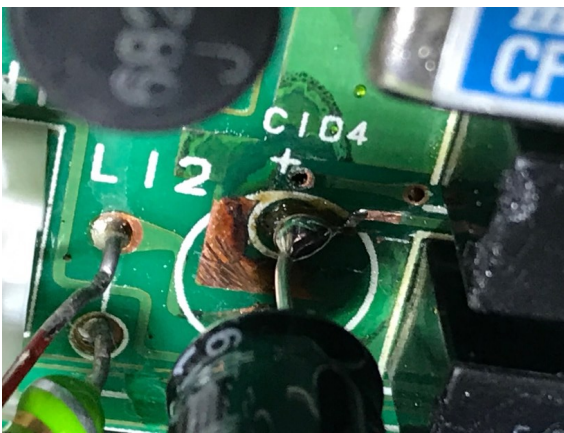
Figure 5 – Damaged PCB Trace

Figure 6 – Cheesy Solder Bridge Repair

Figures 5 and 6 show the broken trace and Kevin's "solder bridge" repair.

The new C104 was about the same size as the old component, and as such it's leads fit into the two PCB holes quite nicely. The negative lead was soldered in place, and then Kevin soldered the positive lead using an extra-large blob of solder to try to close the 2 mm break in the PCB trace.

While the soldering on this C104 lead looks sloppy, it was done on purpose so that the excess solder would bridge the broken PCB trace.

Under visual inspection the job looked fine, but Kevin confirmed that the new C104 was properly in place, and that the broken PCB

Another Tip:

Electrolytic capacitors have a particular capacitance value, and a voltage rating. The original C104 was 470 uF and rated to withstand 10 volts. Exceeding an electrolytic capacitor's voltage rating puts (to use a water pressure analogy) "too much pressure" on the dielectric that separates the capacitor's plates, and this can force the dielectric to fail. If the dielectric gets punctured, this destroys the capacitor.

Kevin noted from the rig's schematic diagram that the typical voltage presented to C104 should be 6.4 volts. He used his voltmeter to measure this voltage when he was diagnosing Kjeld's rig and noted that it measured 6.2 volts, close enough to spec to be considered accurate.

While a 10-volt capacitor technically meets the "pressure" requirement (a 10-volt capacitor should be able to withstand 6.4 volts "pressure"), the two voltage values are pretty close. This was of a bit of concern.

Generally, when you are designing a circuit it is a good idea to select an electrolytic capacitor that has a voltage rating of 2 to 3 times the average voltage that will be presented to the capacitor. This creates a generous margin of safety and will not stress the capacitor beyond its rated limit over time. The stock C104 might have been a little under-rated.

Kevin decided to replace the stock C104 (470 uF, 10 volts) with a new capacitor rated at 470 uF but rated at 16 volts. This will create more headroom, so the capacitor will be less likely to fail again.
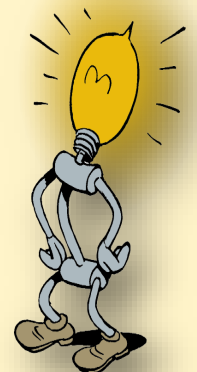
trace repaired using an ohmmeter. It is better to check a repair carefully before applying power to the rig!

Reassembly and Initial Testing:

The receive PCB board was reinstalled in the chassis and the ~20 wiring harness connection points were reattached in accordance with a series of photos Kevin took before the connections were removed. It is of course critical that all wiring harness connections are reattached, and that each connector goes back into the right socket!

Initial Test

The moment of truth had arrived. Kevin confirmed that all wiring harness connectors had been reinstalled, rechecked the rig's power supply leads, turned on the 12 VDC supply, and then fired up Kjeld's rig. To his delight, robust audio emerged from the speaker, and twiddling the AF Gain control confirmed that full audio function had been restored.

Final Testing:

Kevin attached an antenna to the rig and checked its functionality on RX, and then on TX, to confirm that the repair had been effective and that the disassembly/reassembly of the rig had not introduced any new problems.

All seemed well, so Kevin closed up the patient and had that beer!

The rig was returned to Kjeld four days after he had dropped it off, and he happily made several contacts with it in a US contest of some sort. The rig was definitely fixed!

Have a Ham Radio Problem?

The Elmering Group at SARC is here to help. We have a broad range of experience and equipment and can likely help with any sort of operational, administrative or technical issue that might arise in your shack, or with your operating.

We provide these services at no cost and because we enjoy helping others with this great hobby of ours. No problem is too small. Feel free to contact one of the club's Elmers, as listed below!

Feedback on this article may be directed to the Editor, or directly to me at mcquiggi@sfu.ca.

73,

~ Kevin VE7ZD / KN7Q

SARC Elmers

Stan Williams VA7NF	John Brodie VA7XB
John Schouten VE7TI	Kevin McQuiggin VE7ZD
Les Tocko VA7OM	Gord Kirk VA7GK
Ion Marinescu VA7ION	David Sinclair VA7DRS
Steve McLean VE7SXM	Robert Fishwick VA7FMR
	Rob Gilchrist VE7CZV

Page 13—News You Can Lose

The Lighter Side of Amateur Radio

The COVID Blues!

- Half of us are going to come out of this quarantine as amazing cooks. The other half will come out with a drinking problem.

- I used to spin that toilet paper like I was on Wheel of Fortune. Now I turn it like I'm cracking a safe.

- I need to practice social-distancing from the refrigerator.

- Still haven't decided where to go for Field Day... The Living Room or The Bedroom

- PSA: every few days try your jeans on just to make sure they fit. Pajamas will have you believe all is well in the kingdom.

- Homeschooling is going well. 2 students suspended for fighting and 1 teacher fired for drinking on the job.

- I don't think anyone expected that when we changed the clocks we'd go from Standard Time to the Twilight Zone

- This morning I saw a neighbor talking to her cat. It was obvious she thought her cat understood her. I came into my house, told my dog... we laughed a lot.

- So, after this quarantine will the producers of 'My 600 Pound Life' just find me or do I find them?

- Quarantine Day 35: Went to this restaurant called THE KITCHEN. You have to gather all the ingredients and make your own meal. I have no clue how this place is still in business.

- My body has absorbed so much soap and disinfectant lately that when I pee it cleans the toilet.

- Day 35 of Homeschooling: One of these little monsters called in a bomb threat.

- I'm so excited... it's time to take out the garbage. What should I wear?

- I hope the weather is good tomorrow for my trip to Puerto Backyarda. I'm getting tired of Los Livingroom.

- Classified Ad: Single man with toilet paper seeks woman with hand sanitizer for good clean fun.

- Day 36 of Homeschooling: My child just said: "I hope I don't have the same teacher next year"... I'm offended.

Better 2m apart than 2m under!

In 8 weeks, 88% of blondes will disappear from the Earth.

It's like being 16 again, Gas is cheap and I'm grounded!

I understand there will be a new FD category if you operate in an oxygen tent instead of an outdoor one.

Radio Ramblings II

Kevin McQuiggin VE7ZD/KN7Q

Spread Spectrum Communications

This month I'd like to move back onto a technical track and discuss the fascinating topic of spread spectrum communications. Spread spectrum is a truly amazing technology that arguably has some roots in amateur radio, and one that all hams should know something about. The details can get a bit complicated and require a bit of knowledge of math, but the basic principles are easy to understand.

Spread spectrum intentionally converts signals which are normally transmitted in a narrow bandwidth (think of an analog voice or low-speed packet signal) to cover a much broader bandwidth (about 8 to 64 times broader) so that the signals are virtually indistinguishable from background radio noise.

This "spreading" amazingly gives the signal both a measure of *noise immunity* and allows several signals (on the order of ten or more) to occupy *the same bandwidth at the same time*. It also confers some *security through obscurity* on the signal, as the signal will appear as noise to any passing observer (see Figure 1 below). [13]

The way that the signals are spread (see the example below) ensures that *none of the signals interfere with one another*. Any or all of the signals in the spread signal can be

Hedy Lamarr

recovered and used. Like I said, spread spectrum is a truly amazing technology!

While spread spectrum is not currently authorized for use by radio amateurs in Canada on frequencies below 922 MHz, individual amateurs can easily employ open source tools such as gnuradio [1] to build a spread spectrum transmitter and receiver, and then experiment with it "across the bench" or on the authorized ham bands at 922 MHz and above.

We Use Spread Spectrum Every Day

Cellular data networks employ industry standard spread spectrum communication protocols. Cell towers manage multiple user devices (typically smartphones) and are able to multiplex simultaneous telephone calls and data connections by using spread spectrum techniques.

This allows all the devices to utilize the same range of frequencies. Each smartphone is assigned a different "spreading code", and spreads and de-spreads their individual signal using their assigned code in cooperation with the nearest cell tower. The fact that spread signals do not interfere with one another then allows the tower to differentiate between each user device.

Another common use of spread spectrum is in the Global Positioning System (GPS). Each GPS satellite is assigned a distinct "spreading sequence" (again, see the example below) to encode its signals with before they are broadcast by the satellite on two standard frequencies just

above 1 GHz. All the satellites use the same frequencies to broadcast to our GPS receivers, smartphones or handheld radios. All the satellites transmit simultaneously.

Your GPS receiver knows each satellite's distinct spreading sequence (this is part of the "ephemeris" that is downloaded when you do a "cold" or "warm" start on your GPS unit) and is thus able to search for signals from each satellite by looking for each satellite's signal using its distinct spreading code. Those satellites which are detected are then used to compute your GPS unit's location. This is how your GPS unit can tell you which satellites are being used, and their locations.

Other examples of modern use of spread spectrum techniques are cordless phones, WiFi modems and Bluetooth devices.

Types of Spread Spectrum

For practical purposes there are two types of spread spectrum communication systems: "frequency hopping" and "direct sequence". Frequency hopping spread spectrum is quite old, and this idea was documented and patented by the popular 1940s actress Hedy Lamarr and her collaborator George Antheil in 1942 [12]. Both frequency hopping and direct sequence technologies utilize large amounts of bandwidth to spread a message across many frequencies.

Frequency hopping spread spectrum changes the transmitter frequency very quickly (several times per second) and transmits standard analog or digital signals on each frequency in turn. To be able to receive the signal the receiver needs to be precisely in time with the transmitter.

The other type of spread spectrum is called direct sequence. It uses mathematical methods to broaden a signal or set of signals and transmit them in a very wide bandwidth all at once. In effect, mathematics is used to emulate the physical process of retuning a transmitter several times per second. Direct sequence is more efficient than frequency hopping and is the method used by most spread spectrum devices today.

This article will describe the characteristics and mathematics behind direct sequence spread spectrum.

"Spreading" Your Signal

Imagine that you want to transmit your voice to another amateur radio station. If you chose to use single sideband on an amateur band to achieve this, your transmitter would modulate its carrier using your voice's audio characteristics and generate a SSB signal that is about 3 KHz (3000 Hz) wide.

Spread spectrum, alternatively, would digitize your voice signal and use some simple mathematical techniques (described below) to expand your voice signal's bandwidth to 24 KHz, or even 192 KHz wide [2].

This sounds terribly inefficient. Why, then, would anyone want to do this?

Advantages of Spreading Your Signal

A spread signal is less susceptible to narrowband interference. This is because each bit in the baseband (or original narrowband) signal is replaced by a much greater number of bits when the signal goes through the spreading function, as will be described below. [3] Narrowband interference will affect only a few bits in the spread signal. The way that decoding works (see below as well) will tend to minimize the effects of the interference and allow the original bit to be recovered. [4].

Another advantage of a spread signal is that it is virtually identical to background noise that exists at all radio frequencies. Figure 1 shows a plot of a typical spread spectrum signal. Can you see the signal, or differentiate it from the usual background noise?
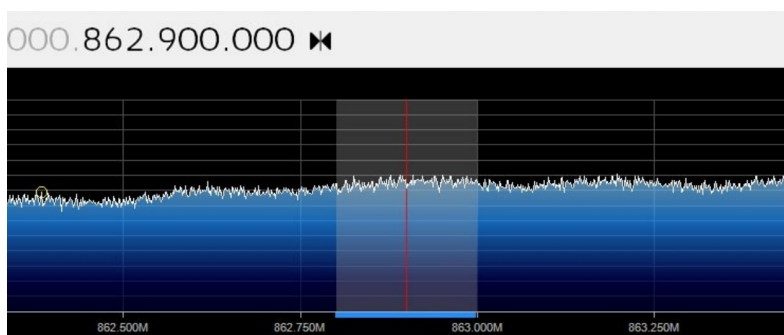

Figure 1 – Typical Spread Spectrum Signal at ~863 MHz [5]

Spread spectrum is a viable mode for covert communications as the signal cannot be detected via normal scanning techniques. During the late Cold War (1970s through 1980s) spread spectrum radios found use alongside the well-known "numbers stations" for clandestine communication. [6]

The Process

Here we will start laying the foundation for an example of spread spectrum communication.

Our sender will create a short message, run the message through a "spreading function", and then transmit the spread message to a receiver. The receiver will need to "de-spread" the message to extract the original message.

We will also imagine a second sender, who also creates and spreads a message for transmission.

In our example we will simplify things for this short article by have each sender use a very short message of 4 bits in length, and a spreading code of two bits. While such a process would work, it is entirely impractical for a real-world system, but we will use these simplifications as it works well for demonstrating the processes.

After we show how a single message is spread, we will show how multiple messages can be transmitted on the same channel at the same time without interfering with each other. This is *really* interesting and shows the power of spread spectrum communication!

We will also assume, for brevity, that the message has been pre-digitized. In the real world, our signal could be text, a voice, music, photo, video, or whatever we want to be. The first step is to digitize the message, which we are not showing for our examples.

Spread spectrum is a mathematical technique, so all inputs to, and outputs from, the process require digital (numeric) values!

Off we go!

Getting Technical: Spreading Codes

Spreading codes are special binary values that have a characteristic called "orthogonality". If two spreading codes are compared, their relationship is always "orthogonal", or in

common terms "at right angles" to one another. One code doesn't' interfere with the other. [7]

Binary values are normally written as a combination of 0s and 1s, but for spread spectrum calculations we will write a '1' for a binary 1, and a '-1' for a binary 0. See Table 1.

Code Number	Spreading Code	Code for Calculation
1	(1, 0)	(1, -1)
2	(1, 1)	(1, 1)

Table 1—Codes for Calculation

Are (1, -1) and (1, 1) Orthogonal?

Our example will use (1, -1) and (1, 1) as the spreading codes for our two senders.

Two codes *(a, b)* and *(c, d)* have the required property of orthogonality if their "dot product" is 0. We can calculate the dot product of our two codes 1 and 2 as follows. Note that we use the "Code for Calculation" values in Table 1 above:

$$R = (a \times c) + (b \times d)$$

If R equals 0, then the two codes are orthogonal. In our case:

R = *(1 x 1)* + *(-1 x 1)*

R = 1 + (-1)

R = 1 – 1

R = 0

Our two codes are orthogonal!

Spreading a Sample Message

We will use the first spreading code above, *(1, -1)* as our example spreading code for the first sender.

The sample message that we will be using for our example is *(1, 0, 1, 1)* [8]. As with the spreading code, we convert *1*s in the message to *1*s; and *0*s in the message to *-1*s:

(1, 0, 1, 1) becomes *(1, -1, 1, 1)*

To spread a message, we replace *each* bit of the message with the two bits in our spreading code, here (1, -1). If the message contains a 1, then

just use (1, -1) at that place; if the message contains a -1, then multiply (1, -1) by -1 and use (-1, 1). See Table 2.

Message bit	Replace With
1	1,-1
-1	-1, 1
1	1, -1
1	1, -1

Table 2 – Bit Replacement

The spread message for sender one is therefore:

(1, -1, -1, 1, 1, -1, 1,-1)

Note that our four-bit message has been "spread" to 8 bits, because each message bit was expanded to 2 bits, the number of bits in our spreading code. In the real world, spreading codes range from 8 to 64 bits. Our 4-bit message would spread to 32 or even 256 bits!

Let's Add a Second Message!

For the sake of example, we will now add another message, from the second sender, to the mix and show that BOTH messages can be combined and sent via spread spectrum at once. The second sender needs another spreading code, and one that is orthogonal to the first user. We will use the spreading code *(1, 1)* as we have already shown above that it has the required property of orthogonality to the first code.

The second sender's message will be (0, 0, 1, 1).

For the sake of space, I have omitted the spreading calculations, but they are exactly the same as above [9]. The second user's spread message (message (0, 0, 1, 1) using spreading code (1, 1)) will be:

(−1, −1, −1, −1, 1, 1, 1, 1)

Transmission

Spread spectrum simply adds all users' messages together and transmits them in that form:

Description	Values
Message 1 from above	(1, -1, -1, 1, 1, -1, 1,-1)
Message 2 from above	(−1, −1, −1, −1, 1, 1, 1, 1)
Total (simple sum by message element):	(0, -2, -2, 0, 2, 0, 2, 0)

Table 3 – Interference Pattern

The message *(0, -2, -2, 0, 2, 0, 2, 0)* is sent to the transmitter (or each sender transmits their single message at the same time). In spread spectrum parlance, this is called the *"interference pattern"*. Key is that the interference pattern contains BOTH the messages from user 1 and user 2!

De-Spreading: Reception is the Reverse Process

So, imagine that the interference pattern *(0, -2, -2, 0, 2, 0, 2, 0)* has been transmitted and received by two receivers, one talking with sender one, and the other with sender two.

On the receive side, the interference pattern needs to be de-spread by each receiver to recover the original message. We will demonstrate how this is done for the first receiver. Recall that the spreading code for the first sender was *(1, -1)*.

Divide the elements of the interference vector into groups which match the length of the spreading code: *(0, -2, -2, 0, 2, 0, 2, 0)* becomes *[Table 4 right]*.

Grouping
(0, -2)
(-2, 0)
(2, 0)
(2, 0)

Table 4 Grouping

Next, repeat the

R = (*a* x *c*) + (*b* x *d*)

calculation we used above to spread the original message, but use sender one's spreading code for *c* and *d*:

Group (a and b)	Multiply By (c and d)	Result R
(0, -2)	(1, -1)	2
(-2, 0)	(1, -1)	-2
(2, 0)	(1, -1)	2
(2,0)	(1, -1)	2

Table 5—Message 1 Recovery

Note that the result column R consists of positive and negative values 2 and -2. We need to convert these values back to binary. For positive values of R, use a bit result of 1, whilst for negative values the bit result is 0.

Therefore, the message recovered from the interference pattern for sender one is *(1, 0, 1, 1)*. *Note that this exactly matches the original message from sender one. Cool!*

Similar calculations to extract the second message from the interference pattern [9] return a message of *(0, 0, 1, 1),* which is also correct.

Amazing! Spread spectrum works!

This was a very simple example, but imagine encoding longer messages from dozens of users simultaneously into a single interference pattern that is 192 KHz wide, and which resembles broadband noise. Very powerful!

Why Don't These Messages Interfere With One Another?

That is a very good question! The reason the two messages don't interfere with one another is because they are each encoded with orthogonal spreading codes. The mathematical separation of the spreading codes propagates into each of the messages encoded with those codes. This property keeps the messages in the interference pattern orthogonal. Orthogonality keeps each message "out of phase" with the others, therefore each message can be recovered from the interference pattern correctly.

In practical terms, it is similar to the way a *horizontally polarized* Yagi cannot hear signals very well from a Yagi that is *vertically polarized*.

Incidentally, this encoding process is called "convolution" and is the basis for many important digital signal processing operations. Your handheld GPS receiver convolves the interference pattern it receives from all the GPS satellites on 1575.42 and 1227.60 MHz [10] with the known spreading codes for all the satellites and looks for which of the convolutions return data. These will be set of satellites that the GPS receiver currently "sees".

For Your Consideration

We did the calculations to show that the two spreading codes *(1, -1)* and *(1, 1)* are orthogonal to each other. That leaves two remaining possible 2-bit orthogonal codes, (-1, -1) and (-1, 1). What are the characteristics of these codes?

Are either of these new codes (-1, -1) or (-1, 1) orthogonal to the spreading codes we used in our example? Are the new codes orthogonal to each other?

If you have programming experience you could quite easily develop some code to spread and de-spread your own messages and compute interference patterns. Then you could transmit your computed patterns using gnuradio and an affordable SDR such as an Analog Devices PLUTO.

If you don't want to write a computer program, then you could even perform spreading and de-spreading and calculate interference patterns in a spreadsheet.

GitHub Repository

I had some time before publication of the Communicator, so I wrote a short Python program that demonstrates the conversion of the messages and spreading codes from our example to a spread message, and then computes the overall interference pattern.

I put the code *[right]* on GitHub. I generalized the program so that it is not limited to a 4-bit message, nor to 2-bit spreading codes. Feel free to upgrade or modify it at will. You can grab the program from my repository at https://github.com/mcquiggi/DSSS-Demo-for-SARC.

Run the Python program *dsss.py* from the command line or in your favourite Python interpreter. Here is the sample output. You'll see that the spread messages and interference pattern match what we calculated by hand above:

If you'd like to add some code to this program to de-spread the interference pattern, then that'd be a fun project!

Summary

I hope that you've seen how spread spectrum can be useful, and how it is implemented [11]. You might want to use gnuradio [1] to develop some spread spectrum experiments. Further introductory reading on this subject is available on Wikipedia at https://en.wikipedia.org/wiki/Spread_spectrum.

```
Python 2.7.17 (default, Oct 20 2019, 14:46:50)
[GCC 4.2.1 Compatible Apple LLVM 10.0.1 (clang-1001.0.46.4)] on darwin
Type "help", "copyright", "credits" or "license()" for more information.
>>>
============ RESTART: /Users/mcquiggi/Dropbox/Development/dsss.py ============
Direct Sequence Spread Spectrum (DSSS) Test Program
Based on SARC Communicator Article, May 2020 by K. McQuiggin VE7ZD

Use and modify as you wish!

There are 2 messages: [[1, 0, 1, 1], [0, 0, 1, 1]]
There are 2 spreading codes: [[1, 0], [1, 1]]

Message 0 : [1, 0, 1, 1] will use spreading code: [1, 0]
Message 1 : [0, 0, 1, 1] will use spreading code: [1, 1]

Messages converted to calculation (-1, 1) format: [[1, -1, 1, 1], [-1, -1, 1, 1]]
Spreading codes converted to calculation (-1, 1) format: [[1, -1], [1, 1]]

Spread message  1 is: [1, -1, -1, 1, 1, -1, 1, -1]
Spread message  2 is: [-1, -1, -1, -1, 1, 1, 1, 1]

Interference pattern containing all messages is: [ 0 -2 -2  0  2  0  2  0]

Done!
```

That's it for this month! Feedback can be directed to the Editor, or directly to me at mcquiggi@sfu.ca.

73,
~ Kevin VE7ZD / KN7Q

References

[1] See https://gnuradio.org.

[2] On our current HF amateur bands, this latter signal, at 192 KHz wide, would take up around half the entire amateur band! This is one reason why spread spectrum is not currently authorized for amateur radio, especially on the HF bands!

[3] In fact, similar techniques closely related to spread spectrum are utilized to add error detection and correction to signals transmitted by deep space probes such as Voyager and the current fleet of science satellites at Mars and elsewhere in the solar system. These techniques include *interleaving*, *scrambling*, and *Viterbi encoding/decoding*, and are well-described at Wikipedia, or contact the author for details.

[4] If you want to try receiving and decoding telemetry from science satellites and lunar probes yourself, then contact the author – resources are all open source and available online!

[5] From the "Signal identification Wiki", https://www.sigidwiki.com/images/9/98/CDMA.jpg

[6] See https://en.wikipedia.org/wiki/Numbers_station

[7] This concept is well known within ham radio: recall that if your antenna is *horizontally* polarized, then you have great difficulty hearing a *vertically* polarized signal, and vice versa! Mathematical orthogonality works the same way.

[8] As noted above, we are using a very short message and a short spreading code for convenience in our example.

[9] You may want to perform the calculations yourself to confirm the result!

[10] See https://en.wikipedia.org/wiki/GPS_signals#Frequency_information

[11] Our example came from https://en.wikipedia.org/wiki/Code-division_multiple_access.

[12] See https://www.scientificamerican.com/article/hedy-lamarr-not-just-a-pr/ and the patent for "Secret Communication System" at: https://patents.google.com/patent/US2292387A/en?inventor=antheil&oq=antheil

[13] Security through obscurity is really no security at all, because unless the digital payload of the signal has been encrypted the content can be extracted and read. However, the broadband, noise-like nature of spread spectrum signals means that casual listeners tuning across a range of frequencies will not easily be able to tell that the signal is there in the first place!

Field Day 2020

— *A Time to Adapt*

Many individuals and groups organizing events for Field Day 2020 have been contacting ARRL for guidance on how to adapt their planned activities in this unprecedented time of social distancing and uncertainty.

"Due to the unique situation presented this year, this can be an opportunity for you, your club, and/or group to try something new," ARRL Contest Manager Paul Bourque, N1SFE, said. "Field Day isn't about doing things the same way year after year. Use this year to develop and employ a new approach that is in line with the current circumstances."

Social distancing and state and local requirements very likely will impact just how — and even whether — you are able to participate in Field Day this year. ARRL continues monitoring the coronavirus situation, paying close attention to information and guidance offered by the Centers for Disease Control and Prevention (CDC). If social distancing means that Class A with a 30-member team set up in a city park won't work this year, then it's time for a Plan B. Part of the Field Day concept has always been adapting your operation to the situation at hand. At its heart, Field Day is an emergency communication demonstration. Field Day rules are flexible enough to allow individuals and groups to adjust their participation and strategies in a way that still addresses their needs while being fun. Some possibilities:

- Encourage club members to operate from their home stations on emergency power (Class E).

- Use the club's repeater as a means for individual participants to keep in touch during the event.

- Family members interested in operating Field Day and unable to participate as part of a larger group may want to consider setting up a portable station in the backyard with a temporary antenna.

One big impact this year will be a decline in public visibility and any interaction with the visitors. Prudence may dictate dispensing with the ham radio PR table to attract passersby, should you set up in a more public location. It's okay not to score all the bonus points you may have attempted in the past. Local and served agency officials may be unwilling to visit, which is understandable under the circumstances. Do be sure to reach out to them as part of your preparations and remind them that you look forward to continuing your working relationship with them in the future.

The impact will differ from place to place, so ARRL recommends that all amateur radio clubs participating in Field Day stay in regular contact with local or state public health officials for their advice and guidance on hosting Field Day activities.

Demonstrating an understanding of the health crisis we all face and your willingness to adapt will show that you and your club or group are good working partners with local or served agencies.

"With any emergency preparedness exercise, it's not about adapting the situation to your operation, it's about adapting your operation to the situation that presents itself," Bourque said. "Try something different. Learn something new about how you prepare. It may be a challenge, and you may have to ask yourself if you're up to the challenge. We hope to hear you on the air over the June 27 – 28 weekend."

~ Thanks to Paul Bourque, N1SFE, and Dan Henderson, N1ND
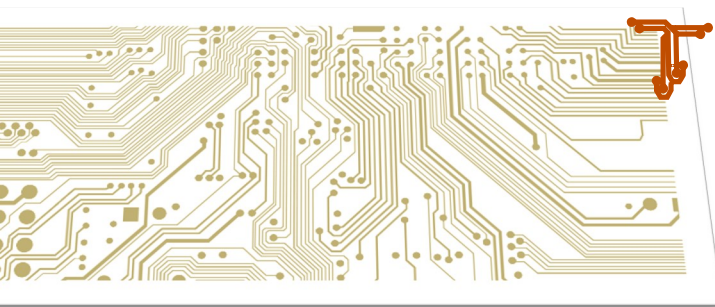
Tech Topics

John Brodie VA7XB

My NEPP Project

My base station is set up to function on mains power, but what if mains power is not available, as might well happen during an emergency? Recent involvement with NEPP and my responsibility for communications in the immediate neighbourhood has given me reason to rethink equipment needs during such an event.

I had participated in the construction of SEPAR's grab & go kits a few years ago, so had some ideas about what might be required to construct a similar, but less ambitious, kit for my own use. In contrast to SEPAR's, this one would be VHF/UHF only (no HF) which greatly simplifies the size, complexity and cost. Fortunately, I had on hand several of the required components from purchases over the years when I was more active on VHF/UHF.

Also, nowadays it is possible to send Winlink messages using software and a digital interface (such as a Tigertronics Signalink), so a TNC is no longer required.

I did, however, elect to purchase a new radio for my kit: a Yaesu FTM-400XDR, as I wanted to have both conventional FM and digital voice capability, especially because SARC has recently purchased a Yaesu fusion repeater, which is to be installed at our South Surrey (Panorama Ridge) site. And, with a go kit in mind, , I earlier had picked up a robust carrying case at the Burnaby ARC swap meet. The go kit was designed to fit neatly inside the carrying case.

Now that email with Winlink Express, rather than voice communication and NTS forms, is evolving as the favoured means of messaging, the kit would necessarily have to include a computer. Laptops, of course, can run on their own power however their battery life is limited, so an additional means of powering it would have to be included if operation was to be assured over an extended period. I plan to deploy an external 80 amp-hr AGM battery, which has sufficient capacity to allow operation of the radio for several days, but what are the options for powering the laptop, which requires approximately 19 vdc?

Option 1: A variety of 12v to 19v DC to DC converters designed for use of a laptop computer in a vehicle is available on the web (see examples below). These converters get their power from a conventional 12 v cigar-socket but I was concerned about RFI as they are switching devices, notorious for creating RF hash.

Option 2: Instead of the DC to DC device, I elected to use a Samlex 120 w pure sine wave 12v to 110 vac inverter, which I guessed (perhaps naively) was more likely to be RFI free than a DC to DC device. The Samlex also has overload protection, low battery alarm/shut down, a replaceable fuse and low idle power draw. Below is the 120 watt model I purchased, which is attractive because of its compact size, but other devices can be found on the web, at virtually any power rating you choose. I am advised that even the Samlex is apparently not free from RFI, so I plan to add split ferrites chokes on the leads.

The West Mountain PWRgate (and similar devices) trickle charge the external battery and automatically switch the source of DC from the power supply (when ac power is available) to an exterior battery (when ac power is not available) using Schottky diodes in a simple circuit. Another useful feature I decided to include is USB charging ports for cell phones. The block diagram *[next page]* shows the concept.

The go-kit was constructed on 3 shelves made of 1/8" aluminum: the lowest shelf holds the laptop computer when not in use; the middle shelf holds the power supply, Signalink USB, PWRgate and 12v fused distribution panel. On the top shelf are positioned the FTM 400 XDR radio, its control head, speaker, 12v to 120 vac inverter and a digital volt/amp meter. In order to secure the FTM 400XDR control head, I fabricated a stand for it, as shown below, which I later painted black. The mic can be conveniently fastened to the back of the stand.

Home-made bracket for the radio control head.

Rear view of the go-kit showing the USB charger, coax and battery ports.

[Above] Front view of largely complete go kit. Voltage-power meter is at left rear. [Below] Go kit inside its case.

My home-made aluminum control head stand shown in the figure above was modeled after a commercial version made by Nifty and available for $25 USD from Yaesu distributors. To my dismay when I tried to drill holes through the base for attaching it to the shelf, I found the plastic shatters no matter how carefully the hole is drilled. So I abandoned it and made my own out of more robust material. The Nifty stand is attractively made and is OK for sitting on a table top, but don't be tempted to modify it.

I also have one significant complaint about the FTR 400XDR radio. It is held to its stand or mounting bracket by a single 10-32 screw (which was missing in my shipment). This single screw is inadequate, as it permits the control head to rotate as the screw invariably loosens in use. To get around this, I had to modify my stand in a way that I will describe to anyone interested, as it does not show in the photo.

Unfortunately, completion of the project as of the time of writing was not possible, because a few key components, including Signalink cables and some hardware items, were held up at the border. However the radio is now functioning. I intend to mount an external AGM battery along with the go kit on an appliance dolly. I have a few other refinements in mind, but they will have to wait. This was a worthwhile project to keep me busy during the COVID-19 shutdown and, when completed, it will take the place of my current base station radio, ready for portable deployment whenever needed.

~ John VA7XB
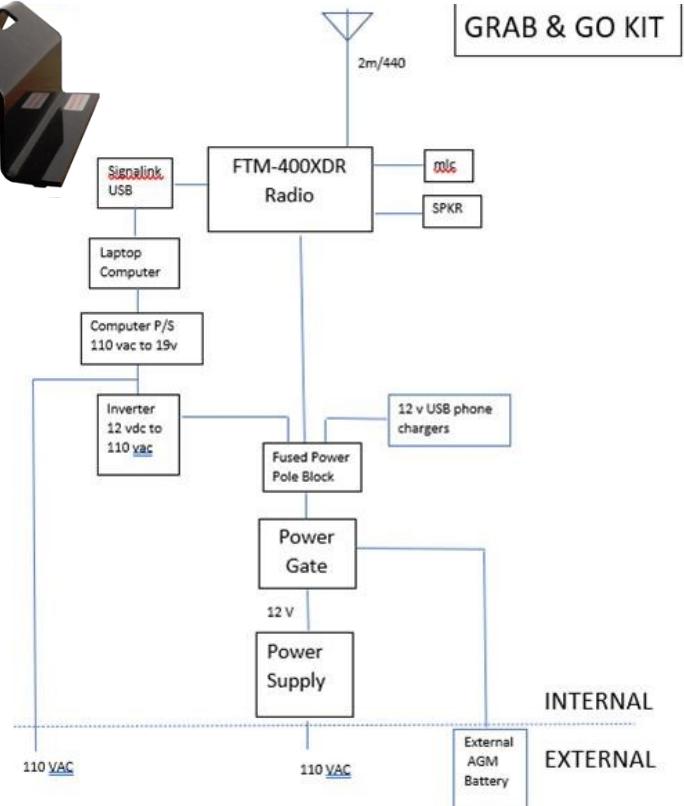
Here's my experience with LED street lights

While working in my front yard last week, I noticed a contractor's vehicle with lift crane parked in the street, while some work was being undertaken at the street lamp fixture. When the contractor moved up to my QTH, I spoke with him and asked him what he was doing. He was very friendly and advised that he was changing out the sodium mercury lamps for LEDs. When I expressed my concern about this because I had been hearing stories of RFI from LEDs affecting HF reception, he asked me what I knew about it. I told him briefly that I was no expert, but would welcome the opportunity to do some testing before and after turning the LEDs on. He agreed readily. I am very fortunate to be in a low RFI neighbourhood, with virtually S-0 noise on 20m and up, and only S5 noise on 40m, and I hope to keep it that way.

So I did 2 things: 1) turned my beam to point directly at the installation with the receiver on 20 m, and 2) I brought out my 80 m "Tocko" foxhunt receiver. I was pleasantly surprised to find no change on the receiver noise level, and no response when pointing the foxhunt sense antenna at the lamp, either before or after the LEDs were turned on. I will continue to monitor to see if anything changes but at least at this time, I find no reason to complain about the LEDs on our street. Both the contractor and I went away happy.

~ John VA7XB

Tech Topics II

*Daniel Romila VE7LCG*

Simple CW Practice Tone Generators

Following an exchange of emails with John, the editor of The Communicator, I made some simple audio oscillators that can be useful for CW practice. It started from observing some errors in schematics that were to be published, and after that I could not stop myself from revising them and reviewing breadboard schematics that I made many-many years ago.

Bipolar Transistor

The first generator is a 2-bipolar transistors oscillator. One is PNP and one is NPN. In my version of this schematic (there are plenty of versions of it on the Internet) I use a 3 Volt power supply. It works without any change from 1.5 v to 6 V. Over 6 V the tone changes a bit and it might be necessary to adjust the 68 KOhm resistor in order to keep the generated tone in the 800 Hz – 1000 Hz range. It would still work. But at 3 V the transistors do not run hot. I used 2N3904 and

2N3906. The consumption is under 10 mA and the total power is under 30 mW. I made it on a breadboard, and I used a power bank with a power supply adapter:
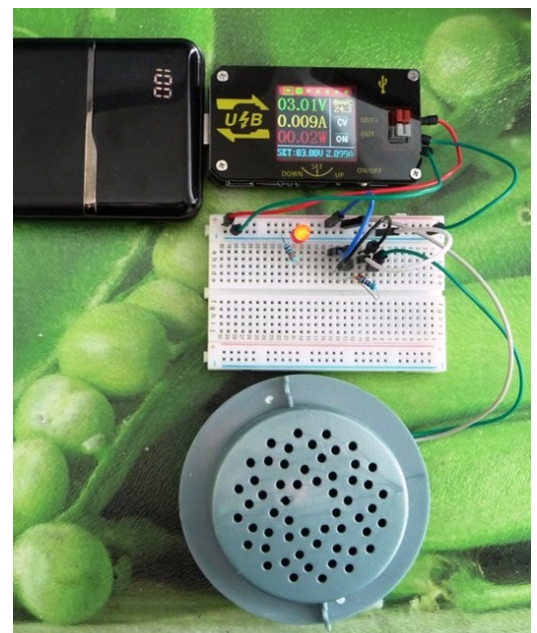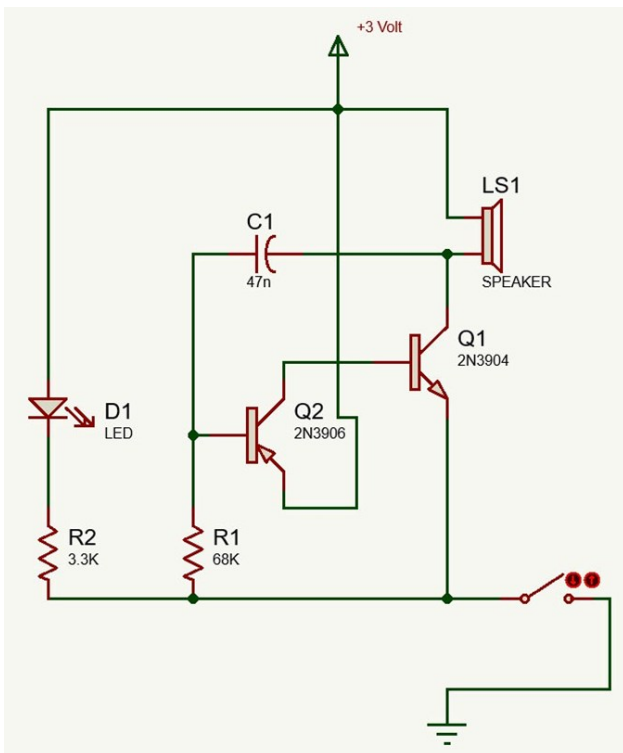
My target current for LEDs is 0.5 mA. They work fine at higher current, but with a shorter life span. They illuminate fine even at 50 micro-Amps. I published pictures and a table with currents and voltages for common LEDs in the SARC Communicator, December 2018 issue, on page 40. LEDs have become more and more efficient in the last years, and the days when they needed 20 mA are gone. They are so efficient that they are even used in street lightning (I learned that from The Communicator – LOL!).

You can see and hear this simple audio tone generator at:

https://youtu.be/d2I5sujsM_c

TTL Inverter

Another simple tone generator is made with a TTL inverter integrated circuit, SN7404 *[at right]*.

The keying is done in the speaker/LED ground circuit. In this way the oscillator functions continuously, and it does not change the frequency when the key is pressed. The consumption is under 1 mA without keying and around 20 mA when the key is pressed. The audio frequency is dictated by R1 and C1. *F = 1/1.1*R1*C1*. The values from the schematic work and sound good. The sound is more pleasant at this second tone generator because:

- The rectangular signal is 50% - 50%, while at the first generator provides a train of short impulses, something like 95% - 5%.

- The oscillator is always powered, so it has its frequency stabilized already in the moment(s) of keying.

- The oscillator part is separated from the speaker/LED output by an inverter buffer (the inverter between the pins 8 and 9 of the IC SN7404.

You can see it and hear it in operation on YouTube at: https://youtu.be/e0-t8pNq5rw

A version of the above uses SN74HC00 instead of SN7400 (SN74HC04). The 14 pin integrated circuit has 4 NOT AND gates inside. One of the gates is used to block or allow the oscillation. It requires a very small current to pass through the key *[centre right]*.

The 'Heavy-Duty 'Version

Based on previous schematics, I made a "heavy-duty" CW tone generator; if your neighbors did not know you are a ham, this is a good opportunity for them to hear you and find out. I did not want to jump over the top, so I limited the audio power at some 1.3 Watts (in the video I showed how to make it 2 W), but it is possible to obtain 3 Watts by simply playing with the values of the resistors connected in the
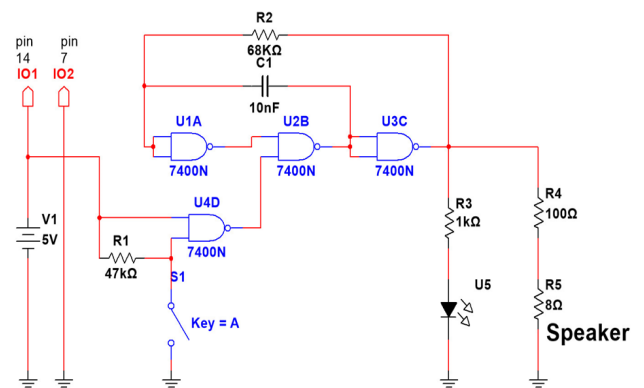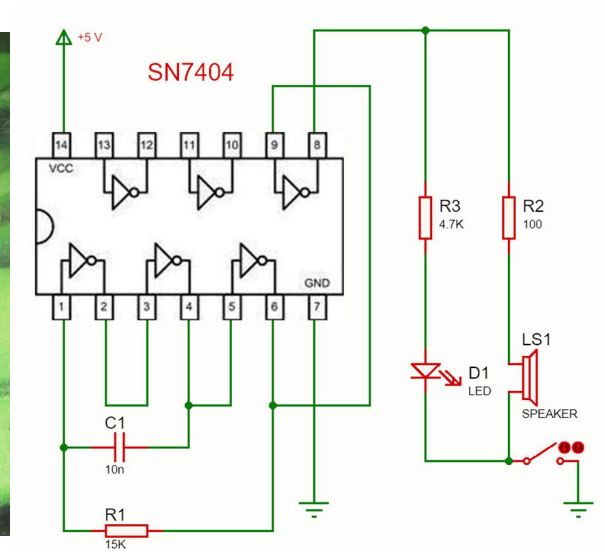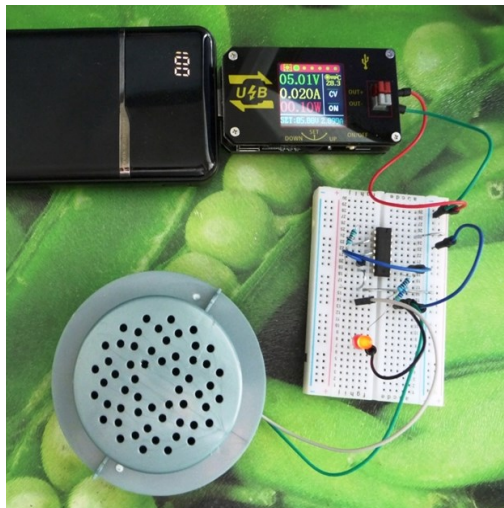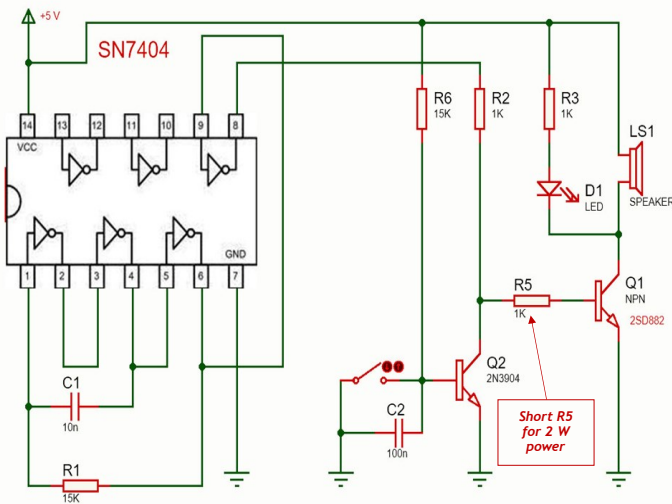
[Below] I also drew the schematic to show the integrated circuit in it.
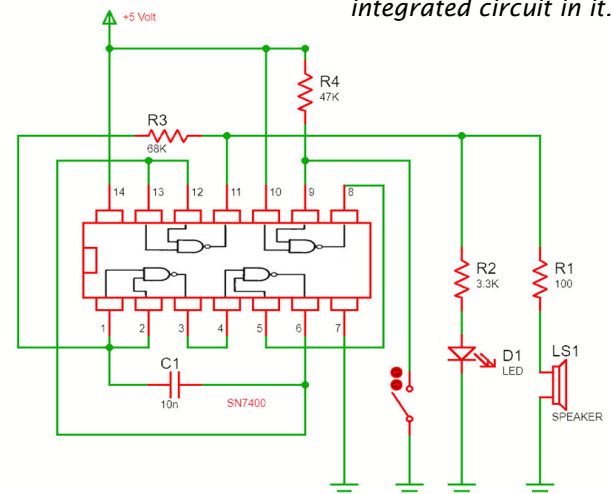
base of the final 2SD882 transistor *[schematic and breadboard below]*.

I'll mention here again that the R1 15 K resistor might impose a too high tone for some tastes, and maybe 68 KOhm or 47 KOhm would generate a more pleasant lower tone. I tried all 3 values for R1, all work OK and can be used. The inverters 1, 2 and 3
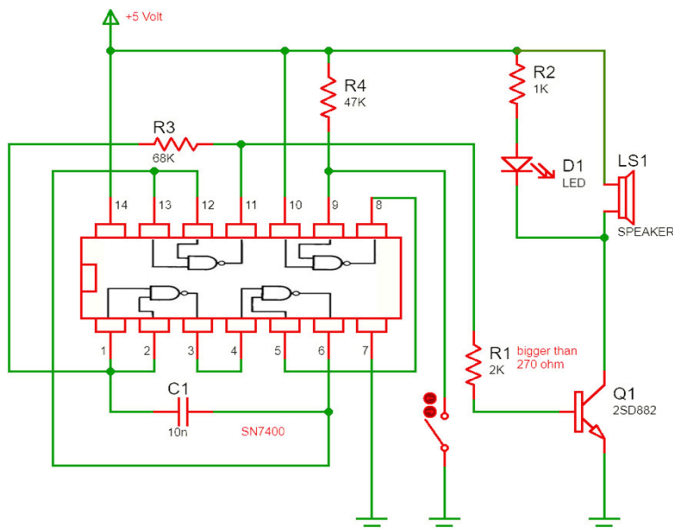

Below is the "heavy-duty" version with the SN7400 (SN 74HC00) integrated circuit.

The maximum power can be obtained by reducing R1 from 2 KOhm towards 270 Ohm. Using less than 270 Ohm would put the last NAND gate in danger because it knows to supply only 16 mA.

(the lower 3 inverters from SN7404) oscillate and supply the buffer inverter connected between the pins 8 and 9 with signal . The output of this last inverter goes through R2 and R5 to the base of the final transistor 2SD882. If Q2 (2N3904) is not put in the circuit, the speaker will continuously be loud, with audio signal, and the LED will light. But the signal path is cut to ground by Q2, and there is no sound on the speaker.

The base of Q2 and R6 (15 KOhm) are connected to plus 5 Volts. The CW keying is done in the base of Q2. In this way the key switches a very small current – otherwise the switching would have been done in the emitter of Q1 and hundreds of mA would have been on the contacts of the CW key. C2 limits the unwanted clicks of the contacts.

It seems I created a new schematic that no one else has done (yet). The final transistor does not go into saturation – so there is still reserve to play with the values of R2 and R5 (to reduce them) and to obtain more audio power. By just shorting across R5, the total power becomes 2 Watts. But even with 1.3 Watts it is enough for a classroom, especially if the speaker is inside a dedicated box. The LED requires a smaller series resistor R3 (1 KOhm exactly) because there is some voltage on the emitter-collector of Q1 and it does not shortcut to ground. The consumption in standby (power supplied) is 4 mA.

The breadboard in the picture, shows a maximum consumption of 262 mA, 1.31 Watts *[below]*.

You can see and hear it in operation on YouTube at: https://youtu.be/hhRU2ucu3Us.

The first part of that video is with R5 shorted. In the second part of the video I removed the short, the green wire, and I repeated the sound test and measurements.

~ Daniel VE7LCG

Tech Topics III   *Daniel Romila VE7LCG*

Audio Chain For Direct Conversion Receivers

Playing with direct conversion receivers is fun. One of the problems with this type of receiver is that almost all sensitivity comes from amplification by the audio chain, from the mixing of the antenna signal with the local oscillator signal and up to the headphones/speakers. If we want to obtain 100 mV into headphones from a 1 microvolt signal resulting from the radio frequency mixer, we need 100,000 times amplification [*that's +100 dB—Ed.*]. Such an audio chain is susceptible to self-oscillation.

My initial goal was to reach a stable 4,000 times amplification and eventually to extend this to 40,000 times amplification. Just to get a grip on those numbers, I mention here that a class AB audio amplifier with 2 complimentary bipolar finals and a bipolar driver transistor has an amplification of around 20 times. A 4 transistor class AB amplifier has around 200 times amplification.

In order to obtain big amplification:

The input and output impedances should be low in all amplification blocks, to lower the chance of self-oscillation.

The output final amplifier should be separated from the preamplifier and somehow the high audio frequencies should be cut somewhere in the middle, by a filter (self-oscillation happens mostly at higher frequencies).

The first audio active element needs to have low noise. The noise of the first element is amplified by the whole audio chain and heard in the speakers/headphones.
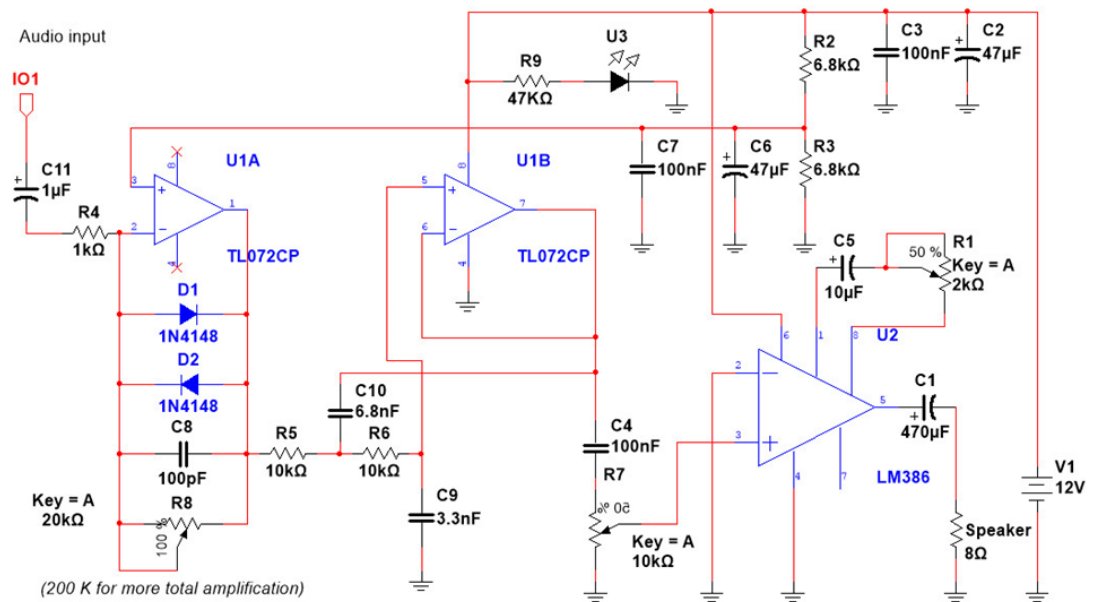
The amplification should be adjustable at various points of the amplifier, for future expansion, from 4,000 times amplification towards 40,000 times amplification.

Following the above ideas, I made a final product on a 4 cm by 6 cm board that looks like this:
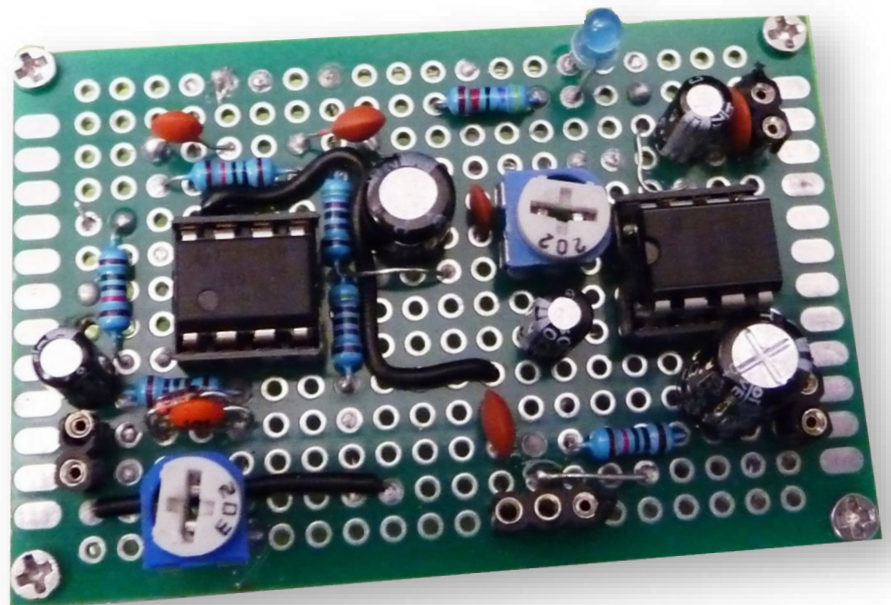
The schematics I got to is shown here.

I used an 8 pin integrated circuit TL072. The typical noise level is 15 nV/√Hz. TL072 is a high speed JFET input dual operational amplifier incorporating well-matched, high-voltage JFET and bipolar transistors in a monolithic integrated circuit. The device feature high slew rates, low input bias and offset current, and low offset voltage temperature coefficients. For comparison, the 741 operational amplifier family of circuits have noise level 60 nV/√Hz, so 4 times bigger than TL072. Even better results can be obtained using the integrated circuit NE5532, which has Equivalent Input Noise Voltage of only 5 nV/√Hz, or LM833-N, with 4.5 nV/√Hz typical at 1 kHz.

At the time of writing this article, in March 2020, LM833-N can be bought for C$0.22 cents per piece (shipping and taxes included), versus C$0.11 cents for a TL072. NE5532, TL072, TL082, LM833-N, and OPA2134. They have the same pinout and can be put in the schematics without any modification. I also drew the schematics showing the real ICs:
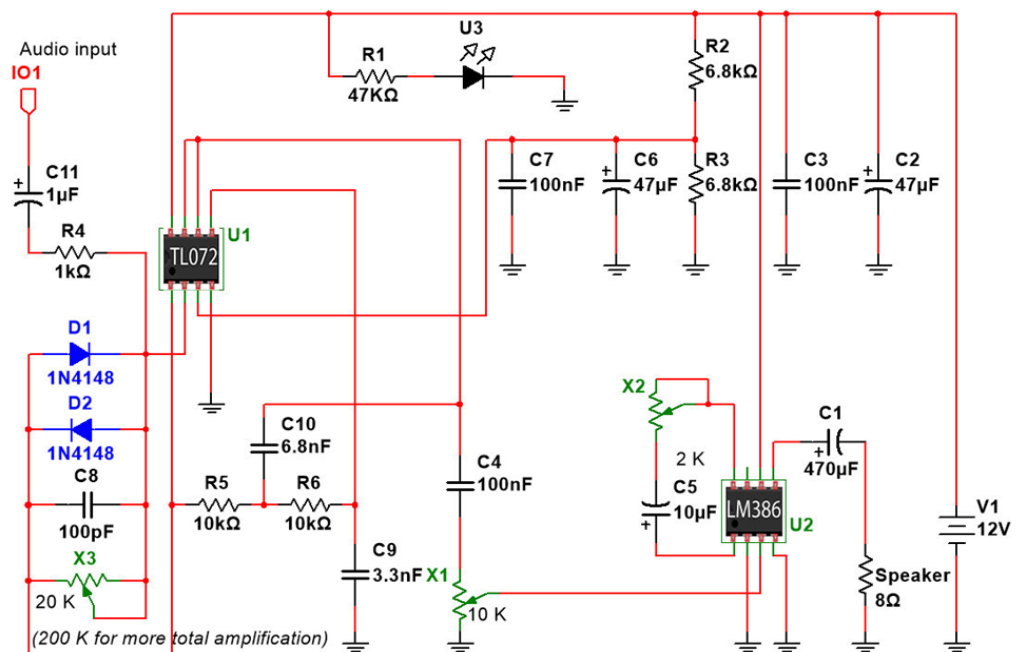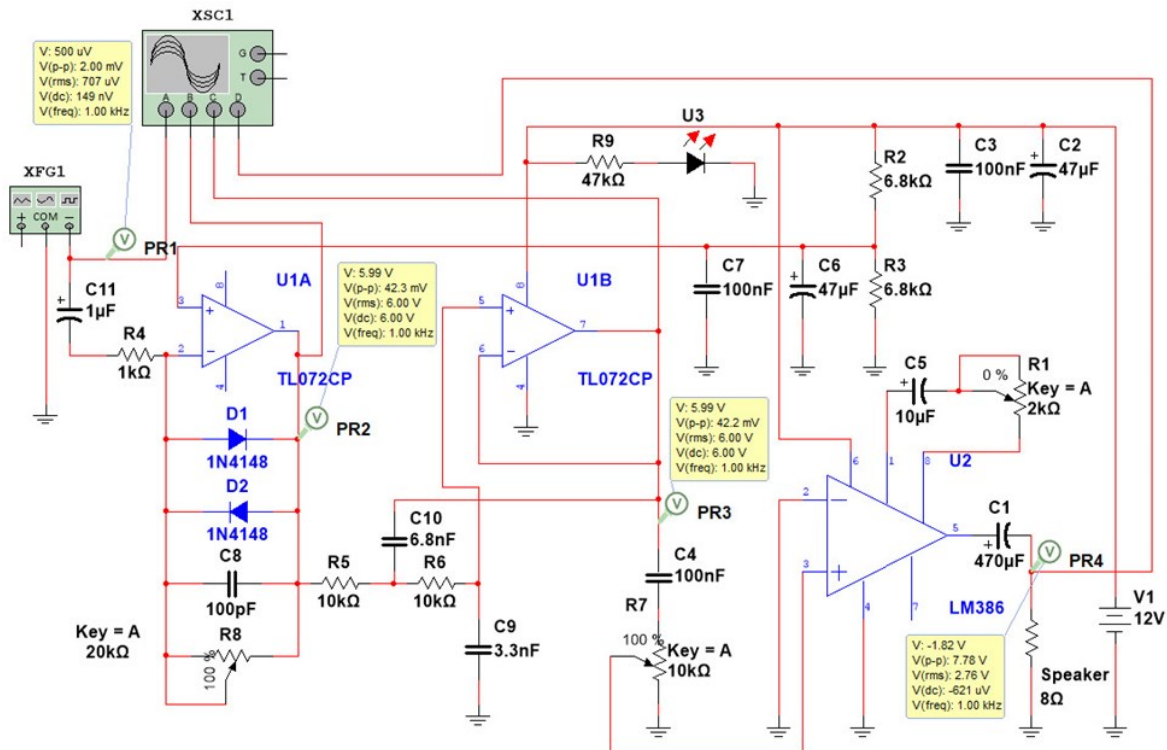
Before soldering everything on a double-sided perforated board, I verified the design in a computer simulation. The setup for the computer simulation done with Multisim *[above]*.

The first operational amplifier is connected in an inverter mode. The amplification is roughly dictated by R8/R4. The stronger the input signal, the stronger the effect of diodes D1 and D2, which function in the nonlinear part of their characteristics diagram. Their equivalent resistance comes in parallel with R8, so the amplification becomes smaller for bigger input signals. R8 is an adjustable semi-pot with a value of 20 KOhm. This would give a maximum amplification for the first block of around 20 times. This R8 component can be increased to 200 KOhm (which I did) or even more. Capacitor C8, with a value of 100 pF is a kind of short-circuit for high frequencies, while having a big equivalent AC resistance (capacitive reactance) at audio frequencies. (TL072 amplifies up to 10 MHz, but I am not at all interested in amplifying RF with it, and it would eventually self-oscillate at RF.) In the above simulation, when the given input is 2 mV at 1 KHz, peak to peak the output is 42.3 mV p-p, for

R8 being 20 KOhm. That is around 20 times amplification.

The second operational amplifier is a low pass filter. C10 is selected from a bunch of 6.8 nF capacitors to have a value as close as possible to 7 nF. C9 has the standard marked value of 3.3 nF, but it was also selected to be 3.5 nF. The cut-off frequency is around 3 KHz. The amplification of this second op amp block is 1, or a little under 1, as seen comparing the values from the input and output. I used the calculator from: http://www.calculatoredge.com/electronics/sk%20low%20pass.htm

As a final audio amplifier I used an LM386. This is not my favorite IC; for example TDA2003 offers lower distortion and higher amplification, but LM386 is incredible stable (TDA2003 is not). LM386 is cheap and it can be bought in 8 pin capsule for around C$.07 cents by piece, shipping and taxes included. The normal amplification is 20 times. It can be forced to 200 times by connecting a 10 microF electrolytic capacitor between pins 1 and 8 of the IC. I did this in my schematics, but I also

inserted a semi-pot of 2 KOhm in series with the capacitor.

When the volume potentiometer R7 (10 KOhm) is set for maximum volume with the semi-pot at 2KOhm, the amplification obtained is 184 times in the LM386 block. The virtual 4-channel oscilloscope shows sinusoidal signals everywhere, even with a big input signal, 2 mV pp *[shown below]*.

In the simulation I obtained 7.78 V on the speaker with an input of 2 mV at 1 KHz. That is 3,890 times total audio amplification. Practically, on the PCB, I immediately replaced the R8 20 KOhm semi-pot with 200 KOhm and it continued to be stable (I had to lower the input signal).

There are various versions of my schematics on the Internet; one op amp amplifier, one op amp low pass filter, LM386 final. My version has the advantage that it is adjustable. So it starts with stable amplification, where the hobbyist can see the amplifier in operation and from there it can improve towards bigger

and bigger amplification. For example, VU2UPX made a direct conversion receiver by using a similar audio chain as I did, and just several components around the integrated circuit NE612 in the RF section. VU2UPX forced the amplification of the first op amp to over 500 times. He did not even put any resistor at the non-inverting input, so I suspect he forced the full audio chain just up to the self-oscillating threshold.

https://www.qsl.net/va3iul/ Homebrew_RF_Circuit_Design_Ideas/ HF_DCR_VU2UPX.gif

Generally, the only possible source of problems is the R7 volume potentiometer. It is a big mechanical component which requires wires to the case, where it is supposed to be mounted. The pot can be soldered directly onto the PCB, and the whole audio and pot assembly can be fixed together somehow to the final case of the project (a receiver or transceiver, most probably). I also experimented with digital potentiometers, which require an IC planted on the PCB and a rotary encoder on the case. Only the digital IC is in the audio path, so long wires to the panel for the rotary encoder do not bring self-oscillation problems anymore.

LM386 is a low power amplifier integrated circuit. It is more suitable for listening to headphones than to a speaker. Whenever I use 3 terminal semi-pots in schematics that require 2 terminals semi-pots, I connect one of the extremes to the wiper. In this way it is less susceptible to collect noise and eventually to contribute to self-oscillations.

~ Daniel VE7LCG
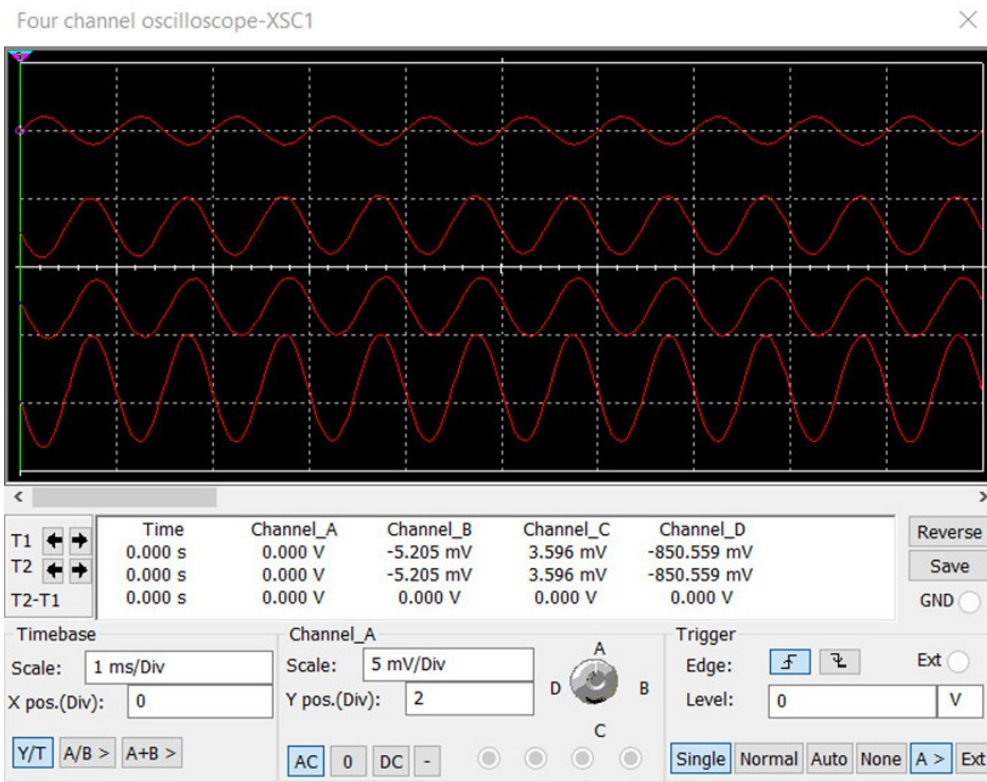
Tech Topics IV   *Daniel Romila VE7LCG*

Power Bank Trigger With NE555

Project summary: the schematics I will describe in this article prevent a power bank from going to sleep, as a result of too low consumption when supplying a ham radio project.

Since I bought a 10 Amp power bank I have not used it much for cell phones and tablets; but I do use it a lot for ham radio projects, and, as I had already learned from the Internet, many other Hams do as well.

Usually I simply put on one of its USB outputs as a regulated power supply XY-UDP which can give me an output of between 0.6 V and 30 V and adjustable regulated current up to 2.6 Amps. It is small, convenient and portable:
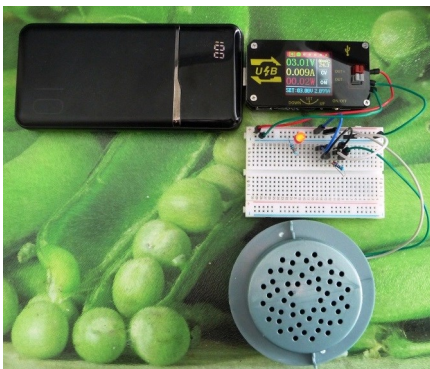
Sometimes I simply need a 5 – 6 V power supply for Arduino ham projects. I found out that a VFO or a receiver controlled by Arduino consumes under 50 mA, and this makes my power bank sleep after 30 seconds. So, I have a power supply for 30 seconds and that is all, until I push the "wake up" button on the power supply. This is not really usable.

I learned from the Internet that many hobbyists face the same problem as I, and the solution is to trigger a higher current consumption from time to time (30 seconds in my case and this is the general value for power banks).

My solution uses a dedicated timer integrated circuit NE555. After experimenting I got to this schematic:
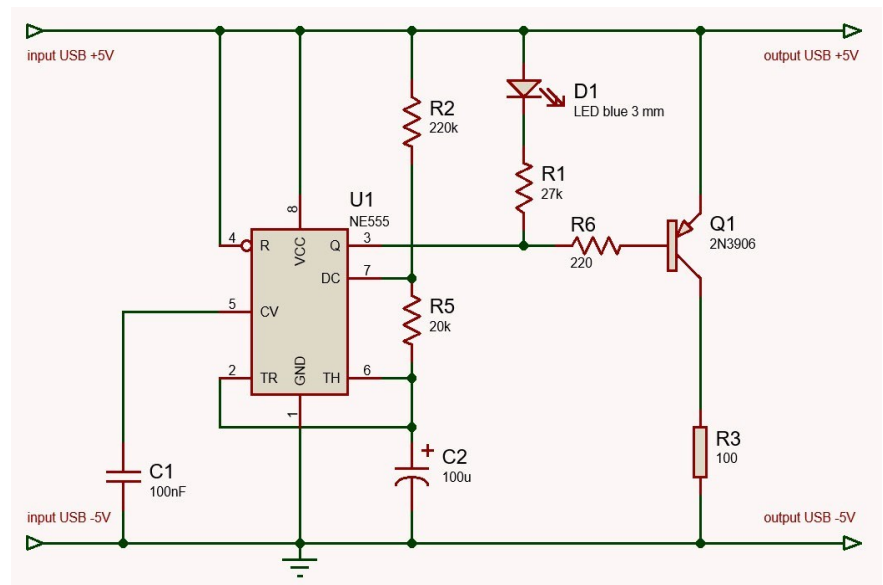
I forced the value of time triggering at around 30 seconds. If it happens that the triggering does not occur often enough for your particular power bank, you should play with capacitor C2. I choose one that is marked 100 uF but the measured value is closer to 90 uF, so the triggering happens around every 28-29 seconds instead of the limit pushing 30 seconds.

For the values needed in my schematics, I used the free online calculator from:

https://circuitdigest.com/calculators/555-timer-astable-circuit-calculator

The final product has 1.3 mA consumption with the exception of a peak of 66 mA. The peak consumption (needed to keep the power bank awake) is visually signaled by the blue LED. The 66 mA value is read by a digital voltmeter which does not have enough time to stabilize the reading (the peak is very short) so I suspect that the value of 66 mA is just something transient. This suspicion is also given by the fact that if I tried to lower the load resistor my project did not do the job anymore.

I assembled everything on perforated board with USB connectors in front of the project and at the end (output of it). It replicates the output USB connector from the power bank, but this time it does not fall sleep anymore.

You can see it in operation in a YouTube video at:

https://www.youtube.com/watch?v=dlrIY_ETbmI&feature=youtu.be

The LED blinks around every 29-30 seconds, when a higher consumption is triggered from the power bank into a dummy load.

This project was fun and easy to build. Not everything we do we actually need to use. I say this because, if you connect a measurement dongle, as shown in the first picture in this article, that dongle takes care the power bank does not go into sleep mode.

~ Daniel VE7LCG
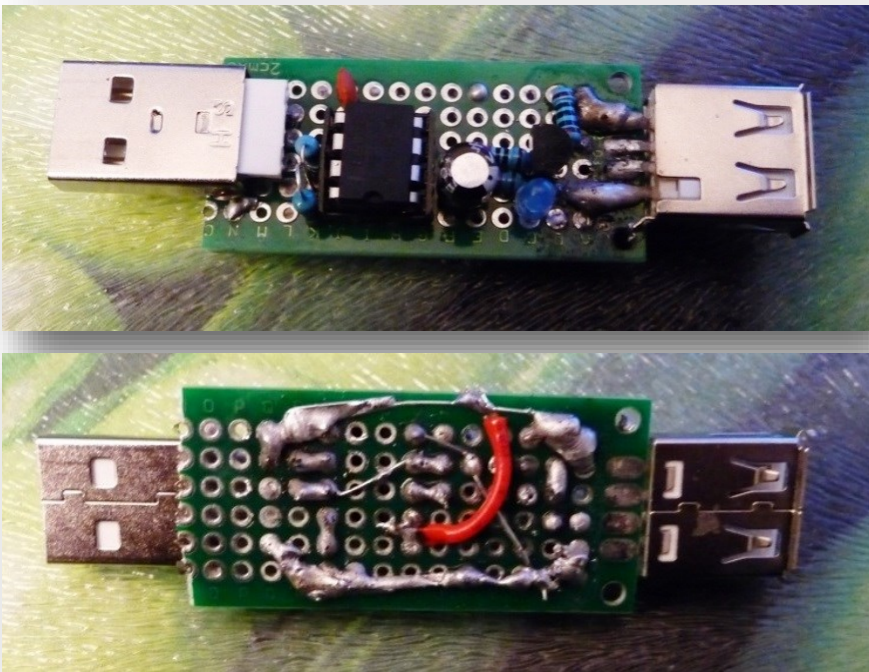
Congratulations to the participants of our recent CW course. It was interrupted by COVID-19 with just a week to go but quite a few have since passed the exam. and are now qualified with a CW endorsement.

Thanks also to the instructors!

Tech Topics V

Daniel Romila VE7LCG

Update to a PL Tone Solution for Older Transceivers

In the SARC Communicator from February 2018, page 48, I presented solutions for keeping old VHF and UHF transceivers in operation, even though they were not designed to generate PL tones. Those tones are required by the majority of today's repeaters.

The main solution presented was to add an audio connector at the back of the old transceiver, and inserted somehow or simply connected directly in parallel with the microphone, to come in with an audio PL tone from outside. In that article I insisted on coming in with this tone either from a computer running a free audio generator, or from a cellphone, also having a free audio generator application installed.

I was also launching the happy hypothesis that maybe cheap boards (under C$3.00, shipping and taxes included) that have digital displays might be used instead of the dedicated kits that cost tens and hundreds of dollars, but offer close to nothing. Such a board would need to generate rectangular pulses with programmable width (50% OK)

and programmable frequency. Since that article, I bought a board for C$2.50 and I was waiting to receive it to experiment with.

I have now received the board and I experimented with it. The results are so good that I decided to make it a permanent solution. I used double-sided perforated board as a back support, and transparent plastic as protection for both sides, each fixed in place with 4 screws.

I needed the strong double-sided perforated board because I mounted two potentiometers, for the two signal outputs, and two independent audio jacks from which to extract the signal. The board knows two independent generators – but I use only one of them – only one is needed.

The plastic face has 3 small holes in it, to be able to access the settings.

In March 2020 there are several options of such generator boards, some with one output and some with more than one output. For
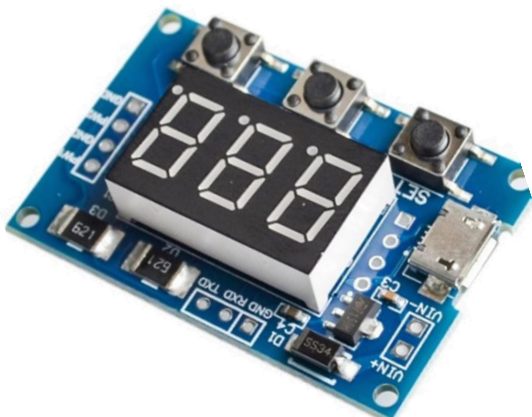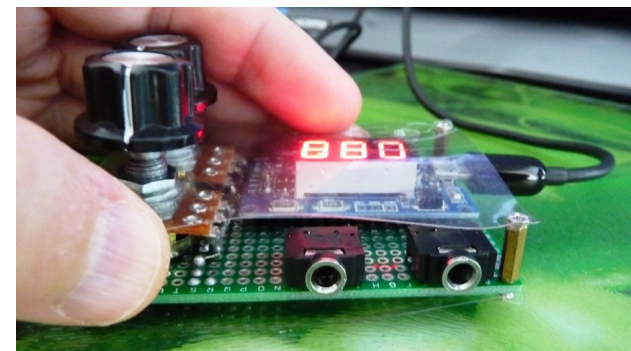
example, for C$3.90, shipping and taxes included, one can even buy something with a big LCD *[left]*.

All the repeaters that I tried tolerated the small difference between the required PL tone and the generated PL tone. We are talking here about a difference of just 0.5 Hz to less than 1 Hz, and repeaters accept much bigger differences. The potentiometer(s) mounted on the perforated-board (my version, not the last picture) allows for adjusting the level of the PL tone into the transceiver. I tried it with a stronger signal first, and the repeaters were activated. I went lower and lower, until the repeater was no longer activated. I increased the level of the PL tone a little from that position, for certain repeater activation. The adjustment is not critical, so I prefer to err on the stronger signal side.

The hardware solution was more practical for me than the software solution. Now the transceiver is no longer attached to a PC computer and can no longer interfere with an eventual phone function of a cellphone. It is a standalone solution that costs under C$4.00, and provides a new life for many UHF-VHF transceivers.

~ Daniel VE7LCG

APRS – Raspberry Pi Virtual TNC

Raspberry Pi IGate/Digipeater

Build an ultra low draw Digipeater, IGate, or APRS Beacon. In its current form, this is best suited to a base station environment because it has no GPS. With no GPS, you tell the system where you're at so this isn't something for your car. You can add GPS to the Raspberry Pi, but that's another tutorial for another day. This setup can also run with or without a monitor. This means you could have it attached to a screen in your ham shack, tucked away by itself in a closet out of sight, or running in a box at a special event checkpoint.

Depending on what you have around the house (radio, spare SD card, USB cable, keyboard, mouse) you could build this for around $40.

https://wcares.org/special-interests-3/aprs/aprs-raspberry-pi-virtual-tnc/

Tidbits...

Hey Radio friends

Just to get some more traffic, and to help all of those people who are feeling isolation keep sane, we are doing a nightly Net on VE7RVF (145.45 MHz -600 t100.0) at 19:05. It was a casual Net, with three parts, a checking (name and callsign), a round robin to discuss a random topic chosen by the NCO, then open discussions after. It is a chance to people to chat on the radio, plus chat about a relatively random topic. So far, they have included New Toys, Things you are missing while in isolation, favourite walks/rides. Some topics are related to Covid, others are more random.

Join us if you have time, help spread the word. I am trying to get the NCO and topic posted on the vectorradio.ca calendar.

~ Hiroshi VA7LET

Digital hotspots make it possible for you to participate in your favorite UHF/VHF digital voice modes without having to have a nearby repeater. I use the SharkRF Openspot as an example to show what can be done.
https://www.youtube.com/watch?v=dQuuMYNeyyE

In anticipation of our new Yaesu repeater, which has now arrived, and is awaiting setup and installation, you might want to look at some of the features such as APRS, GM, Wires-x, and other advanced functions. You will find a series of Yaesu webinars at Yaesu USA Official.
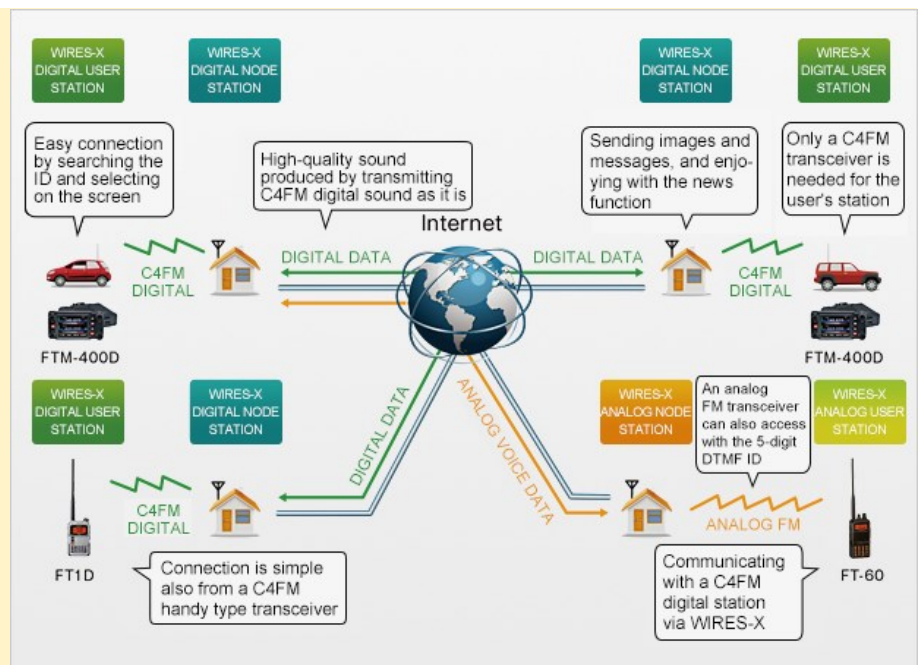
Tech Topics VI

John Schouten VE7TI

A USB Headset On The Cheap!

As a result of the majority of our Spring 2020 Basic course moving to on-line teaching as a result of COVID, I needed a good USB headset for the conference calls, but the only one I had was an inexpensive and poor quality one that I purchased years ago. I checked Amazon to see what USB headsets they had to offer but was somewhat astounded at the price of a good quality unit. I already have two great headsets for my Ham use and did not want to purchase another just for infrequent use on the computer.

I have an inexpensive eBay USB audio module *[below left]* that I purchased years ago for another project, so I thought I would give that a try. The USB audio module is basically a very compact external sound card with a USB interface into which you can plug a standard headphone and microphone. My eBay model was only C$1.25 plus C$0.89 shipping from China and it was fine for low fidelity applications. But, for this course and any similar use, I thought a higher fidelity would be required.

In any case, I dug out the eBay module and tried it out. Although usable for very basic audio needs, I found the quality too poor, and certainly not suitable for the course. A quick search on Amazon showed that there were a wide variety of USB audio modules available ranging in price from C$5.50 to C$628 (yes, that last one is not a typo!). Not wanting to spend a fortune for the above mentioned reason, and needing it quickly, I settled on a Bengoo brand module that I ended up purchasing for C$17 with delivery in 1 day.

- This sound card adapter is equipped with multiplexing technology, advertised as "three-dimensional positional sound and virtual 7.1 channel audio effect". Though I haven't tried the 7.1 audio, it sounds good on my 5.1 home system, and on my headphones.

- The product acts as a good quality sound card which can transfer the audio information via the USB port both via microphone/line-in and out through triple 3.5mm jacks. There is a microphone mute button.

- The volume of the output audio can be adjusted by a volume dial on the control panel.

- The product has wide compatibility, including Windows XP through 10, Linux and Mac OS. Installation was a breeze on both my Windows 10 and Mac machines, with no driver installation required. Audio reports have been excellent and it has great tone and audio response through my Ham headsets.

I have found that I need at least two audio interfaces on whichever computer I use given the many applications I operate, and at some time I'd like to try this out for use as a sound card modem interface for WinLink email.

There are many available choices, brands and prices. This one worked very well for me and it's a great way to add an inexpensive audio card to your device if you have a spare USB port.

~ John VE7TI

SOLDER SMOKE

Steve McLean VE7SXM

Home-Built Multi-Band End-Fed Wire Line Antenna For HF bands

Background

As a new ham, I purchased a Yaesu FT-991 transceiver with an MFJ-929 Auto-tuner and wanted to get on to HF. As I don't have space for a full length 80m wire antenna, or even the anchor points for a traditional dipole, I started to look at alternatives, and something I could build myself. I began to search for alternative antenna designs that were under 100' in overall length.

The first design I came across was an end-fed which used a simple to build 9:1 un-un and could support various wire line lengths and was reasonably effective on many HF bands, although tuning was frequently required when moving between and sometimes within bands. As I also

have an MFJ-929 auto-tuner, this type of antenna worked reasonable well for me, but did require frequent tuning. I continued my search and came across the instructions for a "Multi-band" end-fed antenna, as pictured below, and detailed at https://www.nonstopsystems.com/radio/frank_radio_antenna_multiband_end-fed.htm

I also found similar instructions posted April 19, 2012 by PD7MAA on his blog at http://pa-11019.blogspot.com/2012/04/149-transformer-for-endfed-antennas-35.html,

I took the instructions from each of these articles and implemented an antenna that works very well for me on all HF bands, with very tuning across bands. I have made contacts in to Russia, Japan, South America, Europe and many states and provinces in North America, on just 100 watts.

Please refer to the links above for technical details on how this antenna works, as this article will describe how I built my antenna and how I made it work for me.

Figure 1 - Antenna design

80-40-20-15-10 m	40-20-10 m
a = wire, 2.4 m (7 ft 10")	**a** = wire, 1.85 m (6 ft 1")
b = wire, 20.35 m (66 ft 9")	**b** = wire, 10.1 m (33 ft 2")
L = loading-coil, 110 μH	**L** = loading-coil, 34 μH
C = 100 – 150 pF, 1 kV	

©2015 F. Dörenberg N4SPP
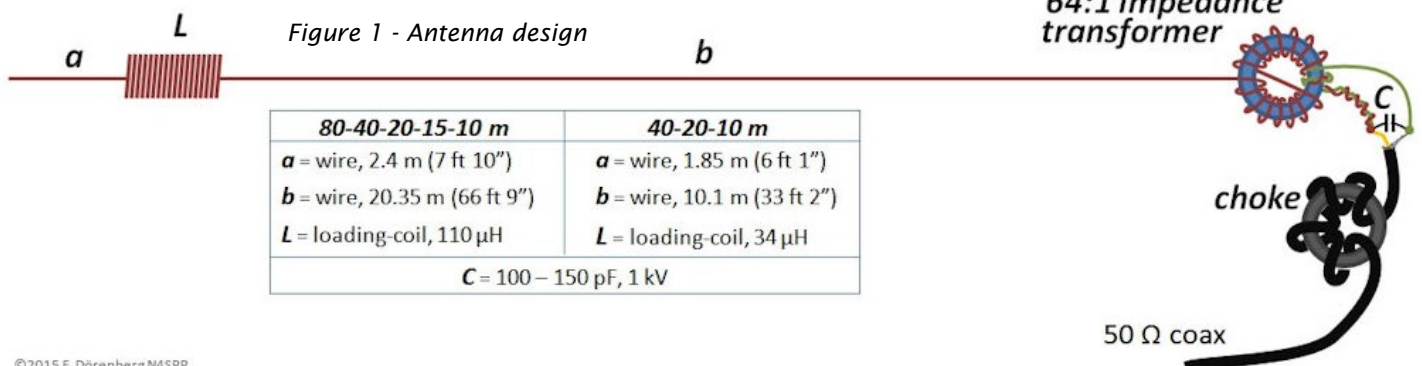
QTY	Description
1	4x4x2 Electrical Box (Home Depot)
1	Toroid (240-43)
1	1kv 100-150pf Capacitor
1	SO-239 connector
2	Line insulators
1	Roll, Approx. 90' of 14 Ga insulated wire
1	Large mounting eyelet
4	#8 Stainless bolts (for Antenna, Counter Poise and Coil)
4	#6 bolts for SO-239
1	Roll #18GA Mag Wire
1	6" Length 2" PVC Plumbing pipe (for Coil)
6	Wire eyelets
	Roll Solder, Tie Wraps
1	50' RG8x Coax
1	12" Length 2" PVC Plumbing Pipe for Ugly Balun

Figure 2 - Parts

My Implementation Overview

This antenna could be implemented for 40m or 80m as shown in the table in figure one, the 40m implementation is shorter. If you are space constrained or don't require 80m, you could chose to implement the 40m solution. In my case, I have about 90-100 feet to work with, so I built the antenna for 80m, with an overall length of a little less than 75 feet after tuning.

Stating with the balun, I used a 4" x 4" x 2" sealed plastic box from Home Depot, all screws and hardware are stainless steel from either Home Depot or Rona, a parts list is provided *[left]*. The transformer is made of a single T240-43 toroidal ferrite core with an #18 Ga enamelled copper wire. There is a requirement for a 1kv ceramic capacitor of between 100-150pf and I was only able to locate a 68pf 1kv capacitor at my local store, so I used two of these in parallel (est. 136pf).

The antenna wire is an insulated 14GA stranded antenna wire, however, automotive wire could be used. The loading coil is made using a piece of 2" ABS plumbing pipe, cut to 6" in length, with 58 turns of AWG #18 enamelled copper wire, same as used for the transformer. As my shack is not far from the antenna balun, I used RG-8x and for the "choke" I implemented an "Ugly Balun" within the feedline. Specifically, for the Ugly Balun, I used a 50 foot length of RG-8x coax which extends 18' from the antenna balun and then wraps 21 feet of coax around a length of 2" PVC pipe. It then extends to the shack. In my case I added another 25' of RG-8x coax to extend to the shack window. At the entrance to the shack the feedline is grounded, through a 6' ground rod just outside the shack window.

During the construction and implementation of a few iterations of this antenna, I found that the grounding the antenna was of critical importance, as I was finding RF in the shack while transmitting, I received a couple small RF burns on my fingers during transmission. It is my understanding that end-fed antennas are more susceptible to such issues and that grounding is critically important. I also tested with and without a counter poise, I settled on a 7' 14GA wire counter poise that hangs free.

Construction

I wound the Balun and assembled the box as shown below, and described in the article, with one exception, as my local parts store did not have a 1kv capacitor *(C in the table above)* in the 100-150pf range, but did have a package of 1kv 68pf capacitors, I used a pair of these in parallel, which is approx. 136pf. The loading Coil *(L in the table above)* is wound with the same mag wire used for the balun winding. I tried a couple a couple different windings, and found 58 turns to work well for me.

I started with 68' of 14GA wire from the balun to the loading coil *(b in the table above)* and 8' for the 80m length *(a in the table above)*.

I added a 7' length of 14Ga wire, as a counterpoise, that connects to the external ground connection on the side of the balun.

Detailed instructions for building this project are provided in the two links at the beginning of the article.

Loading Coli

The loading coil was made from a 6" piece of PVC pipe (same as used for the ugly balun), with 58 turns of 18Ga mag wire. The loading coil is inserted in the antenna wire between the two lengths or wire, as shown in the graphic above.

Ugly Balun

To construct the ugly balun, take a 24" piece of 2" PVC pipe and a 50' length of RG58x coax cable and measure from one end of the coax 18', mark it, then measure another 21' and mark it again. Starting at the first mark, using a couple of long tie wraps, secure the cable to the 2" PVC pipe, and tightly wind the coax around the 2" PVC pipe until you reach the second mark on the coax, and then secure the second end of the coax using addition tie wraps. You should now have 18' off one end of the winding and 11' off the other end. The 18' length connects to the antenna and the 11' length connects to the shack. Use a double female connector to extend the coax to the shack or, as an alternative, you could use a longer length of coax that runs to the shack. Ensure that, before the coax enters the shack, that it is properly grounded. The ugly balun should look something like the photo in figure 6 *[lower right]*.

Shack Egress

To get through the windows and provide a good ground, I have a metal plate to which the ground wire attaches, as does each coax entering the house. The ground wire runs to a 6' metal ground rod in the soil. *[see figure 7 - Shack Access and Ground].*

Tuning the Antenna

Once installed, with the Ugly Balun and grounded feedline, I started to tune the antenna. To tune the antenna, using an antenna analyser on the 40m band, you scan then trim 2-3" off the long length of wire (b), until the antenna is tuned for 40m, then change the analyser to the 80m band, and scan, then trim the end of the wire (a) 1-2" at a time until the 80m band is tuned.

When tuning for a specific band, you would typically look for the SWR dip within the band. As we started with a little extra wire length, the dip should be to the lower end of the band or even below the band; in this case 40m. You then trim the wire length to move the SWR dip closer to the middle of the band. Once 40m is tuned, move to the 80m band and do the same.

Note: One of the articles referenced, discussed how you can fold back the excess wire at the end of the antenna *(length a)* on to itself. However, I came across another article that stated that if you fold back, only half of the length folded back would count for toward the reduced length of the wire. So, if you fold back 6" of wire, it would provide the same result as cutting off 3" of wire. So, be careful if you need to fold back too much wire.

As you can see from the charts on the next page, this antenna tuned up very well for most of the HF bands, including 6m, which is not shown. Even 160m is quite usable.

I don't claim to understand all the theory behind this antenna design, but the documents linked provide additional detail which also discusses and confirms what I had found regarding common mode RF in the
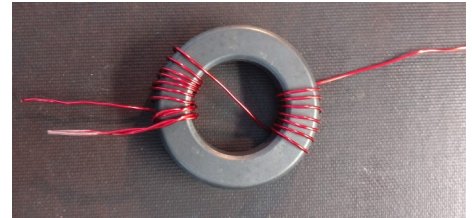
Figure 3 - Balun wound with 18Ga mag wire
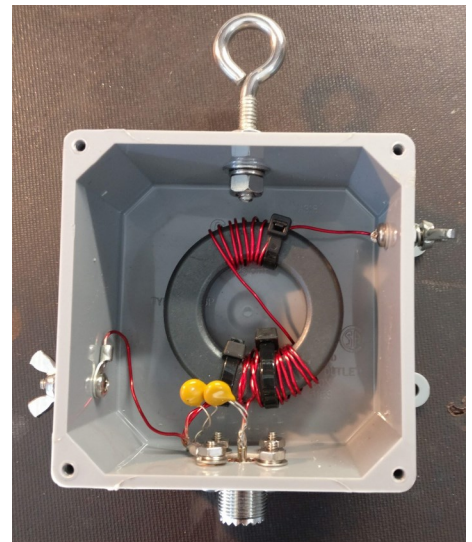
Figure 4 - Finished balun with box

Figure 5 - Loading coil on 2" PVC

Figure 6 - Ugly balun

shack, as I mentioned, I had received a couple mild RF burns on my finger, after adding both a ground rod and the Ugly Balun, I no longer had the RF issue.

Additional background and information

http://hamfest.w7yrc.org/wp-content/uploads/2019/06/EFHWslides.pdf

https://www.youtube.com/watch?v=1BBg6vRybCo

https://www.youtube.com/watch?v=4hOB1j7o7DU

https://www.youtube.com/watch?v=sty7RlXQoJI

~ Steve VE7SXM

Figure 7 - Shack Access and Ground

Figure 8 [right] 40m scan - note the RED line for SWR

Figure 9 [left] 80m scan - note the RED line for SWR

Figure 10 [below] HF Band scan - note the RED line for SWR. Also, notice that the SWR varies and is mostly under 2 or 3 within the ham bands, so little tuning is required

The Samovian QSL Cards

Daniel Romila VE7LCG

He was known as "The Bender". He was capable of travelling back and forth in time. He could also travel between various timelines. Everybody could do that. Just that he cou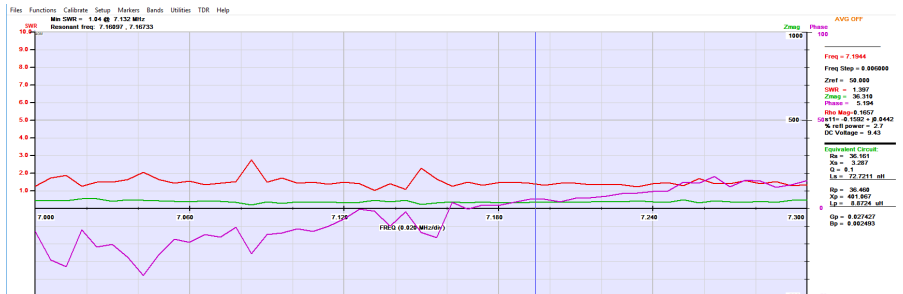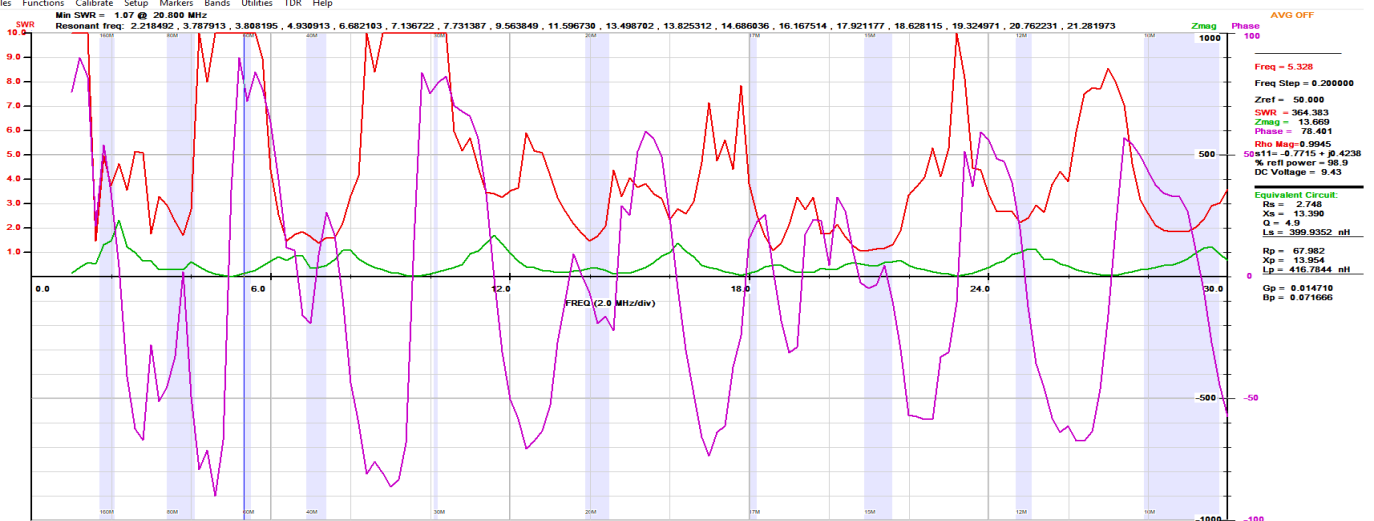ld do it better. Or so he thought about himself, while nobody else did. To tell the truth, he was very upset at such lack of respect. So, he moved his focus into obtaining QSL card awards. He just got proof that he worked all Samovian districts; all towns; all villages. He just had to find a place (and time) at which to get the QSL card award for that.

(We should note here that while he presented himself as "The Bender", his friends always called him "The Offender", which never contributed to his good mood.)

He focused. He needed the Samovian QSL card award. There was nobody like him. He will show everybody…

When he opened his eyes, he was already in front of The Samovian QSL card award authority.

"Yes?"

"I am here for the award."

"The Samovian cards award? Do you really fulfill all conditions for it?"

The two Samovian guys looked neither friendly, nor puzzled and not upset. Just bored. He showed all the proof, all the evidence he had arranged in great detail. Finally, the guys were impressed. Somebody does appreciate his work. The office was full of transceivers. There were even transceivers mounted on the ceiling. Not a square inch was wasted in that room. He was wondering how the transceivers mounted in the ceiling would be used, but he did not let such questions cast a shadow on the beauty of this thing.

"You need to select a model for the printed diploma. You should tell us the size of the frame, if you already bought a frame. Or do you have a particular requirement?"

"You know, here we can customize how we print the award. We can even make it as a banner, if this is what you want", added the other Samovian.

He decided on a model. Everything looked good, and again he was impressed by all the transceivers that surrounded them, even from the ceiling, even from the inside part of the door.

"There is only one problem we should make you aware of. There is no Samovian in this timeline. There is no Samovian in any timeline that we know of, there's nothing like this in any Universe."

He had the award printed. It was his award. And the guys who just gave him the award, somehow declared it void. It was beyond depressing. It was annoying.

"What about the Samovian logo that you have on your shirts?"

"We are the Samovians. The only ones. We were the first to come here to collect the Samovian QSL cards award. We are the only Samovians."

That was strange. That did not add up.

"Why are you here?"

"When we came here to collect the Samovian award, the locals laughed and punished us. They said something about putting us in prison, jail, whatever you want to call it…"

"But I was free to enter this door", he was pointing at the office door, which was a really heavy door, due to the mounted transceivers.

"They never enforced the punishment. We can go anytime. We are free. But they gave us so many transceivers, that we are happy here. We do not want to leave. And look how impressive our office is, isn't it?"

The office was impressive. He never saw transceivers mounted in the ceilings. Never. It was impressive.

"And do you use the transceivers in this world?"

"We tried, but nobody else wanted to talk with us via the radio transceivers. Everybody is telepathic here."

That was a bad thing. To have so many transceivers, and to be completely not useful.

"I'll come back to the question: why are you here, then?"

"We adapted to their way and we contacted almost everybody from this world, and we collected evidence of it. We only miss a million contacts, but we are getting there. There must be some award for contacting everybody, and we still have a small free space to put it, on the corner. Do you see that on the wall behind you?"

An Audio PatchBay For Your Station   John Schouten VE7TI

## Easily patch audio between rigs and accessories

If you're tired of climbing behind your station, and finding the right cable or outlet every time you want to use a piece of gear or an audio accessory connection, it may be time to find yourself a patchbay. A patchbay is a central audio connection area for all the gear in a station that allows any connection to or from equipment to be made in one location with a standardized cable and connector. Patchbays not only save time and headaches, they allow you to easily perform a number of mix tricks that would take serious head-scratching otherwise.

I like a clean station set-up without multiple speakers cluttering up my work area. All my gear is mounted in standard 19-inch rack on top of my desk (see https://ve7sar.blogspot.com/2019/08/bringing-order-to-chaos.html). I found a ProCo patchbay on eBay and I have used it at my home station for a number of years. My four transceivers are routed through them, as are my computers and, when I need it, recording gear or the stereo output from my computer when I'm listening to some tunes. I even have my foot switch routed through my patch bay so that I can use it with any of my HF transceivers. You could also patch a CW key to multiple transceivers. Patchbay jacks are monoraul (mono), so you will have to pair jacks if your use is for stereo, but usually that is not a concern in Amateur Radio.

All of the audio outputs and mic inputs route through the back of the ProCo. From there I can select one or more speakers, headphones or a recording input by using a short patch cable with standard 1/4-inch jacks. I have several compatible mics that are also adapted for use through the patchbay, and that is generally as simple as using a 1/8 to 1/4-inch audio adapter or changing from an XLR to 1/4-inch adapter.

Patchbays are very simple, once you understand their purpose. They let you easily change the way your audio gear is connected, and to easily restore your standard operating setup just by removing all of the plugs from the front of the patchbay. This means that the
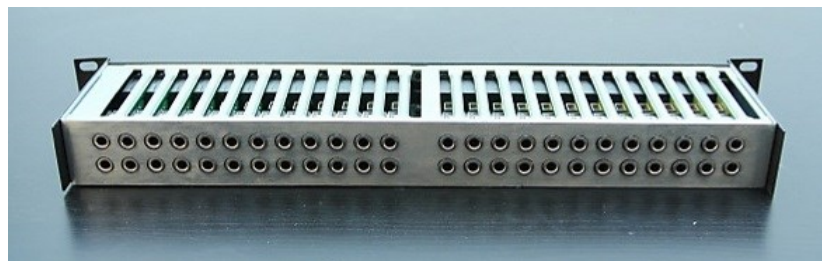
ProCo PM148 Front [top] it fits in a standard 19" rack. ProCo PM148 Rear [bottom]

patchbay must have some way of remembering what your standard operating methods are.

A standard patchbay is divided into a number of columns of pairs of jacks, each one containing one monaural patch point. Usually a patch point consists of an output from one device and an input to another device. How they are connected depends on how you normally use your station. With this in mind, there are four different ways patch points can be connected. Notice that the following diagrams show all combinations of jacks being inserted or removed from the front panel:

OPEN

Patchbay Open configuration

The open configuration never makes a connection from the top jacks to the bottom jacks. Notice how the two circuits are always kept separate.

This is useful for connecting a normally unused inputs to the patchbay. The bottom front panel jack becomes the send and the top jack becomes the return.

Example: recording devices

NORMALLED

Patchbay Normalled configuration

The normalled configuration makes a connection from the top jacks to the bottom jacks whenever no plugs are inserted into either front panel jack. Notice how inserting a plug in either front panel jack breaks the connection between the top and bottom circuits.

This is useful for connecting a source that should not have more than one load, such as a dynamic mic. The mic comes into the back of the top jacks and the feed to the preamp is at the bottom. Inserting a plug in the top front jacks diverts the mic signal for use elsewhere, while preventing the mic from being loaded down. Inserting a plug into the bottom jack allows a different signal to feed the preamp.

By using both jacks, you can insert a mic-level effect between the mic and the preamp.

Examples: microphones, high impedance outputs

HALF-NORMALLED

Patchbay Half-Normalled configuration

The half-normalled configuration makes a connection from the top jacks to the bottom jacks whenever no plug is inserted into the bottom front panel jack. Notice how inserting a plug in the bottom front panel jack breaks the connection between the top and bottom circuits, but inserting a plug in the top front panel jack does not.

This is useful for connecting a normal signal flow from one piece of equipment to another, while allowing the connection to be tapped off of or replaced if needed. Inserting a plug in the top front jacks taps the signal for use elsewhere while letting the normal connection still pass signal. Inserting a plug into the bottom jack allows substituting a different signal while removing the normal signal flow.

By using both jacks, you can insert an audio stream into the signal path.

Examples: mixer to monitor amp, direct out to recorder in

PARALLEL

Patchbay Parallel configuration

The parallel configuration always makes a connection from the top jacks to the bottom jacks. Notice how the two circuits are kept together, and that both front panel jacks are outputs.

This is useful for connecting an output, which is normally connected to one input, to several different inputs at once. Both jacks can send the signal to places where it is needed.

Examples: mixer outputs, monitor feeds, audio duplication tap points

OPEN

NORMALLED

HALF-NORMALLED

PARALLEL
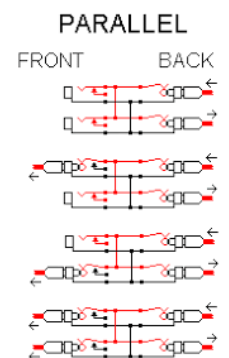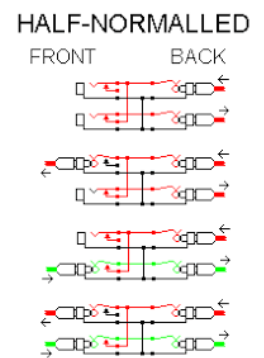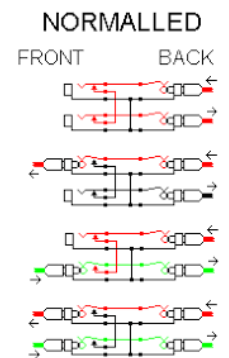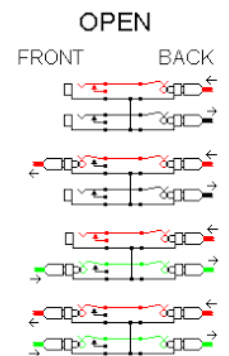
Balanced patchbays have a second set of connections on each patch point for the Ring terminal, which are wired identically to the connections for the Tip terminal that are shown in the diagram. But before the TRS plug was developed, paired plugs were made with one handle, so they fit into two adjacent patch points for balanced signals. Some of these are still around.

My ProCo Patchbays has switches on each patch point, to select whether the patch point is Open, Normalled, Half-normalled, or Parallel. Some patchbays must be removed from the rack to change the switches. Other models require soldering to change each jack's configuration... Avoid those!

USING THE PATCHBAY

For most audio patching, two setups are used most often:

- The first setup is the normal audio chain. For this setup, the output of each component in an audio chain is brought to the rear input of one patch point. The input of the next component in the chain is connected to that patch point's rear output. The patch point is set up as Half-normalled. The normal connection is maintained whenever plugs are not inserted into front jacks of the patch pair.

- Inserting a plug in the upper front panel jack allows you to split the signal off in two directions.

- Inserting plugs in both front jacks allows you to insert another component in the chain.

- By inserting a cable in the front output jack of one patch point, and the front input jack of the next patch point downstream, you can remove a component from the audio chain. You can then connect cables to the remaining jacks of those patch points and use the removed component somewhere else (nifty use!).

The second setup is the isolated component. Bring its output to the top jack on the rear, and its input to the bottom jack on the rear of the same patch point. Set the patch point up as Open. This component is disconnected until needed, but takes up only one patch point, rather than the two that would otherwise be used.

Although it takes interconnection some planning at first, patchbays can make your station cleaner and your operating easier by keeping you from having to reach around behind gear to reconnect equipment frequently. They also make it super-easy to restore your most-often used configuration. All you do is pull all of the patchcords out of the front panel, and you are back to standard operation.

For more information, there is a YouTube video at: https://youtu.be/L5LqR3Lqy5s?t=389

~ John VE7TI

My suggestion is to avoid older solder type patchbays. It is much easier to use the one I use that has jacks front and back and can be configured by slide switches on each terminal.
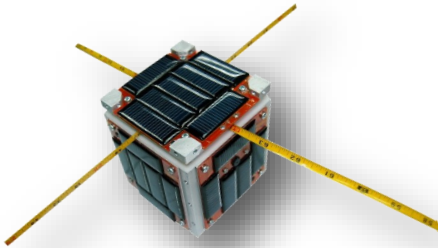
Satellite News

A global satellite ground station network. Built as an open source project, run by volunteers around the world.

SatNOGS Reaching 2,000,000 Observations!

SatNOGS constitutes an amazing open-sourced project comprised of a global network of satellite ground stations. It is a participatory project which allows for satellite information and data to be available to any observer and enthusiast. Not only can individuals utilize all available ground stations, as they have free access to those, but they can even communicate with the satellites. The data and the results of the observations carried out are distributed freely.

This aligns with our values as they are expressed in detail, in the Libre Space Manifesto. We firmly believe in the power of information and how it can drastically contribute to allowing humanity to explore new horizons. Free access to information can help develop and use knowledge differently, and even thrive in different ways while overall changing life for the better. For this, we work hard towards expanding the network of ground stations as well as providing updates (like the one we released) for the SatNOGS software. We wish this project to run on the most up-to-date technology and architecture, offering improvements and making observations more accurate and efficient.

The latest update facilitates improvements in performance, technology, and architecture for a network of 200+ fully operational ground stations and 100+ in testing mode. These have delivered over 1.900.000 observations (and counting), from 400+ satellites and 880+ transmitters and over 64.800.000 data frames. With the latest release, we aim at improving this whole network of free information and knowledge and making it more accurate for the observer.

It was on the 9th of April that the SatNOGS network reached its 2.000.000th observation and we could not be more proud and more excited!

Observation #2000000 got uploaded on the SatNOGS Network by station #6-Apomahon in Nea Filadelfia , Athens, Greece, operated by Dimitris Papadeas receiving data from SOKRAT satellite.

The 2.000.000th observation is a result of an amazing network of ground stations and it marks the continuous efforts of hundreds of ground station owners! The SatNOGS community boasts a booming number of 200+ fully operational ground stations and 100+ in testing mode. The observations come from 400+ satellites and 880+ transmitters and over 64.800.000 data frames.
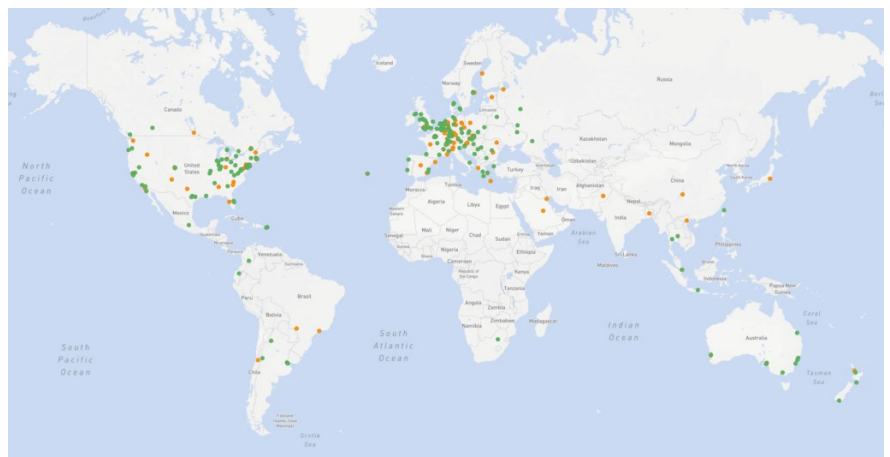
Do you want to join the next millions of observations? Do you want to be part of this community? Check out the SatNOGS knowledge-base wiki, and don't hesitate to reach out to the community forums and chat. We would love to have you onboard the SatNOGS network and community. Join us!

The International Astronomical Union features SatNOGS

The International Astronomical Union has compiled a long list of resources and fun activities to help keep people entertained while at home. The list is thorough and impressively detailed and it features resources for people of all ages. We are thrilled to have two of our projects featured on that list; the Open Source Cubesat Workshop and SatNOGS. You can find the full list of resources here.

The first lines of code for SatNOGS

It was back in April 2014 that we began writing the first lines of code to create SatNOGS as part of the Space App Challenge by NASA. It is amazing to see how the SatNOGS project has evolved since then and how the network has grown, turning into a
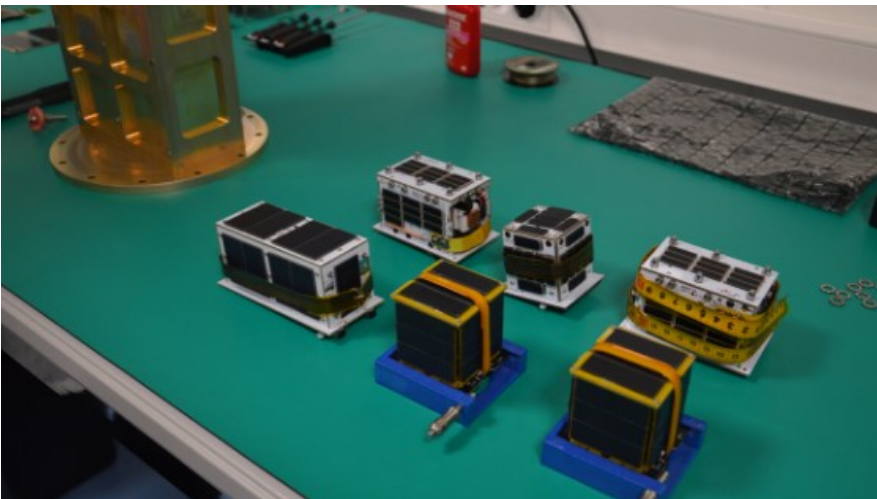
buzzing community. Here's to more satellite ground stations and to the next millions of observations!! Have a look at the video of the Project's Intro from 2014.

The QUBIK Mission: Update on the progress so far

Libre Space Foundation is devoted to the vision of open-source technologies in space, and for this, we often join forces with researchers, individuals, and teams who share this vision with us. One exciting project we have taken up is the **QUBIK Project**.

QUBIK-1

A few words about the Project...

Our love for space has brought us in collaboration with Firefly Aerospace and the DREAM payloads program. This is a global competition to host academic and educational payloads as rideshare participants on the inaugural flight of the Firefly Alpha launch vehicle. For this project, we have been working together with FOSSA Systems and AMSAT EA. We have developed two PocketQube satellites, QUBIK-1 and QUBIK-2, and PICOBUS, a PocketQube deployer.

The satellites are expected to have a short lifespan of up to 3 weeks of orbit. Regardless of how short-lived they will be, though, they are built to perform a range of communications experiments. While those experiments will be taking place, the SatNOGS network of ground stations will be receiving signals from these satellites. By exploiting Doppler Variations, the network of ground stations will perform orbit determination and satellite identification as early as possible. This will utilize the benefits and

From top left clock-wise: GENESIS N, FOSSASAT-1B, GENESIS L, QUBIK-2, QUBIK-1, FOSSASAT-2

the capabilities of the SatNOGS network to the fullest and demonstrate the Space Situational Awareness aspect of it.

How the project has been progressing so far

On the 12th of December 2019, the thermal vacuum test for the PICOBUS took place at Instituto Nacional de Técnica Aeroespacial, and on the 16th of the same month, the vibration test was conducted at the NanoSat Lab of the Polytechnic University of Catalunya. A few months later, on the 8th of February 2020, our team working at Hackerspace.gr completed the assembly of the PICOBUS and QUBIK-1 and QUBIK-2. The next day marked the bake out day for the project at the Institute of Electronic Structure and Laser. Lastly, on the 12th of February 2020, at the NanoSat Lab, the vibration acceptance campaign took place for PICOBUS, and so did the Protoflight campaign for QUBIK-1 and QUBIK-2. At this point in the process, the software is being developed so that the project will be able to facilitate all the experiments that need to be carried out.

QUBIK-1, QUBIK-2, and the PICOBUS deployer form an exciting project for which we have worked hard, and we have collaborated with inspiring teams. As the development draws to completion we are excited to see what this project will achieve.

If you find this project exciting too and you wish to find out more about Qubik you can follow the open-source repositories of the project project .

Interested in joining this project?

If you found what you read interesting and you are fascinated by space you can join us in this inspirational project. You are welcome to be part of this global network of enthusiasts and observers and you can even build your own ground station. Visit the Get Started page and get all the information you need and all the steps you need to take to be part of our Community. An easy way to get started is to build your own omnidirectional station by following the steps found on the How-to Page. We would love to welcome you to our project and to our community!

~ SatNOGS
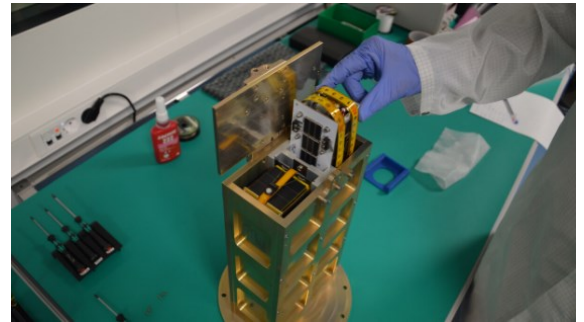
PICOBUS deployer with satellites integrated
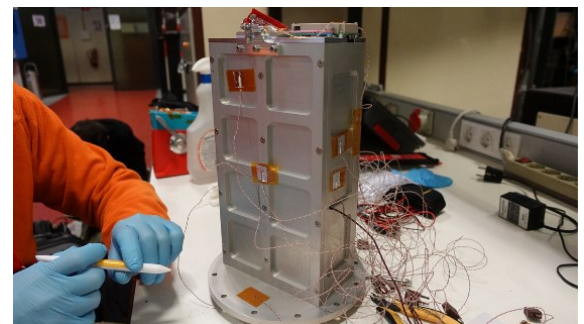
Qualification model of PICOBUS deployer getting ready for Thermal-Vacuum testing
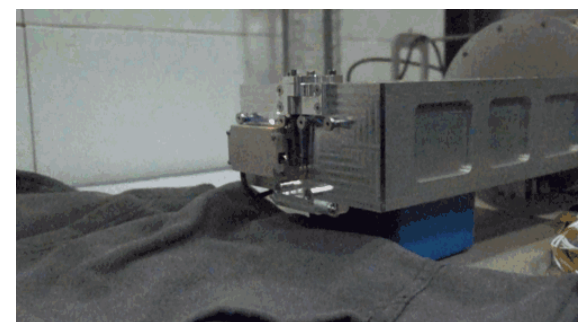
Deployment test of dummy mass satellites from PICOBUS deployer

Amateur Astronomer Finds NASA Satellite Long Given Up For Dead

There are more than 2,000 active satellites orbiting Earth. At the end of their useful lives, many will simply burn up as they re-enter the atmosphere. But some will continue circling as "zombie" satellites — neither alive nor quite dead. "Most zombie satellites are satellites that are no longer under human control, or have failed to some degree," says Scott Tilley.

Tilley, an amateur radio operator living in Canada, has a passion for hunting them down.

In 2018, he found a signal from a NASA probe called IMAGE that the space agency had lost track of in 2005. With Tilley's help, NASA was able to re-establish contact. Read the story here. ~
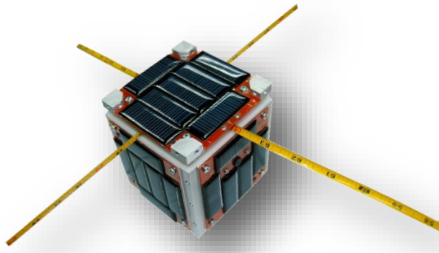
Readied for Launch on SpaceX-20

First Element of ARISS Next Generation Radio System

ARISS lets students worldwide experience the excitement of talking directly with crew members of the International Space Station, inspiring them to pursue interests in careers in science, technology, engineering and math, and engaging them with radio science technology through amateur radio.

ARISS received a special gift and delivered a phenomenal gift to the international community.

Our international gift to all—students, STEM education, the public and the amateur radio community—was the historic transfer of the first Interoperable Radio System (IORS) flight unit, serial number 1001, to NASA Johnson Space Center for launch on SpaceX-20. The special gift received by ARISS was the approval from NASA Safety to launch the IORS on SpaceX-20 and stow the radio system on the International Space Station. December 19, 2019 was truly a banner day for ARISS!

The IORS is a foundational element of the ARISS next generation radio system and is an incredible engineering achievement by the ARISS hardware team. This first element delivery will support easier radio mode transitions and enable new, exciting capabilities for hams, students and the general public. The IORS will include a higher power radio, an enhanced voice repeater, updated digital packet radio (APRS) capabilities and slow scan television (SSTV) capabilities for both the US and Russian segments. The IORS consists of a special, modified JVC-Kenwood D710GA transceiver, an AMSAT-developed multi voltage power supply and interconnecting cables.

This first flight IORS will be installed in the ISS Columbus module. A second flight unit is expected to be launched sometime in 2020 for installation in the Russian Service module. A total of 4 flight units and 10 total units will be built by the ARISS hardware team to support on-board flight operations, training, operations planning and hardware testing. Future upgrades and enhancements to the next generation system are in various stages of design & development. These include a repaired Ham Video system (currently planned for launch in mid-to-late 2020), L-band (uplink) repeater, ground command operations capability, LimeSDR signal reception, a microwave "Ham Communicator" and Lunar Gateway prototype experiment.

While ye**ste**rday was truly an historic milestone, it should be noted that there is still much "heavy lifting" work to be done

to prepare the IORS for Operations on ISS. ARISS has 92 engineering requirements and our operations Phase III safety review to complete. The space agencies take a position of "Trust but Verify." Thus, these engineering and safety "verifications" all need to be closed out before the IORS can be unstowed and turned on. This will be the ARISS hardware team's focus over the next few months.

Also, please remember that ARISS is almost entirely run by volunteers. So donations to the ARISS program for next generation hardware developments, operations, education and administrative functions are always welcome. Please go to https://www.ariss.org/donate.html if you want to contribute to our efforts!

In closing, ARISS would like to thank the outstanding contributions of the IORS hardware development team on an incredible radio system. ARISS would like to thank our sponsors and donors for helping us realize the IORS hardware systems. Ad Astra! To the Stars!

73,

Frank Bauer, KA3HDO
ARISS International Chair
AMSAT V.P. for Human Spaceflight Programs

SARC AT THE Burnaby Swap Meet

KB6NU's Column

Dan Romanchik, KB6NU

Remote Testing:
A Contrary Opinion

Remote license exams have been a hot topic lately. I've blogged about it, the ARRL reports that remotely administered testing is promising, and the W5YI VEC in conjunction with HamStudy.Org has also conducted some remote testing. I think that it's safe to say that before long remote testing will be widely available.

Not everyone is thrilled by this idea. Jeff, KE9V, tweeted the following yesterday:

"Not a fan of remotely administered tests. It puts even more distance between newcomers and other hams, mentors, and clubs. I doubt it will cease when life goes back to normal so this feels like yet another self-inflicted wound. arrl.org/news/remotely-… #hamradio"

He's got a point. I think that we already have a problem mentoring the next generation of hams, and going to remote testing is only going to exacerbate this problem. The flip side, of course, is that this is inevitable. I replied:

That's certainly a concern, but it's been my experience that many, if not most, new hams don't take advantage of mentors and clubs anyway. Whether for good or ill, they're getting their mentoring from YouTube, reddit, and other online forums, or just foregoing it altogether.

Jeff went on to say, "I get that, but ceding this function renders local radio clubs a little more unnecessary, and most are in a tenuous position as it is." Jeff is right on again, but the saying, "You can lead a horse to water, but you can't make him drink" comes to mind. Even with local testing, most newcomers don't attend local radio club meetings or take advantage of the mentoring that club members could provide. For example, I offer to help every single student that attends my one-day Tech classes. and over the past dozen years or so, I've had hundreds of students. My guess is that less than 10 percent of them have ever asked for help.

I still think it's time for remote testing, but Jeff's point is well-taken. There are lots of good YouTube videos on different amateur radio topics, but I don't think any of them are designed to help a newcomer discover what he or she might like best.

I hope the VE teams that do remote testing will at least point the newcomers at some resources to help them get into amateur radio. Hopefully that would include links to the ARRL's Find a Club page so that they could find some one-on-one help, if they need it or want it. And, it might be time for the ARRL to actually get serious about a mentoring program. Many folks do just fine on their own, but I'd guess that many more would benefit by having hams they can rely on for advice and a helping hand.

~ Dan KB6NU

When he's not trying to figure out which way current flows, Dan blogs about amateur radio at KB6NU.com, teaches ham radio classes, and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him at cwgeek@kb6nu.com.

Operating Notes: COVID-19 Edition

As it has almost all areas of our lives, COVID-19 has affected ham radio. Here are a few observations:

It seems to me that the bands have been more active over the past couple of weeks. This makes perfect sense, of course. Ham radio is the perfect hobby for people trying to avoid being infected. Ham radio lets us keep in contact with others while still maintaining our distance.

This is just anecdotal, but this situation is bringing out some guys who may not have operated CW for a while. What leads me to say this is that the operators were definitely out of practice. Just like I hope that the level of activity remains high, I hope that these ops find their way down to the CW sub-bands more often in the future.

I hope that activity remains high once we get back to a more "normal" situation.

It would seem as though this is a perfect time to work on the ham radio projects that are languishing in your workshop. This is not necessarily the case, though. One of my projects is a surge suppressor for the ladder line I use to feed my homebrew Cobra antenna. BUT, one of the reasons that I hadn't gotten around to building it was that I had planned on using stainless steel hardware as it is going to be installed outside. The Catch-22 is that the hardware stores are now closed, so I can't paw through the fastener bins of my local hardware store to get the right nuts and bolts.

As an aside, a friend of mine, Tom, W8TAM, reminded me indirectly that I had all the parts, aside from the hardware. A year or so ago, we both bought the parts around the same time, but like me, put them aside. He emailed me with a question about the project, and I replied that DX Engineering had just come out with a commercial version, and I was thinking about buying it. I felt really silly when he reminded me that I already had the parts, and with a bit of soldering, could avoid spending the $80 that DX Engineering wants for their product.

After finding out that R&L Electronics was now selling a version of the nanoVNA, I decided to finally purchase one. I ordered one online last Sunday, and on Monday, received an email from R&L that it had been "sent to shipping." I still haven't received it, so I punched the tracking number into USPS.Com just now and found out that it's supposed to be delivered tomorrow. That's a lot longer than it would normally take for a small package to travel from the Columbus, OH area to SE Michigan, so I guess that this is hitting the U.S. Postal Service, too.

Finally, my hands are a lot cleaner, if a lot drier, than normal.

~ Dan KB6NU

I recently encountered a problem when using my Yaesu FT-950. Sometime during the CQ WW WPX Contest, I noticed an annoying tone ("a birdie") in my receiver. I've had this radio for many years, used it quite a bit and this was the first time I encountered this problem. It struck me as very odd because it did not go away when I disconnected the antenna and it did not change frequency when I tuned around.

I immediately had visions of needing to tear the radio apart or send it back to Yaesu for repair. Instead, this happened…
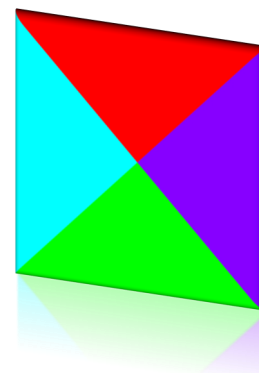
https://www.youtube.com/watch?v=jk-WClye4bw&feature=emb_rel_end

When it comes to troubleshooting problems, it usually pays to fiddle around with it and see what happens.

Foundations Of Amateur Radio

Onno Benschop VK6FLAB

Breaking The Isolation…
One QSO At A Time

For the audio podcast Foundations of Amateur Radio visit the website: http://podcasts.itmaze.com.au/

In our hobby we regularly talk about its purpose, its need, its usefulness and other potentially abstract notions. Often there's a nod towards science, learning, self-discovery, challenge, emergency service or some other higher order concept. I know I've discussed many of those over the years and encouraged you to find what the hobby means to you.

There is one aspect of our hobby that's pretty much left unsaid. It's left unsaid because it's obvious, since radio is about communication at its heart, the idea that we use our radios for communication is ingrained and unheralded. You might find a few new amateurs talking about how they made their first contact on the local repeater, or how they want to use the hobby to stay in touch when they're out and about.

It occurred to me the other day that much of the world is subject to travel restrictions and social or physical distancing requirements. There's places that are in total lock-down and whilst there are strong recommendations for people over 70 to stay completely isolated, that's not yet a requirement where I live. It might come to that, but at the moment the COVID-19 pandemic is changing habits and communities on an hourly basis.

Technology is often sought as a solution. There's plenty of video-conferences being held. Local amateur clubs are going online to stay in touch with members while face-to-face meetings are off the menu. Then there's the ongoing access to social media, blogs, discussion groups, mailing lists and the like.

There are a few brave radio clubs using something a little less technical. The radio. Shock, horror, imagine that, an amateur radio club using an actual, you know radio, to talk to each other. I must admit that communication via radio, as obvious as that sounds isn't always the first thing that comes to mind. I've lost count of the number of times when at the local club one member stood outside yelling back into the shack which way the rotator on the Yagi was pointing whilst adjustments were being made - turns out that the rotator was spinning on the mast in the wind. Took a concerted effort, seriously, to actually turn on a hand-held radio and talk to each other, like civilised people.

On the weekend during F-troop, a weekly net for new and returning amateurs, I also asked how people were doing given the social isolation that is pervasive.

I also started toying with the idea of running an F-troop every day, then I scaled it back to every Wednesday and Saturday and then it occurred to me that the power to host a net is in the thumb of any amateur clicking their push to talk button and I finally settled on continuing

the normal activity of hosting F-troop on Saturday morning at 00:00 UTC for an hour.

I understand that in a technically connected world with cheap internet and fully functional gadgets like smart phones, the idea of going back to radio might seem like a step backwards, but I'd like to point out that we're radio amateurs. That's like being a chef and ordering take-out when you have a fully stocked kitchen.

If you're experienced in this hobby you'll know that nobody needs to grant you permission to host a net, but if you're new here you might not. So, to you I say: "You don't need permission to host a net, so get to it."

There are some things I've learnt since starting F-troop nearly a decade ago. Start small. Depending on the skill-level of the participants, choose an option for hosting it. F-troop is run with a single net-controller, often that's me, and the role of net-control directs who's next to talk. If you're just playing around, the tried and true version is a round-robin net. You'll need to

pay attention a little better because you'll need to know who comes after you so you can hand the call to them. There are also variations on this, but again, start small.

I track contacts in a spreadsheet, but a piece of paper is just fine. Writing down all the stations you hear is a great idea, since it helps you keep track of who's said what. You can add information as it comes to hand. If the net is on HF you might record the signal strength you see when you're listening to each station, as well as the name and location or QTH.

Pro-Tip, use a new piece of paper for each net and put a date on it. Future you will love you for it.

My point is that there should be absolutely no impediment to getting on air, making noise and breaking isolation from the comfort of your own shack.

~ I'm Onno VK6FLAB

When Was The Last Time You Played?

The other day it occurred to me that my callsign had been away from HF for months, probably longer. I didn't really want to think about how long it had been. I moved QTH over two years ago and ever since I've been working on a new antenna set-up. You know the kind, you shouldn't rush this. Anyway, having just had a camp-out with some friends for a portable contest, where I gleefully had fun with the station callsign, I thought it was time to actually do what I keep advocating to anyone who stands still long enough, to get on air and make some noise.

So I did.

You know that feeling when the longer you wait, the harder it gets and the more you put it off? That had invaded my thinking and my avoidance. The typical excuses of not enough

space, too much noise, no antenna, radio not ready, too hard, all fought their way into prominence. I'd had enough.

So, on Saturday I collected all the bits that make up my portable station. It had clearly been a while since I'd used it, since I couldn't for the life of me remember where the head of my Yaesu FT-857d was, that was until I remembered that it had previously been installed in my car, so that's precisely where I found it. The tiny jumper cable between the head and the body was located in my headset bag where I'd stashed it after forgetting it for a contest one year. The microphone was where I'd stored it in the car. The battery was easier, since I'd used that the weekend before. Pulled out a table, a chair and set about putting my station together right there in the driveway.

I'd been meaning to test an antenna that to all intents and purposes was doomed to fail, a long-wire on the ground. I didn't have an un-un or a balun, but I did have my trusty antenna coupler, so I used that. One end of the antenna, twelve and a half meters going one way, the other half going at a right angle. That pretty much solved that.

Then for the final touch, I turned the radio on. All worked and I set about figuring out what I could hear. Across all the NCDXF beacons and bands I could hear the local beacon about 30km away.

I have mentioned the NCDXF before, but in short, the Northern California DX Foundation has since 1979 coordinated the installation and maintenance of a collection of transmitters that 24 hours a day, every three minutes transmits on a staggered schedule across 5 different bands. It's called the International Beacon Project. For funding, the NCDXF relies on donations from people like you and in Western Australia the WA Repeater Group maintain the beacon, VK6RBP.

Each transmission consists of a callsign, a beep at a 100 watts, a beep at 10 watts, 1 watt and 100 milliwatts. You can hear the beacons on 20m, 17m, 15m, 12m and 10m. Their purpose is to determine what propagation is like across the world on each of the bands, in pretty much real time. It was the impetus for me to start learning Morse Code - in case you're wondering, no, I know, I'm still at it.

On my wire on the ground antenna the local beacon on the 10m band was by far the strongest. I also had a listen on 80m and 40m and even found two stations in deep discussion about something or other. Didn't manage to catch their callsigns, but good readability, not so much in the way of signal strength.

I called up a friend on 900 MHz, in case you're sceptical, yes I hold a licence for that, so do you, it's cunningly encapsulated in a sophisticated portable battery powered multifunctional gadget made of electronics and glass. He was in the middle of repairing some damage sustained to his G5RV Jr. antenna during our latest adventures - Hi Glynn - and afterwards we had a go to see if we could in fact hear each other. I was using 5 Watts, he something like 70 Watts. Neither of us could hear the other, even though we're a similar distance from each other as the beacon. Not yet sure if it was his radio acting up, or mine for that matter.

I then started down the digital modes path. Installed a PSK31 decoder and set about programming my radio for the traditional PSK31 frequencies. Didn't hear anything, didn't decode anything, but had a ball none the less.

You might think to yourself right about now what the point of all this was if I didn't make any contacts? The answer is simple, I got outside, in the sun, soaked up some Vitamin D and played radio, just like the weekend was intended for. My next adventures are likely going to involve the same antenna and a vertical for transmit to see how that goes.

You don't need an excuse to get out and play and when you do you might not make any contacts, but that's not really the point of playing, is it?

~ I'm Onno VK6FLAB

To listen to the podcast, visit the website: http://podcasts.itmaze.com.au/

foundations/ and scroll to the bottom for the latest episode. You can also use your podcast tool of choice and search for my callsign, VK6FLAB.

All podcast transcripts are collated and edited in an annual volume which you can find by searching for my callsign on your local Amazon store, or visit my author page: http://amazon.com/author/owh.

Foundations of Amateur Radio Volume 7 is out now - with chapters on digital modes, coax connector loss, waterfalls, station performance and more.

Feel free to get in touch directly via email: onno@itmaze.com.au, or follow on twitter: @vk6flab (http://twitter.com/vk6flab/)

If you'd like to join a weekly net for new and returning amateurs, check out the details at http://ftroop.vk6.net, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link and 2m FM via various repeaters.

ITmaze -ABN: 56 178 057 063 phone: 04 1219 8888 onno@itmaze.com.au

No-Ham Recipes

Grace Byrne VE7IGB

Red Lobster Style Cheddar Biscuits

These are similar to the cheddar biscuits served at the Red Lobster restaurants. Red Lobster comments on its web site, "Sorry, it's a secret… the recipe for our crave-able biscuit is secret, but that hasn't stopped home cooks and cookbook authors from trying to re-create them. 'Recipes' have even been offered on eBay. Of course, we will share a couple of well-kept secrets for making our much-loved biscuit… Do not over knead the dough and make sure you use baking soda as one of the ingredients." Well, at least they have a good sense of humour about all the knockoffs! The biscuit recipe below serves 10.

For those who cannot get Bisquick, make a similar product this way:

- 5 1/2 cups (625 ml) all-purpose flour, sifted
- 1 teaspoon (5 ml) baking soda
- 1 cup (250 ml) vegetable shortening
- 3 tablespoons (45 ml) baking powder

Mix all ingredients well until crumbly. Keep in a tightly sealed container in refrigerator or freezer until ready to use. When you want to bake biscuits, take out amount needed, and let it warm to room temperature before using.

Cheddar Biscuit Recipe

Preheat oven to 450F (230F or a hot oven)

- 2 cups (500 ml) Bisquick baking mix
- 2/3 cup (165 ml) milk
- 1/2 cup (125 ml) shredded mild cheddar cheese
- 1/4 teaspoon (1.25 ml) garlic powder
- 1/4 cup (65 ml) melted butter
- Parsley flakes

Mix Bisquick, cheese and milk into soft dough. Beat with a wooden spoon for about 30 seconds.

Drop by spoon onto greased cookie sheet. Smooth tops of dough so biscuits cook uniformly. Bake for 8 to 10 minutes.

While baking, melt butter in pan and stir in garlic powder. Once biscuits are cooked, brush butter on the tops, sprinkle with parsley and serve hot.

Social Reminder

The Surrey Saturday weekly social gatherings at the Kalmar Restaurant are cancelled until after the COVID crisis, but instead we'd love to see you on the repeater more often to maintain contact.

Back to Basics

John Schouten VE7TI

From The Canadian Basic Question Bank

Canada's Safety Code Six

I thought that at this time of COVID isolation, and the focus on health and safety, it might be a good time to look at some of the Basic Question Bank [RIC-7] questions from the Safety module of our course. Every Basic exam that I have administered has contained at least one, sometimes two or more questions on electrical, RF and tower safety.

B-1-24-2 What is the purpose of the Safety Code 6?

A. *It sets transmitter power limits for interference protection*

B. *It sets antenna height limits for aircraft protection*

C. *It gives RF exposure limits for the human body*

D. *It lists all RF frequency allocations for interference protection*

What Is RF Radiation?

Radio frequency radiation is non-ionizing radiation. This means that RF radiation does not strip electrons from atoms as can occur with ultraviolet, X-ray, and gamma ray radiation that has much higher frequencies than RF. Radio frequencies do not damage genetic material such as DNA by such molecular disruption. Thus, it is not possible to develop radiation poisoning from RF or by touching a transmitting antenna.

If an object is energized by a radio frequency (RF) source, the predominant contact hazard is burning of tissue at the point of contact and arises when the current drawn from the object exceeds a certain value. This RF burn hazard exists on various transmitting aerials and simple precautions can be taken to avoid it. However, such a hazard can also arise on metallic objects excited by radiation from transmitting aerials in their vicinity and this paper is devoted to this aspect.

RF Burns

Touching an antenna while transmitting with it is never a good idea. Although the hazard with very low power levels such as that of a 5 watt HT transceiver is negligible, higher power levels can produce hazardous conditions for touching a radiating element. You should take precautions against the possibility of your antenna being accidentally touched by a person while you are transmitting.

Close or direct contact with RF transmission lines or antennas may result in RF burns. These are usually deep, penetrating, third-degree burns. To heal properly, these burns must heal from the inside to the skin surface. To prevent infection, you must give proper medical attention to all RF burns, including the small "pinhole" burns. Petrolatum gauze can be used to cover burns temporarily before the injured person reports to medical facilities for further treatment.

Radio frequency burns can be deep and very painful, much more so than a conventional infrared heat burn. First aid for RF burns is to

apply cold water or ice to burned areas and seek immediate medical attention. Of course, prevention is the preferred course. Make sure it is not possible for humans to accidentally come into contact with your antenna, and if the antenna is within reach such as a mobile mounted element on a car, be sure no one is in contact with it before you push to talk.

It is also possible to receive an RF burn from other conductors that are resonating from nearby RF fields. For example, ground conductors, cables, or other metal components of your station may develop non-uniform "hot spots" when your station is radiating at high power or if a transmitting antenna is very close by, especially if these conductors have dimensions approaching a significant fraction of the transmitting frequency. Antennas are not the only hazardous element with RF burn potential!

The severity of an RF burn depends upon several factors:

- The strength of the electric field. This is the power output at the antenna where the contact is made. As noted, low power levels do not usually impose burns as the blood flow through tissues can readily carry away the mild heating imposed by low power RF. Higher power levels with stronger electric fields will, of course, impose more severe heating of tissue. Compare touching a 5 watt light bulb with touching a 60 watt light bulb, or a 100 watt light bulb. Although that is infrared heat, the relative comparison with RF energy is similar.

- The frequency. Our bodies are more efficient at absorbing frequencies in the VHF realm than others. So, an RF burn may be imposed at VHF frequencies with lower power levels than at other frequencies. Note that VHF includes the very popular 6-meter and 2-meter bands.

- How well grounded you are. When you come into contact with an RF transmitting element such as an antenna that is conducting RF electrical currents, those currents may seek a path to ground potential voltage through your tissues, quickly heating your tissues near the point of contact with the antenna. In some cases this can cause an RF burn. If you are very well grounded, such as standing barefoot in a puddle of sea water, you're going to

Study Links

Whether you are new to the hobby or brushing up on skills, you should find these study links helpful:

1. RIC-7 is the entire up-to-date Industry Canada (IC) Basic Question Bank. http://tinyurl.com/CanadaBasicQB

2. Industry Canada (ISED) on-line practice page: https://apc-cap.ic.gc.ca/pls/apc_anon/apeg_practice.practice_form

3. The Amateur Radio Exam Generator is at: https://www.ic.gc.ca/eic/site/025.nsf/eng/h_00040.html

4. The ExHaminer Study software for Windows is at: https://wp.rac.ca/exhaminer-v2-5/

5. There are plenty of good resources for both basic and advanced exam study courtesy of the Cold Lake Amateur Radio Society at: http://www.clares.ca/va6hal%20training.html

Contact SARC if you wish to write the Basic or Advanced Exam. If you pass we'll even give you a year's free SARC membership!

Newly Licensed? When you receive your paper license in the mail, it will come with a form that can be filled out and mailed to the Radio Amateurs of Canada office, at which point an introductory RAC one-year membership will be set up. Introductory memberships are identical to our existing basic memberships and you will receive The Canadian Amateur magazine for one year.
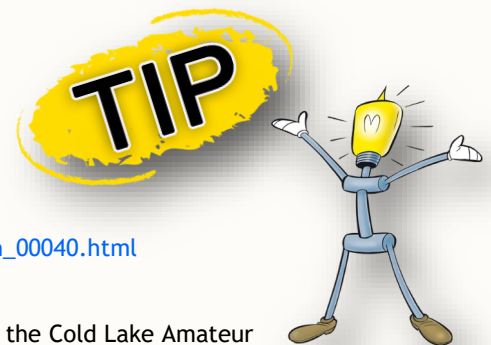
provide a very nice path to ground and the currents will flow readily, burning your tissues at the contact point where currents are most concentrated.

- How much of your body contacts the radiating element. If you touch the antenna with your fingertip, a high concentration of RF will flow through the small area of your fingertip, potentially causing a severe burn. If you grab the antenna in the palm of your hand, a much larger surface area is in contact with the radiating element, and the RF current will be dispersed through that larger tissue area. The concentration of current in this case is lower, so tissue heating is less severe, but it may still burn you depending upon the other factors listed above. If the antenna is coursing with a kilowatt, you're definitely going to feel it in the palm of your hand (and beyond).

More On Dielectric Heating

Dielectric heating is the heating of an insulating material by placing it in a high frequency electric field.

RF radiation is absorbed by the tissues of our bodies and transformed into heat that the body must remove to avoid damage from overheating or burning – to avoid cooking, essentially. Human cells die at about 107 degrees Fahrenheit or above. T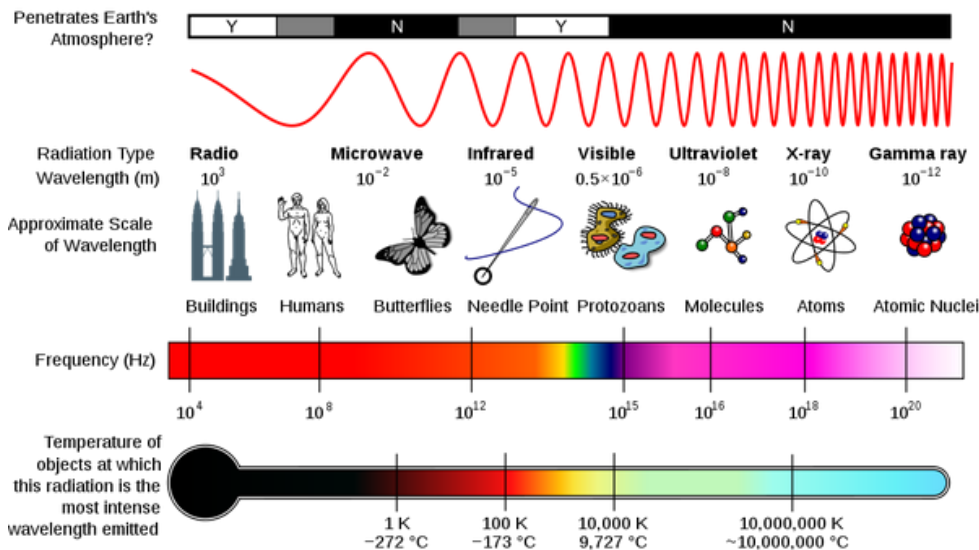he heat results from internal losses during the rapid reversal of polarization of molecules in the dielectric material. In the case of a person in an RF field, the body acts as a dielectric, If the power in the RF field exceeds 10 milliwatts per centimeter, a person in that field will have noticeable rise in body temperature.

The eyes are highly susceptible to dielectric heating. For this reason, you should not look directly into devices radiating RF energy. The vital organs of the body are also susceptible to dielectric heating. For your own safety, you must not stand directly in the path of RF radiating devices.

Canada's Safety Code 6 (2015)

Health Canada's mandate regarding human exposure to radiofrequency electromagnetic energy from wireless devices is to carry out research into possible health effects, monitor the scientific literature related to such effects, and develop exposure guidelines. The current version of these exposure guidelines is specified in a document entitled: *Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz - Safety Code 6 (2015)*. This code is accompanied by the Technical Guide for Interpretation and Compliance Assessment of Health Canada's Radiofrequency Exposure Guidelines, to assist users in understanding and assessing the safety of electromagnetic exposures in working and living environments.

The exposure limits in Safety Code 6 are based on an ongoing review of published scientific studies, including both internal and external authoritative reviews of the scientific literature, as well as Health Canada's own research. The code is periodically revised to reflect new knowledge in the scientific literature. The current version of Safety Code 6 reflects the scientific literature published up to August 2014 and replaces the previous version published in 2009.

https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/limits-human-exposure-radiofrequency-electromagnetic-energy-range-3-300.html

Health Canada reminds all Canadians that their health is protected from radiofrequency fields by the human exposure limits recommended in Safety Code 6. Health Canada has established and maintains a general public exposure limit that incorporates a wide safety margin and is therefore far below the threshold for potentially adverse health effects. The Department continues to monitor and analyze scientific research on this issue and should new scientific evidence arise demonstrating that exposure to radiofrequency fields poses a health risk to Canadians, Health Canada will take the appropriate action to safeguard the health of Canadians.

Safety Code 6 Fact Sheet link.

So, the answer to our original question:

B-1-24-2 What is the purpose of the Safety Code 6?

C. It gives RF exposure limits for the human body

Explanation: Health-Canada publishes 'Safety Code 6' (Limits of Human Exposure to Radiofrequency Electromagnetic Fields) to protect workers and general public from adverse health effects. The lowest exposure limit is set to '28 volts per metre' for the range of 10 MHz to 300 MHz. This range is presumed to be the one over which the human body most readily absorbs RF energy. Limits on either side of that range are higher. Since 1999, a previous exemption for portable transmitters has been removed (i.e., handhelds are no longer exempt from code requirements).

Next month we'll examine some other safety issues of our hobby.

~ John VE7TI

Painful Lesson On The Difference Between Electrical Currents (AC and DC)

Electro-Boom Current Wars:

(CBS News) When we last checked in on Mehdi Sadaghdar, he was demonstrating "Capacitors" and in quite a bit of pain. Come to think of it, the time before that, when he was demonstrating "Electrostatic Discharge" to us, he was also in a lot of pain. I wonder what might happen in his latest video above demonstrating the difference between the two major types of electrical currents? Another lesson you will never forget should "spark" your interest at about 1:10 into the video.

Go ahead and pat yourself on the back if you guessed he'd be in a whole lot of pain all over again. And now that every single one of you has patted yourself on the back, Mehdi Sadaghdar writes about his latest, painful lesson in electricity (that no one should ever try at home!):

"Have you always wondered if you electrocuted yourself, which type of electricity would hurt more: AC (Alternating Current) or DC (Direct Current)? Wait no more!"

A big triple-rainbow salute of electrifying education goes out to Mehdi from all of us here for continuing to put himself through such pain for our ongoing education! And to check out more amusing lessons in science that you will never forget, you can see our previous posts on Mehdi Sadaghdar by clicking here or you can go to his YouTube page by clicking here.

Electro-Boom Current Wars: https://youtu.be/S7C5sSde9e4

Starting Up With WINLINK Global Radio Email®
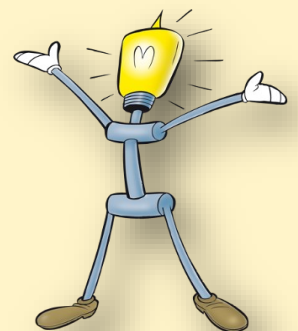
Don Hamilton VA7GL

Some WinLink Start-up tips from Don...

1. First got to https://www.winlink.org/WinlinkExpress

2. Scroll down to the Download and click on the down load current program

3. Follow the instructions to install the program

4. You will need to register your call sign

To help Winlink's newbies overcome software fright when operating Winlink Express for the first time, San Diego, California ARES created a series of 24 short videos to help newcomers find the right button to click in the Express software menus. The topics of the short videos range in difficulty from simple, such as sending a Winlink email to a gMail account, to challenging, such as using software tools to locate a neighbor operating in the vicinity.

The San Diego ARES Winlink video playlist is open to the public and is located at:

https://www.youtube.com/playlist?list=PL-7mirT -kjfs84FQzLr-qv066Kl94rtYM

The SEPAR group decided to use Telnet setting. This give you the ability to practice by using the internet.

Procedure

1. Open the Winlink program, In the open session box, use the pull down, set to Telnet Winlink

2. Click open session

3. You should receive a message from Winlink, click close

4. In the message box click new message, make sure the "send as: Winlink message is showing

5. When finished the message in the to box: type my call va7gl

6. Next post to out box, the open the telnet session and click: Start

~ Don VA7GL

CW Practice?

Missed our last CW class but you have the time now to learn the Morse Code? Great!

We are doing weekly practice sessions on the SARC repeater on Tuesdays after the 8pm net and roundtable. While we are focusing on practice for those who were in the course, it is still practice for everyone.

W1AW suspended its morning code practice and qualifying run transmissions on March 24, 2020. However,

W1AW's evening transmissions, including qualifying runs, will be sent as usual — there are no changes to the evening transmit schedule.

More practice? Here is a video to get you started: https://www.youtube.com/watch?v=EJzjerNJGrA

and here's one more, https://youtu.be/6PRY-LczCB4

and a third with an easy way to practice numbers: https://www.youtube.com/watch? v=ywiJWSdO1r4&feature=youtu.be

HAM NEWS

Tidbits from the Amateur Radio World

Titanic Remembered…

In South Wales, an awful signal from the Titanic was received in Pontllanfraith: April 15, marked the 108th anniversary of one of the world's largest maritime disasters, the sinking of the Titanic and it was the day too when the blood of a Gwent amateur radio enthusiast ran cold.

For Arthur 'Artie' Moore MNX picked up the distress signal from the stricken ship, thousands of miles away in the chill Atlantic, at this home in Gelligroes Mill, near Pontllanfraith. But no-one believed him until days later when news of the tragedy, in which more than 1,500 people died, reached the mainland.

Mr Moore was 26 years old at the time, and the signal came through on his homemade wireless radio set-up in the early hours of April 15, 1912. He raced to inform police about the distress calls that he picked up from the Titanic, but they did not believe him.
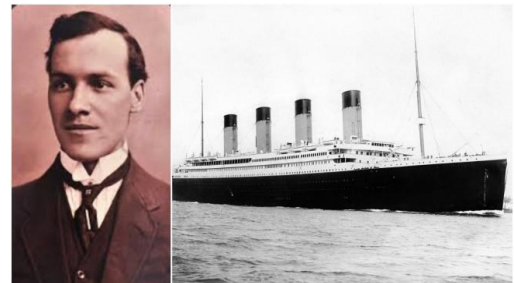
One of the distress calls he had received was faint but read: "CQD CQD SOS de MGY Position 41.44N 50.24W. Require immediate assistance. Come at once. We have struck an iceberg. Sinking." CQD stood for 'come quickly, distress' and MGY was the radio name for the Titanic. Read the full story at

https://www.southwalesargus.co.uk/news/18381566.awful-signal-titanic-received-pontllanfraith/

~ *Courtesy NSARC Newsletter*

The radio set that picked up the distress signal from the Titanic

Amid pandemic, amateur radio societies across the North are seeking new recruits

Amateur radio enthusiast Ron Thompson has made contact with Russia from Yellowknife. He's also used it to reach his wife to get milk from the store. He's part of the Yellowknife Amateur Radio Society, which is joining other radio societies to recruit people to study as licensed operators during their self-isolation. Amateur radio is useful for emergency communications during natural disasters, but it can also be used for fun, for local non-commercial communications. Once someone passes the test, they can set themselves up for just a few hundred dollars and some harvested parts from other technology, or they can spend tens of thousands of dollars, said Thompson.

The call for recruits went out this month, but with a pandemic keeping people at home, the online courses are filling up quickly, said Thompson.

Read the entire story at:

https://www.cbc.ca/news/canada/north/amateur-radio-northern-recruits-1.5520748

HAM

NEWS

For DXers and Contesters worldwide:

GOM - the 'Global Overlay Mapper' Ham Mapping Suite

Fully updated and tested on Win 7, 8, 10. Now with geocoding and log-plotting facilities.

Representing a new concept in the field of Ham Maps, the Global Overlay Mapping System is packed full of features for all Ham Radio enthusiasts, including the feature shown below.

This would be a great program to run during a contest, or Field Day, to show the public the range of stations contacted.

1 World Map, with specialised satellite images and world region-boundaries.

8 Continental Maps - Europe, Asia, Africa, North and South America, Oceania, Arctic, Antarctica.

29 Sub Continental Maps, with Single Click Navigation for easy loading.

Each map has a background, 12 active layers, and custom Scalebar.

Country Outlines, CQ, ITU & Time Zones, Color Relief Map, Grid Locator & Lat/Lon meshes, 100s of Region Names.

2204 Major Cities - Europe:323, Asia:517, Africa:513, North America:314, South & Central America:359, Oceania:178.

The latest Prefix, IOTA, and Flag Information.

Real-Time Mouse Tracking, with continuous Positional and Grid-Locator information.

Easy-to-use Feature-Locate system - Jump to a position on a map from a full list of Prefixes, Capital Cities, Country Names, Admin Areas, IOTA Groups, and over 2500 Major Cities.

Go straight to any Latitude/Longitude position, or load a map from a 4 or 6 digit Grid Locator or Callsign.

Customised to your location, for instant Beam Headings and Distance Display.

Comprehensive multi-page Help System and Information Guide.

Perform online callbook lookups and plot the callsign on a map.

Plot an ADIF log, a list of positions, or grid-locators on a map.

Geocode an ADIF or Cabrillo log and plot it on a map.

See real-time NCDXF Beacon transmission schedules.

Customised to your location, for instant Beam Headings and Distance Display.

To find out more about this unique mapset, click Here

To see Global Overlay Mapper screen-shots, click Here

To download all the Ham Maps you'll ever need click Here

To register the Global Overlay Mapper click Here

**HAM
NEWS**

A *Fabulous worldwide broadcast station website*

I'm not sure if many of you listen to worldwide broadcast stations anymore, but I like to roam the globe this way when natural propagation is lacking. I discovered this site:

http://radio.garden/listen/connect-fm-91-5/RJK9kHB5

Which is probably the best of its kind that I have ever found. Just using it is fascinating.

Lost cosmonauts... *could it be true?*

These Brothers Were Eavesdropping on Space Transmissions When They Heard Cries for Help

It's one of the strangest mysteries of the 20th century.

The year was 1957 and the Soviets had just launched an aluminum beach ball called Sputnik 1 into orbit. For many onlookers, this signalled a terrifying escalation of the Cold War. But for two brothers in Italy with a burgeoning interest in radio, it presented a fascinating challenge.

Their names were Achille and Giovanni Judica-Cordiglia. Both were in their 20s, living in the northern city of Turin, where surplus war equipment was being sold by the kilogram. For several years they'd been buying and repairing broken radio receivers when Sputnik's launch was announced, prompting them to tune in and listen. And there it was, weak but unmistakable: a beeping sound coming from space.

"My god, it was unbelievable," recalls Giovanni. "We were the first people in all of Europe to listen to the signal of Sputnik 1."

Read the full story

CW in a charity logo!

May 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		For details on all SARC events, go to ve7sar.net For details on all SEPARS events, go to separ.shutterfly.com/calendar			1	2 CONTEST: Several US states QSO parties (all modes)
3 CONTEST: Several US states QSO parties (all modes)	4	5 **1930 SEPAR Net** **2000 SARC Net**	6	7	8	9 SARC FOXHUNT (cancelled) CONTEST: CQ-M Intn'l DX Contest (CW, SSB)
10 Mother's Day CONTEST: CQ-M Intn'l DX Contest (CW, SSB)	11	12 **1930 SEPAR Net** **2000 SARC Net**	13 **SARC GENERAL MEETING (Cancelled)**	14 Free Contest University 2020 Pre-register	15	16
17	18	19 **1930 SEPAR Net** **2000 SARC Net**	20	21	22	23
24/31 31—CONTEST: CQ WW WPX (CW)	25	26	27 **1900 SARC Exec Meeting**	28	29	30 CONTEST: CQ WW WPX (CW)

Contest Details: http://hornucopia.com/contestcal/contestcal.html

June 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6 TBA 7:30-9:30 AM SARC Social: Kalmar Family Restaurant 8076 King George Blvd, Surrey, BC CONTEST: Kentucky QSO Party (all modes)
7 CONTEST: Kentucky QSO Party (all modes)	8	9 1930 SEPAR Net 2000 SARC Net	10 **1900 SARC Annual General Meeting** **(TBA)**	11	12	13 TBA 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST:
12	13	14 1930 SEPAR Net 2000 SARC Net	15	16	17	18 TBA 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTESTS: WV QSO Party (all modes) All Asian DX (CW)
19 CONTESTS: WV QSO Party (all modes) All Asian DX (CW)	20	21 1930 SEPAR Net 2000 SARC Net	22 **1900 SARC Exec Meeting**	23 **1900 SEPAR Meeting**	24 **Field Day Setup** **(TBA)**	25 TBA 7:30-9:30 AM SARC Social: Kalmar Family Restaurant **Field Day** **(TBA)**
27 **Field Day** **(TBA)**	29	30 1930 SEPAR Net 2000 SARC Net				

Contest Details: http://hornucopia.com/contestcal/contestcal.html

Radio-Active

John Brodie VA7XB

Profiles Of SARC Members

Frank VE7KKV and part of his 'crew'

One of SARC's and SEPAR's newest and most enthusiastic members is Frank Kowalishyn VE7KKV. Frank is a graduate of the Fall 2019 basic class, recruited via the Neighbourhood Emergency Preparedness Plan (NEPP) for Panorama Ridge.

Frank has long been retired from his profession and is enjoying life on the Ridge where he and his wife, Heather, are 30-year residents. Frank's new career is his several hobbies and interests, which he describes as the "fun stuff" (as opposed to the "work stuff").

Foremost among these interests are cooking/baking, wine-making, electronics and boating. Frank's and Heather's summers sailing on their "Spencer 35" in the Gulf Islands are shared with their border collie, "Robbie McTavish" and other dogs. Frank's reputation for his cinnamon buns and wine makes him popular amongst fellow boaters In the remote anchorages. He describes his boat as "having more gizmos and gadgets (soon to include amateur radio) than a nuclear sub".

Frank's VHF/UHF "grab & go" station includes an Icom ID-5100A dual band radio with a mobile antenna on a tripod.   His current challenge is to master sending email messages and photos by Packet using a Signalink USB interface, Winlink Express and packet software, but progress is currently being affected by the Co-19 crisis which is interfering with pickup of his latest toys from the US.   D-Star is another digital voice option of interest to Frank.

When asked about what SARC and SEPAR could do better to assist him with his radio learning curve, he suggested that more coaching be provided for newbies on use of Winlink, Echolink, IRLP, D-Star etc. along with some "hands-on" demos on messaging, transmission of photos, use of simplex vis-a-vis repeaters, and other basic stuff that we all wrestle with early in our radio careers.

Since becoming a member of SARC and SEPAR, he has been a regular attendee at meetings and net check-ins, while working

towards proficiency with various radio concepts. Frank is an exemplar of what we always hope to achieve through our courses: show 'em the wide scope of amateur radio and get 'em certified, then encourage 'em to pursue their specific interest.

~ John VA7XB

Frank's and Heather's summers sailing on their "Spencer 35" in the Gulf Islands are shared with their border collie, "Robbie McTavish" and other dogs. Frank's reputation for his cinnamon buns and wine makes him popular amongst fellow boaters In the remote anchorages.

Feedback

My name is Patrick Brown AK5TX Alaska to Texas! I just received a copy of your excellent newsletter. IT IS AWESOME! I ask to be added to your email list and receive your letter. Currently I teach Technician Class at our local library and always gathering tips, tricks, knowledge, and activities for our hobby, art, craft, sport, and science. Your letter is well presented and has great information. Since I am working on a newsletter also, you format is easy to read and see as I am legally blind. I do have questions and ask if in the future I can utilize you as a resource on these concerns? Keep up the great work!

73

Pat in Tyler Texas

Public Service

Don Hamilton VA7GL

Amateur Radio Serving The City Of Surrey

Hello, my wish for you is you are well and finding interesting ways to activate our hobby. I've got a couple of things I'd like to discuss with you this month, so here goes.

The major challenge a lot of us face is how can we be of assistance during the "troubled times" we find ourselves. Most of us thought that the problem with expanding our hobby was the lack of time slots. After a 1 ½ months, we find time wasn't the problem. My lack of initiative seems to be the big hold up, how about you.

Let me unpack a somewhat hidden challenge. As I see it the first challenge is unprecedented change. We are all use to have a constant supply of Club meeting, coffee gatherings, and talking to friends on 75 phone. Now it has become not health or socially acceptable to gather.

With these changes come a silent challenge with enforced isolation. We know this is necessary to "flatten the infection curve" but all this isolation carries a potential challenge to cope with the isolation. The Canadian Red Cross has prepared a pocket guide to support us if we feel we might have a challenge with isolation. This was published in our nation magazine to help us have a better understanding of the untended result of isolation. This is not an easy read, but if you feel you might have a challenge here the link "Psychological First Aid Pocket Guide"

Hopefully this might help support someone you know who is not having an easy time of the dramatic changes that we are faced with.

Now for some even more radical thoughts, how about if we treat the VHF, UHF band like a HF radio, by just calling CQ. Remember CQ is our way of asking anyone to respond in the sound of your voice. You could just transmit your call and say "good Morning Surrey" You just never can tell what will happen when you pick up the mike and begin the journey by calling CQ or saying good morning. The other method is to make a schedule on a specific time and frequency, with a coffee buddy.

We have a couple of frequencies open to us. Our repeater 147.360, VHF calling frequency 146.520, UHF calling frequency 446.000 SEPAR uses 146.550 as a simplex frequency. There are quite a few coffee corners if you're interested. I think we still have a repeater on 443.775. I've been experimenting on 1294.500, the 23cm calling frequency, and talked to a very interesting ham.

Hopefully I hope that we might try to hold a "over the air" coffee on a simplex or maybe the UHF repeater. What do think, might just be fun, by the way, I take cream and sugar and a donut if it's available.

~ Don VA7GL

SEPAR Report

Gord Kirk VA7GK

Surrey Emergency Program Amateur Radio

In the last Communicator we introduced and explained SEPAR and some of what we do. The article mentioned that everyone should have a "Communications Plan".

This month I would like to explore what a communications plan is all about.

As we look at this you will see it is a small portion of potentially a larger binder or box with essential documentation.

I want to focus some thoughts towards communications and contacting others in this article. I will make my suggestions based on an available booklet from the BC Government. Towards the end I would like to expand it to non traditional communications for the general public, but very familiar to Amateur Radio Operators. That is using our radios to get messages to our family. I am not looking at our role to provide communications to the city during an emergency but rather our initial contacts as a storm, earthquake etc. is just happening and we are trying to find out if everyone is safe and make the first plan to go home or meet one another.

If you go the the BC Government Website and search for personal preparedness planning you will find a link to a document called "Fill-in-the blanks Home Emergency Plan" (https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/preparedbc/preparedbc-guides/preparedbc_household_plan_2019.pdf).

In this plan the first page asks you to create a list of family members contact information including both their phone and email contact. Throughout the booklet it lists several important types of contact information you should take the time to collect. I will list these add some comments to or thoughts to each for your consideration.

The list includes :

Family Member Name, Phone Number and Email Contact Information. Don't rely on these being in your phone. Your phone might not be charged, or be damaged. You may have to borrow a phone, computer etc. to get a message to your family).

Print off a sheet with this information and put it inside a laminated plastic cover or in a zip lock type freezer bag. (The freezer bags are thicker and less likely to be torn). Carry this plastic bag in your car, backpack, purse, get home bag etc.)

School (Work) Name, Address and Phone Number for each school a family member attends. This is especially important if you have you children in school, but it might also be useful to get ahold of a family member through the security office at a Post Secondary Institution. Also if you are creating this for your family include where each person works and phone numbers and work email as well. Also ensure the school has listed someone authorized to pick up younger children that does not live or work out of the area. There is no point in listing an aunt or uncle that lives across town with a couple of bridges in between. The school will not release your children to someone not on their list.

Social Media, We are also living in digital age so make sure you also identify and document social media account user names so you can try making contact with family through these platforms if possible.

Out of Area Contact, Name, City, Province and Phone Number (you may want to add an email address here as well). Outside of the Lower Mainland will likely be best if you live in Surrey. Also be aware that it is not a good idea to have your main out of area contact either overseas or across an international border. Have your international and overseas friends and family contact your Out of Area Contact for updates about you. It will keep local phone lines clear for an emergency and you will likely be busy dealing with your local emergency.

Contact information for your neighbours. They may be able to check on your home, provide an update to you or walk down the street to talk with your family. if you cannot get ahold of them.

Medical Information including name and Contact Information of Doctors (Dentist, Orthodontist). Add a list of medications, allergies etc. here. Under stress it is natural to forget things and this information you will be very thankful for should you have to attend an emergency department with your family. The contact information for the Doctor may help you get a prescription renewed over the phone, or another medical professional get necessary medical history to treat you or your loved one.

Utility Company and Landlord information including Account Numbers. If you are having trouble with services in your home you will be glad for this information.

Insurance Information. If your home is damaged (or destroyed) you can start getting the support you need for repairs quickly.

Emergency Meeting Location. Pick three spots, the first within a block of your home, the second less than 1 km away, and the third further away in your planned evacuation direction (around 5km away). At the spot within block do not meet "by the fire hydrant" or "electrical utility box", you may find these have emergency vehicles at them. Perhaps in front of a close neighbours house, the mail box etc.

All of the above are items every family and individual should complete and have a copy with them. But for Amateur Radio operators we have another tool we can use.

Amateur Radio as part of your plan. (Add your frequencies and Calling Clock to the above plan).

I will focus on local communications (VHF/UHF) only here.

Do you have a mobile radio in your car, or do you have a small handheld you can take with you? Do you have a set frequency, or repeater you will attempt to make contact on? (SEPAR has the 147.360 Repeater as the primary and 146.550 simplex as our secondary frequencies). At what time? For SEPAR immediately as an emergency develops we turn to these frequencies.

The basics

1. Make sure you have a charged radio with you. (Mobile radio in your vehicle. portable radio in your bag, backpack, office desk, locker etc. Do you have back up power source or way to connect/charge your emergency radio?)

2. Make sure the radio is programmed with you selected frequencies/repeaters. Remember your favourite repeater may not be working due to the type of disaster and you may need a plan "B". It is a good idea to make sure the radios each of you are using a programmed the same (or at least the name on the radio display is set to a common name so there is no confusion. eg. Primary Contact Surrey, Secondary Simplex Surrey etc.)

3. Develop a radio communication plan. Your primary initial contact frequency, and your secondary frequency, etc. This plan can be built around a "Calling Clock". This might be on the 10 minutes (00, 10, 20, 30, 40, 50 minutes) you will call out on the primary contact frequency. On the 5 minute you will callout on the secondary frequency. (5, 15, 25, 35, 45, 55).

4. Challenges.

- Some of my family is licensed but does not regularly use the radio. Create a "cheat sheet" with an example of how to make a call. (VA7GK this is VE7xxx etc.) Leave the radio so when it is turned on, the radio will be in the memory mode with the primary and secondary channels in knob (button) positions 1 and 2. Leave a copy of the calling clock with the radio. Make it easy for your family, have the radio in a location they know and ready to go. A good spot might be with your power blackout kit that has the flashlights, batteries etc.

- Practice with these family when you are coming home from work or school on a regular basis. Give them a telephone call as you are about to leave work (before you start driving) and ask them to go to the emergency radio and turn it on and you will call them. While it seems simple to us who use out radios regularly it may not be easy for them. When you have called them on the radio either they can choose to leave it on and monitor or one the contact is made you can turn it off. Doing it once a month at a minimum will be a short easy way to make sure they are confident to use the radio if needed.

- My family is not licensed. My first thought is now is the time to encourage them and help them get licensed. This may be the one reason they are willing to get a license. In this case do you know of a nearby amateur you can make a plan with who is in close proximity to your home which might be willing to go and pass a message to your family? Can you leave this amateurs phone number on your emergency contact list and they have yours so you can work together to support communications for your families. SEPAR members will be encouraged to do this. One other thing you could do is leave a scanner programmed with you emergency frequencies in them. While your family cannot use a radio they may find some comfort in hearing you talk to other amateurs on your radio and know you are safe and where you are.

As we wrap up this issue of the Communicator I encourage you to take some time while staying home during this COVID-19 pandemic to put together your plan. We have all heard the comments that "these are unprecedented times", this time it does not impact our ability to drive on the roads and move about or impact communications. This could just as easily have been a substantial earthquake, flood, or fire that would have triggered the need for emergency communications.

I encourage all Amateur Radio operators to put some thoughts and actions towards your "Communication Plans"

For more information on SEPAR please check out our website at www.SEPAR.ca

I welcome any feedback.

~ *Gord VA7GK*
  SEPAR Coordinator

Amateur radio enthusiast guide to
SOCIAL DISTANCING
Keep one wavelength apart at 144 MHz
144 MHz
λ
(2.0M)

At The SARC Meeting...

March General Meeting

March 11, 2020

SARC General Meeting Minutes for March 11 2020

Attendees: 22

Meeting Start: 7:05pm

Location: Surrey Fire Training Centre

Welcome

Stan welcomes everyone and informs the group that we will have the presentation first and business meeting after.

Presentation from Amel and Les about ARDF and Fox Hunting.

Coffee Break

Start 8:18pm

End 8:37pm

Field Day

Jason B. (Absent)

Tomorrow (Thursday) at 2000hrs there will be a virtual meeting, using Skype, to discuss Field Day planning. Included will be a general discussion regarding feedback obtained and our goals for this year. We will also review and discuss the initial plans. The meeting will be limited to one hour and arrangements will be made for subsequent meetings. Participation and support by our members are greatly appreciated and essential to having a successful event.

For connection details, please email jason@biggin.me

A brief discussion is held about opinions for field day planning, but most questions are deferred to another time when Jason is available to address them.

Financial

Scott H. Provides an update on financials.

OTC

Stan: No news yet on a new location. Fire Services and City of Surrey are busy working on finding a location for us ASAP.

Gaming

Steve: We will have a gaming grant committee meeting soon. Possibly next Wednesday 7pm at the McDonalds @72nd Ave. One or more repeaters is top of the list to purchase because we do not have an OTC.

Repeater

Stan: Plans were originally to take a repeater from Concord and replace the south repeater node and purchase a replacement for Concord.

Dave S: John B. Dave S, Gord, Steve M. Went to the south repeater site and checked antena and it was good. It is powered up and running.

Membership

John B: We still have a larger list at 150 but ~20 may drop off when their Ham Course membership included drop off.

RAC TCA

John S: Has been contacted to use some of our material from the SARC Communicator for the TCA magazine

Net Control

John B: We still have several openings for net control. Please contact John B or the directors.

SEPAR and Winlink

Don: We had the 1st presentation in Feb to show how to get on Winlink.

2nd presentation will be in March on Winlink RF.

3rd presentation will be in April on peer to peer Winlink.

Quick survey around the room and several are interested in receiving training on Winlink.

Next meeting

John B. The meeting in April will be about "Getting started on HF" with a similar format to the last presentation but with focus on HF.

Meeting Adjourned at: 9:04pm

~ Jeremy Morse VE7TMY

SARC Meeting Notes

March 2020

A Fox Hunting Update

Also known as Amateur Radio Direction Finding (ARDF)

Another Great Meeting Presentation

Amateur radio direction finding (ARDF, also known as radio orienteering, radio fox hunting and radiosport) is an amateur radio sport that combines radio direction finding with the map and compass skills of orienteering. It is a timed race in which individual competitors use a topographic map, a magnetic compass and radio direction finding apparatus to navigate through diverse wooded terrain while searching for radio transmitters. The rules of the sport and international competitions are organized by the International Amateur Radio Union. The sport has been most popular in Eastern Europe, Russia, and China, where it was often used in the physical education programs in schools.

ARDF events use radio frequencies on either the two-meter or eighty-meter amateur radio bands. These two bands were chosen because of their universal availability to amateur radio licensees in all countries. The radio equipment carried by competitors on a course must be capable of receiving the signal being transmitted by the five transmitters and useful for radio direction finding, including a radio receiver, attenuator, and directional antenna. Most equipment designs integrate all three components into one handheld device. (See Wikipedia and HomingIn for additional details)

Receiver equipment

No radio license is required. The radio equipment carried on course must be capable of receiving the signal being transmitted by the transmitters and useful for radio direction finding. This includes a radio receiver that can tune in the specific frequency of transmission being used for the event, an attenuator or variable gain control, and a directional antenna. Directional antennas are more sensitive to radio signals arriving from some directions than others.

We've added to our trophy case!
The SARC !

Most equipment designs integrate all three components into one handheld device. On the two meter band, the most common directional antennas used by competitors are two or three element Yagi antennas made from flexible steel tape. This kind of antenna has a cardioid receiving pattern, which means that it has one peak direction where the received signal will be the strongest, and a null direction, 180° from the peak, in which the received signal will be the weakest. Flexible steel tape enables the antenna elements to flex and not break when encountering vegetation in the forest.

On the eighty meter band, two common receiver design approaches are to use either a small loop antenna or an even smaller loop antenna wound around a ferrite rod. These antennas have a bidirectional receiving pattern, with two peak directions 180° apart from one another and two null directions 180° apart from one another. The peak directions are 90° offset from the null directions. A small vertical antenna element can be combined with the loop or ferrite rod antenna to change the receiving pattern to a cardioid shape, but the resulting null in the cardioid is not as sensitive as the nulls in the bidirectional receiving pattern. A switch is often used to allow the competitor to select the bidirectional or cardioid patterns at any moment. ARDF receiver equipment is designed to be lightweight and easy to operate while the competitor is in motion as

well as rugged enough to withstand use in areas of thick vegetation.

Les Tocko VA7OM has designed a top notch contest grade ARDF 80m receiver that has now gone into production. It is hoped that it will be available for our annual SARC FoxHunt in May *[now postponed]*. Once sufficient quantities are in stock they will be available for general purchase. Inquiries may be sent to VA7XB@rac.ca.
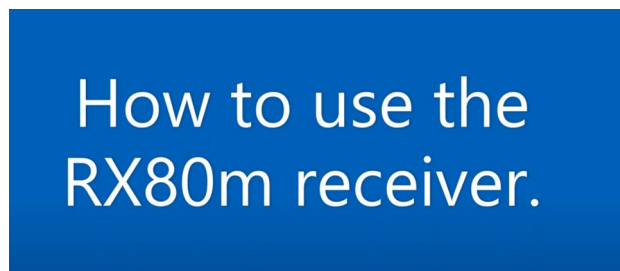
Les presented a club meeting program on ARDF and the receiver on March 11, 2020, along with his cohorts Amel Krdzalic VA7KBA and Dave Miller VE7HR. He has shared his presentation slides and two videos. Here are some links:

Les' Slides on ARDF (PDF 5Mb)

Les' ARDF Video: Fox Placement and Strategy

A video on the use of the new receiver

How to use the RX80m receiver.

Our 2019 SARC FoxHunt video.

Our next Fox Hunt was scheduled for May 9th, however it has been postponed due to the COVID crisis. We will publish a new date once it has been announced.

Our Basic Course Interrupted!

John Schouten VE7TI

Looking for 'novel' new ways to present our material

At the beginning of March, due to the Novel Corona Virus, we suddenly found ourselves without our Surrey Fire Services Training Centre classroom. We were in week 3 of our 9 week Basic course and just finishing up a CW course.

Our usual classroom

For several years we successfully used Microsoft OneDrive as a means to distribute pre-reading and other course content to our students but continuing on-line instruction needed a more complete solution.

I started to investigate popular multimedia conferencing solutions to try to find a way to continue instruction. My criteria were:

- Free or inexpensive

- Accessible by computer on multiple operating systems (preferably web browser based so there is no software download or installation required)

- Allow up to 30 (perhaps more) subscribers

- Have a master 'host' control to talk, show PowerPoint slides and video

- Allow participant questions

- Allow at least 2-3 hours per session

There were 50 or so options, but many only had a short, free trial period that limited time, resources or users. Then I found the open source BigBlueButton and it's associated conference site Canvas. These two resources are used extensively by universities and other remote teaching institutions. It proved to meet my criteria and much more.

I spent two weeks entering material, including PowerPoint slides, video links and questions from the Canadian Basic Amateur Radio Question Bank. The latter is accessible by our students to complete quizzes after the lesson has been presented. It scores and offers a review of wrong answers to questions. There are built-in assignment, announcement and file server features.

We have now completed the course, with the last session on Tuesday, April 21st. Students accessed securely on a number of different devices. As long as you have browser access on a reasonably good Internet connection it works flawlessly, with nothing to install. All went smoothly and our PowerPoint material, including animations and video came through without a hitch. Students were able to comment by audio or the included scratchpad feature, and questions were answerable while the presentation was running. Student feedback was universally positive, including the comment that: "I could sit in my easy chair, in my PJs, with my iPad and a cup of tea. Much better than travelling to a classroom." You can record the session so students can review it within 14 days, before it is erased.

Our BigBlueButton/Canvas Classroom

I can't say how pleased I am with this package. Once the material is entered we could conceivably offer our highly rated course throughout the country by remote access, a boon to those not normally near a training location.

~ John VE7TI

Ham Gear For Sale

RigExpert "AA-55 Zoom" antenna analyzer. Less than a year old. Purchased new at HRO in Portland, OR in January 2019. The unit has the original box, manual, all accessories and is in perfect shape. On sale price at HRO is US$328.95. That is $328.95 x 1.32 or C$434.21. **For sale at C$375.00**

70 cm Fast Scan TV Transmitter
For sale is an analog fast scan (NTSC standard) ATV transmitter in a hardened and waterproof metal case. Suitable for mounting outdoors. Last used by hams at Simon Fraser University on an emergency communications project in the early 1990s. Runs on 12 VDC. Approximately 100 feet of power/antenna/control cables included. As is, but if it doesn't work to your satisfaction you can return it. **$100 OBO.**

Contact: Kevin VE7ZD/KN7Q mcquiggi@sfu.ca

Attention Basic Course Grads! Estate sale transceivers: OPEN TO OFFERS

- Yaesu 2M FT-3000, FT-2500M, FLDX-2000B 1KW
- Kenwood TR-7930, TM-731A, TM-231A, TS-830S, TS-940S

Radio Shack Police, Fire Scanner

Contact: Heinz Buhrig VA7AQ workwpx@gmail.com

Kjeld has a rather large Marine Radio (HF?) sitting at his home and he'd like to find a new home for it. If you're interested contact Kjeld.

Contact: Kjeld VE7GP@telus.net

TYT MD-UV380 handheld radio that we no longer need. Bought a couple months ago. Contact: John mocktower@hotmail.com

Larsen magmount **and 1/4 wave VHF whip antenna** with 4m coax, less than 1:1.5 SWR across the 2m band, about 1:2.5 on 70cm. **$40**

Contact: John communicator@ve7sar.net

FOR SALE
Ham Radio Gear

Message from the RAC President

Glenn MacDonell, VE3XRA

The Covid-19 pandemic has been a part of our daily lives for several weeks now and will most likely continue to be for some time. The pandemic is of particular concern for Radio Amateurs because ours is a hobby that can be practised by people of all ages from elementary schoolchildren to senior citizens.

In fact, it is frequently one of the activities that many take up as they near or begin retirement and finally have the time and resources available to participate. Consequently, we have a high proportion of seniors among our members and indeed some of the Amateur Radio clubs affiliated with RAC are senior citizen organizations.

Canadians are being directed to stay home in order to limit their contact with other people and to "flatten" or "plank" the coronavirus curve. As result, Amateur Radio club meetings and public events have been cancelled and clubs are investigating ways to keep in touch with their members – who are being encouraged to limit direct personal contacts through social/physical distancing and self-isolation – by using existing or new Amateur Radio nets (see below) and/or internet-based communication tools such as Zoom, GoToMeeting, WebEx and many others.

Isolation can have its own potential problems for people who live alone. Amateur Radio is all about communicating and we have the necessary hardware and expertise to enable individuals to stay in touch with their families, friends and colleagues.

The Canadian Red Cross has prepared a "Psychological First Aid Pocket Guide" (PDF file, 631 kB) which "provides emotional and practical support to individuals, families and communities who are having difficulty coping. It is about establishing a connection with people in a compassionate non-judgmental manner to bring calm and comfort."

The Amateur Radio Emergency Service (ARES) is assisting the effort at every level. Some regions have already activated their Emergency Operations Centres to help coordinate agencies working the frontline and because of the current state of emergency declared by provinces, territories and municipalities. This does not mean that Amateur Radio Emergency Services are active or will be activated for this event. We provide communications services to mitigate potential failures and currently, despite the reports of concerns, there have been no reported issues.

Amateur Radio nets regularly connect individuals on a scheduled basis, but perhaps they can play additional roles during these difficult times such as helping isolated seniors keep contact with one another and allowing their colleagues and club members to help out when needed. We do not have a complete list of all Amateur Radio nets in Canada but the links at the end of this Message will provide a good start.

> *Amateur Radio is all about communicating and we have the necessary hardware and expertise to enable individuals to stay in touch with their families, friends and colleagues..*

SARC SOCIETY DIRECTORS

2019-2020

PRESIDENT
Stan Williams VA7NF
president at ve7sar.net

VICE PRESIDENT
Anton James VE7SSD
vicepresident at ve7sar.net

SECRETARY / WEBMASTER
Jeremy Morse VE7TMY
secretary at ve7sar.net

TREASURER
Scott Hawrelak VE7HA
treasurer at ve7sar.net

DIRECTORS
Jason Biggin VA7ITJ
(SEPAR Liaison)

Don Hamilton VA7GL
(Public Service Group Chair)

Steve McLean VE7SXM

John Schouten VE7TI
(SARC Publications/Blog)
communicator at ve7sar.net

SARC MEMBERSHIP, NET & CONTEST MANAGER
John Brodie VA7XB
membership at ve7sar.net

SARC QSL MANAGER
Heinz Buhrig VA7AQ
15684 102 Avenue
Surrey, BC V4N 2G4

SARC REPEATER MANAGER
David Sinclair VA7DRS

repeater at ve7sar.net

The impact and duration of the unprecedented global pandemic we now face has yet to be determined and it is difficult to plan in an uncertain future. However, although the RAC Head Office in Ottawa has been closed indefinitely, the majority of activities and responsibilities of the RAC administration are now being performed remotely. In addition, the RAC Board and Executive and all RAC committees and volunteers continue to work on behalf of all RAC members and for Amateur Radio in Canada and internationally.

The Amateur Radio Service consists of a diverse population, both in age and abilities, and Amateurs and Amateur Radio organizations are adapting to the current crisis and using their skills and knowledge to help in any way they can. RAC is also rising to the challenge and is now looking at ways to do things differently and to take advantage of our technical skills and recent technological advances. For example, we are now in the final stages of organizing both a Basic and an Advanced online Amateur Radio course. More information about this new initiative will be posted on the RAC website in the coming days.

It is interesting that we are discussing this new need for Amateur Radio to provide assistance as we approach World Amateur Radio Day which is held every April 18. It was on that day in 1925 that the International Amateur Radio Union (IARU) was formed in Paris and Radio Amateurs worldwide now take to the airwaves each year in celebration.

Appropriately, the theme of World Amateur Radio Day is "Celebrating Amateur Radio's contribution to Society" and Amateur Radio will play its part as the current global crisis unfolds. RAC is planning to celebrate World Amateur Radio Day this year on the air by inviting Amateurs in Canada and around the world to contact RAC official stations (VA2RAC, VA3RAC etc). The details are still being worked out and we will provide more information about this event in the near future.

Thank you for your continued support and understanding during this time of crisis. Please take care of yourself and your loved ones. Stay safe and, wherever possible, let us help one another during this extraordinary time.

Radio Amateurs of Canada nets:

https://www.rac.ca/nets/

~ Glenn MacDonell, VE3XRA
President, RAC

PROMOTING GLOBAL FRIENDSHIP AMONG AMATEURS WORLDWIDE

Spring

In the absence of regular meetings, here are four sites that will keep you active in the hobby…

- 5 Ham Radio Projects for Quarantine
https://www.youtube.com/watch?v=Yl47zqmMGb4

- This video will show you how to set up a mumble server on your raspberry pi that will allow you to use your phone/tablet for remote ham radio QSO's. NO INTERNET REQUIRED!!
https://www.youtube.com/watch?v=DBfyQRvOmag

- There are plenty of ways for the mic-shy to get on the air. So here are some of the many digital modes amateur radio offers as a way to avoid talking while still communicating.
https://hackaday.com/tag/winmor/

- Automatic Link Establishment, usually abbreviated ALE, is a standard for digitally initiating and sustaining radio communications on HF. ALE enables a station to make contact between itself, another station, or a group of stations, with the goal of providing rapid, reliable HF voice and messaging, despite unstable ionospheric propagation, reception interference, or congested HF channels.
http://oh8stn.org/blog/2020/04/08/ale-selcal-multi-platform/

Down The Log…

SARC Monthly Meetings

2ⁿᵈ Wed. (Sept-Jun) 1900 hrs at the Surrey Fire Service Training Centre, 14923 - 64 Avenue, Surrey, BC. Here is a what3words link and map: https://what3words.com/markers.addiction.ozone

Weekly SARC Social

Saturday between 0730 and 0930 hrs at the Kalmar Family Restaurant 8076 King George Blvd. Surrey

SARC Net

Tuesday at 2000 hrs local on 147.360 MHz (+) Tone=110.9

SEPARS Net

Tuesday at 1930 hrs local on 147.360 MHz (+) Tone=110.9

VE7RSC Repeaters

2 m: 147.360 MHz + Tone = 110.9 Hz IRLP node 1736 Echolink node 496228

1.2m: 223.960 Mhz -1.6 Tone=110.9

70cm: 443.775 MHz + Tone = 110.9 Hz IRLP node 1737

SARC hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228.

On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

We are looking for a SARC Net Manager. Its not a difficult job and, if you have some time to spare, we'd like to hear from you. Basically it involves scheduling someone to do the Tuesday evening weekly net.

	SARC Net 20:00 Hrs
1ˢᵗ Tuesday Standby	Jean-Luc VA7JLU Vacant
2ⁿᵈ Tuesday Standby	Jinty VA7JMR Sheldon VA7XNL
3ʳᵈ Tuesday Standby	Rob VE7CZV Vacant
4ᵗʰ Tuesday Standby	Kapila VE7KGK John VA7XB
5ᵗʰ Tuesday Standby	Vacant John VE7TI
	Want a turn at Net Control? Contact the SARC Net Manager