The Communicator

May—June 2021

SARC

- *Field Day 2021*
- *Nano-VNA—Part 3*
- *Antennas and towers to build*

...and much more

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The Communicator is a publication of Surrey Amateur Radio Communications.

It appears bi-monthly, on odd-numbered months, for area Amateur Radio operators and beyond, to enhance the exchange of information and to promote ham radio activity.

During non-publication months we encourage you to visit the Digital Communicator at **ve7sar.blogspot.ca**, which includes recent news, past issues of The Communicator, our history, photos, videos and other information.

To subscribe, unsubscribe or change your address for e-mail delivery of this newsletter, notify **communicator @ ve7sar.net**

Regular readers who are not SARC members are invited to contribute a $5 annual donation towards our Field Day fund via PayPal.

SARC maintains a website at **www.ve7sar.net**

DEPARTMENTS

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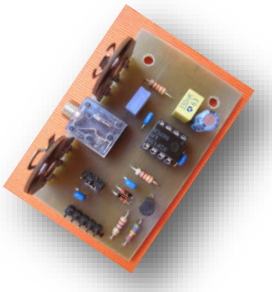
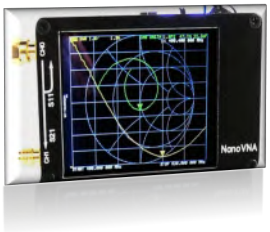




Measurements with the NanoVNA—Part 3

QRM -- --- .-. .-. -- --

...from the Editor's Shack

Do you have a photo or bit of Ham 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.*

Its been a busy month here at VE7TI. With better weather after a very wet winter, there was the usual antenna maintenance as the HF Yagi feedline developed high SWR during a recent contest. Fortunately the fix was easy and we were able to participate in the World Amateur Radio Day event using the Radio Amateurs of Canada (RAC) callsign for British Columbia—VE7RAC. Thank you RAC for widely promoting this event.

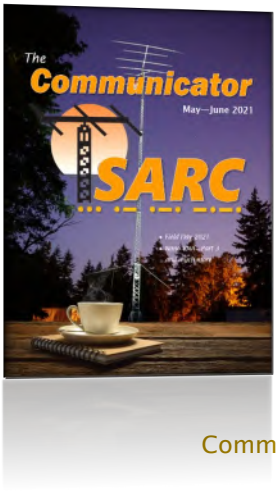
Every Friday, Onno Benschop VK6FLAB publishes his weekly Amateur Radio podcast from Australia with interesting and thoughtful commentary. We typically publish two per Communicator issue but they are so topical that I recommend tuning in at http://podcasts.vk6flab.com/ so you don't miss any. Thank you Onno for your contribution to Amateur Radio.

We continue to receive tremendous feedback from our worldwide reader base. This includes contributions of articles, and in this issue Luc ON7DQ brings us an article from Belgium. It's a versatile circuit using an Arduino Nano that makes it possible to send tone modulated CW. Extra features include a Morse tutor, beacon or memory keyer, CW Decoder and a basic LF Generator. The modular setup lets the builder select only the parts which are needed.

Enjoy, and please let us know what you think of The Communicator.

73,

~ John VE7TI, Editor
communicator@ve7sar.net



This Month's Issue...

Field Day weekend is coming up. This lovely photo was taken by Michael VE7GMP at our event in 2019, the last time we had a 'real' Field Day.

In this issue we have a round-up of articles for you, and there should be something of interest to all. What a fascinating and practical hobby we're involved in.

Communication works for those who work at it.—*John Powell*

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:

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SurreyARC

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tinyurl.com/SARCphoto

The Rest Of The Story…

John L. Reinartz

John L. Reinartz

John L. Reinartz, radio pioneer and inventor was once called the greatest amateur operator in America. Mr. Reinartz's call letters (W1QP, W1XAM and, most re-cently, K6BJ) were known to generations of radio hams.

There are special reasons why the Santa Cruz County Amateur Radio Club station uses those particular call letters. The call memorializes one of the early giants of ham radio.

Mr. Reinartz was of French descent. He was born in Krefeld, Germany in 1894, the oldest of seven children, and was brought to the United States by his parents in 1907 when he was 10 years old. They settled on a Connecticut farm.

When he was 14 years old, while still in school in South Manchester, John became interested in the new science of wireless. This was in the days before the vacuum tube, when the crude apparatus “gave out grunts rather than signals.”

He erected a 600-foot wire between treetops and went on the air with a spark-gap station. In these days, before government licensing, it was common for experimenters to use their initials as call letters. John chose to use JL as his call.

Years later, during World War One, Reinartz taught wireless to military radio operators. He was one of the large numbers of amateurs who joined in the military effort. The ARRL was even forced to suspend publication of QST during the war when the editor was called to service in the Army Signal Corps.

After the War, he was a clerk in a dry goods store long enough to find out he didn't like it, and then went to work in a silk mill in the electrical department, while continuing his radio experiments.

New Designs and Inventions Given Away

In the nineteen-twenties Mr. Reinartz had many opportunities to capitalize on his inventions, but instead gave them away. He refused to allow major radio companies to use his name in advertisements.

Around 1921 John Reinartz developed a new receiver circuit, called the Reinartz Tuner *[schematic on page 6]*. The unit had an unheard of tuning range from 200 meters down to 28 meters. This made it possible for amateurs to build their own sets. He held about 28 other patents. Construction information

was published in QST and numerous other magazines. Thousands of experimenters built the receiver. It was the predecessor of modern day multiband receivers.

In 1921 Reinartz began publishing a free magazine, How to Build Receivers and Transmitters at Low Cost. Throughout the twenties he was a prolific contributor to QST, Radio News and other magazines. Many of his articles dealt with improvements to his Reinartz Tuner.

With the coming of federal licensing of radio stations, John was assigned the calls 1XAM and 1QP. On November 27, 1923 the first successful two-way trans-Atlantic amateur communication took place. 1XAM was one of three stations participating in this feat. 1XAM and 1MO were in the U.S. and 8AB was located in France. All three stations utilized Reinartz designed transmitters and receivers.

In 1924, when he was living in South Manchester, Conn., Mr. Reinartz established radio contacts with amateur radio operators in Los Angeles and England, at a time when scientists were saying that short waves would only go short distances. The October 1924 issue of QST reported that 1XAM was copied solid in Australasia (Australia/New Zealand) on May 29 of that year. Reinartz was operating CW at 108 meters, running 1 KW input.

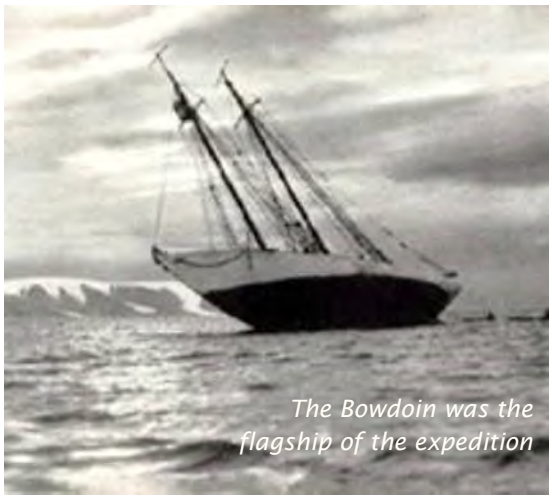
In 1925 Reinartz set a new record for DX by communicating with 6TB in Santa Monica, California on 20 meters at high noon.

Reinartz' work had attracted the attention of the U.S. Navy. He was recruited as radio operator for an expedition to the North Pole in June of 1925. Commander MacMillan, USNR, headed this project. It was from the mill that Reinartz left for the Arctic.

He was appointed the chief radio operator on the MacMillan-National Geographic Arctic expedition. He had been selected by Capt. Donald B. MacMillan because amateurs were more familiar with short wave lengths, then little used commercially.

One stateside city was in daily contact with Reinartz and the Arctic explorers. In Cedar Rapids, Iowa a young high school student, named Arthur Collins, maintained daily contact from his amateur station 9CXX. Collins later established the radio company that bore his name. It was a long-time producer of high quality amateur and commercial radio communication equipment. They kept up the friendship since.

Mr. Reinartz's experimental contact with the West Coast, Mr. Collins said, "was the be ginning of the whole development of



The Bowdoin was the flagship of the expedition

long-distance radio." Mr. Collins described the pioneer as an "outgoing sort of a chap," and said of his first call letters, W1QP, "That's pro-nounced Kewpie and he kinda looked the part."

Reinartz designed the short wave radio gear used aboard the expedition ship Bowdoin. The second in command of the expedition was Commander E. F. MacDonald, Jr., president of Zenith Radio Corporation, who was stationed aboard the Neptune. Neptune was equipped with marine radio gear produced at Zenith Laboratories. Reinartz collaborated in the design of the Zenith equipment.

John was also on the technical staff of QST, the magazine of the Amateur Radio Relay League. He was sometimes described as a man who had "done more for the development of high frequencies than any other man on earth."

A newspaper article published in 1926 referred glowingly to Mr. Reinartz's achievements, it closed this way:

"With moving pictures by radio ahead of us, there is no doubt that there will be another field for amateurs to tackle. But not the least of contributors to the advancement of that part of the radio art should come from men like Reinartz, who play at the game for its very fascination, and who are above all the experimenters and the scientists of tomorrow."

In 1929 the Navy rewarded him for his work with a commission as a Lieutenant in the Naval Reserve.

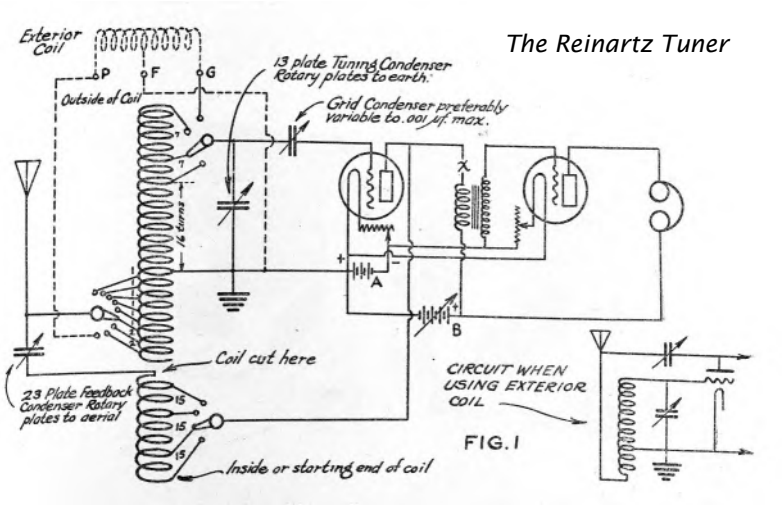
He joined RCA in the early thirties. There he conducted further research on radio propagation and short waves. He was called to active duty by the Navy in 1938 and given the task of assembling a corps of experienced radio personnel. He drew heavily upon the ham community.

Two radio-equipped airplanes played a key role in the exploration. Air operations were under the command of Lt. Commander Richard E. Byrd, USN. In the 1930's Admiral Byrd became renowned for his own Arctic and Antarctic exploration.

During World War II, Mr. Reinartz was in charge of radio training for the Naval Communications Reserve, with the temporary rank of captain. Reinartz served in numerous positions during his Navy service. Among other assignments, he conducted radio and radar research. Captain Reinartz was discharged at the end of the war. He returned to RCA in 1946.

In 1949 John retired from RCA. He moved west to join Eitel-Mc-Cullough, (EIMAC) Inc., a manufacturer whose line includes radio tubes used by hams. At Eimac, he became manager of their Amateur Service Department, a position he held until his retirement in 1960.

The Reinartz Tuner

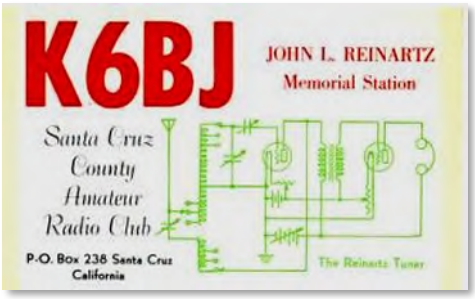


After retiring John and his XYL, Gertrude K6MJH, moved to Aptos. They became members of the Santa Cruz County Amateur Radio Club.

Captain John L. Reinartz, K6BJ, became a silent key on October 5, 1964 at the age of 70. He is buried at Golden Gate National Cemetery. Not only was John an important figure in the development of radio communications, he also represents the American story—youthful immigrant who pulls himself up by his bootstraps and then makes significant contributions to his adopted country.

The Santa Cruz County Amateur Radio Club applied to the FCC for the call K6BJ following the death of this illustrious member. Local 440 and 2 M repeaters operate under the call as memorial stations dedicated to the memory of Reinartz, and his fellow ham experimenters who paved the way for long distance short wave communications.

...and that is the rest of his story.



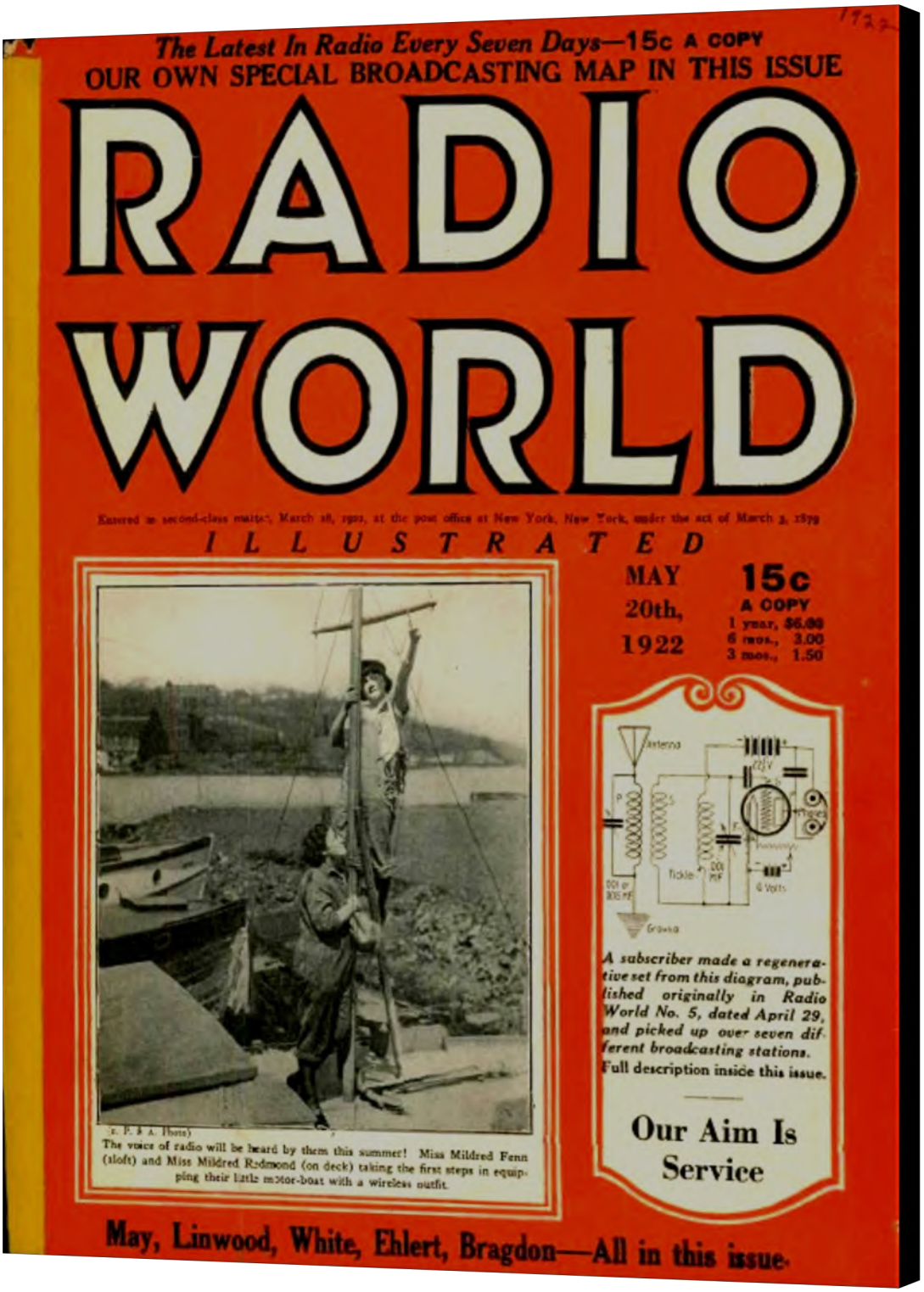
See: http://www.k2tqn.net/oldradio/arrl/2014-03/Pages%20from%20Radio-Age-1922-09-ReinatrtzTuner.pdf

Understanding Why

Propagation of radio waves was not well understood. Reinartz was driven to achieve ever-increasing communication range. To achieve this he conducted numerous studies of antennas and of propagation during the early and mid nineteen twenties. He devoted much of his effort to solving the problem of skip in short wave communications. His article Reflection Theory of Short Waves was published in the April 1925 issue of QST. He presented an engineering explanation of the phenomena of wave propagation.

His work encompassed many areas. He developed a super-regenerator receiver, which offered improved VHF reception; his loop antenna design was used in microwave radar; his design for high efficiency tuned circuits was used in transmitters. He also developed equipment for aerological and meteorological studies. In 1958 he was named a Fellow in the Institute of Radio Engineers now the IEEE.

A look back into the time web's time machine...



Radio World
May 20, 1922

The caption reads:

"The voice of radio will be heard by them this summer! Miss Mildred Fenn (aloft) and Miss Mildred Redmond (on deck) taking the first steps in equipping their little motor-boat with a wireless outfit.

Emergency Comms

Ham Radio Making A Difference

SOTA Radio Amateur Helps Rescuers to Locate Lost Hiker

The keen and practiced eye of ARRL member Ben Kuo, AI6YR, helped to guide rescuers to a hiker stranded on a mountainside on April 12. Hiker Rene Compean, 45, had spent the night in a remote region of the Angeles National Forest after getting in a tough spot. After a concerned friend reported Compean missing on Monday, the Los Angeles County Sheriff's Department dispatched search-and-rescue (SAR) teams. Although amateur radio played no direct role in the rescue, Kuo cited his enthusiasm for technology and ham radio satellites and for Summits on the Air (SOTA) for helping him to develop the skills he needed to guide searchers to the most appropriate area.

"This is actually very applicable to being a SOTA activator — map, navigation skills," Kuo told ARRL. "Also, understanding RF propagation was key to this. The SAR teams were searching the other side of the mountain, where there is no cell signal." Kuo knew that from having hiked there before. As Kuo described it, Compean was found between four SOTA peaks.

SAR teams were deployed in the Mount Waterman area of the San Gabriel Mountains to find the hiker. According to the LA Sheriff's Department, a low-flying helicopter team spotted him Tuesday afternoon between Triplet Rocks and the east bump of Twin Peaks in the San Gabriel Mountains, and he was airlifted to safety with no serious injuries. Kuo pointed the rescuers to the likely search area by matching satellite images with what Compean had transmitted over Twitter.

Kuo told the Los Angeles Times that he has an odd hobby of looking at photos and determining where they had been taken. He was able to employ his skill to determine the hiker's likely location using the tiny photo the hiker posted on Twitter that shows his legs and the valley below. As the newspaper reported on April 15, "When [Kuo] saw the photo posted by the Sheriff's Department, he set to work pulling publicly available satellite images and matching them to the vegetation and terrain below the hiker's legs."

Kuo's eye was good. He sent authorities the GPS coordinates of the most likely area, and the rescue team found Compean less than a mile from that location.

As the LA Times reported, the area where Compean was located on steep slopes and very difficult to access, requiring advanced climbing skills. The Sheriff's Department credited Kuo with saving them hours of fruitless searching. Kuo said this was the first time he'd been involved in a rescue like this one.

~ *ARRL*

Need a water vitalizer?

BERLIN—The Federal Network Agency has banned the sale and use of a water vitalizer from Wassermatrix AG in Switzerland. The high-priced device causes radio interference in the amateur radio band. Radio amateurs and other market surveillance agencies had reported disruptions last year.

The Federal Network Agency said it had received numerous reports that the device, sold by Swiss company Wassermatrix AG as a way to “activate” the body's self-healing powers, was transmitting on the frequencies allocated for ham radio users.

The agency said owners of the 8,000-euro ($9,540) device, which has been sold more than 2,400 times in Germany, are allowed to keep but not use it.

"Our testing and measurement service ensures that frequencies can be used without interference," says Dr. Wilhelm Eschweiler, Vice President of the Federal Network Agency. "At the same time, with the sales ban, we are protecting consumers from spending a lot of money on a device that they are not allowed to use."

According to the manufacturer, the water vitalizer is supposed to energize the water by means of a hand probe and thereby activate the body's self-healing powers. The device costs around 8,000 euros and has been purchased more than 2,400 times by consumers in Germany. Consumers who have purchased the water vitalizer may keep the device, but may not use it until further notice.

The manufacturer issued a statement that: “This is partly because the device is at the same frequency as the amateur radio operators and therefore feels disturbed. In our user manual, we will point out that the device is to be used with shielding if required by the official network operator, which is now the case. We kindly ask you to comply with this prohibition and to use the device only with a suitable shield.”

Furthermore, they claim that the "radiation" caused by hams is interfering with human cells, causing the so called "HAM-Sickness", which will soon be proven by scientists.

After numerous fault reports had been received by the Federal Network Agency, the testing and measurement service had initiated investigations and checked the water vitalizer in the Kolberg measuring laboratory. It has been determined that the device has an incorrect declaration of conformity and generates an illegal interference emission. The water vitalizer thus does not meet the basic requirements for electromagnetic compatibility (EMC).

Pictures of the water vitalizer can be found here: www.bnetza.de/wasservitalisierer.

In addition to the ban on use and distribution, the Federal Network Agency has also informed the member states of the European Union and the European Commission about the case, as it considers that the devices are also distributed in the other member states.

The manufacturer of the water vitalizer has now included warnings on its website for the use of the device in Germany.

The German test and measurement service eliminates radio interference and helps with problems with telecommunications services that have no operational causes. Interference may be caused by unintentional or inadmissible radio broadcasts or other electromagnetic effects.

Wassermatrix AG didn't immediately respond to a request for comment.

~

Russia:

Looking over the horizon

A threat to Amateur Radio

In contrast to traditional radar, which is limited by the radar horizon, Resonance-N can “look” beyond the curvature of the Earth and detect targets at very long ranges. Over-the-horizon radar makes use of radio signals bouncing off the Earth’s atmosphere.

The basic principle of over-the-horizon radar in which a signal from a large transmitter bounces of the ionosphere, reaches the target beyond the horizon, and then reflects an echo signal to a receiving antenna. (Source: Charley Whiskey on Wikimedia under CC BY-SA 3.0)

Over the past five years Russia has constructed three Resonance-N radar installations, two of which are located in the Arctic. The system is designed to detect and track up to 500 targets simultaneously traveling at speeds up to Mach 20.

Russian defense manufacturer Rosoboronexport describes the system as a “very high frequency counter-stealth early warning phased-array radar” which can effectively detect a wide range of current and future air threats, including low-observable and stealth cruise and ballistic missiles and hypersonic aerial vehicles. It also works in severe electronic countermeasures (ECM) environments. For the full story:

https://www.highnorthnews.com/en/satellite-images-reveal-new-russian-long-range-radar-arctic

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Page 12–News You Can't Lose

SARC-SEPAR Field Day planning has started

Planning has started for our 2021 Field Day event, and your input is needed. A crew of motivated SARC members have met four times in April and have included David VA7DRS, Gord VA7GK, Vlad VA7LKO, Stan VA7NF, John VA7XB, Rob VE7CZV, John VE7TI. With the thanks of online technology, we have connected virtually to discuss options and visually share plans. These initial sessions have focused on what we want to do this year, considering implementing safe operations.

There is an understanding that this year's event will not be like previous ones due to the pandemic. The first ARRL Field Day was held on the second Saturday in June 1933, several years after the 1918 influenza pandemic, so this is a first. The only years that Field Day was cancelled were 1942 through to 1945 due to World War II. This year, although we would like to gather, we must adjust to the conditions and operate separately.

With this, the Field Day crew has initially focused on what we can do with SARC and SEPAR resources. Although we will not be gathering with our equipment, there is still an opportunity to establish stations and test our tools. Once confirmed, these stations are valuable to those who do not have home equipment and the community of Surrey. The community needs to know that they can rely on amateur radio when traditional communication methods fail. Of course, the essential component for successful communication is the people with the skills and motivation to operate.

We will deploy both the new Operations Training Centre (OTC) and the SEPAR trailer for Field Day. The OTC was dismantled in 2020 as the space provisioned by the City of Surrey was re-allocated to other resources. Since then, our equipment has been in storage and not used. However, new space has been allotted where the South Fraser Search and Rescue (SFSR) is established, close to the Provincial Court House. Here, our grey portable trailer will be deployed and two stations equipped. Also, the SEPAR trailer will be set up in North Surrey, with the specific location to be determined. Having these resources available and tested will allow operators to participate safely and re-affirms SARC/SEPAR's capabilities.

To complement these stations, we want to know who can participate from home to form a joint effort. The American Radio Relay League (ARRL) has altered the contest rules, allowing home stations to work other home stations and used additional power. Specifically,

- Temporary rule waivers: For Field Day 2021 only, Class D stations may work all other Field Day stations, including other Class D stations, for points. Class D stations ordinarily may only count contacts made with Class A, B, C, E, and F Field Day stations, but the temporary rule waiver for 2021 allows Class D stations to count contacts with other Class D stations for QSO credit.

- For 2021 only, Class D and E stations are limited to 150 Watts Peak Envelope Power (PEP) transmitter output.

- For Field Day 2021, an aggregate club score will also be published, which will be the sum of all individual entries indicating a specific club (similar to the aggregate score totals used in ARRL affiliated club competitions)

These temporary provisions by ARRL take into consideration the need for clubs to continue operating as a unit and facilitate safe operations during a pandemic.

Please email me at j.w.biggin@gmail.com to let me know if you want to operate from the OTC, SEPAR trailer, or your home station. I will add you to our register!

~ Jason VA7ITJ

Page 13–News You Can Lose

The Lighter Side of Amateur Radio

Scientists warn RF may disappear completely by 2040

Pouce Coupe, BC *(2021-04-01)* — A new study published in the science journal Standing Waves shows that RF signals are disappearing at an alarming rate. Some scientists are going so far as to say that if action is not taken immediately, the airwaves could be completely silent by 2040.

The study's chair, Dr. Bunsen Honeydew said, "We looked at daily activity on the HF bands from 3.5 to 29 MHz over the last 11 years. For a while the bands were showing healthy growth with plenty of activity, but in just the last five years signals have become much weaker and some have even disappeared completely. Worse hit has been the 10 meter band where we haven't observed a signal for over two years… the extent of the devastation is breathtaking."

But what is causing it? Scientists have a few theories but the main culprit seems to be that there are simply too many antennas absorbing a limited supply of RF. As this simple formula shows, RF is depleted at a rate inversely proportional to the square of the distance between any two stations:

$$\lambda = \lim_{k\to\infty}\left(\frac{a_{k+1}}{a_k}\right) = \lim_{k\to\infty}\left(\frac{\frac{\sin(\frac{1}{k+1})}{k+1}}{\frac{\sin(\frac{1}{k})}{k}}\right) = \lim_{k\to\infty}\left(\frac{k}{k+1}\right)\cdot\lim_{k\to\infty}\left(\frac{\sin(\frac{1}{k+1})}{\sin(\frac{1}{k})}\right)$$

$$= 1\cdot\lim_{x\to\infty}\left(\frac{\sin(\frac{1}{x+1})}{\sin(\frac{1}{x})}\right) \overset{\frac{0}{0}}{\underset{\text{l'H}}{=}} \lim_{x\to\infty}\left(\frac{\cos(\frac{1}{x+1})}{\cos(\frac{1}{x})}\,\frac{x^2}{(x+1)^2}\right) \overset{1\cdot 1}{=} 1.$$

Scientists warn that, as cos (1/x) increases, we risk reaching "the point of no return" where RF levels will never recover.

But what does this mean to the average ham? The short answer is we must all help conserve RF. Where hams used to just have one radio, it is now common to own three or even four radios, each with an RF absorbing antenna.

Of course, some of the worst contributors to the crisis are the so-called "Big Gun" stations. These use aluminum farming techniques that have gotten way out of control… covering acres of land with multiple towers reaching up to 100 feet and scooping up every signal that goes by.

The International Amateur Radio Union (IARU) and member societies like ARRL are calling for urgent action and plan to table a number of propositions at the next WARC meeting in Geneva. Among them would be a limit on antenna farming, a program for offsetting RF absorption by deploying more transmitters around the globe, and requiring hams to turn off their receivers when not really listening.

Perilous times.

- Adrian VE7NZ reporting

Radio Ramblings

Kevin McQuiggin VE7ZD/KN7Q

Tower Planning and Installation

Perhaps you have considered installation of a tower in order to improve your station's performance. Getting your antennas higher or giving them a clearer view of the sky can significantly improve your ability to make QSOs on any amateur band.

This month I'd like to give an overview of the process so that you understand the steps in the process and how to do it safely and in compliance with regulations which may be in place.

I Don't Need a Tower!

This statement is true. No amateur "needs" a tower. Simple antennas such as dipoles and verticals can perform very well and get you lots of DX. But many hams reach a plateau in terms of the number of countries, regions or zones which they have worked and seek to advance their station's capabilities.

This is where the assistance of an "antenna support structure" comes in. Towers safely elevate your antenna so that it gets a clearer view of the sky. Moving antennas to more than one wavelength off of the ground improves their antenna pattern, optimizes antenna gain and can also reject more interference as the antenna pattern will be clear of ground or surface effects.

We are going to focus on classical "climbable" towers for this article, but other approaches such as masts will also work, especially at higher frequencies for antennas in the VHF, UHF and microwave bands. The downside of masts is that they are not climbable; this makes antenna work more complex.

Future columns will likely address the various types of masts which can be used as antenna support structures for these bands.

Typical Installations

The typical HF or VHF/UHF tower installation consists of:

- A concrete tower base buried in the ground that has been built to manufacturer's specifications, sized and rated to be able to support the tower structure;
- A metal tower around one wavelength in height;

- A rotator and mast installed within the tower structure itself;
- An antenna, typically a Yagi, mounted to the mast;
- Power and control cable going to the rotator; and finally
- Feedline going to the antenna.

At HF, multiband Yagis are common antennas for placement on a tower. The tower should ideally be one wavelength in height for the lowest frequency used on the antenna. This is about 60-65 feet for a typical tri-band HF Yagi (covering 20 metres and some higher HF bands). A shorter tower will work, of course, but performance will generally be worse than if the antenna was > 1 wavelength above the earth.

The tradeoff in favour of a shorter tower can involve:

- Expense – shorter towers are cheaper;
- Feedline loss – shorter feedlines have less loss. This is primarily a factor for VHF and higher amateur bands
- Climbability – many ops prefer not to climb higher towers. 60 feet might be too high for your confidence level
- Regulatory issues – taller towers may require additional and complex municipal or civic approval

Engineering and Compliance

I cannot overstress that any antenna support structure must be installed in compliance with the manufacturer's specifications. Every tower manufacturer provides complete specifications as to the size and form of the concrete base which must be used to support their tower for every given height. These must be followed to the letter. The alternative could be disastrous and result in serious injury or death. See Figure 1 for a typical tower specification for a particular wind load environment. These tables are available for several tower types, heights, and average wind loads (see www.rohnnet.com/files/2015_Rohn_Full_Catalog.pdf).

G SERIES

REV. F ALLOWABLE ANTENNA AREAS (SQ. FT.)

70 MPH Fastest Mile

70 MPH Fastest Mile Wind Speed - No Ice								
	25G		45G		55G		65G	
Height	FT²	Part No.	FT²	Part No.	FT²	Part No.	FT²	Part No.
10'	19.7	25SS010	42.5	45SS010	75.0	55SS010	95.0	65SS010
20'	14.2	25SS020	22.0	45SS020	43.0	55SS020	95.0	65SS020
30'	6.4	25SS030	12.0	45SS030	26.0	55SS030	76.2	65SS030
35'	3.6	25SS035	8.7	45SS035	21.9	55SS035	61.2	65SS035
40'	1.5	25SS040	5.1	45SS040	15.0	55SS040	48.8	65SS040
45'			2.3	45SS045	11.4	55SS045	39.0	65SS045
50'					6.5	55SS050	29.3	65SS050
55'					4.0	55SS055	24.4	65SS055
60'					0.8	55SS060	18.4	65SS060
70'							8.7	65SS070
80'							0.9	65SS080

Figure 1 – Typical Specification for Tower Wind Loading (Rohn)

Similarly, you must comply with all the applicable regulations in your location. These local laws exist to protect the public and the individual (you) erecting the support structure.

However, an important point in regard to compliance is that in Canada federal regulations, as set out in radiocommunications acts have precedence over local regulations or bylaws. For example, in regard to height of an antenna support structure, federal regulations prevail unless the height of the structure exceeds 15 metres (about 50 feet). Cities and municipalities have no jurisdiction for structures lower than this height.

This means that while your city may have passed restrictive bylaws in regard to radio towers, these bylaws do not apply to

antenna structures less than 15 metres in height. Certainly, your city or municipality may complain and even ticket you, but these actions are unenforceable if the structure's height is less than 15 metres.

It is important to add though that municipalities may indeed require building permits, inspections, approvals and the like for some aspects of your tower installation. You are still required to comply with these regulations as the federal preemption applies only to height of the support structure.

Finally, in correspondence with civic or other officials in regard to your tower proposal, do not call it a "tower". Call it an "antenna support structure". The word "tower" often evokes visions of a massive installation several hundred feet tall in the minds of civic officials. This "gets their back up" and you may have an uphill battle where none was necessary. I speak from experience in this!

Safety

It goes without saying that towers are dangerous, both to install and to climb. You can be killed or seriously injured for life if you fall from the structure. Falls even from ten feet can be life-altering.

To install a tower and work on it safely you need:

- Proper safety gear, including a CSA-approved full body climbing harness including shock-absorbing arresting lanyard; and
- Training: when you are new to tower work, enlist the assistance of another experienced amateur who can teach you the correct and safe way to use your equipment, climb the tower, and work on various aspects of its construction.

We will go into each of these aspects in the material below.

Once safety issues are addressed, you will be able to work with utmost confidence and will find tower work such as installing or maintaining your Yagi "at altitude" very satisfying. The view is also great from the top of the structure!

Types of Towers

The broadest classification of amateur radio towers divides tower types into "guyed" and "non-guyed" categories. A guyed tower requires three or more guy lines to support the mass of the tower and tower load (typically an antenna or antennas). Non-guyed towers can support the same load but do not require guy lines.

Non-guyed towers are preferable in most amateur radio installations as guy lines do not interfere with other uses of the amateur's property. Guy lines can be unsightly and can also draw the attention of neighbours who may complain that they, along with the tower are unsightly or even "dangerous". A smaller footprint for your tower installation is better.

A non-guyed tower, however, will either have a lower maximum height for a given load (type of antenna), or the tower construction itself must be more robust. So, a non-guyed tower of a given height will cost more than a guyed tower, but the tradeoff will be the elimination of the need for guy lines.

The decision is really a tradeoff and can only be determined through full analysis of your requirements, budget, and the physical environment where the tower will be located. I prefer non-guyed towers and will either spend the extra money to purchase a heavier-duty tower of a given height, or reduce the height of my lighter-duty tower

to allow the tower to be erected without guy lines. It is really a personal choice.

There are a small number of tower manufacturers in North America, a few in the USA and a couple in Canada. All companies manufacture safe and reliable towers, so the choice is largely one of preference and budget. For my latest tower installation I went with a popular US manufacturer, Rohn (https://rohnnet.com). Previously I have been a customer of an Ontario-based corporation Wade Antennas (http://wadeantenna.com/).

Towers come disassembled in the form of a set of main tower components, including the base or first section, intermediate sections which may be connected together to achieve a desired height, and top sections to which a rotator, mast and antenna may be connected. Bolts are used to join adjacent sections together. Figure 2 shows a set of typical tower components.

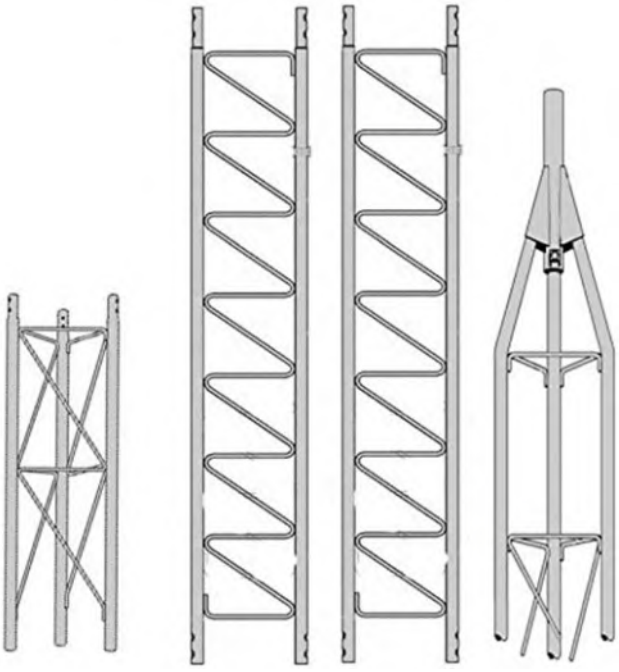


Figure 2 – Typical Tower Components (First section, Two Intermediate Sections, Top Section) (Rohn)

Overview of Installation Process

Tower installation is complex and a full article on this topic would take many pages. Today I will just touch on the stages of the process, roughly in order, and describe what they involve.

A) Choosing a Location:

Perhaps the most critical element in starting to build a tower is deciding upon its location. You will be digging a hole and pouring several tons of concrete for the tower base, so it cannot be moved later. The location is important because it must be:

- Away from other buildings and structures which could interfere with antenna raising or antenna pattern;
- Away from neighbours or other properties. Your antenna, once installed, should not "overhang" the property line and impinge upon a neighbour's property. To do so could also have legal implications;
- In suitable ground for long term support of the base and tower. For example, sandy ground may not hold the base tightly and the tower may start to lean. In the early 1980s I had a ham friend whose tower had the posture of the "Leaning Tower of Pisa". It cost him lots of money to put this right; and
- In a suitable location in regard to local noise and other factors which may impact radio reception.

B) Tower Base:

Once you have decided upon a good location, then it is time to dig. Follow the manufacturer's specifications to the letter. See Figure 3 for a typical tower base specification. You will likely think that the specifications are far too conservative: the base too big, too deep, and the like. Ignore

what you may think! All towers are designed and specified by professional engineers. They have advanced degrees: trust them and do not take shortcuts. When the fall windstorms arrive and your house is shaking in the wind, you do not want to have any worries about whether your tower will survive the storm.

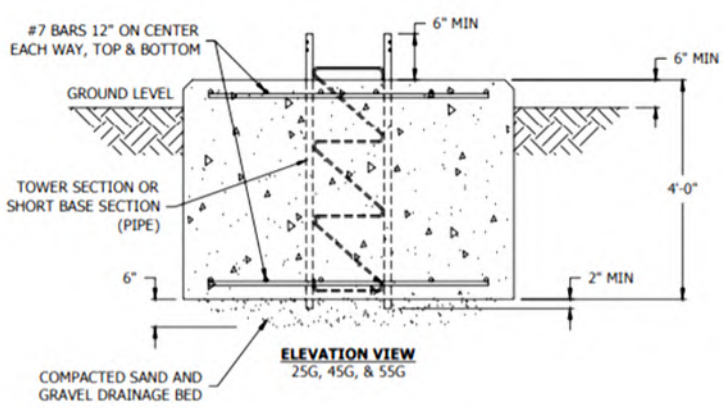


Figure 3 – Typical Tower Base Specification (Rohn, see https://www.rohnnet.com)

I have been there: the base of my 70-foot tower in Burnaby was built to specifications, and through more than thirty years of inclement weather the tower never budged an inch. I worried during windy weather for the first few years, because it is only natural, but after that I never had any concern at all about the tower coming down.

Some recommendations about digging:

- Obtain any permits and comply with local regulations;
- Consult with your local authorities before you put a shovel into the ground to ensure that you don't hit underground utilities. In BC we have the handy "Call Before You Dig" provincial service. Call them before you rupture your neighbour's natural gas line!
- Don't try to do all the digging manually. Rent a small auger from local dealers. For my latest tower installation this allowed my friend VA7BC and I to dig a four-foot deep base in about two hours rather than in probably two days manually. Get training or find experienced help with the auger however, as they can be dangerous. Don't lose a leg!
- Measure, measure, measure: keep the specifications close at hand, keep the walls vertical, and the hole square (or as manufacturer's specs require). You cannot easily put dirt back to shore up walls of a hole. It's a dirty job, but you have to do it!

Once your hole is complete you can relax for a bit before moving onto the next step. Figure 4 shows some photos of my latest tower hole. You'll have lots of extra dirt that can be used to even out the lawn!

Figure 4 – Kevin's Latest Tower Hole

C) Fixing the First Section:

The next step is to support the first section of the tower in the base hole and to ensure that it is perfectly vertical, in preparation for your concrete pour. This is also a good

Figure 5 – What to Do with the Dirt From Your Hole!

time to ensure that the tower is properly grounded. You need to ground your tower to protect against the inevitable lightning strikes.

There are several ways to support and ground the first section, but as shown in Figure 6, I have for many years used a novel method which has passed the test of time.

I start by placing the first section in the hole and positioning it properly in the centre of the base hole. I envision the entire tower rising from the base to ensure that this position will work. I then mark the position of the bottom ends of the tower legs in the dirt and use a bit of rebar to show where the legs of the tower will sit.

I remove the first section, and the next stop is a local welding shop. I ask the shop to weld a 4- or 6-foot steel rod onto the bottom of each of the tower legs, as shown in Figure 6 above. The rods serve two purposes:

- They will support the first section in the base hole approximately 4-6 inches above the "floor" of the hole. When the concrete goes into the hole it will fully encapsulate the first section with the rod protruding through the bottom of the concrete block into the ground; and
- The rods will then serve as grounding rods for the tower, to protect against lightning strike. This electrical ground can then be augmented by additional ground rods placed around the tower base and attached to the tower as necessary.

I will place the first section, with rods attached, into the hole in the previously determined position, and then pound the section down into the dirt so that the rods hold it in a precisely vertical position. As I pound the rods into the ground, I use a long carpenter's level to ensure that each leg of the section is vertical.

Figure 6 – First Section and Grounding/Support Rods

D) Reinforcement and Pouring the Base:

Once the first section is fixed and vertical, the next step is to place a suitable rebar cage around the perimeter of the hole. The tower specification document will describe the proper form of the rebar cage. Attach the cage to the three (or four) tower legs as recommended but ensure that the first section remains stable and vertical. You won't be able to adjust the position of the first section later!

Next is the fun part: getting concrete into the hole. Again, it is critical to either mix or purchase concrete of the recommended strength and specification. The base will hold the entire tower and your antenna, and it has to be strong enough to do this.

Figure 7 – Preparation for Pouring, and Poured Concrete Base With First Section Attached

I recommend spending the extra money and buying premixed concrete of the required specification from a local concrete company. I have done this job both ways (premix, and with a borrowed home concrete mixer) and the difference is like choosing to vacation in "heaven" or "hell" in July. With premix you are certain of the specification, the truck arrives, backs up to the hole and the concrete gets dumped in. Easy-peasy: in ten minutes your base is poured and you are finished except for dressing the top of the block.

Check the verticality of the first section as the concrete is being poured and thereafter. You will have about an hour to fix any misalignments. Do this carefully and repeatedly as it must be right!

Once the block is poured, it will take several weeks to cure. Do not climb or put any stress on the first section during this period.

E) Preparation for Installation of Subsequent Sections:

You can use the several-week period between the pour and when the concrete has cured to finalize your plan, acquire your climbing harness, tools, and line up experienced assistance for the erection of the rest of the tower.

I recently upgraded my old climbing belt to a modern CSA-approved five point climbing harness. See Figures 8 and 9. I also purchased a new approved lanyard that wraps around the tower, and a shock absorbing link which will "catch me" if the lanyard fails. This is a new feature for me, as my old climbing belt from the late 1970s although CSA-approved at the time did not provide for this feature.

Figure 8 [right] CSA-Approved Climbing Harness (https://www.3m.com)

Figure 9 [lower right] Really Bad Photo of Kevin Modeling New Harness

The lanyard goes around the tower as it goes up section by section and clips to two "positioning loops" on the hips of the harness. This allows the climber to use both hands in safety. The safety link clips to the tower as well to provide backup should something go wrong with the main lanyard.

Several weeks have elapsed and it is time to install the remaining sections of your tower. Get experienced help when you are new at this.

The methodology of installing the additional tower sections is as follows:

- You climb to the current top of the tower and secure yourself
- You haul up a "gin pole" (see Figure 10) and mount it securely to the topmost tower section. The gin pole has a pulley at the top of it. See Figure 12. A rope through this pulley is tied to the next section of tower on the ground
- You wait and enjoy the view while workers on the ground haul up the next tower section. The gin pole allows the section to be lifted above the current top of the tower
- Once the next tower section is at height, you maneuver it into position so that the legs at the bottom of the section can go into the top of the legs of the current top section. This can take some time and maybe some persuasion with pin alignment tools, but you can get the new section in place! See Figure 11.
- You place bolts through the new section to firmly attach it to the top section, and the new section is installed
- You untie the rope which is attached the new section and lower the end of the rope back to the ground
- You take a break, and then climb to the top of the newly installed section and secure yourself once again
- You repeat this process until all of the remaining tower sections are installed (see Figure 13)

Most tower specifications will support a significant amount of weight at the top of the tower, so when you are new to this process it is very helpful to perform these steps with an experienced helper at your side. Once you "learn the ropes", quite literally in this case, you can work on top of the tower solo. Don't be afraid to ask for help!

Figure 10 [above left] John VA7XB and the Gin Pole

Figure 11 [above right] Gin Pole lifting the next tower section (https://hamradioschool.com/wp-content/uploads/2015/01/LX4SKY_gin_pole.jpg)

Figure 12 [below] Gin Pole in place on Kevin's latest tower

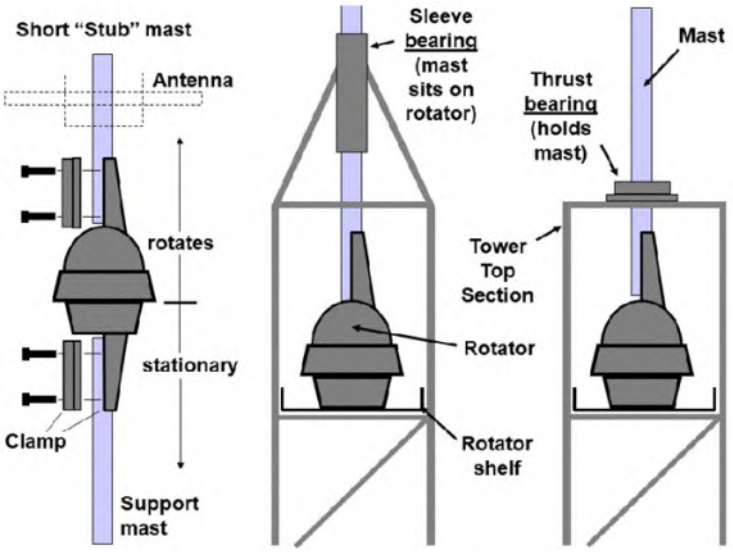


Figure 13 [top] Tower Section Installation Complete

Figure 14 [bottom] From https://www.nutsvolts.com/magazine/article/rotators

F) Rotators and Masts:

At this point your tower is up. The next step is to install the rotator and mast. See Figure 14 for three modes of rotator installation.

Rotators are usually mounted within the structure of the tower itself several feet below the top of the tower. They must be mounted on a rotator plate, which is a triangular (or square, depending upon your tower configuration) piece of metal which is bolted to the tower legs. The rotator plate serves to secure the rotator and transfers the angular force of the rotation to the tower legs.

Attached to the rotator is the mast, usually a 2 to 2.5 inch section of steel or aluminum thick-wall pipe four to eight feet long. The mast extends through the top of the tower (usually through a thrust bearing which keeps the mast vertical) and is attached to the antenna (typically a Yagi). The rotator rotates the mast, and the mast causes the Yagi to turn.

Rotator plates are always available for commercial towers and are pre-drilled to accept popular amateur radio brand rotators. Do not try to make your own (again this is based on my own experience!) – it is far easier and more accurate to purchase the pre-made rotator plate from your tower manufacturer.

It is important that the rotator be installed perpendicular to the legs of the tower (i.e. horizontally) and that the mast be vertical. If the mast is not vertical and the rotator will move the mast in a "conical" manner rather than rotating the mast vertically. A thrust bearing can be used to finely adjust the mast's verticality. Conical motion of the mast will place stress on the rotator's bearings and greatly shorten its life. I would recommend taking a carpenter's level up the tower and ensuring that your mast is vertical before performing the antenna raising and installation.

The rotator is an electrically-powered device. A control unit in your shack powers and controls the rotator. Most amateur rotators are fed by an 8-conductor cable that powers them, reads the current antenna heading, and sends control commands to the rotator.

This cable must be hauled up the tower and attached (with proper winterization and strain relief) to the rotator. The popular "Coax Seal" product is almost universally used to protect cable connections from our extremely wet rain forest weather. Wrap all electrical connections thoroughly. You don't want them to fail in the middle of a contest, in the hellish windy December rains we get in the B.C. Lower Mainland!

I recommend measuring the cable, attaching the requisite connectors and testing the rotator on the ground before it is installed on your new tower. Attach the control cable to one tower leg using good quality, UV-resistant cable ties. Low quality cable ties will fail in a single summer due to sun exposure.

G) Raising the Antenna:

Once your rotator and mast are in place you can get ready to raise your antenna.

You will of course have to build your antenna on the ground. Testing a large Yagi on the ground can be difficult as it's pattern and characteristics like SWR can be greatly impacted by it being only a few feet off of the deck.

Follow your antenna's instructions for testing and setting minimum SWR. Generally, testing will probably involve getting the antenna all built, attaching the feedline, and then tipping the entire antenna up on it's reflector (longest element) end so that it is vertical – pointing straight up into the sky. You can then use an antenna analyzer to test and refine SWR and other characteristics. Borrow the club's excellent 'RigExpert' analyzer if you don't own one yourself!

I have never experienced a problem where an antenna's SWR is acceptable on the ground and then becomes unacceptable when the antenna has been raised to the top of the tower. Just follow the manufacturer's recommendations for antenna setup and testing and you will be alright.

Raising a large Yagi up a tower can be challenging. If you placed your tower away from trees, houses and other obstructions then raising it will be straightforward. If your tower is next to a stand of trees or a house, then it will take some additional care as the antenna is raised.

You will use a gin pole once again to raise the antenna. Climb the tower, secure yourself, then haul up the gin pole. Attach it to the top section. The rope through the gin pole pully should be attached to the centre of the Yagi. Once you are ready, ask your ground helpers to haul the antenna up. Once the antenna is at height you need to manhandle the antenna, flip it from vertical to horizontal orientation, and attach it to the mast using the Yagi's boom-to-mast clamp.

This can require some strength and perseverance. You may want to fix the antenna to the tower securely but temporarily once it is horizontal, and then take a short break as you grab your tools. Then work to securely bolt the antenna to the mast using the boom-to-mast mounting plate. It is hard to use wrenches and other tools at altitude and the antenna itself sometimes gets in the way as you have to place lock washers, washers and nuts on the boom-to-mast clamp and secure them.

It is a good idea to take spare hardware with you for the antenna raising as invariably some small part will get away from you and fall to earth. Take care with your tools as well – if you drop them they can present serious danger to your ground helpers. All ground helpers need to wear hardhats.

The main problem encountered as a large Yagi is raised is the tendency for the antenna to rotate or "spin" as it is raised up the tower. Poor planning can see the Yagi lift off

the ground, go up a few feet, and then "spin" left or right so that the antenna elements hit the ground and bend. The antenna will have to be lowered back down and repaired. In working with large Yagis and towers since the 1970s, I have had this problem once – and that was enough for me to always mitigate against it happening again.

To prevent, or at least to gain some control over undesired antenna rotation or spin, I loop a long piece of light rope through the reflector (longest element) end of the Yagi and tie it into a loop which is secured to the ground. As the antenna is raised, a helper can hold the loop and provide tension on it to stop the Yagi from rotating. Once the antenna is at height and attached to the mast (see below) the ground helper can simply untie the loop and pull the loop free off the end of the reflector.

Do NOT tie the light rope to the reflector! Once the antenna is at height you as the tower worker will be unable to reach far enough to untie the rope! You'll feel really dumb, and the only solution will be to lower the antenna, untie the rope and replace it with a loop, and then perform the entire lift again. Don't ask me how I know this!

H) Feedline:

Attach the feedline to your Yagi and winterize this connection before it is raised into position. Use Coax Seal or another similar product.

Use high quality feedline that exceeds what you think you will need at the present time. You do not want to have raised your tower and Yagi using RG58 feedline, for example, because next year you may decide to acquire a power amplifier and RG58 will not be able to withstand the increased power level.

Replacing the feedline will be a big job that could have been easily avoided by using RG8, RG213 or even LMR400 feedline in the first instance.

When you attach the feedline to your tower leave a large loop at the very top of the tower that will accommodate the rotation of the Yagi both 180 degrees clockwise and counterclockwise. If you attach the feedline tightly to the top of the tower without a "droop loop" then rotating the antenna will pull your feedline connector off or damage the antenna feedpoint. Secure the feedline to a tower leg using UV-resistant high quality cable ties.

I) True North:

The last task before completing the antenna raising is to align your Yagi with true north. Know which direction is true north on your property and when you are ready (boom-to-mast clamp installed but not tightened yet) enlist the assistance of a helper on the ground to tell you when the antenna is pointed exactly towards true north. Once this is achieved, tighten the boom-to-mast-clamp to ensure that the antenna is secure.

You can use a compass to find magnetic north but remember that to set the antenna you will need to know true north, NOT magnetic north! Azimuth headings from logging programs and DX sites are always given in degrees true, not magnetic.

Magnetic variation changes over time and is tracked by the federal government. The magnetic variation in the Lower Mainland is currently about 16.03 degrees, so there is considerable difference between the two values. Consult appropriate sources to find out what the current magnetic variation is before you set your antenna.

You're Finished!

At this point your tower has been successfully planned and installed, and you have deployed your rotator, mast and antenna. It is time to enjoy the fruit of your labours! It is always exciting to power up your station and make the first contacts on a new higher-performance antenna. See Figure 15 for a shot of my latest completed tower project, a 30-foot tower supporting a 6-element LFA Yagi.

Disappear into your shack and enjoy the improvements in reception from your beautiful new installation. Better reception of course will be augmented by an improvement in the directivity of your transmitted signal. Your spouse will wonder what has become of you!

I hope that this overview of the process of tower and antenna installation has been of some interest to you. If you have ever considered installation of a tower this will have given you some detail about the requirements and steps in the process. If you are new to the process, want to discuss it with some experienced hams, or are considering whether this is a good project for you then feel free to contact me or any of the SARC "Elmers" through ve7sar.net. We have a lot of experience in this process, can offer ideas and advice, and can even help you with your first tower (i.e. "antenna support structure") project.

I will close by reiterating the importance of safety, proper equipment and leverage of experience should you be new and want to undertake a project of this type. Ask for help as required and always stay safe. Both the installation and maintenance of towers can be dangerous if you do not have proper equipment or take chances. With proper thought and equipment, however, tower work is safe and enjoyable and a tower can greatly enhance your operational or DX success. It is also important to respect local bylaws and other regulations.

Feedback on this article can be directed to the Editor, or directly to me at mcquiggi@sfu.ca. Thanks and everyone have a great late spring season!

73,

~ *Kevin VE7ZD / KN7Q*

Figure 15 – Completed Installation

http://bit.ly/SARC20SepOct

TECH TOPICS

Luc Decroos ON7DQ

The OST Morse Box

A Morse Tutor, Beacon, Memory Keyer, CW Decoder and a Basic LF Generator

Summary

This is a versatile circuit using an Arduino Nano that makes it possible to send Tone Modulated CW over VHF/UHF FM. Extra features include a Morse Tutor, Beacon or Memory keyer, CW Decoder and a basic LF Generator. The modular setup let the builder select only the parts which are needed.

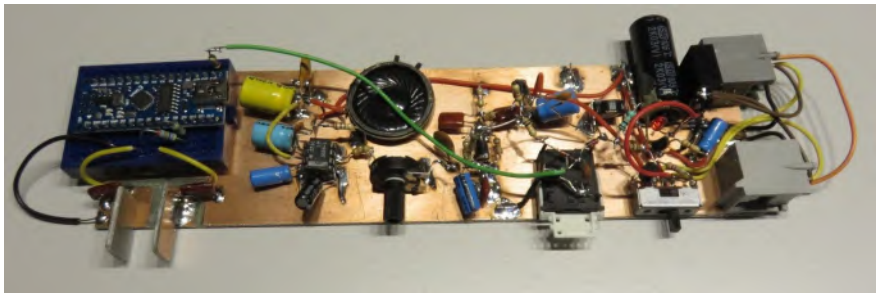
Introduction

My local club in Ostend, Belgium is the **OST** branch of the UBA (the Royal Belgian Amateur Radio Union). We have a small group of people that hold a weekly CW practice session on the local club frequency in the 2m band.

Some years ago, I had the idea to build a **Morse Box**, to be able to have 'Tone CW' practice and QSO's on the 2m band, using FM mode. So I made a prototype in breadboard style, and it worked OK, but was not a project that others could easily copy. And it was UGLY to say the least.

After a while, I had other projects on my mind, and forgot all about it. Until 2020… when we entered the first Covid-19 lockdown. Suddenly, we needed something useful to do, and I picked up this old project. I called in some help from a fellow club member Gil, ONL12523, who is a keen designer and programmer. After a lot of e-mails, we agreed on the basic concept, and this is what we finally came up with, see figure 2 *[next page]*.

It's a versatile circuit that you can fit between the microphone and the microphone input of any transceiver. It was mainly designed for use with a VHF/UHF transceiver, but can be used for many other purposes. It's so much more than a mere Code Practice Oscillator.



Left: figure 1 - Prototype

The basic version was later extended with even more functionality, providing a **D**ecoder and a **G**enerator, so we called that version the OST Morse Box **DG**.

What can the OST Morse Box do?

Many Code Practice Oscillators can be found on the internet, and many of those use an NE555 timer, producing a square wave. A LPF is needed to make the tone somewhat acceptable. Our project uses a **DDS tone generator**, resulting in a nearly perfect **sine wave.** And the added advantage is that you can set it on any frequency you like, in software.

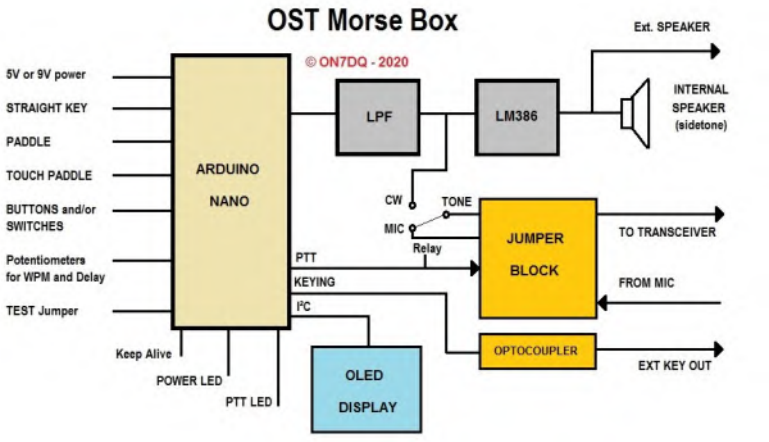
The microphone is muted during transmit, to avoid nasty background noises (dogs, cats, or the XYL/OM yelling at you). All is automatic, just touch your key or paddle, and you're on the air. And don't worry, your microphone works as before for a voice QSO, without the need to change cables or switches. The PTT delay can be set anywhere between 0.5 and 10 seconds.

Since the Morse Box is primarily a training device, CW speed can be set between 10 and 35 WPM. Slower speed can be obtained by increasing the Farnsworth spacing.

A small OLED display is connected to the Arduino Nano and shows several parameters during operation, and you can read the sent and received text as well, but more about that later.

You can key with a Straight Key, a Paddle or even a built-in Touch Paddle!

Three keying modes are built-in: plain iambic, iambic A and iambic B. Paddle polarity can be set to normal or reverse. There is a keying output with an optocoupler, to use the Morse Box as a separate electronic keyer for transceivers lacking a built-in keyer. There is a built-in TEST function for the touch paddle.



Below: Figure 2 - Block diagram

The circuit can be powered in several ways: via the USB connection of the Arduino, via the microphone jack or from an external power supply. If you power the Morse Box from a Power Bank, there is provision for a "keep alive" circuit, to avoid the Power Bank shutting down.

The Morse Box can be adapted to all existing transceivers, using the appropriate microphone plugs. The basic model is based on the widely distributed RJ-45 connectors, but you can make adapter cables for your particular situation.

Is that all? This has been done before, you know…

Oh no, there is more, much, much more… read on.

The Morse Box contains a basic **Morse Tutor**. It can generate random character groups, one group at a time, or a continuous string of groups, varying in length and content (more about that in the manual). In this case the PTT delay is used as an inter-group delay.

The groups are displayed briefly on the OLED display, after completion of course (no cheating!).

There is a **Beacon function**, which can also be used as a **Memory keyer** (1 memory of 80 characters built-in, more memories are possible via a Windows Control program).

After we launched our project into the wild… we had some more time. So in the second Covid lockdown, we added a **CW Decoder** and a basic **Sine Wave Generator.** This only needed upgrading the Arduino firmware! Only for decoding the incoming signals, an extra hardware decoder is needed.

Additional functions can be set via **AT commands**, sent via the serial monitor of the Arduino IDE (or any terminal program). Text to be sent can also be entered the same way.

There is a **Windows program** for controlling the OST Morse Box (then no need for the Arduino IDE or terminal). The program is not strictly needed, but it unlocks the full potential of the Morse Box.

There is a **33 page ENGLISH manual**, which actually was my input to the project. It describes all functions and detailed building instructions, from building a very basic circuit to the full option Morse Box. There is a second manual for the decoder and generator extensions as well.

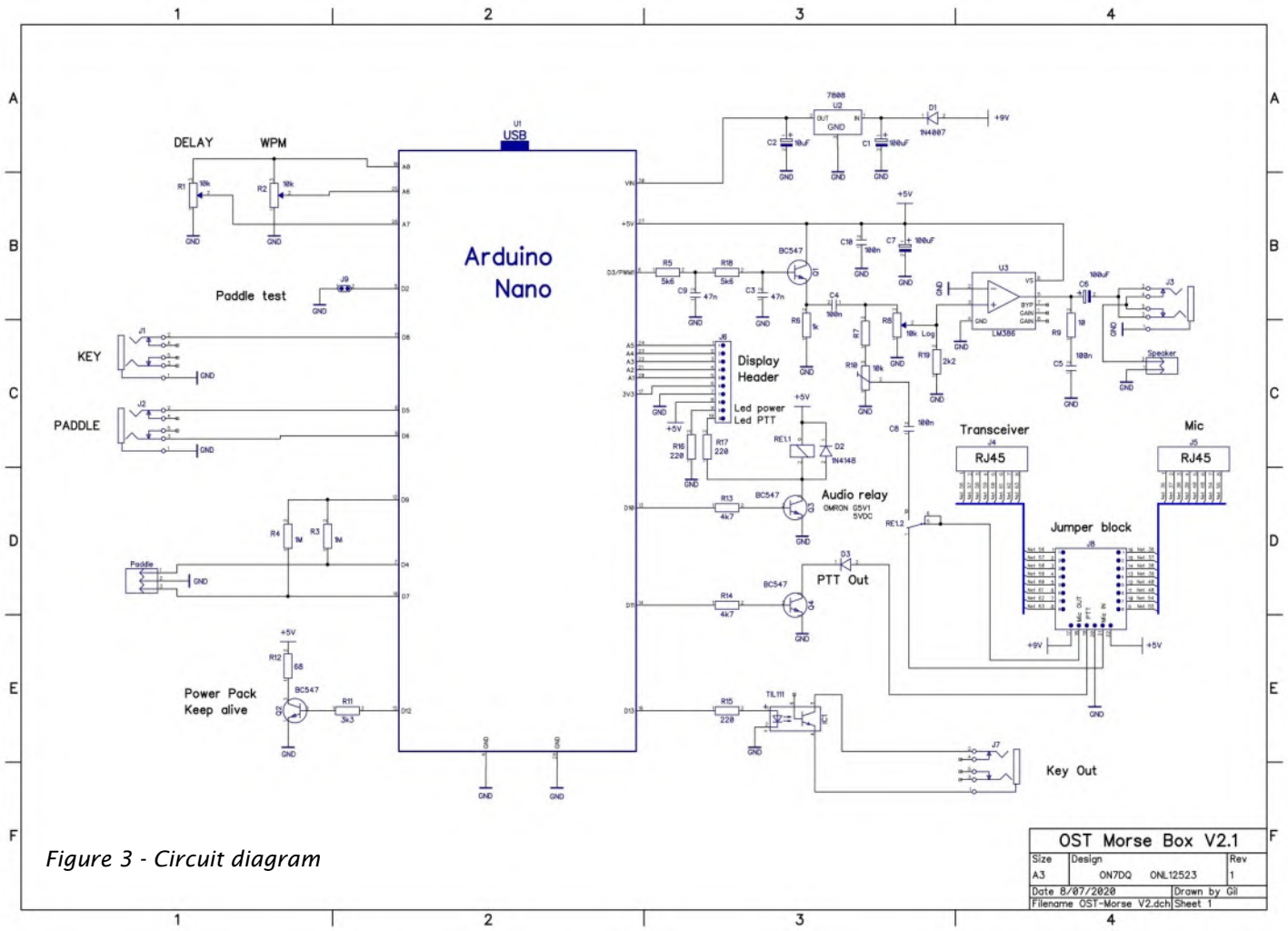


Figure 3 - Circuit diagram

The Hardware

Figure 3 *[bottom previous page]* shows the circuit diagram.

Compare the circuit diagram with the block diagram and you will easily find all functions. To the left are the inputs: key, paddles, buttons and/or switches, potentiometers, test jumper. To the right is the optional power input and all the outputs: the generated sinewave, followed by a Low Pass Filter and AF amplifier, an internal or external speaker, CW/MIC relay, PTT and Keying. The OLED display and buttons, switches and LED's are connected to the 10-pin "Display Header".

The jumper block ensures the correct interconnection of microphone and transceiver. Via the optocoupler, an external transmitter can safely be keyed (your own QRP project, beacon transmitter, etc.).

The Arduino Nano, OLED display and the relay are probably the only special components. The rest is just resistors and capacitors, an LM386 amplifier, a generic optocoupler (e.g. TIL111), an optional voltage regulator, a bunch of 3.5mm jacks, RJ-45 connectors, some buttons and switches to control the random and beacon functions, and three potentiometers. A few LED's can be added for Power, PTT and decoded CW.

The PCB parts placement diagram is shown in figure 4 *[below]*.

All files needed for **making the PCB** are on github (see links at the end of this article). Make it yourself, order it from a local manufacturer, or order them cheaply from China. We ordered 10 boards for our club at https://jlcpcb.com/ for less than 30 Euros, including shipping. You can also change the PCB to your liking, it was developed with the free edition of **DipTrace** https://diptrace.com/.

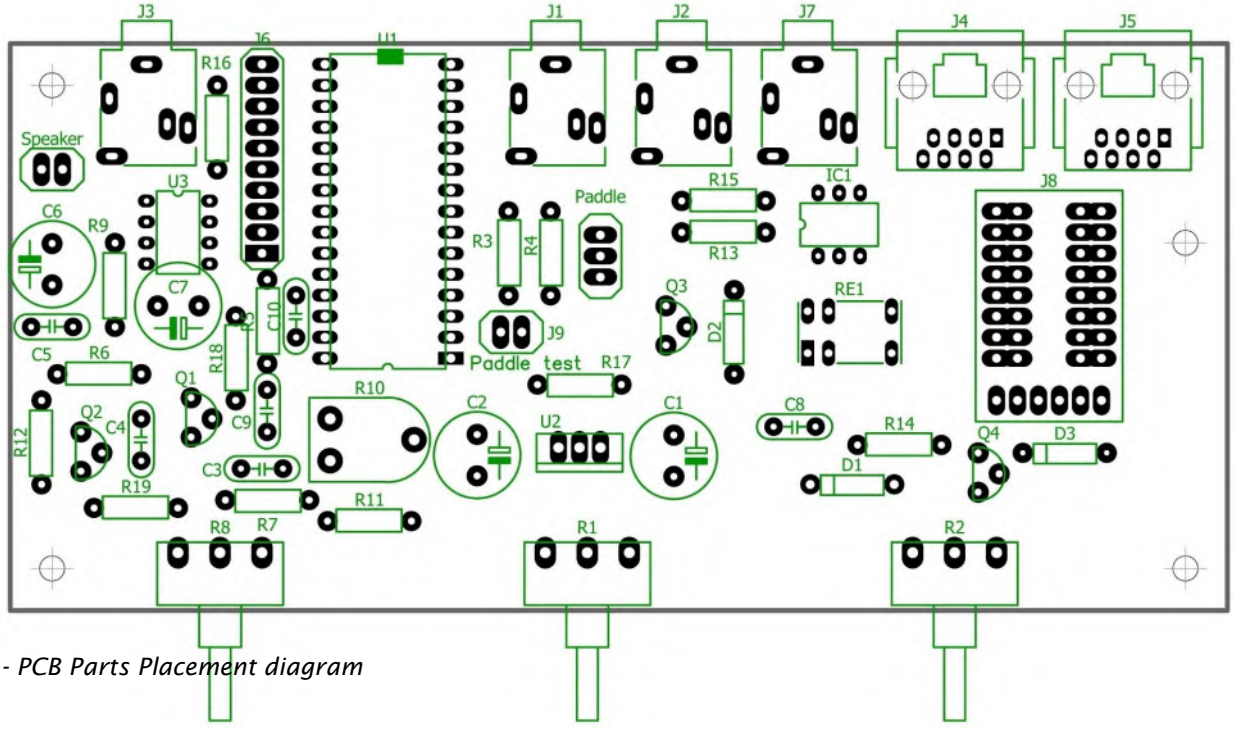


Figure 4 - PCB Parts Placement diagram

Versatility

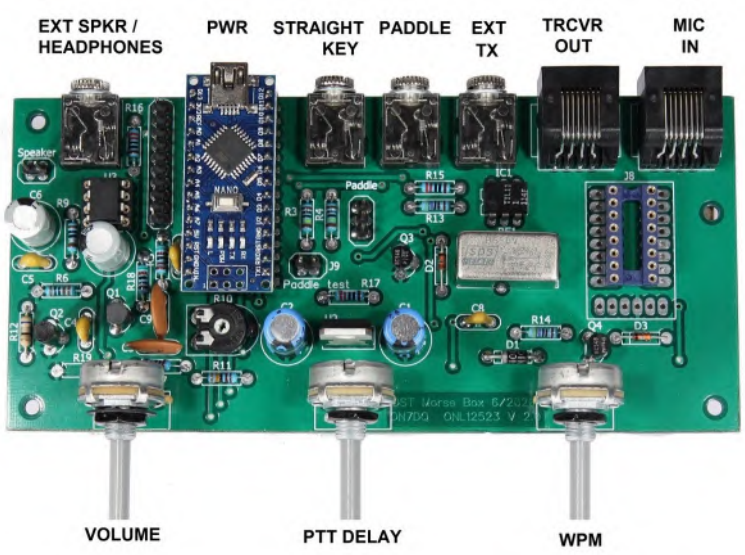
Not all options are mandatory, those who wish to do so, can partially fill the PCB to obtain only the desired functions. This is clearly indicated in the construction manual. If you wish, you could even build the basic version without the PCB, just build the parts that you need on a solderless breadboard.

This is what the **full option PCB** looks like. External components not shown are an OLED display, speaker, touch paddle contacts, LED's and some buttons and switches, and your own straight key or paddle of course! The assembled PCB is shown in figure 5 *[below left]*.

The "jumper block" to the right must be wired to match the microphone pinout of your transceiver. Transceivers with round (8 pin etc.) connectors have to be wired directly to the pads near the 16-pin IC socket, omitting the RJ-45 connectors.

The relay in the picture was a special model for the first prototypes, but the PCB has been adapted since for a more common relay type.

Below: Figure 5 - Assembled PCB

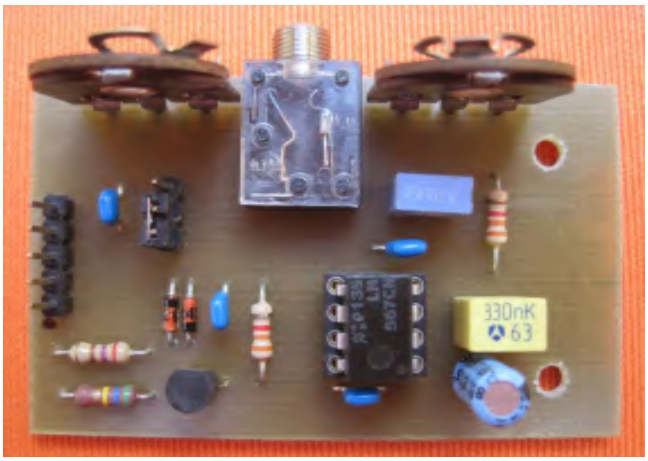


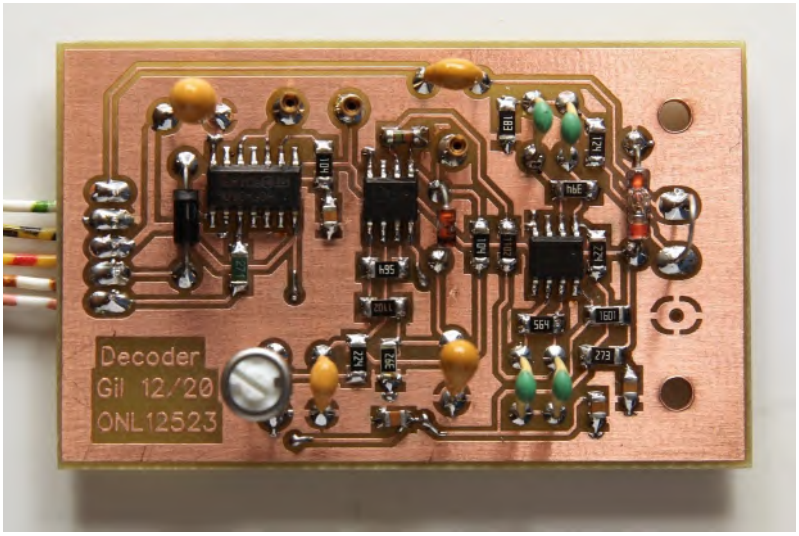
To be useful, you're better off mounting the project into a nice enclosure. Figure 6 *[below right]* shows how Gilbert, ONL12523 did it. Gil didn't include a touch paddle but you can see one in my prototype, with instruction how to build it, and a picture in the manual.

The extended version of the Morse Box works with the same basic PCB. Only the decoding of received signals needs a small extra PCB. We even have TWO versions of the decoder for you. The simplest circuit uses the well known NE567 tone decoder. It has a jack to connect an external audio source, like an HF receiver. This board has to be tuned to the side tone frequency that you wish to decode. This can be a problem if different people start sending code at different tone frequencies, hi. Therefore, we have developed a "better" decoder. It consists of a BPF (roughly passing 450 – 950 Hz), followed by a level detector. This decoder will work on any frequency in its passband, but would of course be useless for decoding HF CW signals if your receiver does not have a narrow CW filter. For this decoder, Gil has only developed an SMD board, but you can design your own through-hole version, or build it in breadboard style.

Both assembled decoder boards are shown in figure 7 -Tone Decoder and figure 8 - BPF Decoder *[both shown top next page]*.

Below: Figure 6 - Case by Gilbert, ONL12523





Left: Figure 7: Tone Decoder

Right: Figure 8 - BPF Decoder

The Software

It would probably take a whole issue of *The Communicator* to explore the Arduino code. It is open source, so feel free to explore and modify as you wish. More details can be found in the manual.

Let's just look at some of the things the software displays on the OLED screen.

In idle mode, the WPM, Character interval and PTT DELAY are displayed. When a jumper is shorted at startup, you enter a special test mode for the touch paddle (if used), to check the timings.

On the right *[top to bottom]* are shown:

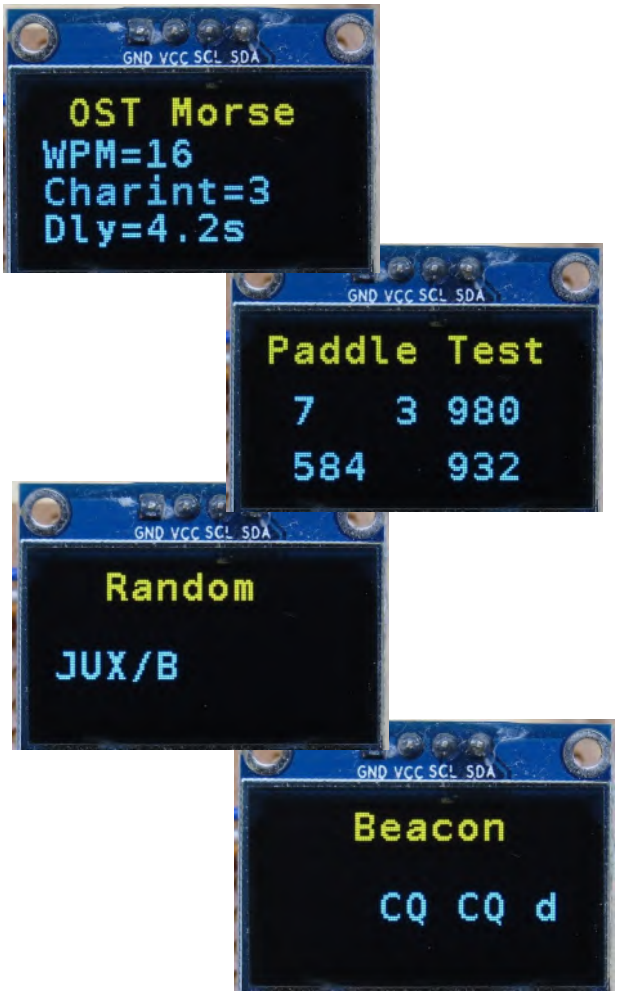
Figure 9 - Parameter display

Figure 10 - Touch Paddle Test display

In Random or Beacon mode you get two other screens.

Figure 11 - Morse Tutor display

Figure 12 - Beacon or Memory Keyer display



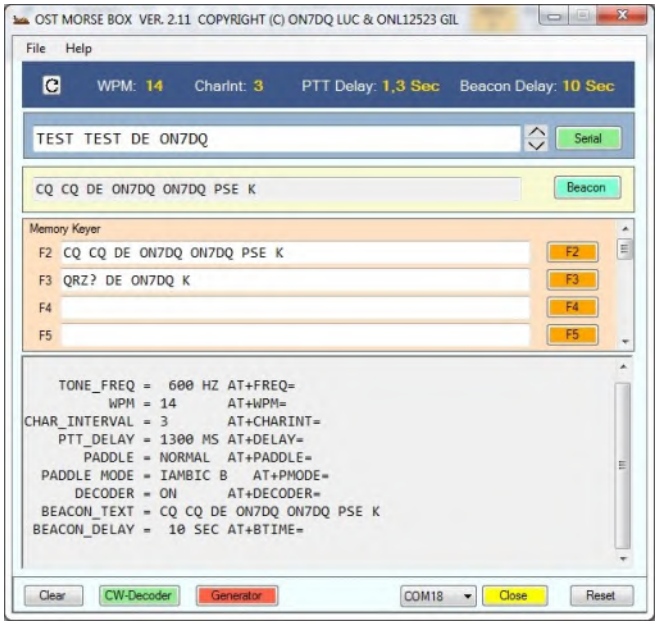


Figure 13—Windows Control Program

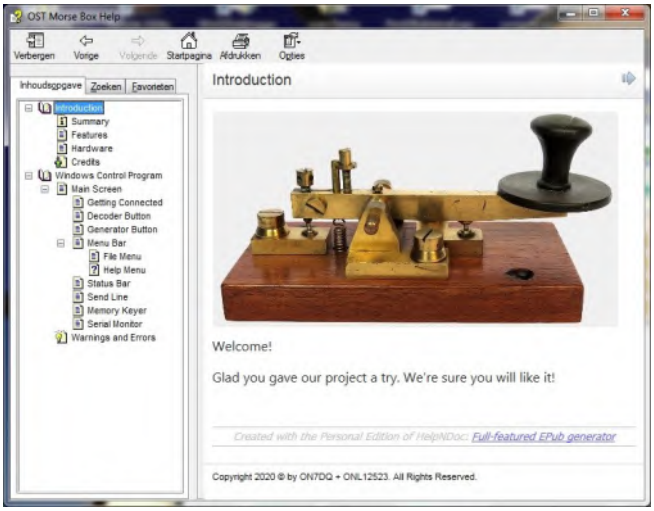


Figure 14—Help screen

Another piece of the software is the **Windows Control program** (this program is not open source). See figure 13 - Windows Control Program *[left]*.

It is optional to use this program, but it gives full control over the EEPROM settings in the Arduino, in an easy to use graphical interface. You can alter the Beacon text, 19 more keyer memories, load text files for sending Morse practice, read decoded text and save it to a file, and using the decoder and generator is also easier. When connected to the PC, this also powers the circuit, so no voltage regulator needed. And to make the Windows program complete, it even has its own Help file. See figure 14—Help Screen *[below left]*.

Documentation

All files and full documentation is on this github page: https://github.com/on7dq/OST-Morse-Box for the basic version, and https://github.com/on7dq/OST-Morse-Box-DG for the decoder and generator extensions.

Even if you build only the basic version, you are advised to use the Arduino firmware of the extended version, because the basic version lacks the iambic A and B modes. The second github link will also lead you to an easier way to load the firmware into the Arduino, with a program called **Xloader**.

My blog contains some examples of OST Morse Boxes built by Gil and some others.

https://on7dq.blogspot.com/2020/07/ost-morse-box-build-by-gilbert-onl12523.html and https://on7dq.blogspot.com/2020/11/more-examples-of-ost-morse-box.html

If you have put it in a nice enclosure and want to be added to the gallery, send me some pictures. Finally, if you (or your club) ever build the OST Morse Box, we would be delighted to hear from you, we like to keep track of how many were built.

Good luck and 73,

Luc ON7DQ / KF0CR
(Luc's e-mail address is on QRZ.com)

Antenna Adventures

Halden Field VE7UTS

Bird Yagi Uda: A lightweight 3-element beam antenna for 20 metres

I had intended to give a presentation to NSARC about this antenna at about this time last year, but the pandemic stopped that, plus a few other things. We're still unable to meet at our usual venue, and this is the time of year that hams tend to plan antenna projects. So I decided to write up some notes about the antenna I built a few years ago in case it might interest others.

I returned to my childhood hobby about four years ago. I had retained three relevant things since I had been on the air in the early '80s – my call sign, the ability to send and receive Morse code, and a Tempo One transceiver. I needed antennas. While out cross-country skiing one day, I paused to marvel at the properties of an object in my hand. It was long, thin, strong, and lightweight. I thought that if a fiberglass ski pole could be scaled up by a factor of 4 or 5, it could enable me to make a directional antenna light enough to carry up a mountain. Of course, I wasn't going to carry an 18 kg transceiver with power supply and an even-heavier generator with fuel up a mountain, but I could solve the equipment problem in another mental thread. It would be fun to relax after a long hike by making some contacts on HF, and having a directional antenna would make that much easier.

After several internet searches for fiberglass poles, I found some meant for catching crappie, whatever that is. I also found articles about Dick Bird's (G4ZU) variation on the Yagi-Uda antenna that involves making the elements from wire, and bending the parasitic elements to reduce the amount of structure needed. See:

- Uda, S. (December 1925). "On the Wireless Beam of Short Electric Waves". The Journal of the Institute of Electrical Engineers of Japan. Institute of Electrical Engineers of Japan: 1128.
- ARRL Antenna Compendium, Volume 2 (pp. 58-60)
- http://www.antentop.org/w4rnl.001/byag.html

Since the higher bands hadn't been propagating well, I scaled Bird's 10-meter plans up for use on 20 metres. Simply scaling the wire lengths in the original article didn't work. Nor did tuning a dipole's length using an SWR meter and then adding the parasitic elements - it turns out that the proximity of parasitic elements changes the resonant frequency of the driven element! After learning about PVC pipe and fittings, how to use 4NEC2, and several other unexpected things, I eventually built a beam with mass less than 3 kg that works well. This is not a step-by-step guide; it will require some ingenuity from the builder. The details given here are only suggestions. These notes are not guaranteed to be accurate. Use your own judgement. Take responsibility for your

decisions. Be safe. This is a hobby, so don't even start if you don't think it'll be fun.

A Yagi-Uda antenna, also known as a "yagi", achieves directionality by inducing current in adjacent, parallel conductors that have lengths such that the induced current will re-radiate the incoming signal in or out of phase with the signal from the driven element, creating directionality via constructive and destructive interference. There are several resources on the internet and books that explain how this works. Antennas using this principle are ubiquitous; one can readily itentify them by the presence of multiple parallel rods on a boom.

Many hams use 3-element Yagi-Uda antennas that have 5 rigid components: a mast, boom, driven element, reflector and director. Using wire and string or rope, one can eliminate two or three of these heavy components, which also reduces the mass of the remaining rigid components because they now have less mass to support. But one can't just substitute wire for an aluminum tube; the wire needs support at both ends. This solution is to bend the parasitic elements at their midpoints and tie them off at the ends of the driven element, which is rigid. See Figure 1 *[below]*.

One can make the structure from common PVC pipe sections and fittings and telescoping fiberglass poles. Suitable fibreglass poles may be found with internet searches for "wonderpole TSP-20" or "black widow BW6". Since the sellers of fiberglass poles change their offerings rapidly, other suitable poles of other models may be available. Anticipate that the tip section and possibly part of the next section may be too weak for this application. Also, anticipate that some sellers do not describe their products accurately.

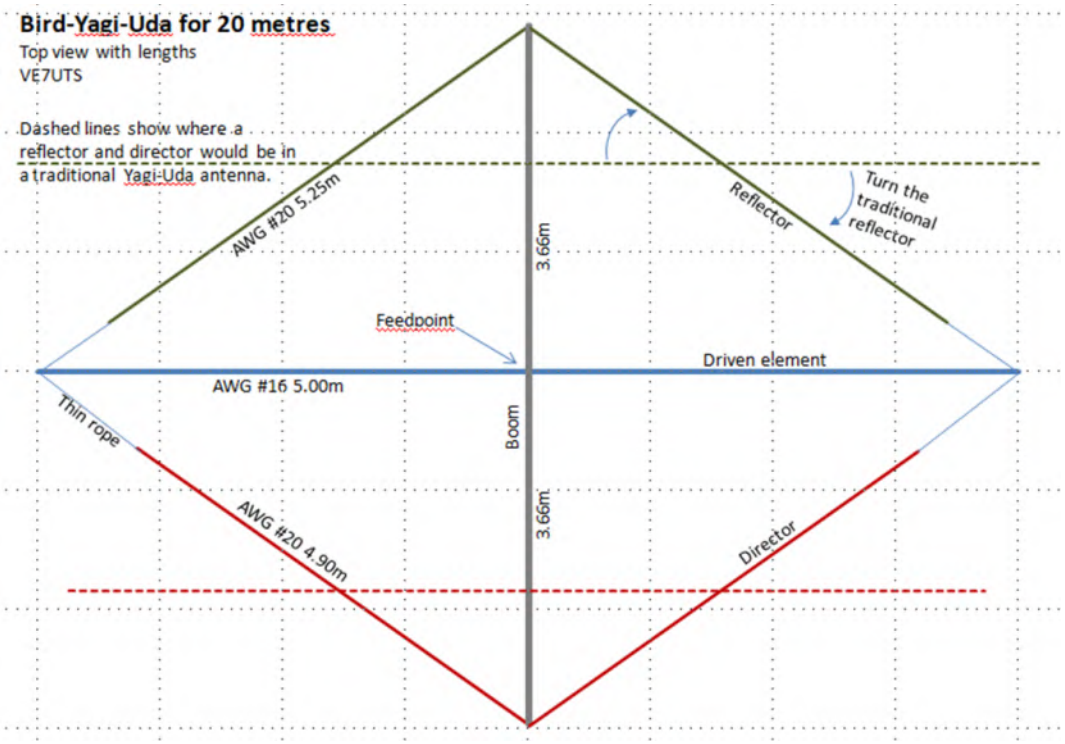


Figure 1. Bird-Yagi-Uda element configuration. Dashed lines showing where parasitic elements are commonly placed for a traditional Yagi-Uda antenna illustrate the concept of this technique for making these elements from wire.

The next two diagrams illustrate how one can assemble the poles into a hub made from two cross fittings. The vertical pole above the hub provides a support for ropes that attach at pole centres to reduce sag.

One can apply electrical tape to the smaller section at pole joints to prevent pole collapse. Take care not to squeeze poles (e.g. with a hose or mast clamp) too much; they're not nearly as strong as aluminum.

I used enamel-insulated wire, also known as "magnet wire". Wire of different gauge may require minor length adjustment. Wire with plastic insulation will require length adjustment due to the insulation's effect on velocity factor. Cut the director and reflector wire to double the lengths shown plus extra length for connections, ends, and ease of tuning in case the lengths aren't quite right. The driven element lies inside the fiberglass poles; running it outside the pole may affect the length required.

The driven element wire ends can terminate by folding the tips over so that they hook on the edge of the pole tip. Parasitic element ends can have loops through a hole in an insulating material such as acrylic. The lengths shown in the diagram do not include the portion that loops back.

One can use 1/8 inch polyester rope from Quality Nylon Rope or almost any other vendor to attach parasitic element ends to driven element pole tips, pole centres to the mast cap, and as a halyard to

Figure 2. A method of assembling the boom to the rest of the antenna.

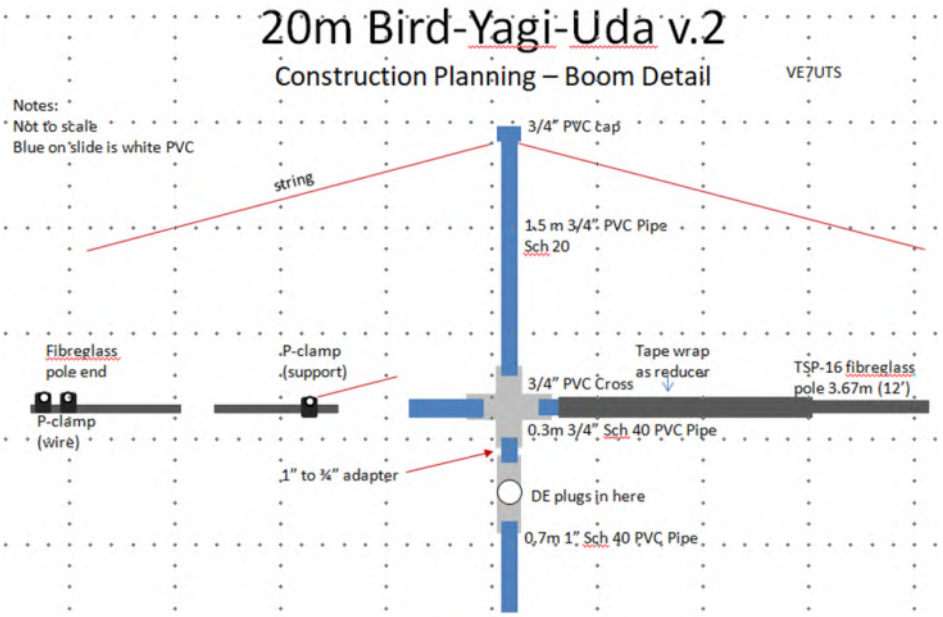
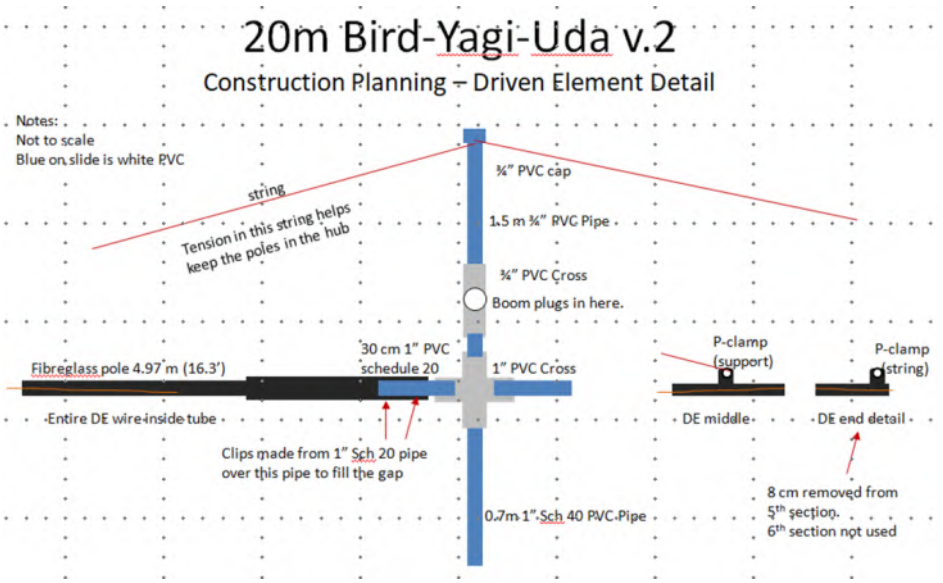


Figure 3. A method of assembling the driven element to the rest of the antenna



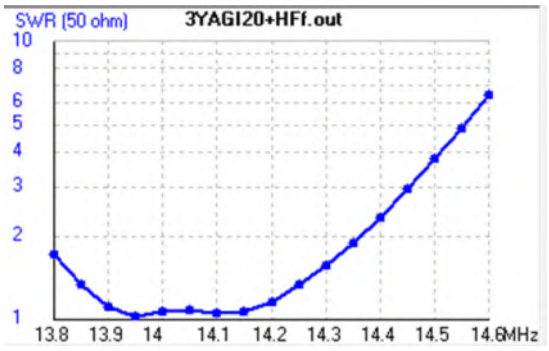
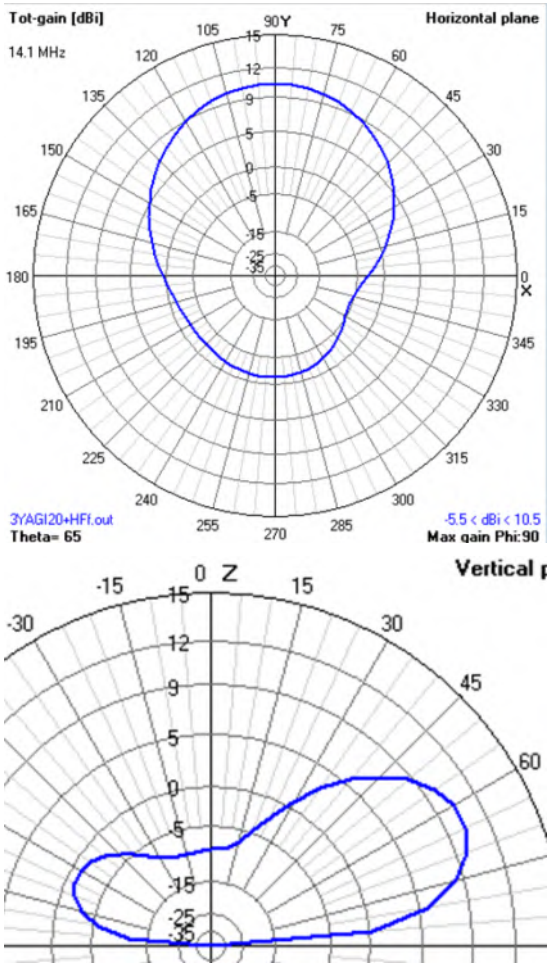


Figure 4. [above] Modelled antenna resonance is suitable for the CW portion of the 20 metre band

Figure 5 [below] Modelled forward gain at 65 degrees from vertical is about 10.3 dBi. Modelled optimum take-off angle is about 25 -30 degrees from the horizon.



hoist the antenna. String and fishing line might also be suitable; choose a material that will retain its strength and flexibility when subjected to UV radiation typical of the site. If hoisting the antenna to hang between two towers or trees, suspend fishing line or string to the boom ends to make it easy to orient the antenna from the ground.

One can feed the driven element directly from coax by routing the #16 wire through holes drilled in the cross fitting and soldering it to the 50-Ω coax center and braid. Alternatively, one can terminate it at a screw terminal block to facilitate experimentation with baluns. One can attach a ferrite clamp to the coax to serve as a balun, or employ a 1:1 transformer balun. Once the antenna is confirmed working, wrap electrical tape around the feedpoint to keep the rain out.

If the antenna will be exposed to much sunshine, paint the PVC components to shield them from ultraviolet light.

4NEC2 helped me zero in on the optimum wire lengths. It took several hours to learn how to use, but that investment paid off. It also reported theoretical directionality and impedance-matching performance as shown below. Performance observations based on reception of local WSPR transmissions resemble those of the 4NEC2 reports.

The gain profile lacks the narrow side nulls typical of traditional Yagi-Uda antennas. This is an advantage if wishing to hear stations away from the beam's heading, but a disadvantage if wishing to use the beam heading to eliminate an undesired signal. The gain profile also contains an asymmetry at heading 335. This is because the modelling included a metallic porch roof only 5 meters below the NW corner of the antenna.

This antenna served well for a few Winter and summer Field Day operations, and has survived a few hefty windstorms. The low wind-loading area and the ability of the structure to flex and swing in the wind instead of breaking seems to compensate for its apparent fragility.

Further development ideas:

- Make 2 directors instead of a director and reflector. Remotely switch in a stub at the center of one or the other element to instantly change which one is a reflector, effectively turning the antenna 180 degrees with a switch.
- Make 2 identical antennas, stack them, and feed them in phase for more gain. Would the lengths of the elements have to change due to the proximity of the adjacent antenna? Would it amuse or annoy other hikers to see such a monstrosity on a summit?
- Make a multi-band version and offer it as a commercial product. Oh, wait. It looks like "Spiderbeam" already did this.

I haven't taken it up a mountain yet. But I returned the Tempo One to the friend who sold it to me in 1980 and built a QRP-Labs QCX. I welcome correspondence, collaboration, enquiries, etc. via my call sign at rac dot ca.

~ Halden VE7UTS

(Reprinted courtesy of the author and the North Shore Amateur Radio Club)

Photo [left] BYU antenna hub and mast assembly

Photo [below] BYU antenna hanging between trees at NR7V

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- A safe, front-row seat at IDXC 2021 without having to leave your QTH
- We will be offering several door prizes -- which is why you need to pre-register.
- All Zoom Webinars will be recorded and posted to the NCDXC website at a later date

There will be regular website updates over the next few weeks, as the program schedule is finalized, so check back often. We hope to see you for our virtual meeting on May 15 and 16th!

Questions-Comments: info@dxconvention.com Website: IDXC Home Page (dxconvention.com)

2 meters

Choosing a first handheld radio

Bob Witte K0NR

Bob maintains a great blog site at https://www.k0nr.com/wordpress/.

Contact Bob at bob@k0nr.com.

You can also check out his book VHF, Summits and More: Having Fun With Ham Radio.

Once again, I was asked by a new ham "which handheld transceiver should I get?" This is a frequent and valid question that comes up. Often the question gets framed as "Baofeng or something better?" I say "something better." I am not writing to bash Baofeng radios or the people that use them. The radios are an incredible value on the low end of the market…amazing what they can do for $30 or so. Besides, I own several of them. I just think that if you have a few more $$ to spend, you can get a much better radio. What's wrong with these low-end Chinese radios? Out of spec harmonics on transmit and poor adjacent channel rejection on receive.

Digital? Probably Not

The other question that usually surfaces is "should I get a digital radio?" Here "digital radio" means D-STAR, Yaesu Fusion or DMR. My answer to that is "No," unless you have a specific reason for going digital. Adding digital to a radio results in two things: 1) a higher price and 2) a more complex radio. Actually, the price difference may not be that significant, especially for a DMR radio. However, the complexity factor is always there.

What is a specific reason for going digital? You already know that there are digital repeaters in your area that you want to use, you have ham radio friends already using digital or you are technically-oriented and have researched the topic to know that it is something you want to try. If one of these things is true, then go for it.

Oh, you do need to know which digital format to get. No radio does them all and the industry is fragmented between D-STAR, Fusion and DMR. I find this very disappointing but life is sometimes like that.

Narrowing It Down

So narrowing the topic down, we are looking for an affordable (under $100) dual-band handheld that is not a cheap Chinese radio (Baofeng, etc.) and is not a fancy digital radio. My opinion is the quality ham radio manufacturers are pretty much Alinco, Icom, Kenwood, and Yaesu. The price points on basic handheld transceivers keep changing, so be sure to check the date on this post and do a little price shopping.

The Alinco DJ-VX50 is about $100, so not too expensive, but I am not seeing any eham.net product reviews on it. Also, it seems to be out of stock at several

vendors, so I am not sure of its production status. Icom and Kenwood have exited the low-end handheld market, so nothing to consider there. This leaves Yaesu as the only "brand name" player in this space. I have been recommending the Yaesu FT-4XR as a good alternative: see What About the Yaesu FT-4XR? at about $80. I recently noticed that the Yaesu FT-65R has come down in price to about $85. With this price difference, it probably makes sense to go with the FT-65R. (I really wonder about Yaesu's product line strategy at this point. Why are there two similar radios priced so close together?)

Here is a quick comparison of the two radios: Yaesu FT-4XR vs FT-65R, which is right for you? Conclusion: FT-65R is probably better for most people. Also, check out the HamRadioSchool.com article: Yaesu FT-65R Product Review. The eham.net product reviews are generally positive on the FT-65R, but there are a few negative themes that surface. Some people are reporting radio failures that may indicate a manufacturing issue with the product. (It is made in China.)

The Good Old FT-60

The other theme that surfaces is that the FT-65R is not a complete replacement for the venerable FT-60R. Joyce/K0JJW and I have a couple of FT-60Rs that we really like and frequently use. Yaesu still sells this older model because it is so popular and, frankly, it is a really solid radio. The HamRadioSchool.com review of the FT-65R mentions several things that people tend to like on the FT-60R that were left out of the FT-65R (e.g., dedicated VFO and Squelch knobs.) The biggest complaint I hear about the FT-60R is that it has an old-school NiMH battery (the FT-65R has lithium-ion).

My conclusion is to recommend the FT-65R to newcomers to the hobby. At ~$85, it fits most people's budgets. There is some risk that you will outgrow it down the road and want a more capable handheld for digital or APRS or whatnot. In that scenario, the FT-65R will still be a good second/backup radio. (Ya gotta have more than one, right?)

That's my opinion. What y'all think?

~ Bob K0NR

This book is an easy-to-understand introduction to VHF/UHF ham radio, including practical tips for getting on the air and having fun messing around with radios. Learn about FM, SSB, repeaters, equipment, band plans, phonetics, portable operating, Summits On The Air (SOTA) activations and more.

Need more reading material?

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...more 2 meters

Which HT for high RF SOTA?

Bob Witte K0NR

Here are the best performing HTs...

On some Summits On The Air (SOTA) summits that are established radio sites, there can be significant RFI on 2 meters. I recently wrote about that here: RFI on SOTA Summits. There have also been discussions from time to time among VHF SOTA activators on which handheld transceiver (HT) has the most robust receiver for use in high RF environments. (Hint: a Baofeng is not going to be your best choice.)

This led me to an excellent web page by Razvan/YO9IRF that tabulates the receiver performance of HTs as measured in the ARRL lab. This is arguably the most objective look at HT performance out there. You can do a sort on a particular parameter and see which models are best.

Probably the parameter to start with is wide 3rd-order intermodulation on the 2-meter band. (I am going to ignore the 70 cm performance because most VHF SOTA contacts are on 2 meters.) The wide 3rd-order intermod performance relates to interference rejection from outside the amateur band.

On the next page are the best performing HTs for this parameter. (Go to the website directly to see other models listed.)

Interestingly, the Icom IC-V8 jumps to the top of the list. This is an older single-band 2m radio...and I happen to have one hiding somewhere in the basement. I am a bit surprised there are two Wouxun radios near the top of the list but they performed well. No surprise that the Yaesu FT-60 shows up... it seems to be well-regarded by SOTA activators.

The narrow 3rd-order intermod performance relates to the receiver performance inside the amateur band. Sorting based on that parameter shows the following radios at the top:

The Kenwood TH-22AT takes the top position, followed by the Yaesu FT-10R, both older single-band radios. The general trend here is that some of the older radios, especially single-band rigs, have better front end filtering. Newer radios tend to include reception of a wider range of frequencies outside the ham band and have receiver front ends that are correspondingly more open. The Radio Shack HTX-202 gets a lot of positive comments from the SOTA crowd and is on the shortlist. Again, the well-regarded FT-60 makes the list.

Let's check a few of my favorite HTs to see how they rate.

My usual SOTA handheld is the Yaesu FT-1DR. The wide 3rd-order intermod is 73 dB, or 12 dB worse than the FT-60 (85 dB). For narrow 3rd-order intermod, the FT-1DR is 58 dB vs 67 dB for the FT-60. This matches my impression that the FT-1DR does OK for most summits but is not the best radio for high RF environments.

Another radio to consider is the Yaesu FT-4XR. I often have this radio on at the house but I don't use it for SOTA. This radio uses the same receiver IC as the Baofeng UV-5R but has better input filtering. The wide 3rd-order intermod is only 63 dB and the narrow 3rd-order is 61 dB (about the same as the FT-1DR). The table does not list any Baofeng radios but I would expect them to perform worse than the FT-4XR.

Regular readers of my blog know that I use a Yaesu FT-90 mini-mobile transceiver for most SOTA activations. I looked up the ARRL tests on it. The wide and narrow 3rd-order intermod are 85 dB and 65 dB respectively, not better than the best handhelds but near the top. My experience is that the FT-90 receiver is better than my FT-60 and FT-1DR, consistent with the ARRL lab measurements.

Another radio of interest is the Yaesu FT-818, which the ARRL measured as 96 dB (wide 3rd-order intermod) and 72 dB (narrow 3rd-order intermod) on the 2m band. This puts the FT-818 at the top of the list with the best handhelds. Actually, I would have expected it to be even better, far superior to an HT, but apparently not.

So I need to dig out that old Icom IC-V8 that is hiding in the basement. It may be a good piece of equipment to have along on SOTA activations.

~ *Bob K0NR*

Of course these recommendations apply not only to SOTA use. The transceiver specifications apply also to their everyday use.—Ed.

Make	Model	2m sensitivity (uV)	3rd DR wide 2m (dB)	3rd DR narrow 2m (dB)	Adjacent Rejection 2m
Icom	IC-V8	0.13	93	64	64
Icom	IC-V80	0.16	89	65	74
Icom	IC-V82	0.11	88	69	69
Icom	IC-T70A	0.1	86	70	70
Wouxun	KG-UVD1P	0.11	86	69	69
Wouxun	KG-UV2D	0.11	86	69	67
Yaesu	FT-60R	0.13	85	67	67
Kenwood	TH-79A	0.14	85	62	56
Yaesu	VX-120	0.16	84	68	68
Yaesu	VX-170	0.16	84	68	68
Kenwood	TH-22AT	0.14	83	76	59
Alinco	DJ-175T	0.18	83	70	70
Kenwood	TH-G71A	0.16	83	62	61
Alinco	DJ-V57T	0.19	82	60	64
Alinco	DJ-195T	0.17	82	58	58
Kenwood	TH-D72A	0.14	81	74	77
AnyTone	AT-D868UV	0.2	81	63	76
Icom	IC-V85	0.2	81	58	65
Alinco	DJ-V5TH	0.14	81	52	55
Kenwood	TH-22AT	0.14	83	76	59
Yaesu	FT-10R	0.14	78	75	67
Kenwood	TH-D72A	0.14	81	74	77
Kenwood	TH-K20A	0.13	80	74	91
Alinco	DJ-162TD	0.18		73	52
Icom	IC-T70A	0.1	86	70	70
Alinco	DJ-175T	0.18	83	70	70
Realistic	HTX-202	0.17		70	72
Icom	IC-V82	0.11	88	69	69
Wouxun	KG-UVD1P	0.11	86	69	69
Wouxun	KG-UV2D	0.11	86	69	67
Wouxun	KG-UV8D	0.11	78	69	79
Yaesu	VX-120	0.16	84	68	68
Yaesu	VX-170	0.16	84	68	68
Yaesu	FT-60R	0.13	85	67	67
Kenwood	TH-D74A	0.19	79	67	67
Kenwood	TH-K2AT	0.17	78	67	71
Alinco	DJ-G5TH	0.15	78	67	63
Kenwood	TH-225A	0.12		67	60

Tower Safety

Highlighting the importance of climbing safety

Dan Renaud VE7ACV of Prestige Telecom offers presentations on tower and climbing safety.

Dan not only trains and certifies on tower climbing safety, but offers expert training on RF hazards, confined space, hoisting and rigging, and many other safety issues of interest to amateur radio operators and industry.

He emphasizes that the talk was not for certification but rather was simply for awareness. He pointed out that if you own a tower, seek assistance from your friends and colleagues, and give permission for work to be done, you likely retain liability, should something go wrong.

When employing a contractor for more than 8 hr/week or a total of 24 hours of tower work, clearance from Worksafe BC should be sought to ensure that the contractor is in good standing.

You must ensure that the contractor has adequate insurance coverage. Subjects reviewed during Dan's talk were hazard analysis, preparation of an emergency plan, fall arrest and fall restraint, climbing equipment, climbing techniques and personal protective equipment. Fall protection is required when climbing heights over 10 ft. in BC.

Dan talked about the requirement for 100% tie-off and 3 point contact; free climbing is not approved. Harnesses, work belts and lanyards, unless otherwise specified, may not be legal if over 5 years old; carabiners must be of a modern self-locking design and of the correct type - rock climbing carabiners are not legal for tower work, nor are shackles.

Tower inspections should be documented and include general condition, grounding, and verticality. Standard and not-so-standard equipment was demonstrated, with limitations and proper use of each explained.

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Solder Splatter

John Brodie VA7XB

Reinforcing ham class theory with a practical project

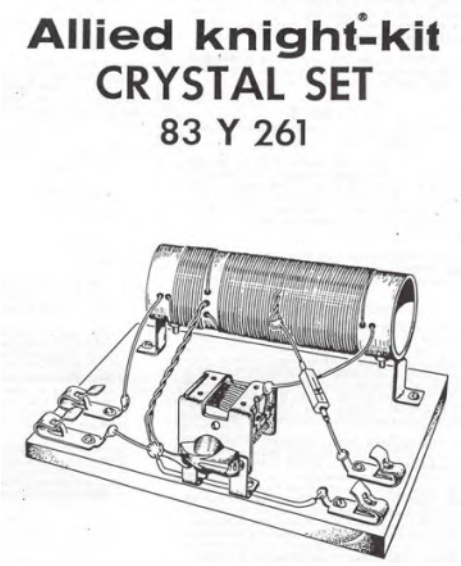
In the 1950s, when I was in my early teens and before I knew about ham radio, I was drawn to the mysteries of radio. My school friends and I poured over Popular Science and other electronics magazines of the day dreaming of projects we might build.

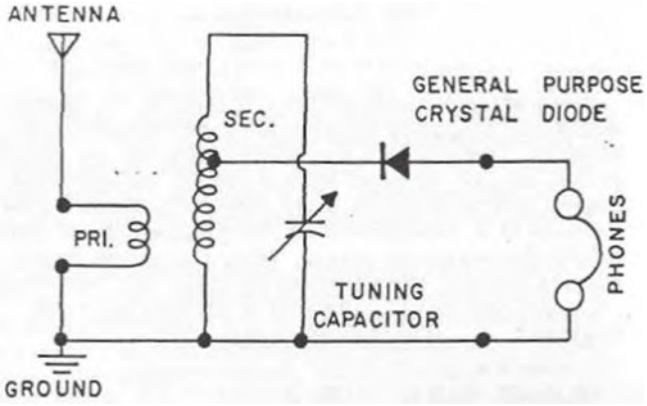
The attraction of a crystal radio was its simplicity and low cost, coupled with the near-magic results achievable, so it was one of the few potential projects which ever made it past the "dream" stage. My first crystal radio served as my Grade 9 Science project and was the beginning of a life-long interest in amateur radio.

Fast forward to 2021. My grandson, Spencer, recently enrolled in the SARC basic ham certification course, decided he too wanted to make his own crystal radio as a first project. I offered my junk box resources to help him and, if needed, testing equipment. This project turned out to be an excellent opportunity to reinforce concepts learned in the ham certification class and (I hoped) launch a more intensive interest in radio and electronics.

Much to my surprise there exists an active "crystal radio community" out there which shares innovative designs and sources for acquisition of now-obsolete components. Though the basic design of all crystal radios is similar, literally hundreds of variations can be found with a Google search.

We settled on a simple, conventional design found at: https://crystalradio.net/crystalplans/xximages/allied.doc. Fifty plus years ago, this could be purchased and assembled as a Knight-Kit, no longer available of course, but Spencer wanted to build from scratch anyway. However, the reprint is useful because it not only shows how to assemble the parts into a working radio, it also provides background on the history of radio, tips on how to solder and advice regarding a suitable antenna and ground. Excellent reading material for the neophyte. The schematic is on the next page.





To begin, we talked about how capacitors and inductors worked together in resonant circuits providing equal and opposite X_C and X_L, how a rectifier demodulates an RF signal, the need for impedance matching to couple a hi-Z circuit to low-Z headphones and a 50 ohm antenna. We then moved on to discussing how the components might be assembled in a neat package, as well as basic soldering and wiring concepts. I showed Spencer how we could use an antenna analyzer to couple into the resonant circuit and confirm proper tuning by measurement of swr, much in the manner of the time-honoured grid dip meter. The need for both antenna and ground, and how it could be achieved, stimulated further discussion.

All the components are readily available except for high impedance headphones, no longer in common use with vacuum tube radios being supplanted by solid state (low impedance) devices. I no longer had my boyhood headphones, so the alternative was to check eBay or find another way around the problem. What I did still have was a variety of transformers, which luckily included a high-Z to low-Z audio transformer, originally used to match a tube audio amplifier to an 8 ohm speaker – just the ticket for use with modern ear buds or stereo headphones.

In looking for a source of high-Z headphones before we settled on this approach, we noted that a suitable transformer connected to a 3.5 mm earphone jack (such as that shown below) is available from eBay for $10-$15. But we didn't need it since we already had the components.

Many things would serve for a detector, the choices being a germanium diode, a galena crystal (a semi-conductor) or even a razor blade

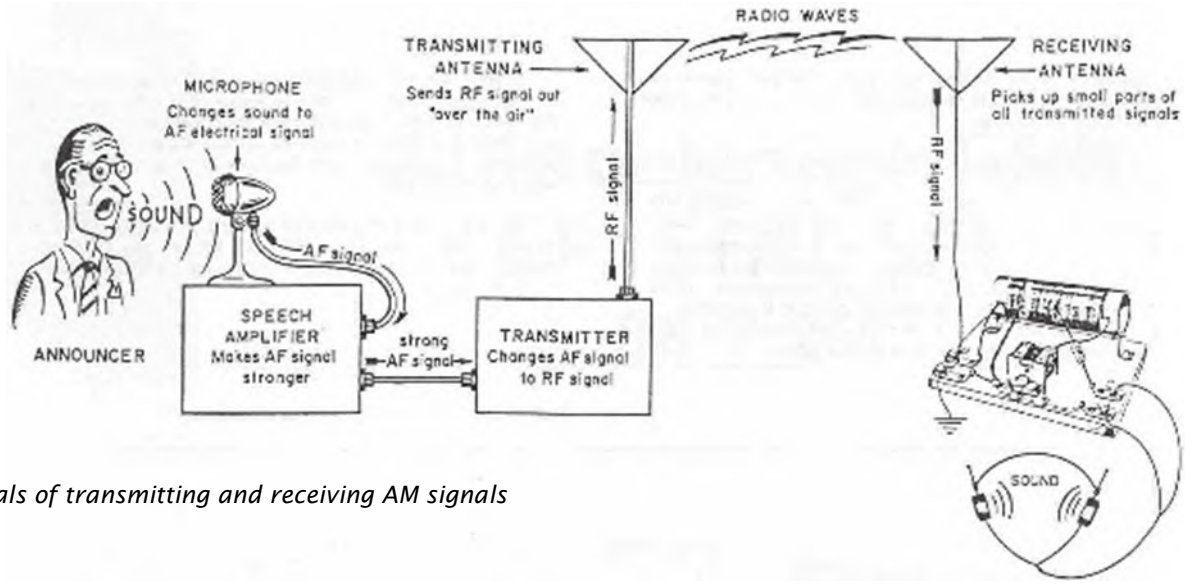


Figure 2 Fundamentals of transmitting and receiving AM signals

with the metal-oxide coating acting as semiconductor diode. However, Spencer elected to start with a germanium diode.

The tuning capacitor was also a problem because the only surplus one in my junk box was around 100 pF but we really needed 365 pF or thereabouts to cover the complete tuning range from 500 kHz to 1500 KHz of the AM broadcast band. Yes, we could pad it up by switching in fixed capacitors, but we wanted to avoid switching. Kevin VE7ZD was kind enough to offer the needed tuning capacitor. Hardware items like Fahnestock clips are no longer available so we would have to improvise for the connectors.

The first task was to create a tuned circuit using the variable capacitor and inductor combination. The Knight kit layout was short on details regarding the geometry of the coil, the number of turns and the wire size. But what we had on hand was a length of 2 inch ABS pipe to use as a coil form, which we cut to 10 inches, to provide the flexibility to add or subtract turns as needed.

Since No. 22 enameled wire was also available from my supplies, Spencer used my 60-year old ARRL coil-capacitor-frequency slide rule to confirm that 110 turns was required to create a coil of 850 uH which would serve to create resonance at both ends of the AM band when tuning the capacitor between its lowest C (about 20 pF) and its highest C (365 pF). However, the same result could have been obtained by using standard formulae from the ARRL handbook. The coil and capacitor were connected in parallel for this purpose. A 20-turn primary winding was then added to inductively couple the low impedance of the antenna to the higher impedance of the circuit.

To confirm the correct tuning range, we connected in my antenna analyzer to the 20-turn primary, and scanned swr between 100 kHz and 1500 Khz. A sharp dip in the swr indicated the resonant frequency which, of course varied as the capacitor plates were rotated.

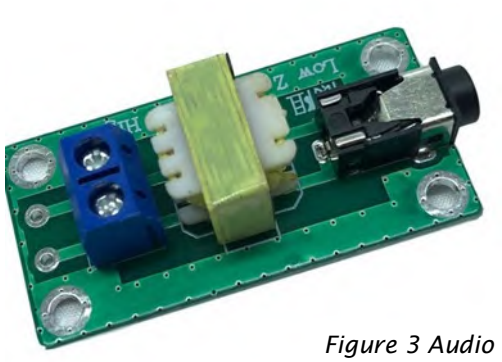


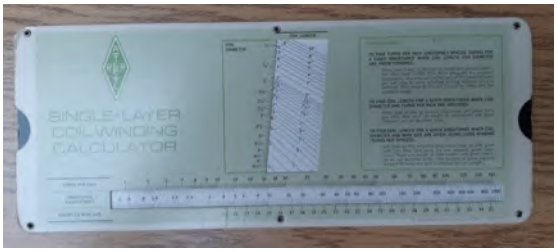
Figure 3 Audio transformer and 3.5 mm jack for use with ear buds or low-Z headphones – available from eBay.

The first try showed that the resonant circuit was tuning too high in frequency. Since adding more turns to the coil was easier than adding more capacitance, Spencer added 10 more turns, joined it to the 110 turns already there and we remeasured; this time the tuning range was just right.

Normally this circuit would use a long wire antenna and a ground. However, we thought that my 80 m quarter wavelength inverted L antenna, fed with 50 ohm coax might work if we connected it with a PL-259 connector, thereby providing both antenna and ground. So the coax socket was mounted on an aluminum panel along with the tuning capacitor and headphone jack and fastened to a small piece of plywood ready for wiring.

Figure 4 ARRL slide rule for determining coil dimensions. Reverse side calculates resonant frequency from C and L..

Last thing was to connect the diode, followed by the audio transformer on a piece of perforated board (after confirming which was the high Z end vs low Z windings with a multimeter), then wiring it all together.



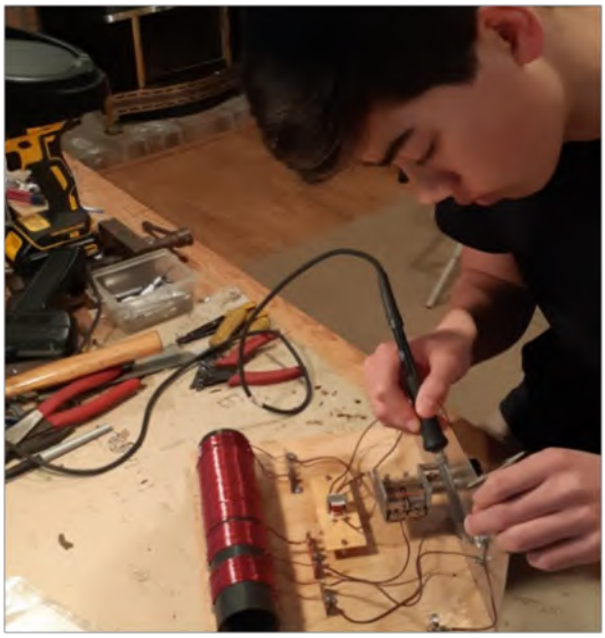


Figure 5 Front panel

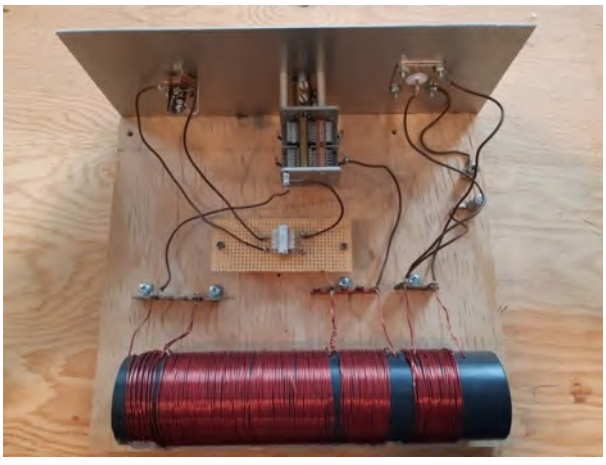


Figure 6 The finished product

Now for the acid test: antenna connected, headphones connected, but… no cigar. A quick recheck of the wiring found the error. Once corrected, Voila - music and voice! Only problem was that the nearby AM station on 600 kHz was obliterating most other stations on the dial. This gave us an opportunity to talk about front-end overload and the need for selectivity in a receiver. This is the same station that has given us intermodulation interference on our VHF repeater frequency, which has a 600 KHz offset between the transmit and receive frequencies. However, the overload problem was minimized when Spencer took the radio away and tested it from his home in Richmond, sufficiently distant from this station.

~ *John VA7XB*

Above: John's grandson Spencer is now VE7SYB, having recently completed our SARC Basic course on-line. Here he is congratulated by examiner Steve VE7SXM on his Basic with Honours pass.

Tech Topics

Jim Smith VEFO

Why we use baluns

Before getting into this, it is necessary to describe a somewhat puzzling phenomenon (called "skin effect") associated with radio frequency currents.

Skin effect

High frequency AC currents in a conductor flow only in that portion of the conductor which is very close to the surface. Very close being 0.1 mm (the "skin depth") or less. While a wire has only one surface, the shield on a coax cable, being a cylinder, has two surfaces - an inner surface and an outer surface. Consequently, you can have a high frequency AC current flowing on the inner surface and an entirely different one flowing on the outer surface, with neither of them affecting each other. It's like there's an insulator keeping them separated.

Weird but true.

Baluns

Unless precautions are taken to minimize it, all coax fed antennas will have significant current flowing on the outside of the coax shield while transmitting.

If the antenna is a horizontal dipole with the coax hanging straight down then the coax acts as a vertical antenna. This is because this current flowing on the outside of the shield will radiate energy exactly as a vertical antenna would.

For casual ham HF operation, this can be a good thing as radiation will take place over a wider range of elevation angles which in turn makes it possible to make contacts over a larger range of distances. However, for a communications antenna system designed to have a specific radiation pattern, this unwanted radiation from the coax changes the pattern and reduces the effectiveness of the system.

When receiving, the coax still acts as a vertical antenna and couples whatever it picks up into the actual antenna and from there into the receiver.

An example of these effects on a Near Vertical Incidence Skywave (NVIS) antenna system follows:

Transmitting

For NVIS the desired radiation elevation angles (the range in angles with respect to the horizon over which the antenna radiates most of the transmitted energy) is about 60 to 90 degrees, 90 degrees being straight up. A horizontal dipole 1/4 wavelength or less above ground will provide this.

If this antenna is fed with coax and no precautions are taken to minimize current flowing on the outside of the shield, the shield will act as a vertical antenna with a range of radiation elevation angles between about 5 to 40 degrees. The amount of power radiated at these low angles can be 50% of the power radiated at the desired elevation angles. This means that less power is available to be transmitted at the desired high angles. In addition, this power radiated at low angles can cause interference to other stations thousands of miles away.

Receiving

This is where the coax shield acting as an antenna really sucks.

The shield, acting as a vertical antenna, will pick up those previously mentioned stations several thousand miles away and feed them into the dipole which will then happily send those signals to the receiver where they will interfere with the signals you want to hear.

In addition, most noise on the lower HF bands is caused by lightning in the tropics. If your antenna responds only to high angle signals (NVIS) it won't respond to these lightning induced static crashes because they arrive at low angles. Consequently, you won't hear them. However, if the coax shield is acting as an antenna you will hear them and they may make it impossible for you to copy the signals you want to hear.

Because the coax comes right into your station, it runs close to all kinds of noise generating equipment such as computer monitors, plasma TVs, switch mode power supplies, etc. Because the coax is acting as an antenna, it will pick up all kinds of garbage that the dipole won't hear because it's much further away from these noise sources.

Baluns to the rescue

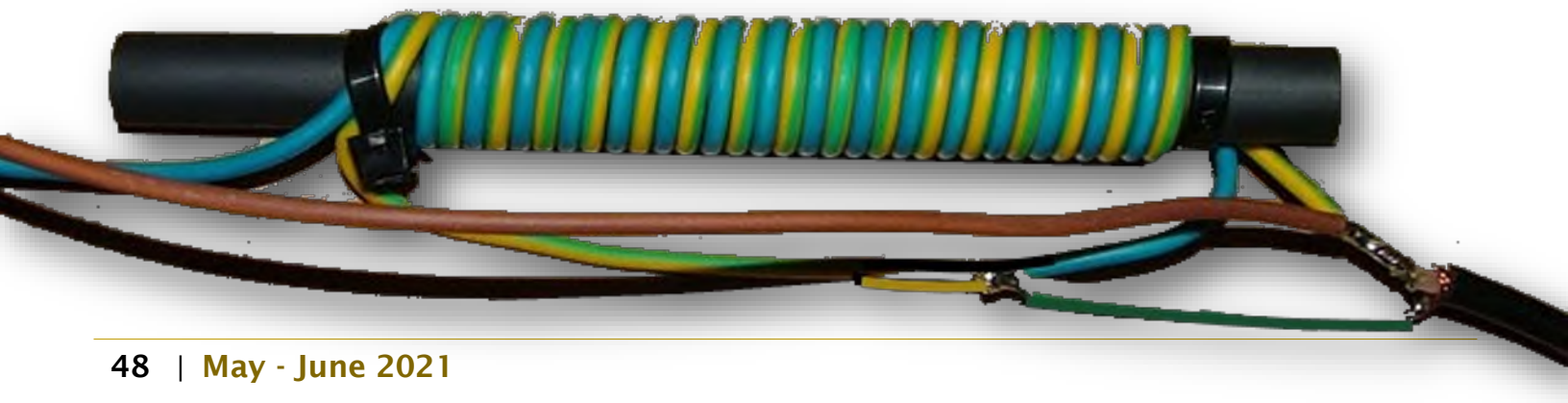
Well, not just any old balun. "Balun" is a contraction of the phrase "balanced to unbalanced". An ideal horizontal dipole is said to be "balanced" with respect to ground. What this means is that:

The voltage between ground and the point where one wire of the feedline is connected to the antenna is exactly equal (but of opposite polarity) to the voltage between ground and the point where the other wire of the feedline is connected to the antenna.

The current flowing out of one wire of the feedline into the antenna is exactly equal to the current flowing into the other wire of the feedline out of the antenna.

This is an ideal which is never achieved in practice. Things like one end of the antenna being lower than the other, closer to a tree or building, etc., will all cause the currents in the two legs to be different. Consequently, no antenna is truly balanced. Some come close, though.

Feedlines such as the old TV twinlead, window line and ladder ("open wire") line are all considered to be balanced as they are



symmetrical with respect to ground (as long as one side of the feedline isn't closer than the other to ground, metallic objects, etc).

Our transmitter outputs are "unbalanced" with respect to ground. This is because the outer shell of the output coax connector is connected directly to ground through the metal case of the radio.

Similarly, the coax cable we connect to the transmitter is unbalanced as the shield is connected directly to ground via the coax connector on the radio.

So now we have a balanced antenna to which we want to connect an unbalanced coaxial cable. Physically, this is easy to do, we just connect them. But, as soon as we do, we destroy the balance of the antenna and we get current flowing on the outside of the coax shield with all the resulting bad effects.

So, what we need is a box between the antenna and the coax to make the transition between the balanced antenna and the unbalanced coax feed line, and, yes, these boxes exist and they are called baluns.

There are two types of baluns:

Voltage baluns

These force the voltage between ground and the point where one wire of the feedline is connected to the antenna to be exactly equal (but of opposite polarity) to the voltage between ground and the point where the other wire of the feedline is connected to the antenna. The idea here is that, if the voltages are equal, the currents will be too.

However, as most supposedly balanced antennas are at least somewhat unbalanced, the currents in the two legs will not be the same. This causes a current equal to the difference between them to flow on the outside of the coax shield. i.e. the coax shield now acts as an antenna. Just what we DON'T WANT.

Current Baluns (also known as "Current Chokes")

These force the currents in the two legs (halves) of the dipole to be equal. As there is now no difference in these current values, no current flows on the outside of the coax shield. This is just what we want, so these are the ones to use.

To see some test results for various baluns go to

http://www.w8ji.com/Baluns/balun_test.htm

Be warned, though, that the material presented is rather technical.

Summary

Every coax fed antenna system designed to have specific characteristics needs a current balun located at the transition between balanced and unbalanced. These are often built into VHF and UHF antennas (skirts, sleeves, etc.) but are generally separate items in HF systems.

Without a current balun the antenna is strongly coupled to the outside of the coax shield.

This means that energy transmitted by the antenna will be coupled into the coax shield which will reradiate it and thereby affect the radiation pattern of the antenna system.

It also means that signals picked up by the coax shield acting as an antenna will be coupled into the antenna and passed to the receiver.

It is important to note that, like any other conductor, the coax shield will pick up signals and reradiate them. The current balun simply ensures that these reradiated signals don't get coupled into the antenna and so don't reach the receiver.

APPENDIX

Skin effect details

If you pass a DC current down a wire, the current flows uniformly down the wire. i.e. the amount of current flowing down the centre of the wire is the same as the amount of current flowing near the outer edges of the wire.

This is not true for AC currents. For a current with a frequency of 1 MHz in a copper wire, the current will be concentrated in a region with a depth of less than about 0.1 mm from the perimeter of the wire. This 0.1 mm is called the "skin depth". The skin depth gets smaller the higher the frequency. It doesn't matter if the wire is 1 cm or even 1 metre in diameter, only this 0.1 mm thick "skin" has significant current flowing in it.

See
http://en.wikipedia.org/wiki/Skin_depth
but skip the eye-glazing math and check out the chart at the end.

As mentioned earlier, the shield of a coax cable isn't a wire with one surface - it is a cylinder with two surfaces, an inner and an outer. This means that, provided its thickness is more than a few skin depths at the frequency of interest, you can have a current flowing on the inside of the shield and an entirely different current flowing on the outside! This is because neither current penetrates far enough into the shield material to affect the other current. It's just as if there were an insulator keeping them separated.

The point to take away from all this is that, counter-intuitive as it may be, you can have two distinct AC currents flowing in a coax shield, one on the inner surface of the shield and one on the outer.

~Jim Smith VE7FO

It's during times of crisis when we realize the importance of communication…

The bombing that shook Nashville on Christmas Day, damaged a key AT&T communication hub, knocking out internet and phone services across their region.

That's just one instance when phone and internet services failed in an emergency. It's for that reason, Massac County Amateur Radio Club President, Ruben Fuente, has added an extra means of communication to his emergency plan.

"It can be a hobby for a lot of people, or it can be a service that people are wanting to contribute towards."

We all have our routine ways of receiving emergency alerts, whether it be via your cell phone, cable box, the internet, or a NOAA weather radio, but in the event of a catastrophe where none of those are options, do you have a way to receive and broadcast communications? If your answer's no, you may want to do what this couple did, and get a ham radio.

"It could be something as simple as the power's out, the internet's out, which means that the phones are out, whether it's a cellphone or a landline. You pick it up and you communicate with another ham radio operator, whether it's a family member or not, to let them know that you're okay, and where you are, and that you're on your way home or whatever."

The full story is at
https://wsiltv.com/2021/03/04/couple-picks-up-ham-radios-as-productive-hobby/

~

Measurements With The NanoVNA

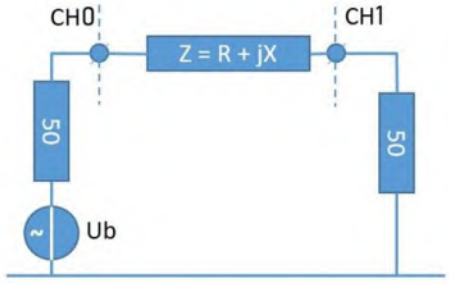
Arie Kleingeld PA3A

Part 3—Practical Measurement of Common Mode Chokes

Preface

Common Mode Chokes (those are things that you need, for example, to avoid getting sheath current on your coax) are widely used. There is also a lot written and discussed about them. There are discussions about how to wind them, which core material is best, where should such a thing be, how much impedance (more than 5 kΩ) is needed, and so on.

We are not going to have that discussion now. We are just going to talk about measuring with the nanoVNA. I have been using various chokes for a long time. It is good to check your own chokes anyway. And we do that ourselves… with the nanoVNA, in my case version H3.2.



The measurement method has already been described in part 2 of this series of articles *[March-April Communicator]*. This means that with the nanoVNA we will measure the S21 (the damping) and then convert the results in Excel to the impedance of the choke expressed in R + jX. To obtain the data, the "nano" is linked to the PC with the program nanoSAVER.

Z = R + jX represents the choke. The trick is to measure it as simply as possible without influencing extra capacitance, resistance, or self-inductance. At the same time, I just want to leave the connections that are currently in place, as they are also there in practice. So it is, as it is. To measure the various chokes, I took a piece of printed circuit board and drilled holes in it. There are now two SMA females on one side and two strands with crocodile clips on the other. It is inspired by the approach in G3TXQ's

article (see reference). On the side of the clips there is a 50-ohm resistor to simply go through the S11 calibration, before S21 is calibrated with the clips loose and the clips attached to each other.

Various chokes

The chokes @ PA3A are made with the connectors already attached. I have chokes in RF coax, USB cables, audio cables, mains 230V, DC 12V, etc. and with various core materials. Nothing special for a simple ham shack. For the coaxial cables to the antennas, it is all possible to stop RF from the outside, both directly at the antenna (balun operation) and closer to the set or between tuner and set. In keeping with the power used, somewhat larger ring cores are used to easily obtain a good damping. For all other cables, the point is to attenuate RF currents in the shack as much as you can. The stress on the chokes is not that great there, so smaller toroids can be used.

The core materials that I use here and there are of the well-known 31 and 43 type. I also use a lot of 3S4 cores. There is a lot of information available about the frequency range in which the different materials can be used. I will not go into that further now.

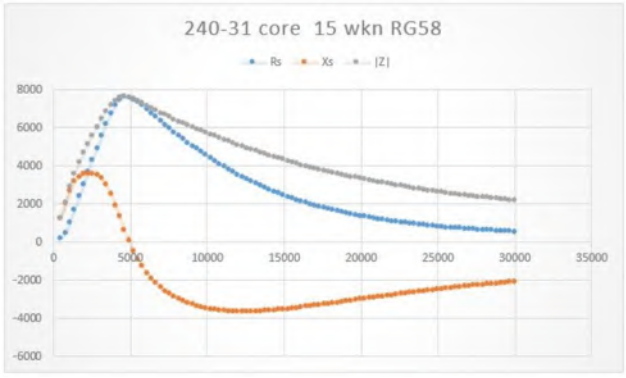
The measurements

We are going to measure 3 chokes. The first choke is used in the coax to dipole antenna for 3.5 - 10 MHz. It is a 15-winding 240-31 core with RG-58 coax, tightly wound around the core. This is very close to the set and the same is on the dipole as a balun *[photo left]*.

The nanoVNA is connected to the outer jacket via the clips. The attenuation reported by nanoSAVER is not disappointing: for the frequency range of 3.5 - 10 MHz it is 35 dB or more *[graphs below]*.

When the damping is decomposed to Z = R + jX with Excel, the above picture emerges. A number of things stand out here:

- The core shows a relatively large loss resistance Rs. According to experts, this is the desired behavior of a sheath current choke coil. Rather a lot of resistance than a lot of reactance. Things are fine between 3.5 and 10 MHz.
- The Xs goes up well in the low frequencies (inductive behavior) and then becomes lower and even capacitive. The fact that everything behaves in this way has on the one



hand to do with the core material, but especially also with the capacity between the coax windings. Resonance point is just below 5 MHz.

- The total Z neatly follows the damping, the higher the Z, the more damping.

This attractive graph was not created just like that. During the first measurement attempts, it turned out that the connection with the PC caused all kinds of resonance effects that changed dramatically when you put your hand on the nanoVNA or held the USB cable *[see the graph right]*. Apparently, the USB-C cable had to be RF disconnected for that. The "first aid" cores I had lying around were 43 and 3S4 material. Using two, stacked on top of each other with 7 wraps through the hole and the problem was gone *[photo center right]*.

The second type of choke that I use in the shack is, for example, in the transmission line of my receiving antenna for 3.5 - 14 MHz. *[photo bottom right]*.

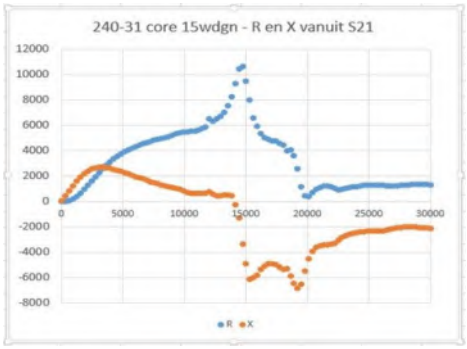
This consists of 7 windings of RG58 coax through a 35mm 3S4 core. Seven is the maximum number of windings because there is not enough space to insert the BNC connector. For a small core with 7 windings, there is quite a lot of attenuation over the HF area. Again, Rs is quite dominant. *[see the graphs below]*.

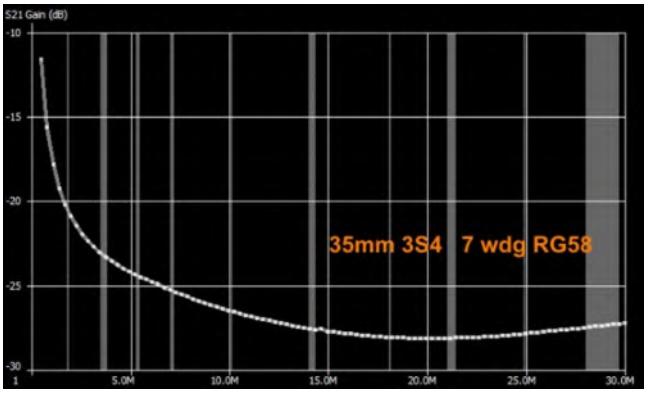
The last choke described in this article is what I call an "occasional choke."

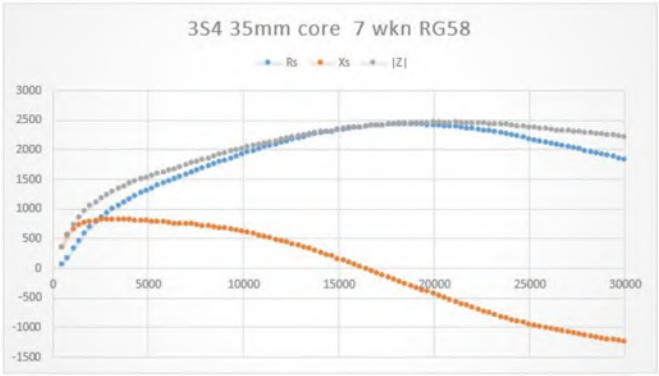
Occasionally you are somewhere in a place where there is some RF feedback or whatever. In my case this is usually during a field day, or during an improvised temporary contest station. Then you reach for those well-known and oh-so-handy ferrite clamp-ons and hope it helps.

You have to do something…

On the next page is such an example with 3 windings of RG58 (more is not possible) due to a heavy clamp-ons in terms of weight. So, this is a quick solution. The clamp is pressed on firmly and looks tight. Now the measurement.







A first measurement (white points) indicates that attenuation in the lower HF frequencies is not great. At 40m we only get to about six dB.

Although it seems as if the clamp was properly closed after wrapping (it has been properly snapped shut...) it was apparently not quite right. A tight tie-wrap around it provided 5 dB extra attenuation with a second measurement (the yellow points). This turned out to be reproducible with various measurements, so it is not an accident.

A good lesson for these clamps is therefore: ALWAYS put a tie-wrap (or rather two) around it, even if it looks so good without them.

Finally, the split of the impedance in ohms and reactive part R_s + jX_s in the following graph. We see that the R_s is only rising slowly and is still rising in the higher HF range. Apparently, it is more suitable as a choke for higher frequencies than what we measured here. But hey, if it helps in the temporary situation, "who cares"?

After these measurements (the chokes have been in use for much longer than I have had the nanoVNA) it appears that the 240-31 core does an excellent job. In addition to RF in the shack, I also use one in the 230V (North America 115V) mains.

The clamp used is clearly less effective in my case, and we shouldn't expect miracles from it.

In the fourth part of the series "Measurements with the nanoVNA" we will identify different cores: which material are you dealing with. The nanoVNA can also play a useful role in this.

For now, have fun measuring your chokes. It is better to measure it yourself than to talk to others.

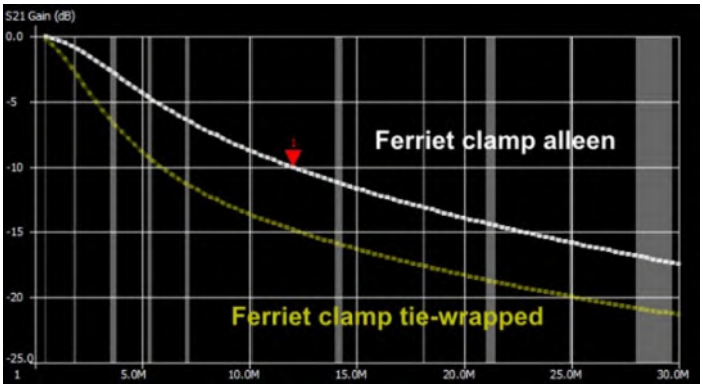
73,

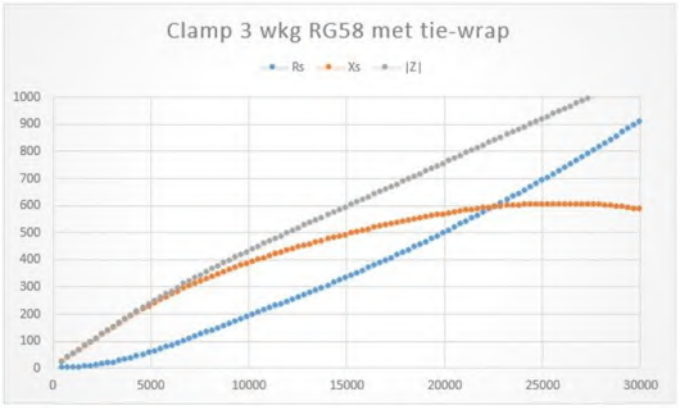
Arie Kleingeld, PA3A

References:

Article by G3TXQ: Amateur Radio (G3TXQ) - Common-mode chokes http://www.karinya.net/g3txq/chokes/#measurement

Article by PA3A: Measurements with the nanoVNA part 2 - Measurement of high impedance values.





Antenna Adventures 2

A popular favourite: The tape-measure Yagi

By popular request we are republishing this plan. You will find this an ideal flexible antenna for fox hunting but it also delivers great performance for everyday use. And you can also mount it as a base antenna.

Description

This antenna evolved during my search for a beam with a really great front-to-back ratio to use in hidden transmitter hunts. This design exhibits a very clean pattern and is perfect for RDF use. It trades a bit of forward gain in exchange for a very deep notch in the pattern toward the rear. (You could optimize the design for more forward gain, but at the expense of a really good notch in the pattern toward the rear.) It is a design that can be constructed using only simple hand tools (no machine shop needed) and still perform well. It has been duplicated several dozen times by other local hams and has been successfully used as a club construction project.

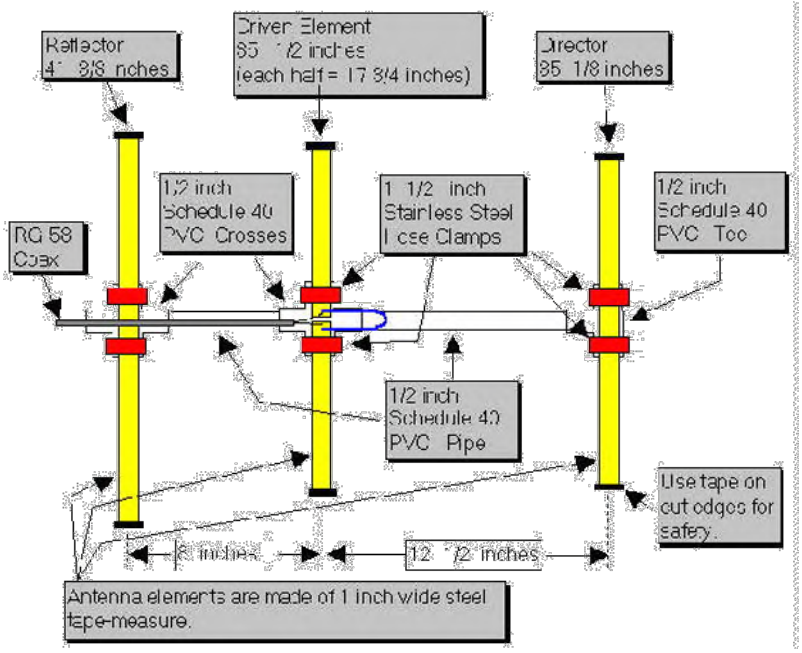
When I designed this antenna I had one basic idea in mind. It had to be easy to get in and out of the car when hunting for a hidden transmitter. This would be accomplished by the use of steel "tape measure" elements. These elements could fold easily when fitting the antenna into my car and yet still be self supporting. I decided to use three elements to keep the boom from getting too long.

Another of my design goals was to use materials that were easy to obtain. I chose to use Schedule-40 PVC pipe and fittings available at my local hardware store for the boom and element supports. These kept the cost for the antenna very low. The element supports consist of PVC crosses and tees.

Since I had never seen any plans for an antenna using elements made from 2.54cm (1 inch) wide steel "tape measure," I had to do the design myself. To assist in the design I used a shareware computer aided yagi design program written by Paul McMahon VK3DIP. It allowed me to optimize the antenna for the cleanest pattern combined with the best front-to-back ratio.

Performance Predicted by YAGI-CAD

When I first built this beam I found it needed a matching network of some kind to have a low SWR. My first attempt was a Gamma match. This was unwieldy. The driven element could barely handle the weight and the Gamma match itself was not very flexible. The best matching network turned out to be a "hairpin match." This is simply a 12.7cm (5 inch) length of wire that is connected across the feed points of the driven element. The antenna has some capacitive reactance without the matching network. The 12.7cm (5 inch) length of wire has just enough inductance to cancel the capacitive reactance. This resulted in a better match than anything else I had tried.



The wire I used for the hairpin match was enamel insulated 18 gauge solid. Other hams who have duplicated this beam have used just about anything they had on hand. 14 gauge house wire works well, so does a length of 22 gauge hookup wire. It does not seem to matter if it is stranded or solid, use whatever you have available. This results in a very good match across the two meter band once you have adjusted the distance between the halves of the driven element for minimum SWR. This was 2.54cm (1-inch) apart on my prototype.

I used a pair of shears to cut the tape measure elements to length. An old pair of scissors will probably do as well. No matter how you cut the elements be very careful. Those edges are very sharp and will inflict a nasty cut if you are careless. Use some sandpaper to remove the really sharp edges and burrs resulting from cutting the elements to size. I put some vinyl electrical tape on the ends of the elements to protect myself from getting cut. I encourage you to do the same. It will probably be best if you round the corners of the elements once you cut them. Wear safety glasses while cutting the elements. Those bits of tape measure can be hazardous.

The RG58 coax feedline is connected directly to the driven element. No matter what method you use to attach the feedline, make sure you scrape or sand the paint off the tape measure element where the feedline is attached. Most tape measures have a very durable paint finish designed to stand up to heavy use. You do not want the paint to insulate your feedline connection.

If you are careful, It is possible to solder the feedline to the element halves. Care must be taken since the steel tape measure does not solder easily and since the PVC supports are easily melted. You might want to tin the tape measure elements before mounting them to the PVC cross.

If you decide not to solder to the tape measure elements, there are two other methods that have been used to attach the feedline. One method employs ring terminals on the end of the feedline. The ring terminals are then secured under self tapping screws which hold the driven element halves. This method does not allow you to tune the antenna by moving the halves of the driven element. 6-32 bolts and nuts could be used if holes are drilled in the elements near the ends. If the bolt heads are placed nearest the PVC fitting, you could secure ring-terminals with nuts and lock washers. Another possibility is to simply slide the ends of the feedline under the driven element hose clamps and tighten the clamps to hold the ends of the coax. I know this is low-tech, but it works just fine.

Stainless steel hose clamps are used to attach the driven element halves to the PVC cross which acts as its support. This has the added benefit of allowing you to fine tune your antenna for lowest SWR simply by loosening the hose clamps and sliding the halves of the driven element either closer or further apart. By using the dimensions specified, I found that the SWR was 1:1 at 146.565 Mhz (our Fox-Hunt frequency) when the two elements were spaced approximately 1 inch apart.

The photo below right shows the method used to attach the driven element to the PVC cross.

I used 3.8cm (1 1/2 inch) hose clamps to attach all the elements on my prototype beam. Others who have duplicated my design have used self tapping screws to attach the elements to the PVC crosses and tees. Performance is the same using either method. The screws are much less expensive but they do not hold the elements as securely. If you do not use 1.27cm (1/2 inch) PVC fittings but instead use 1.9cm (3/4 inch), make sure the hose clamps you buy are large enough to fit.

If you wish a slightly neater looking beam, use the self tapping screws. If you do not mind spending a few more dollars for the hose clamps, use them instead. If I were to build another beam I would use screws for the director and reflector, and hose clamps for the driven element. That would give me the best of both methods.

Rubber faucet washers have been used by some builders between the tape measure element and the PVC fittings on the director and reflector. These allow for the tape to fit the contour of the PVC fitting and will make the antenna look better. Now you know what to do with those washers left over from the assortment you once purchased; You know the ones I mean, the washers that do not fit the faucets you have in your house. If you are an apartment dweller, ask around, these things are stashed in almost every homeowners basement or garage.

Construction:

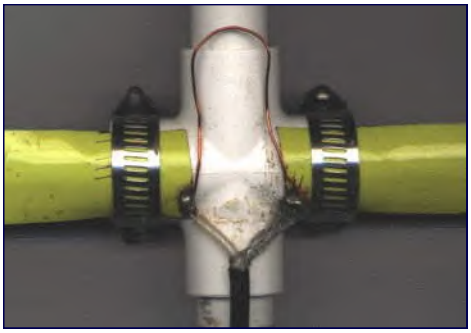
Cut a length of tape measure to 105.1cm (41 3/8 inches). It will be the Reflector element. Cut two lengths of tape measure to 45cm (17 3/4 inches). These will be used for the Driven element. Cut one length of tape measure to 89.2cm (35 1/8 inches). It will be used for the Director. Once you have cut the tape measure to length, put vinyl tape on the cut ends to protect yourself from the sharp edges. You will want to scrape or sand off the paint from one end of each of the driven element halves so you can make a good electrical connection to the feedline.

If you are planning to solder the feedline to the driven elements it is best to tin the elements first before attaching them to the PVC cross. If you don't, the PVC will melt as you apply heat to the element. It would be a good idea to also take the time to form the wire used for the hairpin match into a "U" shape with the two legs of the "U" about 1.9cm (3/4 inch) apart. Tin the ends of the hairpin if you plan on soldering it to the driven element. If you tin .64cm (1/4 inch) of each end of the hairpin it will leave 11.43cm (4 1/2 inches) to shape into the "U".

You will need to cut two lengths of PVC pipe to use as the boom. One should be cut to 29.2cm (11 1/2 inches). It is used to form the boom between the Director and the driven element. The other piece of PVC should be cut to 17.8cm (7 inches). It will be used between the Reflector and the Driven element. Just about any saw will cut through the soft PVC pipe. I used a hacksaw. When we mass produced this antenna as a club project, we marked the pipe and used a portable jig saw to cut the lengths in assembly line fashion. It took longer to measure the pipe than to actually make the cuts. Since the pipe is available in 3m (ten foot) lengths, you can make a few beams from a single 3m length. In any case, you might want to cut a few extras lengths for your friends. They will want to duplicate this once they see your completed antenna.

[Above] I added 7 turns of co-ax to my Yagi to improve the SWR—John VE7TI.

[Below] the 'hairpin' match.



When I built mine, I found SWR was well under 2:1 on the 70cm band and less than 1.5:1 on 2m, making it a suitable dual-band antenna. The tape-measure Yagi can be used as a base or portable gain antenna. Here it is being used to make a satellite contact on a Baofeng UV-5. ~ John VE7TI

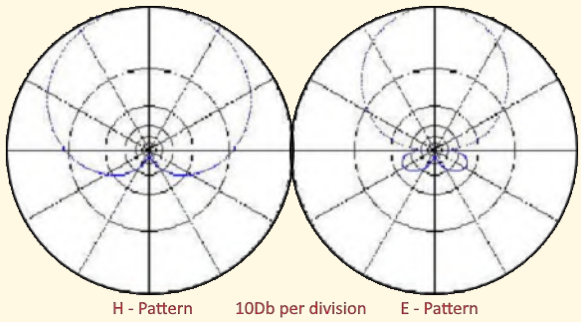
At this time you can pre-assemble the PVC boom, crosses and tee which will support the tape measure elements. I did not use any cement or glue when I assembled mine. The PVC pipe is secured in the fittings with a friction fit.

The hose clamps I used are stainless steel and have a worm-drive screw which is used to tighten them. They are about 1.25cm (1/2 inch) wide and are adjustable from 1.75cm to 3.8cm (11/16 inch to 1 1/2 inch) diameter. Attach the tape measure elements to the PVC fittings as shown in the accompanying drawing. It is normal for the Reflector and Director elements to buckle a bit as it is tightened to the PVC Tee and Cross. You can eliminate this buckle if you use the washers and self tapping screws to attach these elements instead of the hose clamps. I do not think the beam will withstand as rough a treatment as when hose clamps are used.

How does it perform?

Once you have completed your beam you probably will be interested to see if it performs as well as the computer predicted. The SWR should be less than 2:1 across the entire two meter band. The front-to-back ratio is predicted to be very good with the antenna exhibiting a very deep notch in its pattern towards the rear. The YagiCad 4.1 program produced these antenna pattern graphs showing the pattern you should expect.

GAIN 7.3 dBd
Front-to-Back Ratio >50 db
3 db Beamwidth E = 67.5 degrees
3 db Beamwidth H = 110 degrees



Summary

This beam has been used on Fox-Hunts, on mountain tops, at local public service events, outdoors, indoors in attics, just about everywhere. The SWR is typically very close to 1:1 once adjusted. Front to back performance is exactly as predicted. The null in the rear of the pattern is perfect for transmitter hunts. When tested using a sensitive field strength meter and a low powered fox transmitter, full scale readings were seen from a distance of ten feet. With the same field strength meter I was able to point the antenna away from the transmitter and move the reflector element to within a few inches of the transmitter antenna and still not see a reading. I don't have the facilities to verify a 50 db notch as predicted by the Yagi-Cad software but It sure seems close. The flexible elements have taken a lot of abuse. My antenna has seen a lot of use and has held up quite well. Best of all, when on a fox-hunt, this beam is a breeze to get in or out of the car.

~Joe Leggio WB2HOL

Ham Hardware

Al Duncan VE3RRD

The QRP Rig Battery Power Supply

There are several choices when deciding on a power supply for your QRP transceiver, but battery power is preferred for portable operation. If minimum weight is important, then you could use Alkaline AA cells which are often found on sale. AC power supplies (especially "wall warts") generally should be avoided as they can have a noisy DC output that can affect your ability to hear weak stations.

If weight is not important, then a Gel Cell battery of between 4 and 7 ampere hour rating is a good choice. These are available in 12 V and 6V (use 2 in series) versions.

Special charging units designed for Gel Cell batteries can be purchased or made. (an example is found at: http://www.rason.org/Projects/gelcell/gelcell.htm, and more info can be found at: http://www.qsl.net/wb3gck/gel-cell.htm).

A simple way to charge and maintain a Gel Cell battery is to connect it directly to a regulated power supply with a current limiting resistor installed between the power supply and the battery – this is called a float charging configuration.

Obtain the manufacturers info sheet on your Gel Cell batteries, but as an example, I use a pair of Sterling batteries model H7-6 (7 Ah rating) in series. These batteries can be float charged with a voltage between 6.8 and 6.9 VDC per cell, or 13.6 VDC to 13.8 VDC for the pair (these values are for batteries charged at room temperature – 25C, if warmer then a lower float voltage should be used). The advantage with float charging is that the battery can remain connected for long periods of time so it is always charged and ready for use.

I use a regulated 13.8 VDC 5A power supply which has an internal voltage adjustment potentiometer which I have set to just below 13.8 VDC (use an accurate digital voltmeter).

The next problem is to limit the maximum charge current so as to be within the manufacturer's maximum value of 10% of the Ah rating of the battery (about 700 ma for my batteries – your battery may have a lower maximum charge rating).

When considering charge current, you should also consider the minimum voltage the manufacturer has specified for a discharged battery (draining a battery below this value can damage it). I have decided not to discharge my battery pack below about 11.5 VDC (the battery voltage drops fairly quickly during discharge after it gets below 12 VDC), you will need some way of monitoring the battery voltage when you are using it in the field as a Gel Cell should never be discharged below 10.5 VDC.

Next you need to calculate the value of resistance needed to limit the current. Assuming a minimum battery voltage of say

10.8 VDC and a float power supply voltage of 13.8 VDC, the voltage difference is 3V. If the current is to be a maximum of 10% of 7A, that equals 0.7A. Since R=E/I or R=3/0.7, the series resistor would have to be at least 4.4 ohms. A 4.7 ohm resistor would require a power rating of (P=I squared R) or about 2W (4W for a 100% safety factor). You can use a 5W 4.7 ohm resistor or two 2W 2.2 ohm resistors in series. Another solution is to use an automotive light bulb as the current limiting resistor. You may have to try several bulbs in series with an ammeter to find one that limits the current to the desired value. Use a power supply set for 3VDC (in my example above) and connect directly to the light bulb through an ammeter. I am currently using a type 561 automotive bulb which gives me a maximum charge current of just under ½ Amp.

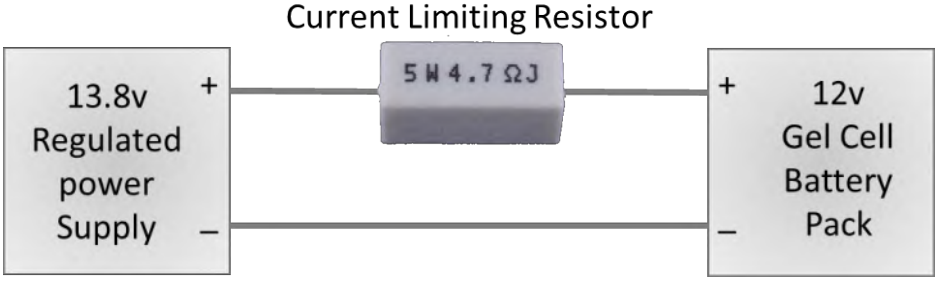
The taillight filament in a 2057 bulb gives closer to 1A charge current which would work well for larger 12Ahr batteries. Charging a discharged battery at the float voltage will take longer than using an automatic gel cell charger which initially uses a higher charge voltage (e.g. 14.5VDC) and then reduces the voltage and charge current after a short time.

Since a float voltage power supply always remains at about 13.8 VDC; with a 4.7 ohm resistor in series, the battery will charge at (I=E/R or 3/4.7) 640ma when discharged to 10.8 VDC. Once the battery voltage reaches say 12V, the charge current will be only (I=E/R or I=1.8/4.7) about 380ma and will continuously get smaller as the battery voltage approaches the voltage of the power supply. Thus the actual charge rate of your battery will vary depending on its terminal voltage (and age – old gel cells can develop internal resistance). Note that the battery voltage can never equal the power supply voltage since the closer the battery gets to 13.8V, the closer the charge current gets to 0 Amps. It is only the initial charge current that you must worry about, choosing a series resistance that will limit it to less than 10% of the battery rating when the battery is fully discharged (as close to 10.5V as you have permitted it to go). After having my battery pack connected for several days, when I disconnect it for use, the no-load terminal voltage is about 13.2 VDC. Gel cells can be considered to have a life expectancy of about 10 years from date of manufacture.

More than one battery (each with its own current limiting resistor) can be connected to a single regulated 13.8 VDC power supply, just make sure the continuous output current rating of the power supply is sufficient for the sum of all the maximum charge rates of all the batteries connected.

When shopping for a 12V gel cell battery, take along an accurate digital volt meter. Any battery with a terminal voltage below 10.5 VDC should be avoided. If you want to actually run a load test on the battery you have purchased, fully charge the battery and then attach a load that will draw about 10A for 1 minute. Check the battery voltage after removing the load – it should be up at about 12.6 VDC (or higher).

~ *AL VE3RRD*



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Summits on the Air

"Outside" Magazine

Inside the summit-obsessed world of ham radio

On a gray Friday afternoon last spring, Steve Galchutt sat high atop Chief Mountain, an 11,700-foot peak along Colorado's Front Range. An epic panorama of pristine alpine landscape stretched in almost every direction, with Pikes Peak standing off to the south and Mount Evan towering just to the west.

It was an arresting view, and the perfect backdrop for a summit selfie. But instead of reaching for his smartphone, Galchutt was absorbed by another device: a portable transceiver. Sitting on a small patch of rock and snow, his head bent down and cocked to one side, he listened as it sent out a steady stream of staticky beeps: dah-dah-di-dah dah di-di-di-dit. "This is Scotty in Philadelphia," Galchutt said, translating the Morse code. Then, tapping at two silver paddles attached to the side of the radio, he sent his own message, first with some details about his location, then his call sign, WG0AT.

Steve WG0AT: SOTA with Goat

At this point, a prying hiker could have been forgiven for wondering what, exactly, Galchutt was doing. But his answer—an enthusiastic "amateur radio, of course!"—would likely only have further compounded their confusion. After all, the popular image of an amateur-radio enthusiast is an aging, armchair-bound recluse, not some crampon-clad adventurer. And their natural habitat is usually a basement, or "ham shack," not a windswept peak in the middle of the Rockies.

Galchutt fits part of this stereotype—he's 75—but the similarities end there. An avid hiker and camper, his preferred shack is atop a mountain, and the higher the summit, the better.

Another rapid-fire burst of dits and dahs sprung from the radio. "Wow!" Galchutt said, "Spain!"

Nearby sat Brad Bylund (call sign WA6MM) and Bob and Joyce Witte (K0NR and K0JJW, respectively). Together, the four are part of a group called Summits on the Air (SOTA), an international, radio version of high pointing.

"I've had a woman come up to me and wonder what I'm doing," Bylund said. "And she pointed out to me, 'You know your cell phone works up here, don't you?' They totally miss the whole thing."

"Bob and I call those bubble people," Joyce added with a smirk.

Read the full article here:
https://www.outsideonline.com/2421479/ham-radio-hobby-summit

~

VE7SL's Radio Notebook

Steve McDonald VE7SL

Non-directional beacons (NDBs)

What are NDBs?

Wiki defines an NDB: "A non-directional (radio) beacon (NDB) is a radio transmitter at a known location, used as an aviation or marine navigational aid. As the name implies, the signal transmitted does not include inherent directional information, in contrast to other navigational aids such as low frequency radio range, VHF omnidirectional range (VOR) and TACAN. NDB signals follow the curvature of the Earth, so they can be received at much greater distances at lower altitudes, a major advantage over VOR. However, NDB signals are also affected more by atmospheric conditions, mountainous terrain, coastal refraction and electrical storms, particularly at long range."

The 'XX' NDB (344 KHz) is located just a few miles SW of the Abbotsford Airport, about 40 miles east of Vancouver, B.C. Abbotsford is the 'alternate' for YVR traffic and when the fog sets in on the coast, Abbotsford gets very, very busy. The Abbotsford Airport is also the home of one of the world's biggest annual airshows in mid August.

Types of NDBs

NDBs used for aviation are standardized by ICAO Annex 10 which specifies that NDBs be operated on a frequency between 190 kHz and 1750 kHz, although normally all NDBs in North America operate between 190 kHz and 535 kHz. Each NDB is identified by a one, two, or three-letter Morse code callsign. In Canada, privately owned NDB identifiers consist of one letter and one number.

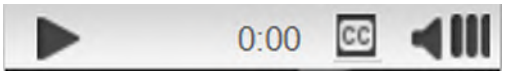
Non-directional beacons in North America are classified by power output: "low" power rating is less than 50 watts; "medium" from 50 W to 2,000 W; and "high" at more than 2,000 W.

There are four types of non-directional beacons in the aeronautical navigation service:

- En route NDBs, used to mark airways
- Approach NDBs
- Localizer beacons
- Locator beacons

The last two types are used in conjunction with an Instrument Landing System (ILS).

What do they sound like? Here is an audio clip of non directional beacon WG, on 248 kHz, located at 49.8992 North, 97.349197 West, near Winnipeg MB's main airport https://upload.wikimedia.org/wikipedia/commons/b/b1/NonDirectional_Beacon_WG.ogg



Monitoring NDBs

From the DXers point of view, as that's only how we see them, they are challenging DX targets.

Besides their use in aircraft navigation, NDBs are also popular with long-distance radio enthusiasts ("DXers"). Because NDBs are generally low-power (usually 25 watts, some can be up to 5 kW), they normally cannot be heard over long distances, but favorable conditions in the ionosphere can allow NDB signals to travel much farther than normal. Because of this, radio DXers interested in picking up distant signals enjoy listening to faraway NDBs. Also, since the band allocated to NDBs is free of broadcast stations and their associated interference, and because most NDBs do little more than transmit their Morse Code callsign, they are very easy to identify, making NDB monitoring an active niche within the DXing hobby.

In North America, the NDB band is from 190 to 435 kHz and from 510 to 530 kHz. In Europe, there is a longwave broadcasting band from 150 to 280 kHz, so the European NDB band is from 280 kHz to 530 kHz with a gap between 495 and 505 kHz, because 500 kHz was the international maritime distress (emergency) frequency.


NON DIRECTIONAL BEACON

397 kHz | LVO | Mitillini, Greece

To: Costas Krallis, SV1XV

This will verify your reception of radio beacon LVO on 397 kHz at 1910 UTC on 25 Sept 2004. Beacon output power: 25 W
Antenna: Marconi T

Signature & Official stamp

An NDB QSL card

The beacons that transmit between 510 kHz and 530 kHz can sometimes be heard on AM radios that can tune below the beginning of the Medium Wave (MW) broadcast band. However, reception of NDBs generally requires a radio receiver that can receive frequencies below 530 kHz. Often "general coverage" shortwave radios receive all frequencies from 150 kHz to 30 MHz, and so can tune to the frequencies of NDBs. Specialized techniques (receiver preselectors, noise limiters and filters) are required for the reception of very weak signals from remote beacons.

The best time to hear NDBs that are very far away is the last three hours before sunrise. Reception of NDBs is also usually best during the fall and winter because during the spring and summer, there is more atmospheric noise on the LF and MF bands."

My main website has a page devoted to some of our local NDBs along with photos and a brief description. I spent a few days several years ago driving around the countryside with my Sony radio and DFing them. The 'LU' beacon near Cultus Lake is now off the air but the rest are still active.

My page at: https://qsl.net/ve7sl/ndb.html also has two links at the bottom.

The first will take the reader to a lot of NDB DXing related information while the second link goes to the huge database of all NDBs reported heard. The list is updated daily and is the best way for newcomers to identify who they are hearing, where it has been heard before and by whom it has been heard.

Also, here is a short paragraph extracted from one of my blogs that also might help:

"Some might wonder why listening for NDB's would be of any interest. For me, there are a number of reasons:

- the challenge of hearing distant low-powered transmitters below the broadcast band, particularly from one region… for me it is Alaskan NDBs;
- the necessity to develop an efficient receiving antenna has led to numerous antenna trials using loops and wires in various configurations;
- learning about LF propagation and how it compares with HF;
- the ability to compare what is being heard at my location with what is heard just a few hundred miles away can often be surprising (and humbling).

If you are planning a 630m station, listening for NDB's is a good way to test your system's receive capability as there are hundreds of signals to be heard, many of them very close to our new 472KHz band."

Here are a couple of my own links where readers can hear two NDBs from Alaska recorded here on Mayne Island. The first is from Adak, out at the end of the Aleutian chain, while the other is from Kotzebue on the northern west coast of Alaska. The one in Adak is fairly easy to hear because of its frequency at the bottom end of the broadcast band while the other is a challenging target, even from BC.

https://qsl.net/ve7sl/adk.mp3

https://qsl.net/ve7sl/hhm.mp3

You may want to monitor the CLE announcement posts as there is some basic info there as well. There is one each month and I always announce it on the blog.

This months announcement is here:

https://ve7sl.blogspot.com/2021/04/hunting-for-ndbs-in-cle267.html

Summertime is not the best time of the year to start DXing NDBs as the thunderstorm noise can easily drive one off the band quickly. Propagation is usually not at its best during the summer as well.

The 'WC' NDB (332 KHz) is located just a few hundred feet from the Canada - U.S. border, about 25 miles south east of the Vancouver International airport and about 20 miles west of the Abbotsford airport. I suspect it is an 'enroute' locator for both facilities.

Hunting For NDBs In Coordinated Listening Events

It's CLE time! 'CLE's are 'Co-ordinated Listening Events, and NDB DXers around the world focus their listening time on one small slice of the NDB spectrum.

It's another 'normal' one again with a 15kHz window - the hunting ground is 335.0 - 349.9kHz.

Propagation on MF has been both hot and cold for the past few weeks, seemingly depending on where you live and the amount of geomagnetic activity affecting your region. As well, the Sun has been throwing a lot of Coronal Hole Streams toward earth which may or may not affect this weekend's propagation… but this is all part of the radio-magic fun.

A 'challenge target' for listeners in North America is YUT - 335kHz in Repulse Bay, NU, at the north end of Hudson Bay. Even though running just 25 watts, it's widely heard throughout North America and Europe and is a good target for listeners everywhere. Listen for YUT's upper sideband on 335.406 kHz.

When tuning for NDBs, put your receiver in the CW mode and listen for the NDB's CW identifier, repeated every few seconds. Listen for U.S. NDB identifiers approximately 1 kHz higher or lower than the published transmitted frequency since these beacons are modulated with a 1020 Hz tone approximately.

For example, 'AA' near Fargo, ND, transmits on 365 kHz and its upper sideband CW identifier is tuned at 366.025 kHz while its lower sideband CW ident can be tuned at 363.946 kHz. Its USB tone is actually 1025 Hz while its LSB tone is 1054 Hz.

Often, one sideband will be much stronger than the other so if you don't hear the first one, try listening on the other sideband.

Canadian NDBs normally have an USB tone only, usually very close to 400 Hz. They also have a long dash (keydown) following the CW identifier.

All NDBs heard in North America will be listed in the RNA database (updated daily) while those heard in Europe may be found in the REU database. Beacons heard outside of these regions will be found in the RWW database. These databases have recently been re-vamped and are slicker than ever before!

The 'AP' beacon (378 KHz) is located on Mayne Island, B.C., at the entrance to Active Pass. If you have ever taken the ferry trip from Tsawwassen to Victoria on Vancouver Island, then you have passed right by the beacon. 'AP' is mid-way between the very busy Vancouver - Victoria flight path and most VFR flights pass directly over the beacon. For such a perfect seaside location, 'AP' does not radiate too well, and is only rarely reported in California, points to the east and recently in northern Texas.

See https://www.ndblist.info/cle.htm

~ Steve VE7SL

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Ham Leftovers...

The early years of Amateur Radio

The Antique Wireless Association has released another vintage presentation from its collection.

In this video, AWA founder Bruce Kelley, W2ICE, explores the history and technology of early amateur radio in the days when spark transmitters and Alexanderson alternators were cutting edge technology. In a rare interview, ARRL founder Clarence D. Tuska, talks about the origin of the ARRL.

Watch it here: https://youtu.be/2v9aLIm26p8

EchoLink for Windows version 2.1 now available

16 March 2021: After a 14-year hiatus, we are pleased to announce that EchoLink for Windows version 2.1 is now available. Please download here: https://secure.echolink.org/news.htm

Is Amateur Radio losing it's alure?

These days, we hear that Amateur Radio is losing its alure, with the Internet, cell phones and other new technologies, there are fewer entrants to our Hobby. But that is not true: Ham Radio is more popular than ever. On the ITU site Lisa Leenders PA2LS describes the fascinating hobby of Amateur Radio and the significance of World Amateur Radio Day (WARD) on April 18. She notes:

"In those early days and weeks of the pandemic, radio amateurs reached out to each other spontaneously via the airwaves at the local, national, and global levels. Today, the hobby is more popular than ever, with more than 3 million licensed operators worldwide, according to the International Amateur Radio Union (IARU)."

Read the article at https://www.itu.int/en/myitu/News/2021/04/16/11/16/Home-never-alone-World-Amateur-Radio-Day-2021

'Space hurricane' that rained electrons observed for the first time

The spiral-armed storm swirled roughly 125 miles over the North Pole, churning in place for almost eight hours. The full story at: https://www.nbcnews.com/science/space/space-hurricane-rained-electrons-observed-first-time-rcna328

14 Common phone mistakes in ham radio

Quin (K8QS) and Tom (WA9TDD) identify 14 common mistakes ham radio operators make on phone (FM, SSB, AM) -- and what to do differently to maximize communication and boost intelligibility in amateur radio. See the video at: https://youtu.be/E-8E-ZwLkZA

More Ham News

Ham radio rig used to control MQ-9 Reaper drone

General Atomics Aeronautical Systems, Inc. (GA-ASI) used an amateur radio transceiver to demonstrate Beyond Line of Sight (BLOS) HF Command & Control (C2) of an MQ-9 Reaper Uncrewed Aircraft System (UAS)

The HF C2 capability does not require a Satellite Communications (SATCOM) link and is capable of providing BLOS connectivity up to 8,000 miles, depending on transmit power and link geometry.

"We demonstrated a BLOS assured Command & Control capability that can be used in contested or denied environments," said GA-ASI President David R. Alexander. "GA-ASI is committed to developing a flexible UAS architecture with assured C2 that is relevant in a broad set of mission scenarios."

For the demo, GA-ASI integrated the U.S. Government's Collaborative Operations in Denied Environment (CODE) autonomy software into the Open Operational Flight Profile (OFP) of an MQ-9A Block 5 Remotely Piloted Aircraft (RPA) and flew the MQ-9 using improved diagonal tails with conformal HF antennas incorporated into the leading edges.

GA-ASI's MQ-9 housed a FlexRadio Systems' FLEX-6600 HF software-defined radio and associated hardware to translate and execute an autonomous mission plan. GA-ASI created a specialized HF software adapter to manage the unique latency and throughput constraints of the HF waveform to demonstrate BLOS command and control of the RPA.

The demonstration was flown out of Laguna Army Air Field/Yuma Proving Grounds on Dec. 16, 2020. The MQ-9 was commanded from Austin, Texas approximately 1,000 miles away over an HF C2 link. This capability enables an operator to task the MQ-9 without needing SATCOM, providing a means to operate in SATCOM-denied, contested environments.

~ Source Southgate News and GA-ASI

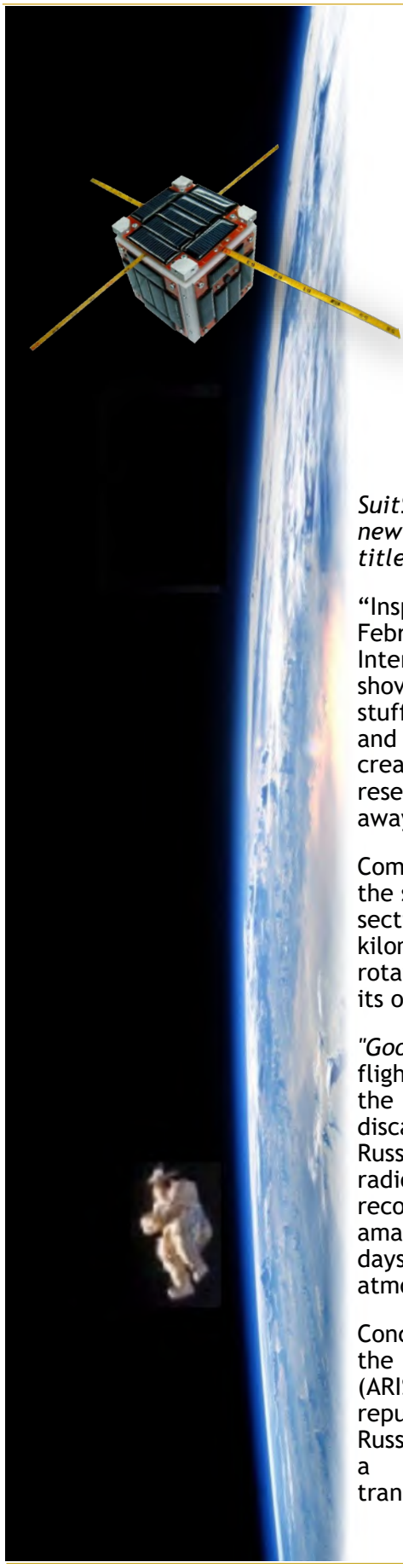
https://www.ga-asi.com/ga-asi-demonstrates-blos-command-control-over-hf-using-mq-9

GA-ASI announcement on Twitter

https://twitter.com/GenAtomics_ASI/status/1347356367812755456

FlexRadio Systems' FLEX-6600 HF Software Defined Radio

https://www.flexradio.com/products/flex-6600-signature-series-sdr-transceiver/

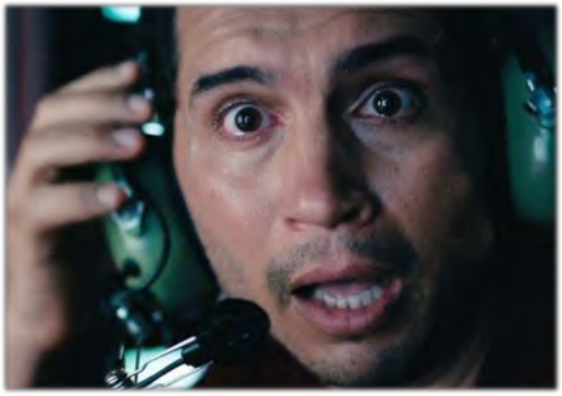


Satellite News

Looking Back..

SuitSat: the horror movie

SuitSat loses its innocence in a new video short sci-fi thriller titled "Decommissioned".



"Inspired by true events," on February 3, 2006, the crew of the International Space Station (ISS) shoved an unmanned spacesuit stuffed with discarded clothing and radio equipment out the door, creating a ghostly scene that resembled a cosmonaut tumbling away from the orbiting outpost.

Complete with helmet and gloves, the spacesuit floated past the Russian section of the ISS, 220 miles (354 kilometres) above the Earth, before rotating away feet first and beginning its orbit around the globe.

"Goodbye, Mr. Smith," said Russian flight engineer Valery Tokarev, giving the figure a nickname. Tokarev discarded the old spacesuit. The Russian suit was equipped with a radio transmitter which sent recorded messages in six languages to amateur radio operators for several days before re-entering the Earth's atmosphere and burning up.

Conceived by the Amateur Radio on the International Space Station (ARISS) team, the ISS crew repurposed a decommissioned Russian Orlan spacesuit to function as a free-floating amateur radio transmit-only satellite.

"ARISS designed and built an antenna and radio gear that got approved for installation into the suit, and cosmonaut Valeri Tokarev and Commander Bill McArthur, KC5ACR, put SuitSat-1 into orbit at the start of a spacewalk," ARISS-US Delegate for ARRL Rosalie White, K1STO, recounted. SuitSat-1 transmitted a voice message, "This is SuitSat-1 RS0RS!" in several languages, plus telemetry and a slow-scan TV image on an 8-minute cycle as it orbited Earth.

But it's back… at least in the production "Decommissioned". In the 6-minute film, a SuitSat returns in the future to haunt International Space Station commander "Diaz," played by Joey Vieira. Diaz is seen taking photos from inside an observation dome on the ISS when he spies some distant space debris and radios Houston to express concern.

"If there was any cause for alarm, you know we'd see it too," Houston assures. As the object closes in, an increasingly anxious Diaz recognizes the "debris" as SuitSat. "This is SuitSat," comes a voice on the ham radio.

"Houston, you're not gonna believe this. We're picking up transmissions on the ham radio that sound identical to the SuitSat experiment," he tells a skeptical mission control. "It's SuitSat! I'm seeing SuitSat!"

"SuitSat re-entered the atmosphere and burned up years ago," mission control responds. "It's impossible."

Decommissioned was produced by Perception Pictures and directed by Australian filmmaker Josh Tanner. He told Gizmodo that he produced the video "using the Unreal Engine technology that The Mandalorian used, albeit old-school rear projection, as opposed to the fancy LED wall tech they used."

SuitSat-1 — called Radioskaf or Radio Sputnik in Russian — was so successful that another unneeded Orlan spacesuit was subsequently refitted as SuitSat-2.

As an interesting sidebar with respect to the real SuitSat, White explained, "After the ARISS engineers calculated SuitSat-1's orbit and spin characteristics, they knew the legs and arms would have to be filled with something, so they asked the crew to stuff dirty laundry inside." White said Decommissioned was a hit at a recent ARISS meeting. The original SuitSats were deorbited to burn up in Earth's atmosphere after their useful lives ended.

ARRL is a partner in the ARISS program, which has kept amateur radio on the air from the International Space Station for 20 years. A hallmark of the ARISS program is the scheduled ham radio contacts made by astronaut crew members with schools and student groups around the world.

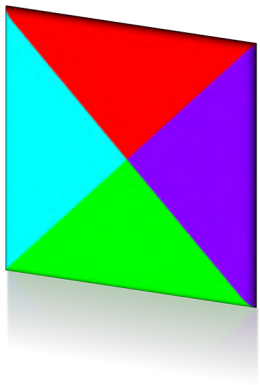
~ ARRL et al

Link to the SuitSat movie:
https://vimeo.com/502018179

Foundations Of Amateur Radio

Onno Benschop VK6FLAB

The massive physics phenomenon just over eight minutes away ...



To listen to the podcast, visit the website: http://podcasts.vk6flab.com/. You can also use your podcast tool of choice and search for my callsign, VK6FLAB.

Full instructions on how to listen are here: https://podcasts.vk6flab.com/about/help

If you've been around radio amateurs for a little while you're likely to have heard about the Solar Cycle and that it affects radio propagation for HF or High Frequency, also known as shortwave communications. The frequencies in the range of around 3 to 30 MHz, or 100m to 10m wavelength. One of the main ways it's used is for is for long distance or global communication and one of the most common ways that's done is using the ionosphere around the globe to refract a radio signal.

In September 2020, the Solar Cycle 25 Prediction Panel, announced that Solar Cycle 25 had commenced in December 2019 and radio amateurs around the globe rejoiced.

The first question for me was, why Solar Cycle 25?

You might think of the Sun as a stable light in the sky. As it happens, the bright light hides all manner of ferocious activity. One of the measures of this activity is the number of dots observed on the surface of our Star. These dots are called sunspots. As Solar activity increases, the number of sunspots increases. The activity is cyclical, it increases and decreases over time. Each increase and decrease combined is known as a Solar Cycle.

On average a cycle lasts about 10.7 years. Simple maths gives you that Solar Cycles started somewhere around 1750. That seems a little strange. Our Sun is 4.6 billion years old. There are paintings on the rocks at Ubirr in the Northern Territory of Australia that are 40 thousand years old. The pyramids in Egypt are 45 hundred years old. The Solar Cycle has been going for a lot longer than the 7 million years there have been humans on the planet, let alone dinosaurs who experienced the Solar Cycle 66 million years ago. Using fossil records we've determined that the Solar Cycle has been stable for at least the last 700 million years.

Chinese astronomers recorded Solar activity around 800 BC and Chinese and Korean astronomers frequently observed sunspots but no known drawings exist of these observations. The first person to draw sunspots was John of Worcester on the 8th of December 1128. Five days later, half a world away in Korea on the 13th of December 1128, the astronomers in Songdo reported a red vapour that "soared and filled the sky", describing the aurora borealis in the night sky that resulted from those very same sunspots.

In the early 1600's there was plenty of activity around the recording of sunspots. Thomas Harriot appears to have predated Galileo Galilei by more than a year with notes and drawings dated the 8th of December 1610. There's plenty of other names during this period, Father and son David and Johannes Fabricius and Christoph Scheiner to name three, but I'm moving on.

The Solar Cycle, was first described by Christian Horrebow who more than a century later in 1775 wrote: "it appears that after the course of a certain number of years, the appearance of the Sun repeats itself with respect to the number and size of the spots". Recognition of the Solar Cycle was awarded to Samuel Heinrich Schwabe who noticed the regular variation in the number of sunspots and published his findings in a short article entitled "Solar Observations during 1843" in which he suggested that the cycle was 10 years.

Stay with me, we're getting close to Solar Cycle number One.

In 1848 Rudolf Wolf devised a way to quantify sunspot activity. His method, named the Wolf number, is still in use today, though we call it the relative or international sunspot number. In 1852 he published his findings on all the available data on sunspot activity going back to 1610 and calculated the average Solar Cycle duration as 11.11 years. He didn't have enough observations to reliably identify Solar Cycles before 1755, so the 1755-1766 Solar Cycle is what we now consider Solar Cycle number One lasting 11.3 years with a maximum of 144.1 sunspots in June of 1761.

Until 2009 it was thought that there had been 28 Solar Cycles between 1699 and 2008 with an average duration of 11.04 years, but it appears that the 15 year Solar Cycle between 1784 and 1799 was actually two cycles, making the average length only 10.7 years. I should also point out that there have been Solar Cycles as short as 8 years and as long as 14 years.

With the announcement of Solar Cycle 25 comes improved propagation for anyone who cares to get on air and make noise. The current predictions vary depending on the method used, ranging from a very weak to a moderate Solar Cycle 25. There are predictions for the Solar maximum, the time with the most sunspot activity, to occur between 2023 and 2026 with a sunspot range between 95 and 130. By comparison during the previous Solar Cycle, in 2011 the first peak hit 99 and the second peak in 2014 hit 101.

I have purposely stayed away from electromagnetic fields, geomagnetic impacts and the actual methods for HF propagation, I'll look at those another time.

I can tell you that we've gone a little beyond counting dots on the Sun to determine activity and we have a whole slew of satellites orbiting our Star doing all manner of scientific discovery, all of which helps our understanding of what's going on in the massive physics phenomenon 8 minutes and 20 seconds away by radio.

That said, Solar eruptions are still pretty unpredictable, much like the weather around us. Not because we don't want to know, but because this is a very complex one to solve, much like ionospheric propagation is hard to forecast, much easier to measure actual performance and much more accurate.

So, if you want to know how well propagation is going to be today, turn on your radio and have a listen. If you want to know how great it's going to be tomorrow, look at the forecast, but bring an umbrella, or an FT8 transmitter.

I'm Onno VK6FLAB

The dynamic nature of your shack

If you have the opportunity to build your shack, it might start off as a table in the corner where you plonk down a radio, plug into nearby power and run coax to. That's pretty much how most shacks start, mine included.

For me the step of running coax was an activity that took weeks of planning and procrastination and days of climbing on the roof. After actually completing that and getting two runs of coax to my planned shack, one for HF and one for UHF and VHF, the shack building itself was pretty simple.

I had to get power to the location, but an extension lead took care of that. In the interest of space I put the power supply on the floor, a wooden floor that ensured good circulation, unlike carpet, perhaps a topic for another day, I plugged my coax into the radio, plugged in the 12 Volt power and was up and running.

Over time that space continued to grow. Looking at it right now, it has two computer monitors, a laptop, three radios, two coax switches, a keyboard, mouse, digital interface, two speakers, and a fan to cool the radio when I'm calling CQ on FT8.

I'm not a messy person, but I do like to have my tools convenient. It's not a pristine environment by any stretch, but it's orderly as shacks go. An hour ago it wasn't, actually, looking at the clock, that was four hours ago. Time flies when you're having fun.

My shack is the centre of my radio activities. I might receive a gadget from a friend to test and I'll put it on my desk ready to go. The same is true for a foot pedal that I found when looking for something else, as is the audio adaptor that I used in the desk mixer that I'm experimenting with.

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. Volume 7 is out now.

Feel free to get in touch directly via email: cq@vk6flab.com, follow on twitter: @vk6flab or check the website for more: http://vk6flab.com/

If you'd like to join a weekly net for new and returning amateurs, check out the details at http://ftroop.vk6flab.com/, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link, IRN and 2m/70cm FM via various repeaters.

If you'd like to participate in discussion about the podcast or about amateur radio, you can visit the Facebook group: https://www.facebook.com/groups/foundations.itmaze

This podcast episode was produced by Onno (VK6FLAB). You can find more at http://vk6flab.com/

Over time each of these bits and pieces accumulate on the surface.

When I noticed that my radio was running hot, or in my mind uncomfortably warm, given that I'm using 5 Watts, I decided to invest in a fan, clipped to the edge of the desk requiring yet another wire.

It's not limited to small bits. I'm testing a new radio, that comes with removable head, a microphone, cables to join those to the main body, two antenna port cables, a coax switch and a power lead with two cables.

Over time you have coax mixed with 12 Volt DC and 240 Volt AC, audio leads, USB leads, video leads, grounding wire, remote control switches, microphone leads, CAT leads and more, all running all over the place.

Making a minor change can become a big hassle, making it hard to determine what goes where, not to mention that each cable generates it's own little slice of RF, wanted or not.

The four hours I've just spent consisted of taking everything except the bolted on computer monitors off the desk and starting from scratch.

I also did this when I first added a second radio, but that was so long ago that the "system" I implemented then was unrecognisable.

Doing it again today I made better use of the environment and changed some things around. I started with the 240 Volts requirements, then the coax, then 12 Volts, then audio and finally USB, using cable ties for semi-permanent things like power boards and hook and loop straps for things that move more frequently like audio wiring and video cables.

It's not perfect. I'm looking for some flexible coax patch leads, there's USB cables going every which way, the laptop keyboard isn't used, so why use a laptop, no doubt I'll discover more.

My point is that this is dynamic and every now and then it pays to spend a little while putting things back together.

My next project is to use an audio mixer to bring all the audio together in one place so I can use one headset for everything and give me the opportunity to plug in a tape recorder as my regulator suggests for monitoring emergency communications, though I might have to come up with something a little less 1980 for the actual recording.

If you're going to do this, move the desk at least a meter from the wall so you can get at the back of your shack, you can thank me later.

I'm Onno VK6FLAB

Ham Radio Contests Explained

Electronic Notes provides an overview of amateur radio contesting and a contest calendar of some of the more popular contests. Amateur radio contests and contesting are an important feature in the activities of many radio hams. Contests and contesting add a further dimension to amateur radio operating, proving new challenges and interest to the hobby. Some radio hams even run their calendar by when the contests occur.

Read the Electronic Notes article at:

https://www.electronics-notes.com/articles/ham_radio/amateur-contests/contesting-overview-calendar.php

KB6NU's Column

Dan Romanchik, KB6NU

How do you deal with inaccurate articles about amateur radio?

I've never liked the old saw, "There's no such thing as bad publicity." When a piece is just plain wrong, it can certainly do more harm than good. To give you an example, look at this message to the ARRL PR mailing list:

So the following article came to my attention:

Why CB Radio Is Still Popular In Some Circles

Note that the station added a statement two days later: "*KHTS Editors Note: The author of this article has mistaken the term "CB Radio" with "Ham Radio." There are big differences between the two: Ham Radio is a nickname for "Amateur Radio", a radio service governed by the FCC. CB Radio stands for "Citizen's Band" and is also governed by the FCC, but is quite different than Ham Radio. We apologize to our readers for the confusion. All opinions in the below article are that of the author and not KHTS Radio/Hometown Station.*"

I ask you:

What would you do if you saw this article in your local area? How would you as a PIO or PIC handle it?

What can be done to prevent such articles?

I replied: "Whenever I see these articles, I contact the reporter and try to set them straight on the differences between the various radio services. As to what can be done to prevent these articles from being published in the first place, I think that the PR committee could be a little more proactive:

1. Include a page on the ARRL website linked from the Reporter/Media Information page describing all the personal radio services, the differences between them, and the role of the Amateur Radio Service in particular.

2. Write a press release notifying reporters that page is now available and distribute it as widely as possible.

3. Include the name and phone number of an actual person on the Reporter/Media Information page and on other press releases. (I'll note that the Press Releases page is way out of date. It lists two press releases, both from 2016!)"

Having said all that, I'll ask you. How do you deal with inaccurate articles about amateur radio?

~ *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.

No-Ham Recipes

Marianne ZR6JMT

Strawberry yoghurt cake

"I got this recipe from my Gran before she left South Africa for the United Kingdom. She always made this cake for my birthday every year," recalls Marianne with a smile. Marianne suggests using the 250 milliliter container in which the yoghurt comes to measure the recipe ingredients, but you can use a standard measuring cup if you prefer. Either way, this recipe is very quick to make!

- 1 1-cup container of strawberry yoghurt (250 ml)
- 1 cup (250 ml) vegetable oil
- 3 cups (750 ml) self-raising flour
- 3 eggs
- 2 cups (500 ml) castor sugar
- Pinch of salt

Castor (or caster) sugar is a very fine sugar sold in Britain and a few other countries, so named because the tiny grains fit though a sugar caster or sprinkler. It is sold as "superfine" sugar in Canada and the United States. If you don't have any castor sugar, make your own by grinding granulated sugar in a food processor for one to two minutes.

Preheat oven to 350F (180C or a very moderate oven)

Combine all ingredients in a bowl and mix together. Pour into greased cake pans and bake for 40 minutes.

Makes 10-12 servings.

Social Reminder

The Saturday Surrey weekly social gathering is postponed until further notice due to COVID restrictions. We hope to get together again very soon.

Back to Basics

John Schouten VE7TI

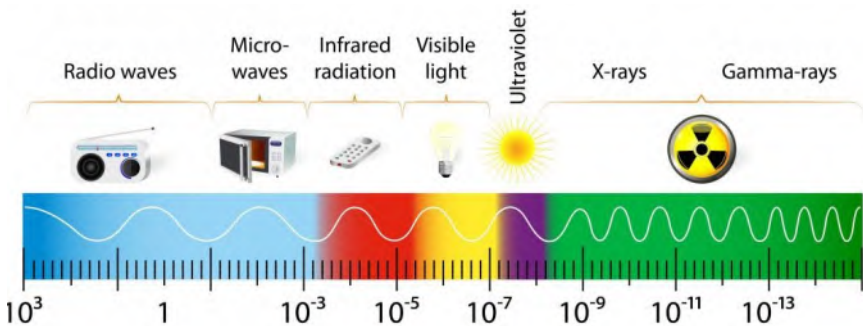
From The Canadian Basic Question Bank

How much bandwidth is there?

The Amateur Radio Service is allocated a broad range of radio spectrum covering many frequency bands. We are the only radio service, except perhaps for the military, that has as much spectrum at our disposal, and we can choose to operate on any frequency within that spectrum that we choose, as long as our certificate covers that band.

The Basic Question Bank covers this in multiple ways:

- Allocated spectrum as defined by federal regulations;
- Maximum signal bandwidth within a band; and
- Operating modes permitted within a specific band.



For example, question:

B-1-16-8 What precaution must an amateur radio operator take when transmitting near band edges?

A. Watch the standing wave ratio so as not to damage the transmitter

B. Ensure that the bandwidth required on either side of the carrier frequency does not fall out of band

C. Restrict operation to telegraphy

D. Make sure that the emission mode is compatible with agreed band plans

Radio amateurs use a variety of transmission modes, including Morse code, radioteletype, data, and voice. Specific frequency allocations vary from country to country and between ITU regions as specified in the current ITU HF frequency allocations for amateur radio. The list of frequency ranges is called a band allocation, which may be set by international agreements, and national regulations. The modes and types of allocations within each frequency band is called a bandplan; it may be determined by regulation, but most typically is set by agreements between amateur radio operators.

Transmissions occupy a certain bandwidth on the radio spectrum, i.e., a range of frequencies around the operating frequency; how wide a chunk depends on the amount of information to be transmitted concurrently. For example, a commercial TV channel requires 6 megahertz of bandwidth.

Here are a few common Amateur modes and their bandwidth requirements:

- CW (Morse) = about 100 Hz;
- SSB = 2 to 3 kHz;
- FM @ 5 kHz deviation = 10 to 20 kHz.

Amateur radio frequency allocation is done by national telecommunication authorities. Globally, the International Telecommunication Union (ITU) oversees how much radio spectrum is set aside for amateur radio transmissions. Individual amateur stations are free to use any frequency within authorized frequency ranges; authorized bands may vary by the class of the operator or station certification.

North America is in ITU Regio Two. National authorities regulate amateur usage of radio bands. Some bands may not be available or may have restrictions on usage in certain countries or regions. International agreements assign amateur radio bands which differ by region.

In Canada, the scope of these rules are set out in a document issued by the Canadian Ministry of Industry, Science and Economic Development (ISED) formerly referred to as Industry Canada (IC). This document is RBR-4 Standards for the Operation of Radio Stations in the Amateur Radio Service. It's scope is to set out the standards for the operation of radio stations in the amateur radio service. Operators must comply with these provisions in accordance with sections 45, 52 and 53 of the Canadian Radiocommunication Regulations.

The total spectrum allocated to amateur radio operation in Canada is approximately 23,198,000,000 Hz; that's over 23 Gigahertz! At the end of 2020 there were 73,173 certified Amateurs in Canada. With some quick math, that's over 317 KHz each!

RBR-4 sets out more than just bandwidth though. It covers many of the regulations topics in the question bank, including:

- Frequency Bands and Qualifications
- Foreign Amateur Equivalencies
- Bandwidths
- Frequencies for Radio Control of Models
- Communications on Behalf of Third Parties
- Operation Outside Canada
- Interference
- Station Identification
- Restrictions on Capacity and Power Output
- Amateur Radio Operator Certificate with Basic Qualification
- Amateur Radio Operator Certificate with Advanced Qualification
- Unmodulated Carriers and Retransmission
- Amplitude Modulation and Frequency Stability
- Measurements
- Environmental Process, Radio Frequency Fields and Land-Use Consultation; and
- Change of Address

I was prompted to cover this topic in this issue's Back to Basics column by a piece written by one of our regular contributors, Onno VK6FLAB. In his Foundations of Amateur Radio podcast, Onno asked the question: "Have you ever taken a moment to consider the available bandwidth on the various amateur bands?" He provides an excellent overview of our privileges…

“As an entrant into amateur radio in Australia as a Foundation licence holder you have access to six different amateur bands, the 80m band, 40m, 15m, 10m, 2m and 70cm. If you add the bandwidth from each of those bands together, you end up with 26.65 MHz worth of bandwidth to play with in Australia.

I can tell you that's a big chunk of bandwidth, but until I give you some context, 26.65 MHz isn't likely something that you can picture.

You might think of things as being pretty crowded. For example, on the 40m band during a contest it's common to hear wall to wall signals. There's barely enough room to call CQ and not interfere with anyone else. But how crowded is it really?

Let's start with an SSB signal, typically it's 2.4 kHz wide. On the 40m band, with 300 kHz of bandwidth, there's room for about 125 SSB signals side-by-side. On the 10m band, there's space for over 700 SSB signals side-by-side. Across all the available bandwidth for a Foundation license holder in Australia, there's room for over 11-thousand different SSB signals side-by-side.

While we're on the subject of crowding, there's talk about the massive influx of FT8, some call it a scourge. FT8 channels are transmitted within a single SSB channel and each takes up 50 Hz. That means that within an SSB channel of 2.4 kHz, there's room for 48 different FT8 channels, and if you take into account the odd and even time-slots, that doubles to 96 different signals, all within the same single SSB channel. So while FT8 is popular and growing, let's not get too excited about how much space it's taking up. From the perspective of an Australian Foundation license holder, it's taking up exactly six separate SSB slots of those 11-thousand across the six available bands, room for 576 separate FT8 signals, taking up a total of 14.4 kHz, or 0.05% of the available bandwidth.

Let's look at this another way, of the 26.65 MHz available bandwidth, 20 MHz is from the 70cm band alone, that means that all the other bands put together, fit inside the 70cm band three times over.

Let that sink in for a moment, adding the 80m, 40m, 15m, 10m and 2m band together fit inside the 70cm band three times.

You can use the 70cm band alone for 800-thousand FT8 signals, remember that there's two time slots, so you get two for one.

If this makes your mind explode, then consider that a carrier wave signal is considered to be about 25 Hz wide, so on the 70cm band you could have 800-thousand individual CW signals. You could allocate a personal CW frequency to every one of the amateurs in the United States in the 70cm band and still have room for expansion, not that I'm advocating that, just to give you a sense of scale. I should note that the 70cm band in the United States is even larger than it is in Australia, but I don't want to get bogged down into the various band plans across the world at the moment.

You might ask yourself why am I getting so excited about this?

Amateur radio is about experimentation. I've been telling you about HF propagation and using techniques like FT8 to determine just how far your signal goes, but you could use the same techniques to build a 70cm communication network with the amateurs within your city and share information across the city, perhaps even build a mesh network using your 70cm hand-held and an FT8-call network. It could be used to distribute propagation information, or messages in case of an emergency, or form the basis of something completely different.

If that doesn't whet your appetite, consider that the 1mm amateur band, which runs from 241 to 250 GHz is ready for you to experiment when your license permits. The current world distance record is 114 km, set in 2008 by Brian WA1ZMS and Peter W4WWQ, it has 9 GHz bandwidth and has room for 360-million FT8 signals, or 60 exclusive FT8 channels for every amateur on the planet.

My point is that as radio amateurs we have access to a massive chunk of radio bandwidth and it's just sitting there waiting for you to experiment with".

Thank you Onno… I couldn't have said it better myself.

Oh, and as to the question we asked at the start of this column? The correct answer is (B) Ensure that the bandwidth required on either side of the carrier frequency does not fall out of band.

~ *John VE7TI*

Calling all New Amateurs:
Get your Name in Lights!

Did you get your Amateur Radio certficate within the past year or two and want to introduce yourself through TCA to the Amateur Radio community? If so we would love to hear from you.

Drop a line to tcamag@yahoo.ca and tell us how you were introduced to the magic of Amateur Radio.

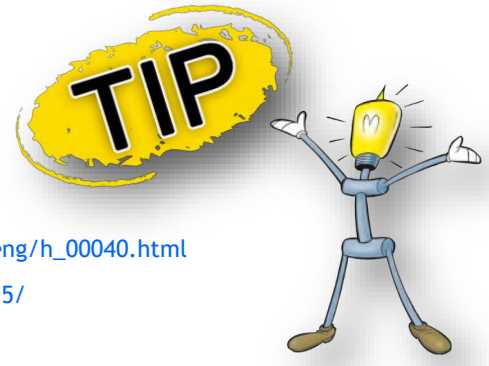
Do you credit any particular Amateur ("Elmer") with getting you started? Which aspect of the hobby do you enjoy so far?

Please be sure to include your name, call sign, date and level of certificate – and don't forget to include a photo or two. We hope to hear from you soon!

Do you need more information about our courses?

https://bit.ly/SARCcourses or scan the QR-code with your cellphone camera

Study Links for more information



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. VE3YT has an excellent question-based guide available at ve3yt.com
6. 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 free as a SARC prospective member!

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.

Next course starts Monday, June 14

SURREY AMATEUR RADIO basic course

OBTAIN YOUR FEDERAL AMATEUR RADIO CERTIFICATE

7 WEEK ON-LINE COURSE

for information contact sarc@ve7sar.net

due to high demand we have decided to offer additional courses

Presented On-line on Mondays 7—9pm Pacific Time

- Ideal for outdoors activities. Long range communications anywhere for free without commercial infrastructure
- Use satellite communication to speak around the world, perhaps even to an astronaut
- Participate in 'Radio Sports' like Contesting and Hidden Transmitter Hunts
- Enhance your personal and your community's preparedness in an emergency
- Use a radio, computer, smartphone or tablet for free worldwide digital communications
- Practice an exciting hobby or start a career opportunity

City of Surrey separ
Surrey Emergency Program Amateur Radio
https://separ.ca/

SARC
Surrey Amateur Radio Communications
http://ve7sar.net

More information needed? Click: https://bit.ly/SARCcourses or use the QR code above

SURREY AMATEUR RADIO foxhunt

HIDDEN 80M TRANSMITTER HUNT

no radio license needed

FREE EVENT • OPEN TO THE PUBLIC

Postponed to Saturday, August 28

Crescent Park, South Surrey

Pre-hunt Coaching, Registration & Instruction 9am
FoxHunt 10am—Noon

Location See QR Code Below

If you are a beginner and do not have an 80m receiver, come anyhow, we have loaner equipment, or we can team you up with someone experienced.

Talk-in 147.36+ (110.9 Tone)

All are welcome but we ask that you RSVP to jamesadf77@gmail.com

COVID Protocols Apply

SARC
Surrey Amateur Radio Communications

Monster dipole can deliver a monster signal

A video shows how Gary Watson, ZL3SV, in Nelson, New Zealand, installed an enormous all-band dipole with each leg extending 320 meters (about 1,050 feet). The antenna is multiple wavelengths on HF, and on 20 meters it has a gain of more than 16 dB, Watson says. It hears quite well, too.

A huge 12:1 balun resembling a utility pole power step-down transformer converts the impedance from 50 W unbalanced to 600 W balanced.

The wire he uses for each leg is aluminum-wrapped, power-line cable (10-millimeter cable with wrap), and he uses power-line fittings, because they're designed to handle the wire. The line has a 60-ton breaking strength. Watson said he made the 600 W ladder line himself and he uses the antenna on all bands, typically running only 200 W. The coaxial feed line goes to his house down a slope from the antenna via a conduit. His home is entirely off the grid, powered by solar power. The noise level is very low at his location, with power lines some distance away, although his solar power system's inverter is nearby.

Watson says he can copy stations with the "monster" antenna that remain undetectable with a half-wave dipole.

~ Portage County AR Service

We appreciate the kind comments from Jim KH6HTV.

If you want to learn more about Amateur TV, this is the best resource I know of. You will find the Repeater newsletter at https://kh6htv.com/newsletter/

GREAT HAM RADIO MAGAZINE

The ham radio club, SARC, VE7SAR, in Surrey, British Columbia, Canada puts out a really great electronic magazine. It is called the Communcator and comes out bi-monthly. The editor is John Schouten, VE7TI. John's magazine is much better than QST in terms of interesting and useful content. The typical issue runs to over 100 pages and does not include advertisements, but all meaty articles. I found out about it when John asked me to write an article for it about ATV. Check out the SARC web site at: *https://ve7sar.blogspot.com/* There you will find a link to their FREE magazine.

Ham Gear For Sale

For sale are **Four 8' long tower sections** = 32' free standing. The bottom anchors are missing as they were left in the concrete after it was taken down. **$75.00 or best offer.**

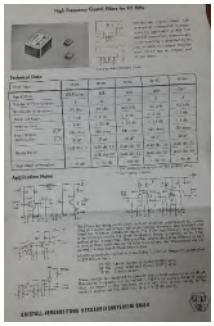
Kjeld also has a rather large Marine Radio (HF boat anchor?) sitting at his home and he'd like to find a new home for it. If you're interested contact him.

Contact: Kjeld VE7GP 604-531-6396 or VE7GP@telus.net

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 McQuiggin VE7ZD/KN7Q mcquiggi@sfu.ca



Crystal Filters

$60 each or both for $100, plus shipping.

I have both the XF-9A for SSB TX and the XF-9B for SSB RX plus matching crystals, sockets and spec sheet. These are high quality crystal filters made in Germany. The TX is unused and the RX is like new.

I can also supply crystals to heterodyne 10-15-20-40-80 m to a 9 MHz IF using a 5-5.5 MHz VFO. And, if you are building a receiver, I can provide 9 MHz IF transformers to match.

WANTED: **Old National Geographic and Reader's Digest Magazines.**

Contact: John VA7XB va7xb@rac.ca or 604-591-1825

A *REAL* SDR Transceiver! Flex-3000 fully SDR 100W Transceiver C$800 with FireWire card and headset adapter (laptop not included)

Great condition but rarely used now. Details at https://www.flexradio.com/documentation/flex-3000-owners-manual/

Free Oscilloscope

Early 80s solid state Tektronix scope. Has a trace, may need some work but you can't beat the price… Free

Contact: John VE7TI ve7ti@rac.ca

May 2021

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1 CONTEST: DE, IN & New England QSO Party (all mode)
2 CONTEST: DE, IN & New England QSO Party (all mode)	3 **On-line Basic Course 19:00 hrs**	4 **1930 SEPAR Net** **2000 SARC Net**	5	6	7	8 CONTEST: CQ-M Intnl DX Contest (CW/SSB) AK QSO Party (all mode)
9 CONTEST: CQ-M Intnl DX Contest (CW/SSB) AK QSO Party (all mode)	10 **On-line Basic Course 19:00 hrs**	11 **1930 SEPAR Net** **2000 SARC Net**	12 **1900 SARC General Meeting [Zoom]**	13	14	15 DX Convention [Zoom] https://dxconvention.com/ Register for workshops and presentations
16 DX Convention [Zoom] https://dxconvention.com/ Register for workshops and presentations	17 **On-line Basic Course 19:00 hrs (REVIEW)**	18 **1930 SEPAR Net** **2000 SARC Net** **On-line Basic Course 18:30 hrs (EXAM)**	19	20	21	22
23/30 30: CQ WW WPX Contest (CW)	24/31 **Victoria Day**	25 **1930 SEPAR Net** **2000 SARC Net**	26 **1900 SARC Exec Meeting**	27	28	29 CQ WW WPX Contest (CW)

For details on all SARC events, go to ve7sar.net

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

June 2021

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 1930 SEPAR Net 2000 SARC Net	2	3	4	5 On-Line Seminar: SEA-PAC 2021 See page 84 CONTEST: SEA-PAC QSO Party 0900-2100 PST. See page 87 KY QSO Party (all mode)
6 CONTEST: SEA-PAC QSO Party 0900-1500 PST See page 86 KY QSO Party (all mode)	7	8 1930 SEPAR Net 2000 SARC Net	9 1900 SARC General Meeting [Zoom]	10	11	12
13	14 NEW On-line Basic Course starts 19:00 hrs	15 1930 SEPAR Net 2000 SARC Net	16	17	18	19 CONTEST: WV QSO Party (all mode)
20 CONTEST: WV QSO Party (all mode) mode)	21 On-line Basic Course 19:00 hrs	22 1930 SEPAR Net 2000 SARC Net	23 1900 SARC Exec Meeting	24	25	26 ARRL Field Day (all mode)
27 ARRL Field Day (all mode)	28 On-line Basic Course 19:00 hrs	29 1930 SEPAR Net 2000 SARC Net	30	For details on all SARC events, go to ve7sar.net		

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

SEA-PAC WAVES

The Pacific Northwest's Largest Amateur Radio Convention

2022 Theme - "Out of the Darkness; Into the Light"

SEA-PAC On-Line Seminars

SEA-PAC Weekend Activities

June 5, 2021

The general theme for the 2021 SEA-PAC on-line seminars is "Preparedness", although there will be other topics.

We're planning a full day of seminars on Saturday, June, 5th, from 10AM PDT until 6PM PDT.

To access the seminars, you'll need to register via the SEA-PAC website and receive the passcode for the Zoom presentations. Registration is free and will soon be located on the "Registration" page.

As the SEA-PAC Seminar planning continues, confirmed seminars will include a Keynote Address by ARRL CEO David Minster, NA2AA; a "NW Division ARRL Forum" hosted by Mike Ritz, W7VO, ARRL Northwestern Division Director; Randy Hall, K7AGE, "Time and Ham Radio"; Barbara Yasson, AC7UH, and Linda Ford, AA6MR, "Go Kits"; David Wahl and Oliver Dully, K6OLI, "Earthquakes in the Northwest and Reporting"; Toby Clairmont, KH7FR, "Communicate After an Emergency"; Alex Swartz, VE7DXW, "Earthquake Detection Via the Ionosphere"

https://SeaPac.org

SEA-PAC Waves

2021 – SEA-PAC QSO Party

Saturday - June 5, 2021, 9:00 AM to 9:00 PM PDT

Sunday – June 6, 2021, 9:00 AM to 3:00 PM PDT

Contest Objective:

To encourage Radio Amateurs in the Pacific Northwest and beyond to work as many stations as possible in celebration of our annual SEA-PAC Ham Conventions, past and future. The format and scoring is intended to reward and encourage the new and casual operator who may not be an active contester. Categories reflect reported mode activity from 2020. To be held in conjunction with the 2021 "Virtual SEA-PAC Convention". Join our 2nd annual SEA-PAC QSO Party for a "*Ham-tastic*" time on the air-waves!

Categories:

- SSB: Low Power <150 watts All Bands (2-points per QSO)
- SSB: High Power >150 watts All Bands (1-point per QSO)
- Digital: All bands, all modes (1-point per QSO)
- Sponsoring Club Stations: W7OTV and W7AIA (20 bonus points each)

(Contest Bands include: 80M, 40M, 20M, 15M, 10M, 6M, 2 meters and 440 MHz)

Contest Exchange:

The contest exchange includes: signal report, your state and the operators name.

Reporting and Results:

We hope that all participants will submit a contest summary form for special recognition and bragging rights. Log submission is not required. A summary of the final results will be available to all who submit a summary sheet. Please let us know how you did!

For information and the results form:

Review this contest outline and download the "fillable" PDF of the results summary page on the Sea-Pac website: www.seapac.org Any questions, email your inquiry to: seapac.qp@gmail.com Attn. Ron O'Connor – KD7VIK

Submit your completed PDF results summary form to: seapac.qp@gmail.com
Attn: Ron O'Connor - KD7VIK

https://SeaPac.org

Radio-Active

Profiles Of SARC Members

John Brodie VA7XB

John Meneghello VA7VGC

I was born and raised in Stewart British Columbia, a small mining town surrounded by mountains and glaciers on the BC /Alaska border. My grandparents were notable pioneers from Venice Italy, arriving in Stewart one hundred years ago. My surname is rarely found in Canada, but it is extremely common in Italy. My father was the first generation born in Canada. He married my mother who was born in the nearby community of Kitwanga British Columbia and was of Scottish and Indigenous descent. Growing up, I was the eldest of four children. It was a somewhat sheltered life in those days. There was no road into town until 1972. We did not have television. Occasionally we could hear two Vancouver AM radio stations in the evening – 730 CKLG and 1410 CFUN. One had to take a boat or plane to get in out of Stewart. I remember the Northland Prince arriving from Vancouver every Saturday bearing groceries and all manner of other supplies.

To help put my life into perspective, I'll share a little of those early years. My grandfather and father believed in investing in real estate. My grandfather bought the defunct Empress II Hotel (there was already a famous hotel bearing that name in Victoria). He eventually shutdown the Empress in 1940 and moved to Vancouver. Stewart became a ghost town during the war years. My maternal grandmother could not take the harsh living conditions and left my grandfather, taking the three younger children with her to Prince Rupert. My father completed grade ten in Strathcona (Vancouver). At 13 my grandfather swore an affidavit that my father was 16 thereby enabling him to go to work in a False Creek shipyard. They returned to Stewart after the war to build the Letisha Hotel (named after my grandfather's 2nd wife). Both my grandfather and father were carpenters, as is my youngest brother. My grandfather and father would buy old houses and rebuild them for rentals. I spent my childhood helping to rebuild these houses and working on other contracts which my father had taken on. Certainly, it would have been easy to take up the trade, but I chose a different livelihood.

It was not an easy life for my grandparents and my father, which I believe reflected on me. I first left home the summer that I turned 16, moving in with a friend's family for the summer. That fall parents were told that there were not enough students for grades 11 and 12, meaning my fellow classmates and I were sent to nearby communities such as Terrace, Prince Rupert, or Smithers. I was fortunate in that my grandmother lived in Coquitlam. I completed senior high school in Coquitlam. Leaving town to go to school was a bit of an ordeal. It meant flying on a very small plane such as a de Havilland Beaver or Grumman Goose for an hour to Prince Rupert and then taking a 737 to Vancouver. I would return for Christmas, Easter, and summer breaks. In Coquitlam, I was suddenly attending a school with 2250 students. That was a cultural shock, to say the least.

Fast forward a few years. We were living in New Westminster. My wife and partner Linda worked two jobs to put me through university. We were married for 5 years before I finished my education at SFU. We have two children. Prior to marriage I worked as a heavy equipment operator at a pulp mill in Prince Rupert, Granduc Mine near Stewart, and after marriage, worked on various construction projects throughout the province. I also worked parttime stocking shelves at BC Liquor stores during the Christmas season while in university.

After graduation I had applied at the Royal Bank, Finning Canada and Chevron Canada. I liked all three opportunities, but it wasn't even close, Finning offered the highest starting salary and quickly hired me as General Line Salesperson. Unfortunately, the economy was heading in the wrong direction in the early eighties, and I was only there for a year and half before being laid-off. I was extremely fortunate in that Chevron hired me the very next day. I spent 29 years in marketing management while in their employ. I managed bulk plants, truck fueling facilities (cardlocks), service stations, and marinas for most of my career, but also spent three years as Assistant Treasurer & Commercial Credit Supervisor. My first assignment, (after spending 6 months at head office), was to move north to Prince Rupert or Terrace to manage Haida Gwaii to Houston. I chose Terrace as it rains less than Prince Rupert. We lived there for three and a half years.

In Terrace I started my community service by joining the Chamber of Commerce, Rotary and Kinsmen service clubs. Along the way I spent 15 years on Chevron's Emergency Response Team. This included learning the basics of the Incident Command System in order to manage oil spills. The company also thought I should obtain my Class 1 license and airbrake certification in the rare possibility of a work stoppage by truck drivers. Managers would be needed to drive semi-trailers and B-Trains. However, my favourite responsibility was marketing the refinery's asphalt inventory. I was able to attend asphalt meetings and conferences in every province and many US States.

Unexpectantly another opportunity came forward and I opted for early retirement from Chevron to form JLM Marketing Limited to manage petroleum marketing consulting for a Calgary based company. No more commuting to downtown Vancouver. I was able to setup an office and work at home. This gig also afforded the opportunity to travel (and play golf) in Canada

SURREY AMATEUR RADIO COMMUNICATIONS

and several US states. This is now a parttime job. However, I more aptly describe myself and my wife as community volunteers. Some of the organizations that Linda and I have raised funds for include JDRF for Type 1 Diabetes, Crossroads Hospice, Michael J Fox Foundation for Parkinson's disease, and the Coquitlam Foundation. I have been on several boards and local organizations including the Kinsmen, Rotary, BC Senior Games (Sgt at Arms), Coquitlam Public Library Trustee, City of Coquitlam's Economic Development Committee, and others. In 2012 I was awarded the Queen's Diamond Jubilee Medal. I was named one of two Canada 150 Community Leaders representing the City of Coquitlam. I have just completed the maximum 6 years on Crossroads Hospice Society board. I am currently a director on the Kinsmen Rehabilitation Foundation of BC where I coordinate a very successful golf tourney to raise money for disabled adults. I am now in my final year on a Ministry of Health regulatory body – College of Dietitians. I am a member of the Tri-City Photography Club as well as the Vancouver Golf Course (hence my callsign VA7VGC). Many years ago, someone convinced me to enroll in the Vancouver Sun Run. I eventually became a Sun Run Trainer and managed to complete a half-marathon. Thankfully, my body allows me to continue to run today.

Linda and I enjoy travelling to different countries as well as visiting family in Ontario each year where we share a lake front cottage. And of course, we like to go south for a few weeks during the winter. My brother has worked in several countries, thereby providing the impetus to visit some foreign cities, including Prague and Helsinki. Our last vacation included visits to Iceland, Finland, and Estonia. However, we have visited many countries in Europe and UK. And of course, travelled to Italy several times to visit distant relatives. We enjoy cruising. We have cruised throughout the Caribbean and the Mediterranean. Our most memorable cruise was in 2012. We visited Venice for a few days and then enjoyed a cruise through (some wonderful) Greek islands to Kotor, Greece and Istanbul. A highlight was touring the ancient city of Ephesus.

Pre- COVID-19 pandemic, my life was very full spending time with Linda and our two adult children, volunteering, photography, golfing, exercising, and travel. But like everyone this past year, the pandemic and lockdown put a stop to our social gatherings and travel. My son, who uses radios for communication while out in the backcountry gave me a handheld radio last summer. As a result, I decided to get my amateur radio license which I completed with Honours in November. I would like to extend a huge thank you to John Schouten, Stan Williams, and John Brodie of Surrey Amateur Radio. I really appreciated the additional time and patience offered to answer all my questions. I just attended the two-day virtual Comm Academy Conference this month. I highly recommend this for new hams. There is a myriad of ham radio avenues that one can learn. I am particularly interested in Winlink, APRS, as well as learning more about amateur radio in order to prepare for a disaster (i.e.: earthquake). I'm hoping to setup a base or mobile station.

From beautiful British Columbia, Canada, I wish you all good health and wellness during these difficult times. And hope to connect with you in the radio world!

~ John Meneghello VA7VGC

The Communicator

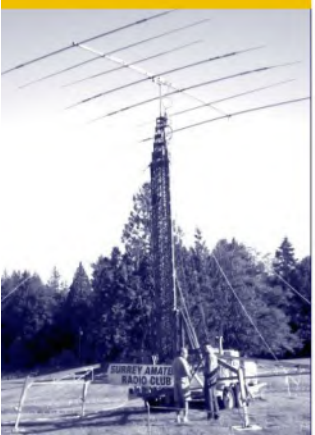
The Monthly Newsletter of the Surrey Amateur Radio Club

June 2011

INSIDE THIS ISSUE...

The **SARC Communicator** is published monthly for members of the Surrey Amateur Radio Club.

SARC maintains a website at **www.ve7sar.net** that includes club history, meetings, news and other information.



SARC PIONEER 'SK'

Mike Heritage VE7CLE Was A Founding Member

The initial Surrey Amateur Radio Club meeting, chaired by Doug Moore, VE7CBM, was held in September 1975 in a classroom at the North Surrey Senior High School. Doug was a teacher at the school and had graduated many new, young Hams from his annual courses. In attendance at this meeting were the founding member VE7's: Doug Moore CBM, Fred Orsetti CJG (now IO), Carl Bertholm CLC, Mike Heritage CLE, Mike Holley AVM, Cary Miller CFC (SK) Vic Medway CON (SK), Cecil Bogies YM (SK), Cory Galbraith CGR, Ken Clarke EZV (now BC), Ron Davies CBT, Ray Sims AXF, Bill Moore BGA, Wayne Horne CNJ, Bob Searle CHB, John Buchanan CTJ (SK), Jim Johnson CSJ (now VA7ET), Al Neufeld CDC, Bill Driscole ARL, Bren McCullough BGM, Lee Hopwood BDZ, Len TAM, and George Cruikshank (SK). Doug Moore was elected President. Mike became Secretary/Treasurer in 1977 and he remained in this position until 1980 he was a very active member of SARC.

Mike's dad was an amateur radio operator and Mike and his dad spent many hours enjoying contacts on CW and SSB. Ham radio was something Mike thoroughly enjoyed especially the Field Day outings on top of Monkey Mountain. The club purchased a generator, a 204BA monoband antenna, and went after first place in Field Day. In addition to finding time to operate the radios, Mike and his buddy Carl VE7CLC, became well known for their ability to provide the Field Day team with excellent food . I'm sure it was the food that helped move SARC into first place in Canada for several years. Mike always provided much fun, laughter and camaraderie during these outings. It was always a pleasure to work alongside Mike on the radio or setting up antennas. He consistently provided a positive approach.

Mike was also an accomplished Harmonica player and provided entertainment at several SARC Christmas parties. Mike continued as an active member of SARC and was always ready to help with club projects or help any member who needed a hand.

In the 90's Mike was diagnosed with Parkinson's disease and was forced to retire from his job. You will notice on his QSL card he proudly displayed the Parkinson's Logo and he became a very active member of the Parkinson's Society. This was typical of Mike, always helping others needing a helping hand. During the last few years Mike found it very difficult to operate his radio as his hands were not steady enough to handle the microphone. Not to be deterred, Mike advanced to operating PSK-31 where he made many contacts, but eventually it became very difficult for Mike to continue with any type of radio communication.

Mike was a close personal friend who freely gave his time whenever it was needed. As recently as last September when I was installing a new antenna on my tower Mike was there to help. His Parkinson's made it very difficult for him but he never gave up and for that I will always admire his endurance. Mike spent many hours discussing Parkinson's with my wife, who is also affected, providing her with information and support. My wife and I will miss Mike very much and we both feel privileged to have known him for almost 40 years through the good and the difficult times.

I believe all who knew Mike and shared his love of life, the outdoors and amateur radio will agree he was a special person. At Mike's celebration of life memorial many guests paid tribute to his generosity and his warm personality.

We take some comfort in knowing that Mike is now at peace and free of the stresses associated with Parkinson's.

DE Fred Orsetti VE7IO

SURREY AMATEUR RADIO COMMUNICATIONS

General Meeting Minutes

March 10, 2021

SARC General Meeting Minutes
March 10, 2021

Attendees: 32

Start Time: 7:05pm

Online Zoom Meeting

Welcome & presentation of agenda

John Brodie VA7XB welcomed everyone to the zoom call and asked for new attendees to self-introduce. The following did so:

- Ray Schneider VA7ASU
- Marvin Hunt VA7HIS
- Cristian Antonescu VA7CTK
- Geoff Higginson VA7HIG (not new but first zoom call)
- Jim McNee VE7GD (was a member many years ago)
- John Meneghello VA7VGC
- Kapila Jayaweera VE7KGK (not new but first zoom call)

Geoff Higginson VE7HIG moved to accept the agenda; Kapila Jayaweera VE7KGK seconded. Carried

Announcements

Upcoming meetings

- The April meeting will include an introduction to Fox Hunting scheduled for May plus Resource Roads and APRS (John Schouten/Jeremy Morse)
- The May meeting will be Field Day Planning
- The June meeting is our AGM and election of 4 directors, but it has been deferred to September.

Committee Reports

Financial (Scott Hawrelak VE7HA)

- Scott presented the financial report and made a last call for name badges. The new procedure means badges cannot be picked up locally and must be mailed out. So we will be only ordering once a year.
- John B: John Schouten needed to purchase toner cartridges for the printer used for ham class, at a cost of $399.99 + tax.
- A used PBX phone was purchased for the OTC by Kevin McQuiggin VE7ZD: Cisco SP504 $30 plus attendant console sidecar $50. SARC Ham Shack hotline number is 11858
- John Schouten VE7TI moved that we donate $500 to SEPAR from the Ham Class funds. Seconded by Geoff Higginson VA7HIG. Carried

Communicator (John Schouten. VE7TI)

The latest edition of the Communicator (112 pages) went out on March 1st, with much positive feedback received. Latest readership country count is 132 countries.

SURREY AMATEUR RADIO COMMUNICATIONS

SEPAR (Gord Kirk VA7GK)

SEPAR is Surrey Emergency Program Amateur Radio and consists of many volunteers for the City of Surrey. SEPAR has a radio room at Fire Hall #1, and is working to establish the new OTC (Operations & Training Centre). Those interested in volunteering their radio skills please contact va7gk@shaw.ca. It requires a criminal background check and a form to be filled out to volunteer for the city. SEPAR is also working with NEPP (Neighborhood Emergency Preparedness Program).

OTC (Gord Kirk VA7GK)

The new OTC is located at the South Fraser Search and Rescue Society building 5752 142 St. Surrey V3X3A3. It is very close to the old OTC which is across the parking lot. Surrey Fire Services has made space for our portable tower, and relocated buses blocking this location.

Net (John Brodie VA7XB)

John B: We still need net control operators as we have no backups. Contact John if you are interested.

Repeater (John Brodie VA7XB)

John B: Intermodulation interference continues to be a problem on the North repeater, resulting from a nearby AM station at 600 KHz. Work continues with the help of Dave Cameron. Repeaters are located at:

- North site: King George Blvd & 100th Ave (Concord tower) with IRLP and Echolink.
- South site: 128th St and 62A Ave. (Telus tower). This is a C4FM/Analog repeater.

Foxhunt (Anton James VE7SSD)

- John B: The annual SARC Fox Hunt will be held Saturday May 8th/2021 at Crescent park South Surrey. We will start gathering at 9am and commence the hunt at 10am *[Note: Now postponed to August 28].*
- Anton James VE7SSD is monitoring the COVID situation closely and will be able to determine if we can have a BBQ or not by the April meeting. 80m receivers will be available to borrow or purchase at the event.

Membership (John Brodie VA7XB)

Membership is currently 120 plus 133 ham class students/graduates plus another 40 in the upcoming March class for a total of 293. Ham class students are designated as provisional or prospective members but otherwise eligible to participate in all society activities and receive the Communicator.

Ham Class (John Schouten VE7TI)

- John S: We have wrapped up the January class with about 64 participants from across Canada including a few on the East Coast. Exams have started and 17 people have passed to date with more exam sessions planned. We have to keep the exam session small due to COVID restrictions. The Firefighters from the Okanagan have taken their exam locally. The success rate is quite high with an average mark above 90%. Congratulations to Marvin Hunt who scored 100%. March 29 we start again with another round of students. The demand is very high and we are trying to run a new class every 10 weeks.
- John B: A big thanks to John S. VE7TI for the huge effort he puts into the preparation of the course and 3 nights a week training new students. John S: There are other people involved in the course. John VA7XB helps organize the class from an administration standpoint, and co-teachers Stan VA7NF and Kevin VE7ZD do their part.
- Jason B: Field Day is June 26/27 and planning will commence soon. After consulting with the Elmers group we are considering a multi station this year operating from the OTC, EOC and some

home stations. It's not known if the city would approve a public event at this time, neither do we know yet what the ARRL rules for FD will be around COVID/safety. Will need 5-6 people to help get us organized and to meet weekly (virtually). There has been significant effort from the senior members on past events but if you are newly licensed this is an opportunity to apply your theoretical knowledge to a practical use. Please let Jason know at va7itj@winlink.org or j.w.biggin@gmail.com if you can help in the planning.

- John B: To a certain extent the details will need to be deferred a while yet. We aim to get the OTC up and running before FD.
- Gord K: Field day is a 24-hour contest that is in effect a simulated emergency activity. Normally we set up at a public location using generator power and camp out overnight. FD is the form of a contest but allows us to use our radio skills.

New Business

Jinty Reid VA7JMR: Wanted to let everyone know that the 85-89 age group can begin booking COVID vaccines as of noon tomorrow.

Presentation

Success with FT-8 (Kevin McQuiggin VE7ZD). Thanks to Kevin for a stimulating talk *[see column right]*.

At 9:21pm Gord Kirk moved that we adjourn; seconded by Kevin McQuiggin; carried.

A post meeting social and FT-8 Q&A session continued after adjournment.

~ Jeremy Morse VE7TMY

Success With FT8

Kevin McQuiggin, VE7ZD/KN7Q

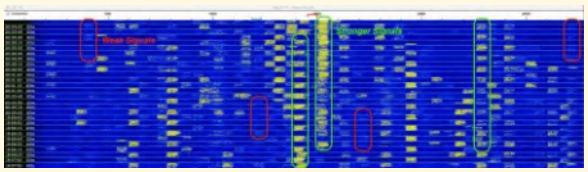
The presentation is available at: https://drive.google.com/file/d/1Xl0raVHyvW_liZ0Tt7G9rB1fevXbMWxx/view?usp=sharing

Basics for newcomers and those wanting to give the mode a try • Operating tips to make more, or more distant, QSOs. I've made 4,836 QSOs since my return to the ham radio in December 2018: 4,344 were using FT8, 491 were using other digital modes, plus ONE CW contact!

FT8 was developed primarily by Dr. Joe Taylor, K1JT, a physics professor at Princeton University in New Jersey. The mode is one of a number of digital modes available through the open source "WSJT-X" software package. WSJT-X focuses on weak signal communications: it is able to detect the very weakest signals in a receiver's audio passband.

FT8 has revolutionized HF operation and now accounts for the largest percentage on contacts on HF, and a significant percentage of QSOs on VHF as well.

WSJT-X Specializes in Weak Signal Detection. Due to some very sophisticated digital signal processing, WSJT-X (and modes like FT8) can detect signals that (amazingly) are BELOW the "noise floor" of your receiver. What this means is that the program can detect and decode signals that you cannot even hear above the "hiss" of the audio passband on your radio.



General Meeting Minutes

April 14, 2021

SARC General Meeting Minutes
April 14, 2021

Attendees: 56

Start Time: 7:00 pm

Online Zoom Meeting

Welcome & Introduction

Call to Order and Introduction: John Brodie VA7XB welcomed everyone and asked that new attendees introduce themselves. Gord VA7GK moved to accept the agenda; seconded Steve M; carried

Announcements (John VA7XB)

- WARD (World Amateur Radio Day) starts 5 pm Sat evening April 18th to 5 pm Sunday evening. See https://Rac.ca for more information. Members are encouraged to participate and make contact with RAC stations.
- The AGM is deferred to Sept. Current Directors will remain through the summer.
- Ask an Elmer: This is a new feature, to be after the meeting.
- RAC Advanced Course: Registration requires participants to be RAC Maple Leaf Members. https://www.rac.ca/rac-advanced-course-for-maple-leaf-operators-summer-2021/
- Give Aways: Surplus society furniture is to be given away Saturday at 10 AM. More under the OTC update topic.

Committee Reports

Financial (Scott)

- A $500 donation was made to SEPARS.
- A $100 donation was made to Orchard City Radio Club in thanks for helping with course exams.
- Payments are now coming in for the next basic course.
- Last call for the name badges ($10); orders will be taken once a year.

SEPAR (Gord)

- SEPAR Surrey Emergency Program Amateur Radio.
- Contact VA7GK@shaw.ca for more info.

OTC (Gord)

- We are moving ahead with the new Operations & Training Centre with the objective of having it operational by Field Day.
- Free tables and chairs will be offered to members at 10am Saturday.

Field Day (John VA7XB))

- The Field Day planning committee has been meeting weekly. Contact Jason if you would like to participate. Rules will likely be the same as last year, i.e. not a public event.

SURREY AMATEUR RADIO COMMUNICATIONS

Communicator (John TI)

- The Communicator is published every 2 months with 130 countries and 5000 downloads a month. We will soon publish the May/June edition and require contributions of articles or stories.
- The Communicator has a swap meet/buy sell section. Contact communicator@ve7sar.net if you have an item for sale.

Ham Class (John TI)

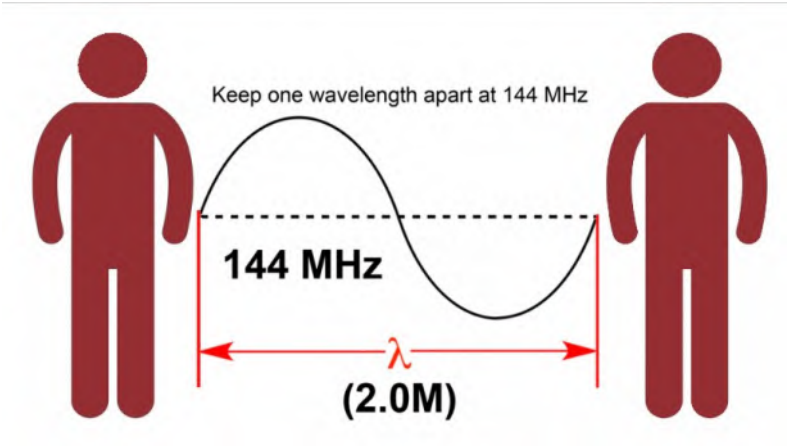
- Week 3 is concluded and the interest is quite high as a hobby, for outdoor activities and emergency use. A new class will be offered about every 10 weeks.

Repeaters (Steve/Gord)

- Steve McLean: Nothing new to report in the last couple of weeks. The intermod problem will be revisited when the weather improves.
- Gord Kirk: Dave Cameron has been testing a remote-receive function for the UBC repeater using our site and if it is successful, we may consider separating the RX and TX for our repeater.

Foxhunt (John/Les/Anton)

- John Brodie: It is being planned but we may have to cancel depending on Health Orders. Decision will be made at our Directors meeting April 28th. *[Note: Now postponed to Saturday, August 28].*
- Anton James: Email Anton at jamesadf77@gmail.com if you wish to participate.
- Les Tocko : although this is an 80m event, bring your 2m radio equipment if you can.



New Business

None.

Presentations

1. Foxhunt Introduction (Les Tocko VA7OM)

See: https://ve7sar.blogspot.com/search/label/Amateur%20Radio%20Direction%20Finding

2. Using RR and LADD frequencies properly (John VE7TI) See the article starting on the next page and

https://ve7sar.blogspot.com/2021/04/more-on-ladd-and-rr-frequencies-for.html or the video available via our SARC YouTube channel at https://youtu.be/SjwCSLSZtXk

3. APRS (Jeremy VE7TMY) - presentation not available, but a good overview is available at Bob Bruninga WB4APR's website: "The Global APRS Messaging Initiative" http://www.aprs.org/aprs-messaging.html

Adjournment

John Schouten moved to adjourn at 9:02pm; seconded by Steve McLean; carried.

~ Jeremy Morse VE7TMY

April General Meeting Presentation

John Schouten VE7TI

Back-country operation and the radio regulations

Note to our readers that this presentation refers to laws in British Columbia, Canada. Your jurisdiction may differ. A YouTube video of the meeting presentation is available at: https://youtu.be/SjwCSLSZtXk.

It has become apparent from our Basic courses that there has been a great deal of discussion, confusion, and misinformation surrounding the legality of the off-road community using so-called LADD and RR frequencies while travelling the back country. Many of our SARC Basic class students take the course to become certified and are under the impression that having an amateur radio operator certificate gives them legal access to LADD and RR frequencies with amateur equipment. To shed some light on this oft discussed subject, and perhaps avoid forfeiture of equipment or a fine, this monthly meeting presentation offers an explanation.

The focus in this column has two question bank entries that apply. One has to do with the equipment, the other with the licencing or certification requirement:

Question B-001-006-006

Some VHF and UHF FM radios purchased for use in the amateur service can also be programmed to communicate on frequencies used for land mobile service. Under what conditions is this permissible?

A. The equipment has an RF output of 2 watts or less

B. The equipment is used in remote areas north of 60 degrees latitude

C. The radio is certified under the proper Radio Standards Specification for use in Canada and is licenced by Industry Canada on the specified frequencies

D. The radio operator has Restricted Operator's Certificate

And the second question:

B-**001-006-005**

Which of the following statements is NOT correct? A person may operate radio apparatus, authorized in the amateur service:

A. only where the person complies with the Standards for the Operation of Radio Stations in the Amateur Radio Service

B. only where the apparatus is maintained within the performance standards set by Industry Canada regulations and policies

C. except for the amplification of the output power of licence-exempt radio apparatus outside authorized amateur radio service allocations

D. on aeronautical, marine or land mobile frequencies

I will be quoting frequently from Innovation, Science and Economic Development Canada regulations and policies and will refer to them hereafter as 'ISED'.

Some definitions…

Amateur Radio Service

Amateur radio service means a radiocommunication service in which radio apparatus are used for the purpose of self-training, intercommunication or technical investigation by individuals who are interested in radio technique solely with a personal aim and without pecuniary *[monetary]* interest.

An Applicable Basic Amateur Radio Certificate Restriction

According to Radio Information Circular (RIC) 3

4.4.1 Basic Qualification

The following privileges and restrictions are applicable to the Basic Qualification:

- re-programming of radio equipment to operate in the Amateur Bands if this can be done by a computer program

Note: No physical modifications to the circuitry of the radio are permitted.

Land Mobile Service

Radiocommunications Regulations state:

Land mobile service means a radiocommunication service that provides for communications between mobile stations and

(a) fixed stations,

(b) space stations, or

(c) other mobile stations

Mobile Station

A Mobile Station is also defined on the ISED website as: "a radio station intended to be used while in motion and during stops."

Commercial Licence Radiocommunication Services and Stations

Per the Canada Radiocommunications Regulations:

s.3 It is a term of a radio licence that the holder of the licence may

(a) install, operate or possess radio apparatus to perform any of the following services, as authorized by the radio licence, namely,

(i) aeronautical service,

(ii) amateur radio service,

(iii) public information service,

(iv) developmental service,

(v) fixed service,

(vi) intersatellite service,

(vii) land mobile service,

(viii) maritime service, and

(ix) radiodetermination service; and

(b) install, operate, or possess radio apparatus at a fixed station, mobile station or space station as authorized by the radio licence.

Mobile Stations s.60 (4)

The radio licence fee payable in respect of radio apparatus installed in a mobile station that operates in the land mobile service is the applicable fee set out in item 5 of Part I of Schedule III for all authorized transmit and receive frequencies.

S.63 The fee, for the applicable metropolitan or other area, set out in Part IV of Schedule III for each assigned transmit or receive frequency (Sections 56 and 60) Fee Schedule Applicable for a Mobile Station in any Service other than the Amateur Radio Service

- Mobile station in the land mobile service – monthly $3.40 - annually $41.00

Licences, Certificates and Callsigns

The Amateur Radio Service requires the operator to hold an amateur radio operator's certificate. Traditionally, amateur radio operators were issued two separate authorizations: An Amateur Radio Operator Certificate and a radio station licence. The Amateur Radio Operator Certificate was issued for life and had no fee associated with it, while the radio station licence was issued on a yearly basis and a licence renewal fee was charged.

Effective April 1, 2000, ISED combined these documents into one authorization, the Amateur Radio Operator Certificate. This certificate is the sole authorization required to operate amateur radio apparatus in the amateur radio service.

A callsign is assigned when you receive your amateur certificate. This is required for the purpose of station identification. For a fee, additional callsigns can be requested by contacting the Amateur Radio Service Centre. Your callsign covers all your base, mobile, and portable radios at that location, and allows you to operate within any of the amateur bands (frequency ranges) for your certification class. Fixed stations at separate locations require a separate callsign for station identification.

A radio operator certificate is required only in the aeronautical service, maritime service, and the amateur radio service. (per s.33 of the Radiocommunications Regulations). A radio operator certificate is not required in the Land Mobile Service but each radio requires a separate licence (callsign); this is different than your Amateur certificate. So, if you own a mobile and a portable used on a commercial band, you would require two licences. You pay per radio, not per frequency in the radio, but each frequency in the radio must be listed on that radio's licence.

'Type-Approved' Radio Equipment

Contrary to Amateur Radio, commercial radio is *pre-programmed* to operate on specific frequencies and cannot be *user programmable*. So, you cannot actually "attempt" to transmit on an amateur frequency if it does not already exist in the radio. Commercial radio equipment must pass testing to ensure it does not create interference and is compliant with both ITU and Canadian regulations. This is referred to as being "type-approved". Radio equipment is approved according to the bands and purpose for which it is marketed, and a lower standard exists for amateur equipment than commercial. Unlike Amateur Radio, where we can choose our own frequency to operate (if it is within an Amateur band), commercial radios are not permitted to be frequency-agile. For example, a trucker cannot one day decide to set up a talk channel on a frequency that is not already designated and licenced by ISED for trucking. Commercial radios modified to be programmed by the operator in the field are not type-approved and can not legally be used on commercial frequencies.

A commercial VHF radio's frequency range will typically be capable of covering all or a portion of the amateur VHF band. The amateur VHF band is 144-148 MHz; you will find commercial radios with ranges of 136-174 MHz, 146-174 MHz, 136-152 MHz, or similar. So amateur frequencies *CAN* exist in a commercial radio, but they would have to be programmed in and the operator licenced to use them in a specific band.

Surplus and new commercial radios are readily available and may be programmed and used by amateur radio operators within the *amateur* bands for which YOU are certified. If you are an amateur radio operator and have a licence for your commercial radio, you can have your commercial frequencies and your amateur frequencies in the same commercial VHF radio, but they must be *professionally programmed* to avoid errors.

VHF and UHF commercial gear is better quality because they have more stringent specifications than amateur radios and have minimal operator controls for ease of use, typically only an on/off and volume control, squelch, and a channel selector.

One more caveat. Since 1997 narrow band equipment has been implemented in North America for VHF commercial radio equipment. This means that twice as many channels can be assigned as each channel takes up only half the bandwidth. Channels are now specified narrowband (11 kHz) with a maximum transmitter power of 30 watts, or as otherwise indicated. *Amateur radio equipment is not narrow-band* and causes interference on narrow-band channels. This is one of the reasons Amateur radio equipment is not permitted on commercial frequencies. If you buy an older commercial radio it may not be narrow band and would no longer be type-approved for certain commercial frequencies.

SURREY AMATEUR RADIO COMMUNICATIONS

...it is not illegal to program an amateur radio to receive outside of the amateur band, or possess such a radio if you have a licence, but it's illegal to use it to transmit outside of the amateur band

So, amateur radios cannot be used to transmit on commercial frequencies, in part because they do not necessarily meet the specifications required for use in the commercial (land mobile) radio service, and in part because ISED does not want commercial users to be able to program frequencies on the fly, generally assuming that the commercial users are not radio hobbyists and therefore would not have the knowledge to correctly program a radio.

Lastly, it is not illegal to program an amateur radio to receive outside of the amateur band, or possess such a radio if you have a licence, but it's illegal to use it to *transmit* outside of the amateur band. Some amateur radios come from the factory able to transmit outside of the amateur bands, but this is not ISED approved.

LADD Frequencies

In Canada, the LADD (or LAD) VHF channels (Logging ADministration Dispatch) were originally intended for commercial trucking, general communications in forestry & logging, heavy mining, and exploration and petroleum. These are also known in Western Canada as the "Opens". Their use is governed by Industry Canada and require a licence and compliant, type-approved radio equipment. Click here for info about ISED licencing.

Due to the wider availability of low cost amateur VHF FM radios and the decline of CB Radio, recreational users have adopted them for back country communications and, for those who do not have reliable cellular service, especially survivalists and preppers, they are marketed as an essential communication resource. Users of LADD channels require *commercial type-approved equipment and require a corresponding licence for the radio - NOT AN AMATEUR RADIO LICENCE* to comply with the regulations. Also, in keeping with Spectrum Canada regulations, it is important to note that there are geographic restrictions where LADD channels can be used to prevent interference to adjacent users.

ISED has approved four LADD channel frequencies for radio licencing. Companies or individuals with only one or two radios no longer have to wait for a letter of permission from an existing radio channel holder in order to licence their radios. Their radio supplier can apply with ISED on their behalf for the use of 154,100Mhz (Ladd-1), 158.940Mhz (Ladd-2), 154.325Mhz (Ladd-3) and 173.370Mhz (Ladd-4) in their ISED approved commercial VHF radios. Larger companies may apply for a commercial (shared) channel frequency if they have many mobile vehicles needing to be dispatched from an office base station.

For legacy compatibility, LADD1-LADD4 channels use normal FM (FM is +/-5 kHz deviation, bandwidth 16 kHz, max bandwidth 20 kHz), while most of the other channels increasingly use Narrow NFM (NBFM is +/-2.5 kHz deviation, bandwidth 11 kHz, max bandwidth 11.25 kHz). Normal FM has slightly longer range than Narrow FM (see the RadioMaster article FM versus NFM for Best Radio Communications). If you are using NFM and reception is loud and distorted, try FM instead.

Resource Roads

Background

Mobile radio communication on resource roads had been historically highly variable across the Province of British Columbia (BC) for a multitude of reasons:

- Road users were required to know unwritten local protocols
- Heavy radio traffic caused overlapping calls and interference
- Radios had to be reprogrammed to local channels with each location change
- Road signage was inconsistent and unclear

A standard mobile radio communications protocol was developed to standardize and simplify, and thus make travel on resource roads safer.

Refer to the ISED page RR — British Columbia Resource Road Channels

ISED RR channels are specified narrowband (11 kHz) with a maximum transmitter power of 30 watts, or as otherwise indicated. These channels must only be used in locations where it is specifically posted for usage. Improper usage, for example "chit chat", will result in harmful interference to other resource road and loading usages or to other priority radio spectrum users. All channels are designated such that they cause no interference to other users and must accept interference from other priority users.

Mobile Radio Station Licence Application

In the Province of British Columbia, Resource Roads are typically one or two-lane gravel roads built for industrial purposes to access natural resources in remote areas. Over 620,000 kilometers of roads on the British Columbia landbase are considered resource roads.

Two-way radios using these channels require a mobile radio licence. The use of amateur, marine or user programmable radios is not permitted.

The BC Forest and Range Practices Act regulates the use of these roads and radio communications. Outside BC check your applicable legislation.

FOREST SERVICE ROAD USE REGULATION *[current to 2020-07-28]*

Use of 2-way radio

s.5 (1) A driver on a forest service road who uses a 2-way radio to communicate with other drivers on the road must announce, in accordance with any road markers posted at intervals along the road,

(a) his or her position, and

(b) the branch of the road being travelled if the radio's signal can be received on more than one adjacent branch of the road.

(2) Subsection (1) applies to a driver only if

(a) the driver uses a radio frequency provided by the holder of a private commercial radio station licence, or other licence under the Radiocommunication Act (Canada) and the regulations under that Act, to communicate with the other drivers, and

(b) the forest service road is posted with a sign that indicates the radio frequency that is to be used.

[Editor's note: This legislation says 'MUST announce, in accordance with any road markers' and appears to make it illegal for anyone ***without*** *proper communications - i.e. a licenced commercial type-approved radio with programmed RR channels, to drive on a Forest Service Road if marked with RR signage.]*

Liability insurance

s.12 (1) A person must not operate or cause to be operated a motor vehicle or trailer, other than a motor vehicle or trailer described by section 2 (5) of the *Motor Vehicle Act*[1], on a forest service road unless

(a) the driver, motor vehicle and trailer are insured under a valid and subsisting contract of accident insurance providing insurance against liability to third parties in the amount of at least $200 000, and

(b) the driver carries written evidence, supplied by the insurer, of the insurance referred to in paragraph (a), or a copy of that written evidence, and produces it, on demand, to a peace officer or an official.

(2) Motor vehicles operated by the government that are subject to a government self-indemnification plan are exempt from the requirements of subsection (1).

[am. B.C. Reg. 354/2004, Sch. B, s. 2.]

[Editor's notes: [1]For clarity, the insurance exemption under section 2 (5) of the Motor Vehicle Act referred to above is for farm implements.

If travelling on a Resource Road the vehicle or trailer must have third-party liability insurance of minimum $200,000 and proof must be carried and shown if requested by a peace officer or official.

A reminder also that anyone operating two-way radio equipment is subject to any applicable distracted driving legislation that may be in force.]

Offence

s.13 (1) A person who contravenes section 3 (3), 5 (1), 6 (5), 10 (1) or 11 (1) or (3) commits an offence and is liable on conviction to a fine not exceeding $5 000 or to imprisonment for not more than 6 months or to both.

(2) A person who contravenes section 4, 6 (3) or (4), 7, 8 or 12 (1) commits an offence.

Resource Road User Safety Recommendations

http://www.bcforestsafe.org/files/tk_pdfs/gde_resrd.pdf and Resource Road Radio Communications

Government in collaboration with industrial and other stakeholders has moved forward with implementation of standard radio communication protocols on Forest Service Roads (FSR) and other natural resource roads across the province. FSRs with industrial activity and many other resource roads have adopted and are using the standard protocols which consist of:

- standard call protocols - call content and order
- standardized signage
- dedicated, standardized bank of resource road radio channels

The standard bank of resource road mobile radio channels is available, to those with applicable *[NOT Amateur]* mobile radio licences, for programming at local commercial mobile radio shops.

It is important to note that not all resource roads have adopted the protocols and standard bank of resource road radio channels. It is recommended that road users retain current radio frequencies until such time that they are sure they are no longer required.

Most resource roads are "radio assist" and use of mobile radios for communicating location and direction is not mandatory. Always drive safely according to road and weather conditions and if using a mobile radio, do not solely rely on mobile radio communications recognizing that not everyone has or is using a mobile radio.

In the transition to new resource road radio channels and communications protocols, resource road users are advised to exercise additional caution when traveling on resource roads. Drive safely according to the road conditions and weather at all times. This should be communicated by employers to all their affected employees and contractors.

Most Forest Service Roads and natural resource roads are radio-assisted, but not all roads are radio-controlled. Road users are reminded not to drive exclusively according to the radio. Where posted, road users using mobile radios must use the posted channels and call protocols.

Channel Maps

A standard bank of resource radio channels has been provided by Innovation, Science and Economic Development Canada (ISED) for dedicated use for mobile radio communications on resource roads in BC. By agreement, the Ministry of Forests, Lands and Natural Resource Operations is responsible for administering the use of the standard bank of resource road radio channels in BC.

The standard bank of resource road radio channels has been distributed across the B.C. landscape to minimize the likelihood of interference. Channel assignment maps have been developed, and periodically are changed, to reflect channel assignments as planning tools. The maps should not be relied upon for appropriate channel selection in the field as in some cases, the channel assignments have not been implemented on the ground. The radio channel signage in the field will always govern over the maps. See the mobile resource road radio planning maps:

Resource Road Radio Channel Planning Maps

Best management practices for mobile 2-way radio use on resource roads in BC, installation and maintenance

Radio requirements on BC resource roads (and elsewhere) will be for narrow-band communications. Radios manufactured after 1997 have this capability but older radios may only communicate with wideband transmissions. Wideband transmissions sound overly loud when received by narrowband radios and narrowband calls received by these radios may sound too quiet. Wideband radios should be replaced with newer, narrowband capable radios.

FRS, GMRS and Other Common Non-Amateur Frequencies

It should be no surprise to you that the licence exempt radios marketed for these bands are very low power and have narrow channel spacing. Licence exempt devices include cordless telephones, baby monitors, family radio service (FRS) walkie-talkies, remote garage door openers, or wireless local area networks. Although licence-exempt radio devices generally transmit signals at low-power levels, the power level alone does not determine if a licence from Industry Canada is required. By law, licence exemptions only apply to radio equipment that has been tested and certified to comply with specific technical standards and operates in specially designated frequency bands.

For the General Mobile Radio Service (GMRS) in Canada transmit power is capped at 2 watts by law, while the units sold in US can operate at 5 watts. Everything else is the same - frequencies and the communication standard. One needs a BS licence to operate a GMRS radio in the States (easily obtainable by anyone and does not require any test), but no licence is needed in Canada.

These devices may not be modified or fitted with different antennas. It is NOT permissible for you to transmit on any of these channels with your amateur equipment as you will exceed power and/or bandwidth limits. As with other frequencies, you may monitor them as receive only.

The answers to our original questions

Some VHF and UHF FM radios purchased for use in the amateur service can also be programmed to communicate on frequencies used for land mobile service. Under what conditions is this permissible?

C. The radio is certified under the proper Radio Standards Specification for use in Canada and is licenced by Industry Canada on the specified frequencies

You can wade through RSS-119 – Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services, but it all boils down to: "The radio is certified under the proper Radio Standards Specification for use in Canada and is licenced by Industry Canada on the specified frequencies."

And the answer to the second question:

Which of the following statements is NOT correct? A person may operate radio apparatus, authorized in the amateur service:

D. on aeronautical, marine or land mobile frequencies

You are certified to operate ONLY on the frequencies assigned to the Amateur Service. This means "on aeronautical, marine or land mobile frequencies" is incorrect.

So there it is. I'm not preaching but simply passing along the existing regulations and policy. These rules exist for a purpose. Do with it as you will but be aware that there is enforcement and you are subject to the penalties if you are caught.

~ John VE7TI

[Thanks to Kasun Somaratne (ISED) for the review of this article to confirm it reflects current ISED policy and regulation.]

SURREY EMERGENCY PROGRAM AMATEUR RADIO

SEPAR Report

A busy time despite COVID

Gord Kirk VA7GK
SEPAR Coordinator

SEPAR has enjoyed a busy few months. Our monthly Zoom meetings and weekly nets continue to be well attended both by SEPAR members and guests.

In the month of April several SEPAR members attended the Virtual Comms Academy event.

https://www.commacademy.org This event is normally held at a Community College in Seattle but due to COVID the organizers created a Virtual Event. With the event being online several more Lower Mainland amateurs were able to attend. The sessions are focused on communications during emergency events. They also had sessions on grounding for your shack, and on Winlink. One of the presentations was also on the Incident Command System and creating the understanding of how it is used both in planning for, and during an event.

As the ICS is used in BC it was very helpful to have the SEPAR group gain an understanding in a very practical talk on how it can be used.

During our monthly meetings we have discussed several topics:

In February we discussed building your station. Both home and mobile/portable. As most new amateurs start with a hand held portable radio we discussed the value in using a better "gain" antenna. In vehicles this usually means an external antenna. Better signals are more easily understood from "noise" and usually mean further coverage when using simplex, as well as the repeater. We talked about the need for emergency

SURREY EMERGENCY PROGRAM AMATEUR RADIO

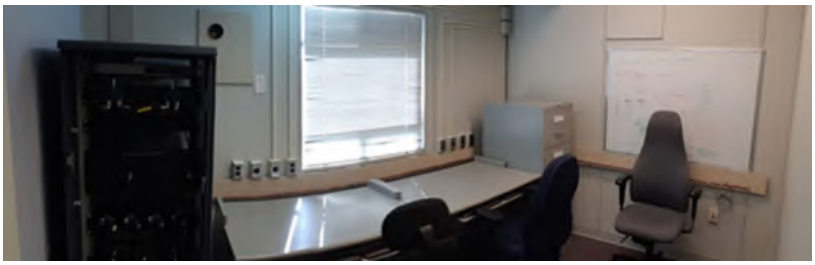
communications likely occurring during a power outage and how a back up source of power, extra charged batteries are something those involved in the emergency program should have.

In March we had a new class of licensed amateurs graduate from the Surrey Radio Licensing Course put on by SARC. With this in mind we did a "virtual" introduction to SEPAR. Who we are, what we do and our available equipment to provide communications. Of course the ideal situation is each amateur as their own equipment and is familiar with how to use it. For deployment SEPAR does have three Grab and Go kits. A short YouTube video describes these: https://youtu.be/E-a0yC--k6Q. As well we have a radio room in Fire Hall 1 to support the Emergency Operation Center (EOC). There is also a portable station in our Trailer fully equipped with HF, VHF/UHF, and Digital Communications. [John do you have a picture of the SEPAR trailer you can add in here?] During the meeting we discussed our weekly nets and how this is training every week for radio use during an activation. If anyone wants to try running a net we will train them and support the through proper net management.

In April we reviewed one of the Communications Academy videos and had a very good discussion about supporting our community after an earthquake. We have been working on a community communications plan to link our city's Neighborhood Emergency Preparedness Program (NEPP) with our SEPAR program. One of the gated communities within the city has recently had members of their NEPP program graduate from the Amateur Radio Licensing course. One of our members recently visited and attempted to conduct a pathway test for communications from the community to the SEPAR weekly net. They are working on setting up a radio in their community clubhouse building. A great start for their program.

Our big news is we finally have access to the new "Operations and Training Centre" (OTC). We have a new room in the Search and Rescue Building. We have started moving into the room. Our radio grounding has been installed as well as the power outlets. The Fire Department which manages the Cities Emergency Program was able to have 30A power outlets installed along with generator outlets to ensure we can continue to operate should the power fail.

The room has the computer rack moved in and the two desks for the stations. While doing this work the storage container and room have been gone through and old desks, chairs etc. have been disposed of. We have also moved the portable tower into position and are working on the anchor installation and getting the coax into the radio room. We have had a small group working on this each Saturday morning to get the room ready for Field Day this year.



The new OTC radio room, and the mobile tower placement

Due to Covid we are planning on how we can conduct a smaller field day at the OTC and possibly a couple of other locations to allow proper "physical distancing".

SURREY EMERGENCY PROGRAM AMATEUR RADIO

As a reminder we still run the "Weekly Winlink" net in conjunction with our voice net. Each week the participants are sent an email asking for them to respond to a question or use a template over the next week. If you are interested in participating, please send an email to VE7HME@winlink.org and the digital net controller will add you to the list. This digital net has been running for over a year and we have had several hundred check-ins over that time. The net has participants from within and outside Surrey and is open to anyone who wants to join in. This allows us to weekly use our digital email and make sure everything works.

Don Hamilton VA7GL has been running this for the entire time. He has now asked for others to help him with this and Ion VE7NL and Drew VA7DRW have stepped up to assist. I want to thank Don for his hard work in getting this set up and working as well as running it for all this time.

We encourage your involvement and will help get you started with Winlink if you need assistance.

SEPAR holds monthly meetings on the 4th Thursday of the month at 7:00 pm. For now these are being conducted on Zoom. These meetings are open to all interested amateur radio operators and those considering getting licensed. If you want to be added to our email distribution list please send us a message using the contact form on our website. The website is www.separ.ca. The contact form is on the very bottom of the main page.

~ Gord Kirk VA7GK
SEPAR Coordinator

Name	Frequency	Offset	CTCSS
VE7RSC (Primary Repeater)	147.360	+0.600	110.9
VE7RSC (Secondary Repeater)	443.775	+5.0	110.9
VE7RPT (Primary Regional Repeater)	146.940	-0.600	Optional 136.5 Rcve
Simplex 1	(VHF) 146.550		
Simplex 2	(VHF) 147.420		
Simplex 3	(UHF) 446.550		
Simplex 4	(UHF) 447.425		

Other frequencies in the Greater Vancouver area:

Primary:	Coquitlam/Abbotsford	146.430
Primary:	Inter-Municipal Group 3	146.445
Primary:	Vancouver; Mission; Sec. Coquitlam	146.460
Primary:	Kent-Mission; Sec. Richmond	146.475
Primary:	Inter-Municipal Group 2	146.490
Primary:	New West; Sec. Richmond	146.505
National	Calling / FM Simplex Group I	146.520
Primary:	North Shore; Port Coquitlam	146.535
Primary:	Bowen Island; Surrey	146.550
Intermunicipal Group 1 Coordination		146.565
Primary:	Lions Bay/Vancouver/Delta/Langley	146.580
Primary:	Port Moody; Sec: Burnaby	146.595
Secondary:	Vancouver/Surrey	147.420
Secondary:	Vancouver (UBC) / Maple Ridge	147.450
Primary:	White Rock/Chilliwack; Sec. No. Shore	147.480
Secondary:	Burnaby/Pitt Meadows	147.510
Primary:	Delta; Sec: Abbottsford	147.540
Primary:	Hope; Sec: Delta; ALSO EMBC	147.570

Surrey Emergency Program Amateur Radio

We're QRT for this issue

Our Vision for Field Day 2021

John Brodie VA7XB

Field Day, always on the 4th weekend of June, is the annual event that tests our ability to set up quickly and demonstrate readiness for a disaster requiring emergency communication. SARC (and, more recently, SEPAR) have participated in Field Day every year since the inception of the society nearly 5 decades ago. Normally we operate around the clock from a public location such as school grounds relying on portable power and antennas. FD is also in effect, a competition, with SARC usually placing amongst the top contenders in Canada.

This is primarily an HF event for communication within North America, although there is also a role for VHF/UHF. It also presents an opportunity for recently-licensed amateurs to learn and practice communications skills that might be required during emergency conditions.

Last year, planning for Field Day was interrupted by the pandemic, the result being that we could not set up in a public location. Instead, all radio contacts were made from the home stations of members whose individual scores were later combined into an aggregate score. While this form of participation is worthwhile, it fails to qualify as a demonstration of our ability to deploy in the field, as might realistically be required in connection with a remote command centre. Neither does it permit us to involve the public in promoting amateur radio as a public service or showcase our abilities to response agencies.

Nevertheless, we are apparently stuck with these conditions again in 2021 and must make the best of it. Planning is now underway under the direction of Jason Biggin VA7ITJ.

We must now think of Field Day as an opportunity to ensure that the OTC, SEPAR trailer and individual home stations are fully operative and up to the job because they, too, may be put into service during an emergency. Based on discussions to date, the following is what is likely to happen.

SARC SOCIETY DIRECTORS 2020-2021

PRESIDENT
John Brodie VA7XB
president at ve7sar.net

VICE PRESIDENT
Steve McLean VE7SXM
vicepresident at ve7sar.net

SECRETARY / WEBMASTER
Jeremy Morse VE7TMY
secretary at ve7sar.net

TREASURER
Scott Hawrelak VE7HA
treasurer at ve7sar.net

DIRECTORS

Gord Kirk VE7GK
(SEPAR Liaison)

Kevin McQuiggin VE7ZD / KN7Q

John Schouten VE7TI
(SARC Publications/Blog/Social Media & Courses)
communicator at ve7sar.net
course at ve7sar.net

Stan Williams VA7NF

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

SARC QSL MANAGER
(pro tem) John Brodie VA7XB

SARC REPEATER MANAGER
VACANT
repeater at ve7sar.net

Having in recent weeks been provided by the City of Surrey with a new home for a fixed station at what we call the "Operations & Training Centre" (OTC) in shared space with South Fraser Search & Rescue, the imminence of Field Day provides the incentive to quickly get our station organized and fully operational. Many things need to be done in order for this to happen: firstly, surplus items and furniture currently in storage have to be disposed of to provide access to our equipment. Then installation of a tower, antennas, power, grounding, computers, Internet and radios must be complete within 2 months.

The OTC will be our primary operating location. Participants will be scheduled to operate individually or in pairs in compliance with COVID restrictions. Over 24 hours, 6 operators each taking a 4 hour shift (for example) will be required. If we are able to deploy two radios, then we can accommodate double this number of operators. The OTC would likely use the callsign VE7SAR.

A secondary station would be the SEPARS trailer operating at a separate location utilizing its usual equipment and antennas, but possibly supplemented with an NVIS antenna for local HF contacts. This station would likely use the callsign VE7HME.

The first task is to determine how many members wish to operate at either the OTC or the SEPAR trailer with a schedule established from that list. The next task is to determine how many member have home HF stations available to contribute to the aggregate effort.

Another operating location may be the EOC at No. 1 Firehall however, this location is not well equipped with HF antennas so any activity there would likely be restricted to VHF/UHF.

Each home operating station will use the callsign of its owner. After Field Day is over, all scores will be submitted as contributors to a combined score under either SARC or SEPAR.

If members have other ideas for Field Day then Jason would like to hear from you. He can be contacted at: j.w.biggin@gmail.com.

~ *John VA7XB*

It's May—June

and Summer is just around the corner!

Despite the slow pace of COVID life, the year is moving right along. It's almost Field Day time again and the May SARC meeting will discuss how we might participate this year while keeping everyone safe. Please join us for this meeting, visitors are always welcome.

Unfortunately the SARC Fox Hunt had to be postponed again this year. This annual June event is now planned for Saturday, August 28 when (hopefully) the health restrictions will be eased.

Take care, stay healthy, good DX!

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	Jinty VA7JMR John VE7TI
Want a turn at Net Control? Contact the SARC Net Manager	

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

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

2m South: 147.360MHz+ Tone=103.5Hz Fusion capable; No IRLP/EchoLink

1.2m: 223.960 Mhz -1.6 Tone=110.9

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

We Have A SARC Patch!

These are suitable for sewing on a jacket, cap or your jammies, so you can proudly display your support for SARC.

The price is $4 each or three for $10 and they can be picked up at a meeting or the weekly Koffee Klatch.

We thank our sponsors for their support of SARC

Please support them.