The Communicator

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ARC

A Publication Of Surrey Amateur Radio Communications

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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.

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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

IN THIS ISSUE

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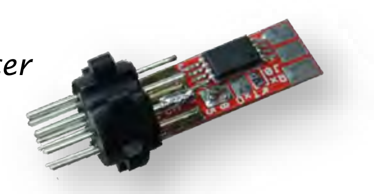
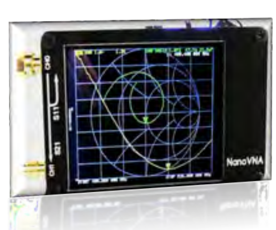
A Yaesu transverter sequencer





Measurements with the NanoVNA—Part 6

...and so much more!

QRM 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.*

Calling on all Amateur Radio Clubs that have a published newsletter! I find that there is a lot of interest in sharing newsletters, ours is certainly a prime example. There are some excellent ones out there with articles and information that extends well beyond their membership. Many clubs now have an Internet presence only but often that is not up to date.

I'd like to invite clubs to forward the link to their newsletter and I will publish them in a future issue of The Communicator.

I thank those who have provided feedback on this publication. I have received favorable comparisons to QST, CQ, TCA and other ham publications. We have no intent to compete but If we provide a useful publication beyond our immediate membership, all the better. The one distinction we have is an absence of advertising to clutter our pages. All of us working on this newsletter (eZine?) do so as volunteers with no remuneration, in the true spirit of Amateur Radio. Keep those cards and letters, and emails coming. We appreciate hearing from you.

Heading into September and Fall, we at SARC/SEPAR start a new Amateur Radio year. Lots of events, contests and presentations are ahead. If you have not been active lately, pick up that mic, send a message or try out some of those new modes. Our hobby is like few others. There are so many facets, it is nearly impossible to be an expert at all but it is fun to experiment and there is lots of help if you look for it.

73,

~ John VE7TI, Editor
communicator@ve7sar.net

This Month's Cover...

Fred Orsetti VE7IO, a long time Ham and SARC member and one of my mentors has been recognized for his service to our national organization Radio Amateurs of Canada. The story is on page 12, Fred's Radio-Active profile is on page 91.

"It has been said the greatest discoveries are yet to be made." - *John Kraus*

On the Web

ve7sar.net

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

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The Rest Of The Story…

The story of John Kraus and 'Big Ear'

John D. Kraus
W8JK

John Daniel Kraus (June 28, 1910 – July 18, 2004) was an American physicist known for his contributions to electromagnetics, radio astronomy, and antenna theory. His inventions included the helical antenna, the corner reflector antenna, and several other types of antennas. He designed the Big Ear radio telescope at Ohio State University, which was constructed mostly by a team of OSU students and was used to carry out the Ohio Sky Survey. Kraus held a number of patents and published widely.

Kraus was born in 1910 in Ann Arbor, Michigan. He received his Ph.D. in physics from the University of Michigan in 1933. In addition to his professional achievements, he also contributed to amateur radio. His father was scientist Edward Henry Kraus.

Before World War II Kraus developed antennas including the corner reflector and W8JK close-spaced array. He also helped construct and operate the University of Michigan 100-ton cyclotron, then the world's most powerful particle accelerator.

Career

Following the completion of his doctorate, Kraus was a member of the research team in nuclear physics at the University of Michigan, helping to design and build the school's new 100-ton cyclotron. During World War II he worked on degaussing ships for the United States Navy and on radar countermeasures at Harvard University.

After the war, Kraus joined Ohio State University, later becoming the director of the Radio Observatory and McDougal Professor (Emeritus) of Electrical Engineering and Astronomy. He supervised the Ohio Sky Survey which cataloged over 19,000 radio sources, more than half previously unknown, and later participated in the SETI survey conducted by Bob Dixon.

Sputnik I

In 1958, while he was at Ohio State, Kraus used the signal of radio station WWV to track the disintegration of Russian satellite Sputnik 1. Kraus knew that a meteor entering the upper atmosphere leaves in its wake a small amount of ionized air. This air reflects a stray radio signal back to Earth, strengthening the signal at the surface for a few seconds. This effect is known as meteor scatter. Kraus predicted that what was left of Sputnik would exhibit the same effect, but on a larger scale. His prediction was correct; WWV's signal was noticeably strengthened for durations lasting over a minute. In addition, the strengthening came from a direction and at a time of day that agreed with predictions of the paths of Sputnik's last orbits. Using this information, Kraus was able to draw up a complete timeline of Sputnik's disintegration. His data also led him to conclude that satellites do not fail as one unit. Instead, his data indicated that the spacecraft broke up into its component parts as it moved closer to the Earth.

QSL card of John Kraus sent to shortwave listener, 1933

Kraus, SETI and the 'Big Ear'

If ever there is a radio astronomer's hall of fame, one of the first inductees would be Ohio State University professor emeritus Dr. John Kraus, the "Big Ear's" proud father.

Kraus emerged as one of the country's leading radio telescope pioneers in the 1940's. His contemporaries included Karl Jansky, a Bell Telephone Laboratories engineer who invented the radio telescope in the 1930s. A good friend, Grote Reber, another radio engineer, helped mold the science.

Today, Kraus, at 84, lives only a few miles from the Big Ear off U.S. 23 in Delaware County. Kraus is still acknowledged as director at the Big Ear, although he is retired from the project.

Kraus designed the Big Ear and built it in the late 1950's with the help of undergraduate and graduate students for about $250,000. In Kraus' classes, students got a working education. The Big Ear's assistant director, Dr. Robert S. Dixon, says he came to OSU in 1963 because he wanted to study under Kraus. "This was one of the wonderful features of our academic institution," Kraus says. "Because the students in doing this got a fantastically good experience that they would not have obtained elsewhere."

The scope's basic design is similar to a reflector telescope. Its design has been copied for radio telescope observatories in Russia and France.

"Well, the whole idea was a maximum size for a dollar cost," Kraus says. "It achieved that objective. It was designed for mapping the radio sky, and it has been successful finding the most distant known objects in the universe."

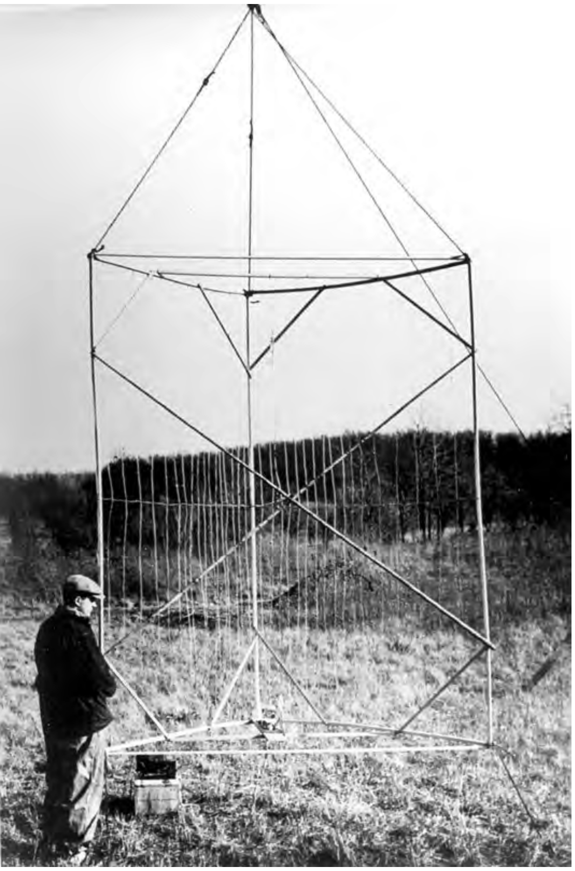
In his 1976 book "Big Ear," [now in a revised edition called Big Ear Two] Kraus talks about starting the search for extraterrestrial intelligence on Dec. 7, 1973.

"There was no fuss or fanfare; switches were set; recorders started and the data began to flow," Kraus writes.

More than 20 years later, the search continues. Kraus won't predict the chances for success, only that "someday, something may occur. But that may be a long ways in the future."

"It's very tough," he says. "It's a lot more difficult than many people think. It may also be something that is found serendipitously. Somebody looking for something else may stumble on it."

Kraus (W8JK) and the first corner reflector antenna; operating at 5 meters wavelength, it could be rotated for pattern measurements.



In radio astronomy circles, Kraus is revered. His textbook "Radio Astronomy," published in 1966, is the bible in the field.

"I think John is a prime mover in SETI [Search for Extraterrestrial Intelligence]," says Dr. Paul Horowitz, director of his own long-running search at Harvard University's Oak Ridge Radio Observatory. "I think John is such a gentleman, too. In fact, John had made a personal contribution to our search, and not an unsubstantial amount."

Kraus is an accomplished man, but he doesn't like to dwell on his fame. His inquisitive nature leads him to be the interviewer. His responses are terse and to the point; he doesn't speculate.

He updated his textbook "Electromagnetics," now in its fourth edition, a year ago. He still carries out electromagnetic experiments at the home he shares with his wife, Alice.

Kraus is a pioneer, but he's not willing to predict the future of radio astronomy. "It's very hard to say," he says. "New discoveries will undoubtedly come. It has been said the greatest discoveries are yet to be made."

Kraus grows tired of the interview. It's the mark of a man who has always asked the questions. His eyes twinkle and it's his turn. "Tell me a little about yourself," he says, warming to the task.

~ From the Cleveland Plain Dealer

Sunday Magazine section, September 18, 1994

Social Reminder

Subject to COVID prevention policy in effect at the time, the Saturday weekly social gathering is once again 'on' at the Denny's Restaurant, 6850 King George Blvd., Surrey BC from 07:30—09:30. All are invited. Afterwards, we will host workshops and will be available to invigilate Amateur Radio exams at the OTC, 5752—142 Street, Surrey from 10-noon. Bring your ham issues, our Elmers will try to help you sort them out.

Obituary: Professor John Kraus, W8JK

I am saddened to report the death on 18 July 2004, just three weeks after his 94th birthday, of Dr. John D. Kraus, W8JK, a true renaissance man. John was Professor Emeritus at Ohio State University, where he had taught engineering, physics, and radio astronomy for nearly half a century. Long after his retirement, he was still going to campus daily, to meet with students. Ever the optimist, John had renewed his ham radio license a few days before his death -- for a period of ten years.

Prof. Kraus distinguished himself as a prominent physicist, educator, antenna designer, engineer, writer, publisher, radio amateur, and philosopher. His textbooks Radio Astronomy, Antennas, Electromagnetics, and Our Cosmic Universe guided a whole generation of astronomers and engineers, including me. His two volumes of memoirs (Big Ear and Big Ear Too) inspired a whole generation of radio amateurs (again, including me). His short-lived periodical, Cosmic Search, was the world's first SETI magazine, its thirteen issues still cherished by those of us involved in the SETI enterprise. And his designs (including the legendary Big Ear radio telescope) have expanded humanity's knowledge of the cosmos.

It was at Big Ear that the most tantalizing, elusive and enigmatic evidence yet of extraterrestrial intelligence was collected. The legendary 'Wow!' signal received there on 15 August 1977 remained the greatest mystery of John Kraus' life, a detection that fit exactly the expected profile of intercepted radiation from another intelligent civilization in the cosmos. That the anomaly was observed right around the time of his retirement must have been frustrating to John, who would have liked to direct the hundreds of repeat observations that followed. Instead, Kraus turned the effort over to a most able lieutenant. Bob Dixon, W8ERD, had come to Ohio State as a grad student, specifically to study under the best antenna engineer of his day. He was studying there when Big Ear was being commissioned, stayed on as a faculty member, became John Kraus' deputy director, and ran the observatory during its final years.

Those final years of Big Ear came too soon, both for Dixon and for Kraus (who remained actively involved in radio astronomy and SETI well beyond his retirement). The land under the antenna's beautiful 3.5 acre ground plane had become just too valuable, and ultimately the University sold it to the developers. Big Ear, John Kraus' brainchild and one of the greatest radio telescopes of all time, was ploughed under in early 1998 to make way for a commercial golf course. Such is progress.

On a personal level, it was John Kraus who ordained me as a radio astronomer.

That particular episode occurred a number of years ago at the Ohio State University, where Kraus was already a Professor Emeritus. I had just given a SETI paper to a room full of astrophysicists, and I was justifiably nervous. "After all," I told him afterward, "I'm just an electrical engineer.

"Don't ever say that!" roared Kraus, with a forcefulness which belied his then eight decades. "You are a radio astronomer!"

Right there, I realized I had offended my mentor. (After all, he himself was, first and foremost, an electrical engineer.) "But John..." I started.

"But nothing!" he retorted. "As an engineer, you can very easily learn (and, in fact, have already learned) all the astronomy you need to call yourself a radio astronomer. The converse cannot be said of the physicists."

Over the years, John Kraus remained quick with his wit, frank in his criticism, generous with his praise, and ever supportive of the young upstart with his head in the clouds. I am proud to have been able to call him my friend.

The last time I saw Kraus in person was on 5 November 2000. John and fifty friends gathered on the green at the former Big Ear site, to dedicate an historical marker. That ceremony was not only a memorial to Big Ear, but a tribute to Kraus and his many accomplishments. I know that when Big Ear died, so did a part of John Kraus. That he remained among us, warm, compassionate, and mentally alert for an additional four years, was a gift to all who knew him.

~ H. Paul Shuch, SETI Executive Director

Emergency Comms

Ham Radio Making A Difference

Tom Cox VE6TOX

What's your problem?

Tom Cox (VE6TOX) is the Senior ICS Consultant with the Alberta Emergency Management Agency and a Master Instructor with ICS Canada.

He has taught over 400 ICS instructors in Canada, conducts professional development workshops across North America and has written extensively on ICS and ICS instruction.

He received his first ICS training as a volunteer with the City of Vancouver and the Vancouver Emergency Community Telecommunications Organization (VECTOR).

This is part two of the series "Why do you need the Incident Command System?"

When trying to describe the Incident Command System (ICS) to individuals and organizations, I always start by trying to understand what problems they are trying to solve. Whether it is a problem with the response, coordination with other entities, or trying to wrap their mind around what is an Incident, if I can get them to articulate the problems, I can use ICS to resolve the problems and make the response more efficient and effective. Whether it is looking at a single Incident or trying to move an entire organization into ICS, I always start with "What's problem(s) are you trying to solve?"

ICS solves problems. Forget the history, the terminology, the instructional challenges and organizational resistance and simply understand the problem.

ICS Canada

Various countries in the world have adopted and adapted the concepts of ICS to their particular needs. This risks "modification" of ICS so that it is less effective and less interoperable, but within an entire country, if everyone is using the same system, then the risks associated with modification are lower.

But there is one modification to ICS that I believe is a substantial improvement over all other systems of ICS and that is the addition of PPOST to the ICS Canada materials.

PPOST stands for "Priorities, Problems, Objectives, Strategies, Tactics". This was added to the ICS curriculum in 2009 by Dean Monterey who was one of the four people who went down to California and brought ICS back to Canada. Where the FEMA ICS uses Priorities and works everyone through the Objectives, strategies and tactics [2], Canada codifies the relationships between Priorities and Incident Objectives.

For the purposes of these discussions, ICS Canada and PPOST will be used throughout.

Three Types of Problems

All problems for any incident or organization fall into three categories:

1. Problems created by the Hazard/Incident
2. Problems created by the arrival of the responders
3. Problems that aren't your problem.

The reason it is important to understand these broad categories of problems is that each requires a different type of solution. Putting all problems into the same basket creates a giant "to do" list and risks using the wrong solution which makes the response less effective, less efficient, and less safe.

Problems Created by the Hazard/Incident

These are the problems that define the need for the response. They are easiest to understand if you separate these problems from the problems of the response by thinking of them without the responders yet on scene. While some problems may arise as cascading events or as an incident continues, think of these problems as "Before the response arrives – why is a response required?"

This is why the all-hazard format works for ICS; you don't have to be an expert in nuclear power plants, tornado dynamics, protests, or hazardous materials to see that the injuries, gas leaks, property damage, or environmental degradation need a response.

You can look and generally see the majority of reasons why a response is required. For most hazards, the danger is obvious. For others, people may not understand their lives or property are at risk.

These problems are the problems created by the hazard.

The solution to these problems is called an "Objective". Objectives solve the problems created by the hazard/Incident. Objectives are always given to the Operations Section of the ICS organization. When the Objectives are completed and there are no more threats, the response can go home.

The Objectives are why we must respond and define when we can go home because there is no longer an Incident. Most important, the Objectives define the response and why everyone in the response organization must be there. You are all there to accomplish the Objectives, even if many are not in the field actually doing the response tactics. You are there because you are doing the Objectives or supporting those doing the Objectives.

Problems Created by the Arrival of the Responders

Problems created by the response do not exist until the responders arrive on scene. They are solely the problems of supporting the responders and have are not defined by the hazards.

The Incident doesn't care that the responders are hungry. The flood is oblivious to time sheets and overtime. A riot doesn't have the capability of thinking that you will struggle if you run out of tear gas or barricades. And a toxic leak goes downhill into creeks and houses whether that makes it harder for the responders or not. A tornado doesn't care that it is creating multiple hazardous spills.

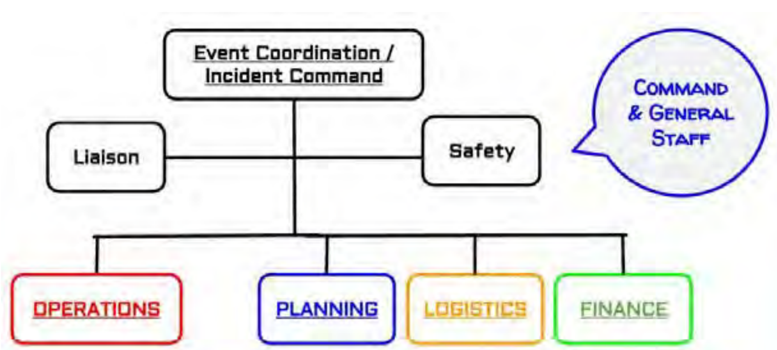
In 1970-1973 the FIRESCOPE task force that created ICS understood that all problems created by the arrival of the responders have nothing to do with the problems created by the Incident and the hazard itself. They looked at the problems created by the arrival of the responders and came up with a solution for every single issue.

Problems of the response are always solved by activating the box on the ICS organization chart or the box above it.

Responder problems are distinct from the problems created by the Incident/hazard because the Objectives apply to everyone; problems of the response apply only to the person filling the one box. This is the division of labour and effectiveness of specialization and execution. The Safety Officer doesn't collect time sheets, the Time Unit doesn't program radios, and the Communications Unit isn't stopping unsafe work practices.

If it is the role of the position on the organization chart or and specific task is assigned to a box on the organization chart outside of the Operations Section, then it is not an Incident Objective. It is not the reason you must be there. When all the responders have been fed, the Incident Management Team (IMT) has the situation defined, when the time-sheets are being completed properly, it doesn't matter that you have done every task and role perfectly if you still have people hurt and dying.

Tasks and roles should never be listed as "Incident Objectives". They do not apply to all responders, they are not the reason a response has been instituted, and you are wasting everyone's valuable time identifying them as everyone's problem rather than walking over to the person who is filling that



ICS uses a standard system of naming sections and the positions within those sections.

role (or the box above) and saying "Do you job" or "Do you need help doing your job?".

Problems of the response are solely resolved by activating the org chart.

Problems that Aren't Your Problem

An incident response cannot solve all the world's problems. There are a multitude of problems that get thrown at the Incident Command System that they cannot and should not deal with. They are not your problem.

But (and this is a very big "but"), they are still a problem. Whether you like it or not, these are a problem for someone. They may be due to the economic impacts of the incident, pre-existing problems within the community, or other people's priorities. Incident Command was not designed for loss of tourism, poverty, lung cancer from cigarette smoking, political agendas, religious beliefs, or cultural sensitivity.

Not being "your problem" never means it isn't a problem.

But these problems cannot be solved by the responders and should not come before saving lives, property and the environment. Getting business back may not be possible until the Incident is over. Long-term cumulative issues are not best solved with a knee-jerk response. Politics may have a major impact on the response (as we found with the Covid-19 pandemic) but politics is not the reason for the response. Given a choice between religion and culture and saving your life, the responders must try to save your life. If you don't wish to be saved for religious and cultural reasons, the responders are still compelled to try. Save lives is always the first Priority.

Many of the "Other Problems" are created by the Incident but are not (and possibly should not) be the problem for the responders. But you can see the connection. Evacuating 500 people to save their lives means 500 people must be accommodated away from the Incident scene. A perimeter may stop people from entering a dangerous zone, but may create traffic chaos on the community. An action of the response, such as releasing water from a overflowing dam to prevent a complete dam failure may cut a rail line and transportation hub impacting all of North America [2].

If it is not the responsibility of the Incident Commander or it is best handled by an entity outside of the Incident response efforts, these problems should be documented by the Incident response (for example, on the 201 briefing form under "actions taken") as still being a problem. The key is to identify who is the more appropriate party/organization outside of the response, that should deal with the problem or make the decisions concerning that problem.

Never say "It is not a problem". It is always a problem. By stating explicitly who you sent the problem to for resolution, you show that you recognized that it was a problem and everyone can evaluate afterwards if you were correct in where you sent it.

"Not my problem" is still a problem. Acknowledge and document it as a problem and send it to a more appropriate party/authority/organization to resolve.

Malicious Intent

I want to acknowledge that some Incidents are not natural or technological but are created by human intent. These Incidents include criminal intent, terrorism, war, and/or human induced Incidents. There are two issues that must be addressed with human intent.

First, these Incidents often include an aspect of intentionally interfering with the response efforts to make them ineffective, inefficient, or impossible. Flying a jet into the World Trade Center, having secondary explosives to kill responders, and using arson to start wildfires are meant to make the response difficult or impossible.

Second, the malicious intent adds a level of concern for responder safety. Bunker gear on a firefighter doesn't stop bullets from an ambush.

As well, even if criminal investigation is not an Incident Priority, it is definitely a priority for police and national security organizations. Criminal investigation cannot always be divorced from the threat to responders and the public, especially in the early response efforts.

For human-induced incidents, there may be the need for an investigation/intelligence to occur simultaneously with the incident response and/or criminal investigation. If you can't separate the non-emergency justice priorities from the current or ongoing Incident, then the Incident Command System must accommodate a non-emergency role such as incident investigation within an emergency response. This would also apply to Occupational Health and Safety issues and aircraft crash investigations.

Up next:

- What to know to make ICS work
- our uses of ICS – from events to disasters
- Communications Failures and ICS
- Supporting emergencies
- Supporting disasters

~ *Tom VE6TOX*

[1] Capitalization of specific words and not others is a conscious and deliberate technique to distinguish words with a defined Common Terminology meaning from the exact same word with a potential different and/or contradictory meaning within plain language.

[2] The Minnewanka Dam release during the 2013 Southern Alberta floods cut the main rail line and the Trans-Canada Highway. Effects were seen in Chicago, one of North America's main rail hubs, within an hour and reportedly within 15 minutes.

Page 12—News You Can't Lose

RAC Canadian Award to SARC member

Thank You Fred !

The Canadian Amateur Radio Hall of Fame (CARHOF) is administered by an independent Board of Trustees, one per province, appointed by the Directors of Radio Amateurs of Canada.

Fred Orsetti, VE7IO, has served on the Hall of Fame Board of Trustees for 12 years as the representative from British Columbia and has recently decided to step down from this position.

The Board sincerely thanks Fred for his dedicated service and contribution to the Hall of Fame and Amateur Radio in Canada.

Fred was recently presented with a RAC Certificate of Appreciation signed by President Glenn McDonnell, VE3XRA.

Due to the rigid COVID public health restrictions in place the professionally printed Certificate had to be sent by mail to Fred but we look forward to being able to do in-person presentations once again.

The Board of Trustees wishes Fred continued success in his many endeavours.

~ *RAC*

Page 13—News You Can Lose

The Lighter Side of Amateur Radio

Ham Community in Disarray After Discovering First Mentor Actually Named Bruce

Recently discovered documents have revealed that the first ham radio mentor was not named Elmer, but Bruce. The documents were found at an archeology dig beneath a coffee shop in Newington, Connecticut. The key discovery was a ham club's meeting minutes dated April 1, 1914. Just under the agenda item "Discussion: AM Voice – Is it Real Ham Radio?" was a note calling on the club to officially recognize the contribution of "Bruce 'Sparky' McTavish" for his outstanding work in mentoring new hams.

According to ham historian Chris Smart (yes, that's his real name) VE3RWJ, "It turns out that the original 'Elmer' was actually a student of Bruce's. Elmer took over mentoring new hams after Bruce was electrocuted, having accidentally connecting 240VAC to his Morse Code key." Smart continued, "A teacher to the end, Bruce's last moment on Earth provided an important lesson for us all."

As a result of the discovery, the ham community is in a state of confusion. Being against any form of change, most hams say they will still refer to their teachers as "Elmer" despite the new information. However, national organizations are seeking to correct the record and give Bruce his due recognition. The Radio Amateur Society of Australia is going to sponsor a "Worked all Bruces" award and the Radio Society of Great Britain has put forward a proposal to formally change their name to the Radio Society of Great Bruce.

~ Adrian VE7NZ

Bruce "Sparky" McTavish – circa 1914

Radio Ramblings

Kevin McQuiggin VE7ZD/KN7Q

Problem solving

Welcome back, and I hope that you all had an interesting and fun summer. This issue I would like to talk about problem solving and how we as amateur radio operators can apply our knowledge to resolve problems and improve performance of our radio systems.

The Obvious vs the Subtle

Radio systems can have "obvious" problems that are easy to locate and fix, but more subtle problems usually cannot be traced to a specific "simple" error and are therefore much harder to solve. Solution to these problems often requires the insight and creative thinking that comes with experience. We face both types of problems as radio amateurs.

Obvious problems are easy to isolate, and the solutions are clear. For example, a loose connector or a shorted feedline will immediately manifest itself as a drop in radio system performance. We find that we have no audio on our transmissions, or the SWR goes from the usual 1.5:1 "to infinity and beyond!" The symptoms are clear, and the solutions are usually easy to find: we discover that the mic connector has slipped out of the rig, or that the neighbour's dog has played "chew toy" with our coaxial cable. We have all been there!

Subtle problems are harder to identify and even harder to track down. Specifications are correct, everything has been built with care and connected properly, but the system just doesn't work, or its performance is far lower than what it should be. How can we solve this type of problem?

Like the "obvious" problems, these problems can also be emergent: a good example is intermodulation or other interference that shows up on a repeater system that has worked reliably for years. Nothing has been changed within the radio system, every component checks as working properly, but the problem persists. How do we resolve this?

As I will describe below, I experienced a subtle antenna system performance problem this summer. Finding the cause of the problem and resolving it took over a month. Hence the topic of this column!

Solving these problems can take a significant amount of time. It can also require that nebulous factor that we call "experience", sometimes aided by a fair amount of insight and creative thinking. The problems can be solved, but it is not just a matter of checking cables, components, and feedlines. It feels great when you "figure it out" and the system starts working as it should.

Amateur Radio's Perspective

I have written about the unique placement of amateur radio in the technological world before [1]. Amateurs come from all walks of life and share a common interest in radio communications, but most of us (myself included) lack formal training in electronics, radio systems, feedlines and antennas: i.e. the "tools of the trade" that are mastered by all RF engineers and other electronics system professionals.

This broad-based perspective can actually be an advantage for the amateur radio service, as it has generated innovative experimentation with radio that is outside the formally accepted professional standards of industry. In the simplest terms, amateurs "do not know what will not work" [2].

What does this mean? Hams are not subject to the subtle professional constraints that tend to keep formally trained "experts" away from certain areas of research. Unfettered access to explore unusual ideas and conduct creative experimentation has led amateur radio operators to many scientific discoveries: a great example is current propagation theory, developed within the amateur radio sphere in the 1930s.

That said, there have been lots and lots of (bluntly) *really bad* ideas and truly illogical experiments pursued by amateur radio operators in the last 100+ years. Freedom to experiment does not imply that the majority of these experiments are valid. Nonetheless, this freedom from constraint has generated many innovative ideas and even spurred new technologies, so amateur radio continues to prove its value to society.

Other scientific fields have been restrained by these cultural constraints before: good examples are the search for "exoplanets" and detection of extra-terrestrial radio signals. Research into SETI and these other "oddball" fields could represent "professional suicide" for scientists a few decades ago, but they are now accepted fields of research.

In relation to problem solving, amateur radio's broad perspective allows hams to draw on their experience outside of formal professional training. This can sometimes help them identify solutions to the subtle class of problems that have no obvious, direct cause.

1296 MHz EME Station

As I described in the last column [3], one of my projects this past summer was to get my 23cm EME (moonbounce) station assembled and try to make my first EME contact on that band.

I ran into a subtle problem with performance of my antenna system and spent about a month working to resolve it. I'll describe the system and the problem, and my eventual resolution of it, as this is a good example of problem solving and how experience can supplant professional opinion.

Station Components

My 23cm station consists of an Icom IC-9700 transceiver that puts out ten watts at 1296 MHz, a 300-watt power amplifier from VHF Design in Ukraine, 50 feet of LMR600 low-loss coaxial cable and two 45-element loop Yagis which are combined using a power divider. I also have a high gain low noise amplifier (LNA) or preamplifier next to the antennas which amplifies the very weak received signals from the moon.

The general layout of the antenna system is shown in Figure 1.

Figure 1 – 23cm 45-element Loop Yagis (2m Yagi at the rear)

The antenna system and LNA are mounted on a 16-foot mast, and the antennas track the moon using software I developed that runs on a Raspberry Pi (rPi) microcomputer.

The logistics of getting the entire setup completed are not to be underestimated. There are several "moving parts" in the project and getting all the components to work together takes a bit of time, especially for the ham new to the mode. I've been working on this project for over a year.

The Enemy

Loss is the enemy of successful EME operation. The path loss of EME signals is in the range of 250 dB, as described in the last column [3]. Any received EME signals are exceedingly weak, so it is critical that these signals be amplified as close to the antenna as possible to avoid them being lost due to feedline and other system losses. Boosting received signals "at the front of the system" can make them strong enough to survive the subsequent feedline losses before they reach the receiver.

I placed my LNA right next to the power divider which combines the signals from each of the two antennas. See Figure 2.

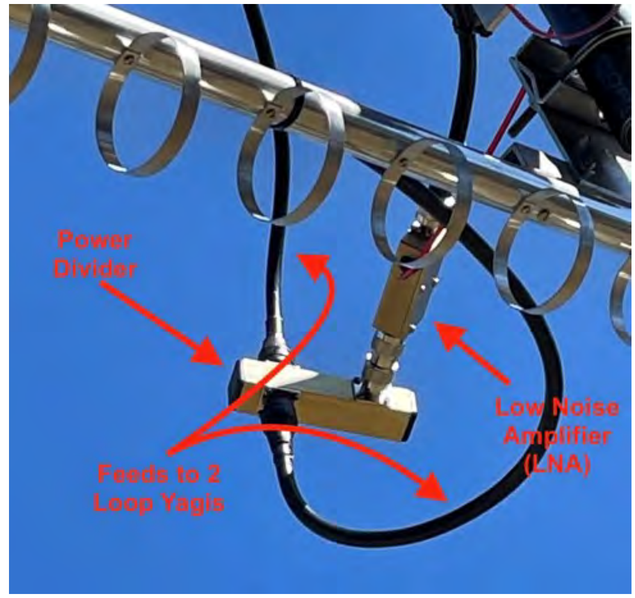


Figure 2 – Power Divider and LNA

Receive Before Transmit

You need to be able to decode signals before you can have a QSO, so my first focus in the project was to achieve consistent decoding of 23cm signals from the moon. I am using the new Q65 mode in the WSJT-X open source software package, as the program is very sensitive and is "where it's at" for most EME operators these days. There is plenty of 23cm Q65 EME activity so there are lots of stations to work.

Once I got the system set up, I would be ready to receive Q65 decodes. I would proceed towards transmit capability once I had the receive side working.

Disappointing Initial Results

The first month of 23cm EME reception was very disappointing. Although my base calculations (computation of gain and loss figures) showed that I should be able to readily decode Q65 from several of the larger (and even mid-size) EME stations, I had decoded only a single message from an EME "superstation" in Sweden (SM5DGX).

Nothing worked. I knew that many, many stations were active through my participation in a popular web-based chat server for EME (See www.hb9q.ch). Four of the larger stations even powered up and spent 30 to 60 minutes calling me as I performed system troubleshooting and tried to see them on the WSJT-X waterfall display. I felt like a burden on the entire 23cm EME community. It was depressing.

I checked my cabling, continuity, SWR and the WSJT-X audio and decoding settings. All was well. I checked the IC-9700 setup and made some changes as per direction from other hams on the chat service who had the same rig, but this made no difference either.

"No decodes" became my daily report as the other hams on the chat kept asking if I was operational yet.

I thought that maybe my moon tracking or antenna tracking was off – of course if the antennas are not pointing at the moon, you'll hear nothing. Many trips outside during the clear days this past summer showed the antennas slightly off centre, so I adjusted my rPi tracking routine appropriately, but this made no difference: no decodes… I also tracked the sun in order to check my antenna pointing (see the photographs in last issues' column) and determined that the pointing problem was likely not the reason for the system's poor performance.

Sun Noise

One suggestion made by Bill KB2SA in California regarding my lack of performance would turn out to be key in understanding and resolving the problem. He suggested measuring "sun noise" on the antenna system and comparing it to that of other EME operators.

The sun emits broadband noise at all wavelengths and polarizations and thus will generate a high level of noise in your receiver. To measure sun noise, you point your antennas directly at the sun and record the average noise level in your receiver. You then move your antennas well away from the sun, but at a high elevation to avoid terrestrial noise, and measure the average noise level there as well. The difference in the two noise figures, converted to dB, can then give you a pretty good indication of the sensitivity of your antenna system. Higher dB figures are better.

Additionally, a freely available older version of the WSJT program has a "Measurement" mode that measures average noise in the receiver and converts it to dB. See Figure 3. I downloaded the program [4] and used it to make sun and "cold sky" (i.e. away from the sun) measurements one afternoon. I determined that my antennas' sun noise figure was about 1.1 dB.

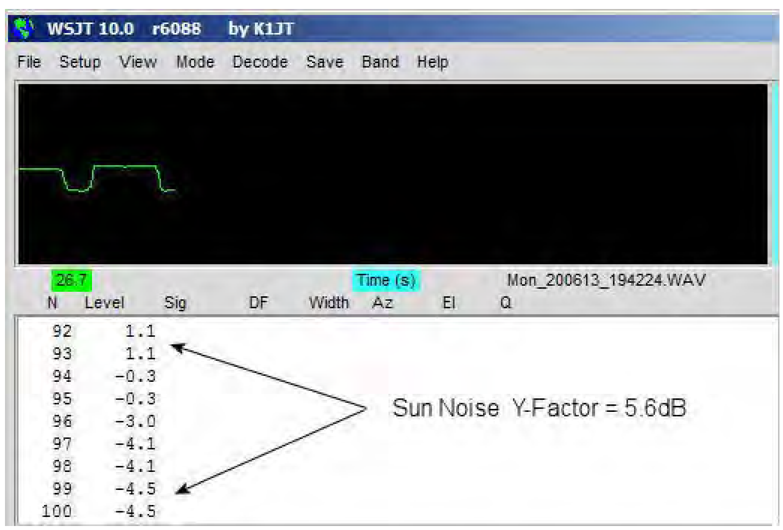


Figure 3 – WSJT10 Measurement Mode [5]

1.1 dB is an extremely poor sun noise figure, and it was a clear indication that there was something wrong with the antennas. A good sun noise value for my antennas would be in the range of 4 to 5 dB. In "human" terms, the noise in the antenna should have been 3 to 4 times louder than what I was seeing. At least the numbers confirmed that there was a problem!

Troubleshooting

After about three weeks of unsuccessful monitoring and checking the components of my system, I consulted with my good friend Dennis AC7FT, who works professionally in advanced microwave engineering at a major tech company in Oregon. Dennis is a transplanted Canadian engineer and I've known him since the 1990s.

My intuition said that the problem was with the antenna system rather than the feedline or radio setup. Dennis agreed. He suggested a complete end-to-end evaluation of all the components of the antenna system. This would quantify the system's performance and give me a solid numeric foundation on which to analyze the problem.

I spent the next week evaluating my antennas, feedline, and LNA. This took a bit of work as I had to take the entire antenna system apart:

I isolated the LMR600 and obtained a loss figure of 1.7 dB at 1296 MHz for its 50-foot run. This was on par with the specifications for the cable. 1.7 dB doesn't sound like much, but it represents a 32 percent loss of signal over the length of the cable. With reception of weak EME signals, 32 percent loss could put a decodable signal way down into the noise.

Loss through about 15 feet of LMR400UF cable between the end of the LMR600 and the power divider was about 1.1 dB.

The power divider represented about 0.5 dB loss itself. I confirmed that it properly combined energy received from the two ports, and that the two loop Yagis had been configured so that their patterns summed, rather than cancelling each other out.

I checked the LNA using a signal generator and spectrum analyzer by putting a very low level RF input into it and documented both its gain, which turned out to be a very impressive 39 dB, and it's noise figure, which I determined to be under 1 dB. This means that negligible noise was being added to the weak EME signals as a byproduct of their amplification by the LNA.

I guesstimated another 2 dB of loss through the various 'N' connectors in the antenna system, and another 2 dB loss through each antenna's 5 feet of coax from the power divider to the antenna feedpoint. These last two figures are probably high, but I wanted to be conservative.

I now had definitive, quantified figures for all of the elements of my antenna system. The beauty of working in decibels is that amplifications and losses can simply be summed to come up with a final figure. From the tear-down I was able to calculate the loss of my antenna system as follows:

Antenna System Component	Gain/Loss (dB)
50 feet of LMR600	-1.7
15 feet of LMR400UF	-1.1
Power Divider	-0.5
LNA	39
Antenna feeders (both)	-2
All connectors (estimate)	-2
Total for System	**31.7**

Table 1 – Measured Antenna System Performance

The LNA's gain easily overcomes the losses present in the other components of the antenna system, so given that it's noise figure as calculated was very low, this indicated that the antenna system was not the cause of my non-decodes. Received signals made it to the receiver about 1000 times stronger (i.e. 30 dB or 10^3) than when they were first intercepted by the antenna.

What other factors needed to be considered?

One critical factor is the gain of the antenna system itself. As the saying goes, *"you can't make a silk purse out of a sow's ear"* [6]. Two 45-element loop Yagis (representing approximately 23 dBi gain) represent a minimal antenna system for 23cm EME. There simply may not be "enough metal" in the air to induce detectable current from the received waves at the antenna. Even 31.7 dB of system gain (as calculated above in Table 1) will not be enough to overcome this deficiency. I considered this possibility very carefully.

However, I learned from the chat group and other online resources that other new EMEers with similar minimal antenna systems have indeed seen Q65 decodes, and in fact have also made many QSOs using their systems. My system should be capable of similar performance. There was something else going on.

I put the antenna system back together and decided that I would just think about the problem for awhile.

I rechecked my software and rig settings, did another week of monitoring without a single decode, and even considered that perhaps by IC-9700 had some sort of a problem with its receiver. This seemed unlikely as the rig was almost new, but I did not have any other leads.

I checked the rig's frequency accuracy and even added a GPS-based frequency standard to the radio. I confirmed that its frequency accuracy was within about 10 Hz at 1296 MHz. This had not been the problem. I still had no decodes.

Intuition

One thing that concerned me when I was evaluating the antenna system was the distance of the two loop Yagis from the azimuth/elevation rotators on the mast. See Figure 4. The distance from the antennas to the rotators was only about 20 cm. I had mounted the two antennas there as the crossboom on which they would be mounted was only exposed for about 40 cm.

Figure 4 – Original Position of Loop Yagis

I recall that the antennas' proximity to the rotators (as a large mass of metal) concerned me at the time, but that moving the crossboom would have been complex and required repositioning the 2m Yagi on the other side of the rotators as well. So I mounted the two loop Yagis as in the photo and thought that it would probably be fine.

As part of my discussions with my friend Dennis, I mentioned the proximity issue and he did not think that the short distance would really be of concern. The antennas' wavelength of 23cm meant that the antennas were about a wavelength from the rotators, so in our discussion we both dismissed this as probably not being a factor in the poor antenna performance. This decision was backed up by other professional sources.

Nonetheless, the proximity of the antennas to the rotators stuck in my mind. I was not happy with it.

Revisiting this issue as part of a re-think of the possible causes of the antennas' poor performance (and, honestly, because I felt that I had tried everything else!), I decided to go up the ladder and adjust the crossboom anyway, even if "professional opinion" said that it did not matter.

This change would give the two loop Yagis an additional 18 or 20 inches of distance from the large metal mass of the two rotators. Readjusting the 2m Yagi on the other end of the crossboom was a pain, but I was out of other ideas. Even if the literature said "this won't work" I thought that it was worth a try.

Figure 5 shows the repositioned location of the two loop Yagis on the crossboom. Note the new ~60 cm distance between the antennas and the rotators.

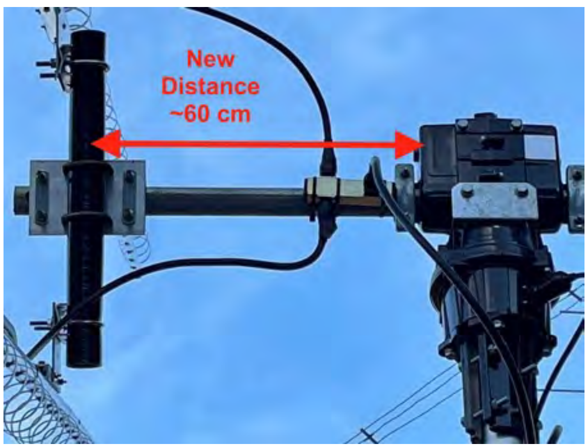


Figure 5 – Repositioned Loop Yagis

Follow-up Testing

Once the antennas had been repositioned, it was back to the shack to see how they worked. Some testing was in order, to make sure that the system still had low SWR and the expected directivity.

Things looked good, so I decided that I would re-run the sun noise test to see if moving the Yagis had had any effect. I was not too hopeful. To my surprise, the new measurements showed that the sun noise figure had jumped from 1.1 to just under 5 dB! Moving the antennas away from the rotators had greatly improved antenna system performance.

I had to wait for moonrise to test the system on actual EME signals. Once the moon was up and clear of neighbouring houses, I went through the usual steps to get the moon tracking program running and started listening for other stations. While I was encouraged by the improved sun noise figure, I was accustomed to failure, so frankly, I didn't expect much.

Decodes!

The difference in performance was immediate. My first decode was from G4CCH in England. See Figure 6.

```
---------------------------------- 23cm
1703 -22  2.9  875 :  KB2SA G4CCH IO93   q0
---------------------------------- 23cm
1705 -21  2.9  872 :  KB2SA G4CCH R-08   q0
---------------------------------- 23cm
1707 -23  2.9  875 :  KB2SA G4CCH 73     q0
```

Figure 6 – First Decode!

This was followed by decodes of several more stations including Steve K5DOG, who decided to call me directly even though I was not yet set up for transmission. See Figure 7.

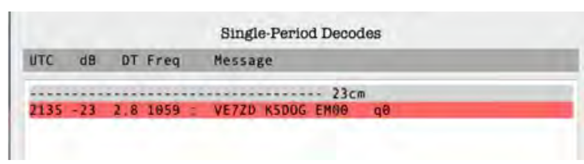


Figure 7 – A "Courtesy Call" from K5DOG

I copied a few other stations and gained my first "hands-on" experience with using Q65 for 23cm EME operation. I noted that the waterfalls often did not show much detail at all for signals which nonetheless decoded just fine, although stronger signals did have easily detectable traces in the Q65 waterfall. I could even hear stronger signals on the rig's speaker! See Figures 8, 9 and 10 below.

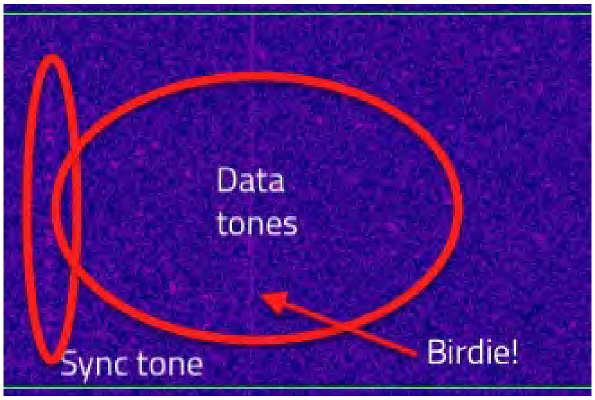


Figure 8 – Decoded Signal, Visible Sync and Data Tones (SM5DGX)

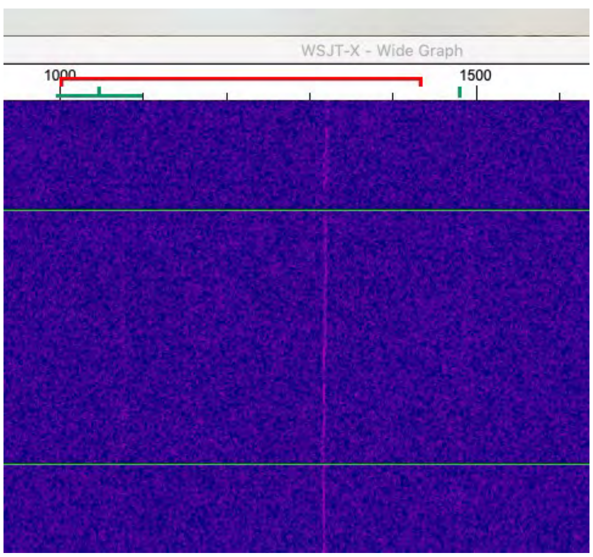


Figure 9 – Decoded Signal, Indistinct Waterfall (K5DOG)

Over the next couple of weeks, I decoded stations on a regular basis, and used the shack time to develop my operating skills with the rig and the WSJT-X program. I was eager to move on to being able to transmit as well as receive.

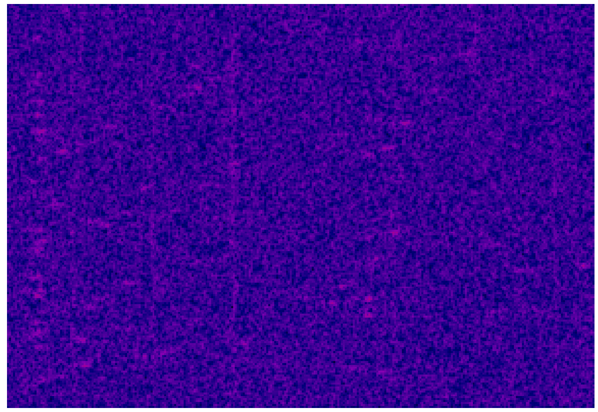


Figure 10 – Decoded Signal, Sync and Data Tones Clearly Visible (KD5FZX)

Next Stage: Transmission

I had my 300-watt power amplifier (PA) all set to go, but unlike on HF or other lower bands, it is not a simple matter to add it into the antenna system. Having an LNA in the "receive chain" right at the antennas means that this sensitive device must be switched out of the circuit so that the high power generated by the PA does not destroy the LNA. Transmit power must be switched "around" the LNA, and the LNA's input also needs to be switched to a 50-ohm dummy load to prevent the LNA from being overloaded by the nearby TX power. This is accomplished through the use of coaxial relays and an automatic "sequencer".

The coaxial relays (which are available from all of the amateur radio dealers who handle VHF/UHF/microwave gear) handle the switching of the transmit (TX) and receive (RX) paths and are specially designed to have low loss as well as very high levels of isolation between the outgoing (TX) and incoming (RX) signal paths. See Figure 11. Three SPDT relays are usually employed for this. The sequencer serves to control the relays as well as the keying of the rig and the PA. Figure 12 shows how the relays are used in my setup to switch the TX/RX path and isolate the LNA from transmit power.

Figure 11 – Typical SPDT Coaxial Relay [7]

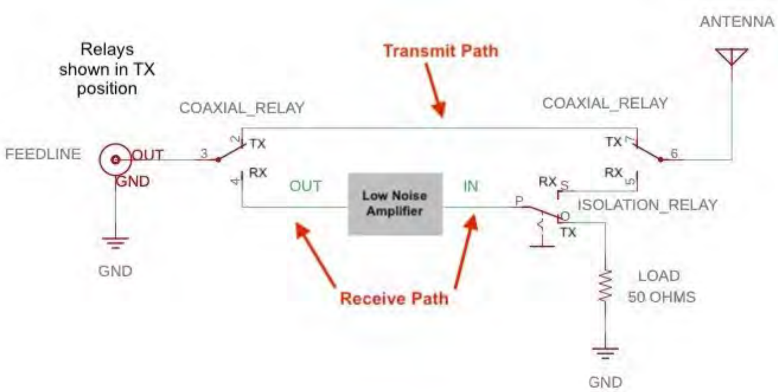


Figure 12 – Relay Configuration

Over the next couple of weeks, I assembled my relays, moved the LNA to the switching circuit and conducted extensive tests to make sure that the LNA would not be "blown" when I applied 300 watts to the antenna system. See Figure 13. The sequencer takes care of switching the relays and powering down the LNA before the rig and PA are keyed.

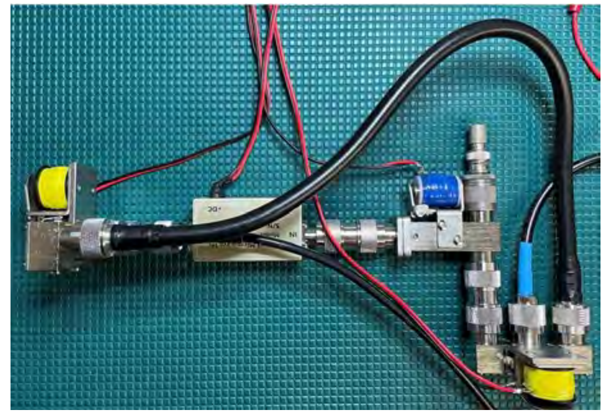


Figure 13 – Relays and LNA

I put the relays in a plastic box on the mast and ran power (12 VDC) from the shack to the mast for control of the LNA and relay system. See Figure 14.

Figure 14 – Relay Box and LNA on the Mast

Culmination of a Big Project: First QSO

On August 29th, just before 2 AM local time here in Burnaby, I successfully completed my first 23cm EME QSO with Anders SM5DGX (grid JO89) in Jarlasa, Sweden. See the WSJT-X screenshot in Figure 15.

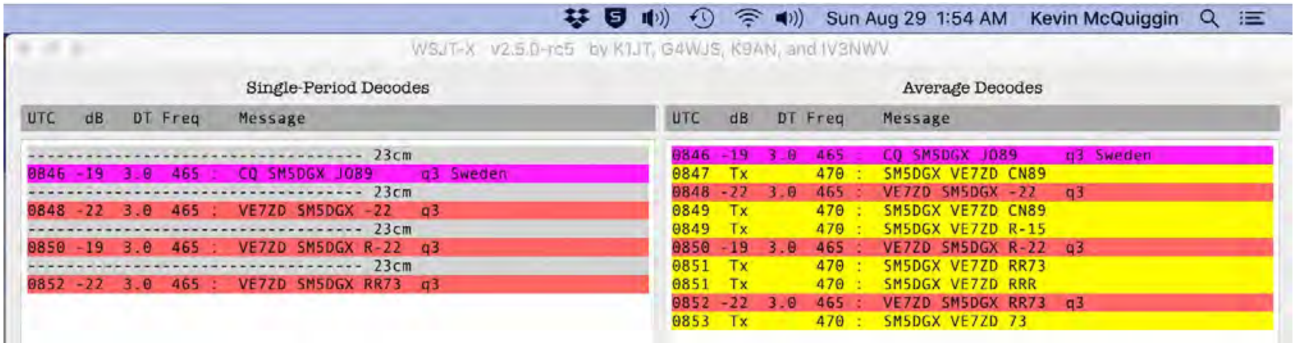


Figure 15 – First 23cm EME QSO

SM5DGX is a premier station on 23cm, with an 8-metre parabolic dish antenna and a kilowatt of power on the band. A dish this size generates approximately 39 dB of gain [8]. Anders' antenna is about 17 dB (which means $10^{1.7}$) better than my two loop Yagi antennas (at about 22 dBi gain). 17 dB of difference between our antennas equates to a factor of 50.1 – Anders' antenna has 50.1 times as much gain as my two little antennas have. That is quite a difference!

After a self-congratulatory cheer and waking up XYL Laura (VE7LPM) to tell her of my success, I went back on the radio and was able to work an additional three stations on EME in the next hour. See Figure 16 below. I worked ops in Belgium, the USA and England. Signals were quite good, and I could even hear a couple of the stations on the rig's speaker.

After several congratulatory messages on the HB9Q chat server from other ops, I thanked everyone, said my 73s and headed back to sleep. I am looking forward to further EME experimentation and more QSOs in the coming days and weeks.

Conclusion

This has been a big project and huge challenge for me. I have learned an incredible amount and have also had a huge amount of fun. We learn more through failures and setbacks than we do from "clear sailing".

Getting started on 23cm EME took over a year of study, planning and detailed research into many aspects of radio systems that I did not have previous experience with. It represented a huge opportunity for learning and development of new skills in a brand new (for me) area of amateur radio.

I had to acquire or build several new station components: antennas, an LNA, a switching system, rotators and tracking software, a rig capable of operation on 23cm, a PA and necessary control cables and feedlines. I also learned much more about the specialized modes in WSJT-X.

A not insignificant aspect of becoming active on a new mode such as EME is learning new operating techniques, and the configuration of the various hardware and software components of the system. One must also learn new terminology and be able to interact

Figure 16 – Stations Worked in First Session

Call Sign	First Name	Time On	Rx Freq	Mode	Power	RST S	RST R	DXCC Country	City	State	Grid Sq...	Distance
G4CCH	Howard	2021-08-29 09:57:00	1296.06...	Q65	240	-23	-21	England	Gainsborough,...	En...	IO93ql	7361.9 kr
NC1I	Frank M	2021-08-29 09:48:13	1296.07...	Q65	240	-21	-26	United States	SOUTHWICK	MA	FN32ob	3868.1 kr
ON5GS	Dirk	2021-08-29 09:18:00	1296.06...	Q65	240	-28	-22	Belgium	OUDSBERGEN	Li...	JO21sc	7777.6 kr
SM5DGX	Anders B.	2021-08-29 08:48:00	1296.05...	Q65	240	-15	-22	Sweden	JARLASA	Up...	JO89nv	7391.7 kr

with other operators – to learn how they use their systems, what frequencies and sub-modes are used, how contacts are conducted, and what the “norms” are for (in this case) 23cm EME operation.

The importance of learning these operational aspects (i.e. mode of use of the new equipment and technology) cannot be underestimated. Success in any new field (especially a highly specialized one such as EME) cannot be achieved by just buying a bunch of equipment and putting it on the air.

Just because you can buy a trumpet or an electric guitar doesn’t mean that you know how to play it. You need to do the hard work of learning and, most importantly, to practise!

With completion of the first few EME QSOs I have taken a big step in the project, but I still have lots to learn. My station should be capable of working most of the bigger stations on 23cm, but I will need to look at how to improve its performance. I will stick with the system as-is for now, however, and try to push it as far as possible. Eventually, I will run out of larger stations to work and then it will be back to the drawing board to see how I can “up my game” and work more stations. A better antenna system will likely be required.

Finally, through these columns I hope to encourage every one of us amateurs to try new modes and new communication techniques and to develop our knowledge and skills, in recognition of one of the overarching goals over the amateur radio service, “to advance the state of the radio art” [9]. While I describe these projects from a personal perspective, my hope is that some readers will be motivated by my stories and experiences to try some new mode or new aspect of amateur radio themselves. For SARC members, we have a highly experienced group of “Elmers” (i.e. mentors) who can give you support in whatever types of new ham radio projects you would like to try. We are eager to help, so please get in touch.

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

73,

~ Kevin VE7ZD / KN7Q

References:

[1] Previous columns have looked at the social and innovative aspects of amateur radio, see https://ve7sar.blogspot.com.

[2] See https://highgate.comm.sfu.ca/thesis for an overview of innovation within amateur radio.

[3] See http://bit.ly/SARC21Jul-Aug for details.

[4] WSJT10 (the old version) may be downloaded from https://physics.princeton.edu/pulsar/k1jt/wsjt.html

[5] See http://www.bobatkins.com/radio/sun_noise_measurement.html)

[6] Idiom originated in Scotland, 1600s. See https://wordhistories.net/2016/12/28/silk-purse-sows-ear/

[7] See https://www.henryradio.com/tohtsu.html

[8] See the parabolic antenna gain calculator at https://www.everythingrf.com/rf-calculators/parabolic-reflector-antenna-gain.

[9] Canada’s legislative philosophy for amateur radio is aligned with that of the USA and other ITU nations. The FCC documents the goals of the amateur radio service in Part 97 of their radio regulations: Section 97.1(b) “Basis and Purpose” states that one of the objectives of amateur radio is the “continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.” See https://www.law.cornell.edu/cfr/text/47/97.1

Hi Kevin,

Just read your moon tracking article [The Communicator July-August 2021] and found it very interesting. It reminded me of a time many years ago when serving my last year in the military. An officer friend of mine was a keen sky watcher and had just obtained a new telescope. He had me look through it at the moon and move the scope to the right so that the leading edge of the moon was just off the lens edge on the left hand side and I was to say “now” when the edge entered the field of view. I was to watch the leading edge move across the lens and when it reached the right hand side, call “Now” at which time he stopped his watch.

I can not remember the diameter of the objective lens, it was 2.5 to 3”. I was amazed to learn that it only took the moon just over thirty seconds to move across the lens. Radio signals travel at the speed of light but it has to travel to the moon and back again. If that telescope had been an antenna and a signal had been sent when the center of the moon was in the center of the lens and the lens/antenna had tracking software moving the antenna /lens keeping the center of the moon in the center of the lens, the signal would not hit the center of the Lens/Antenna when it returned because it had been moved several degrees away from the original point of transmission.

I know that I am way out of my league with moon tracking but it would appear to me that this software and rotors are for telescope tracking, keeping the object lens on target so that the viewer has a nice steady view of the star he is looking at. Am I way off track here Kevin? Surely, the antenna should remain in it’s transmission position, stationary, whilst waiting for the signal to return.

Robert VA7FMR

Hi Robert:

A very interesting story!

I didn’t want to go into too much detail in the story, but you are correct in that the antenna does stay stationary during transmission. The reason it is not necessary to move the antenna constantly is because of the very wide beam width of the antenna compared to the angular size of the moon. At frequencies such as 144 MHz, the beam width of most antennas, or even antenna arrays, is much bigger than the moon’s diameter, so the moon cannot drift out of the antenna’s coverage during the minute or two of an EME exchange.

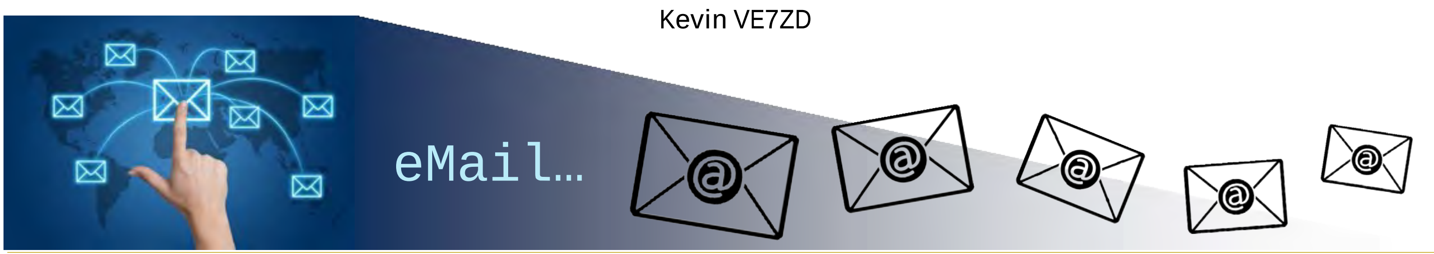
Even a very high quality Yagi has a beam width of probably ten degrees, so it is really only necessary to move the antenna every five or even ten minutes. This is similar to a telescope’s beam width as you observed with your friend - the moon took a bit of time to move across the telescope’s field of view. A telescope will have much narrower beam width than a Yagi, especially at a low frequency such as 144 MHz.

So that explains why the antennas don’t have to move constantly.

If one was to try EME at a higher frequency, say 10 GHz, then antenna beam width is MUCH narrower and it is necessary to move the antenna much more often. A parabolic antenna (a dish) at 10 GHz could have the moon “drift out” of the very narrow antenna bean in maybe a minute or two, so pointing (and in particular ACCURATE pointing becomes much more important. Normal HF/VHF “azimuth/elevation” rotators don’t have good enough resolution to be able to point an antenna accurately enough at 10 GHz, so other forms of mechanical mounts are used such as worm gears and repurposed telescope mounts.

73,

Kevin VE7ZD



Tech Topics

John Schouten VE7TI

Repair of an IC-208H head unit

It happened in a moment of inattention… I dropped my mic and the hanger caught the screen of the head unit of my Icom IC-208H. The crack was obvious but I thought I could make it less so. I applied some super glue, hoping it would seep in so that I could then polish it out. It didn't.

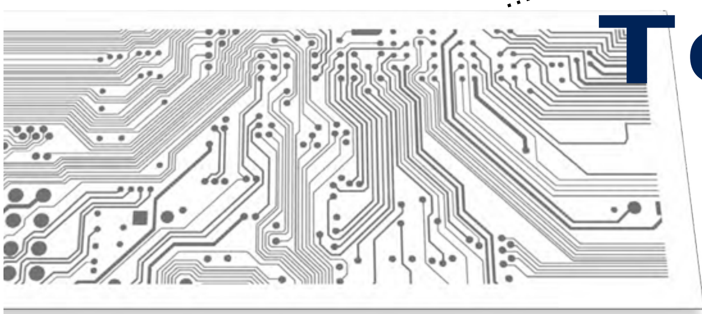
I found the service manual on-line and discovered that the repair would be relatively easy. But this transceiver is 16 years old, and unlikely a replacement part would be available. I'm a big Icom fan. My first transceiver was an Icom and I've owned several since with great success. I once had to send a Yaesu for repair. The nearest service facility was in California and it took just under a year before I got it back. We're fortunate that Icom Canada has a service depot locally. Staff has always been very accommodating… like when I lost a knob from a handheld. I received a replacement within a day.

I called the depot expecting to be disappointed. Surprise! The part was in stock, immediately available, and only a couple of dollars.

I remain an Icom fan. The gear works well, is well constructed, and is well-supported - even after years of use.

~ John VE7TI

Left [top to bottom] The crack in the screen and the replacement part; Removing the back of the head unit; Removing the circuit board. Right [top to bottom] The screen pops out with minimal glue residue. The new screen popped in; The successful repair.



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Evgeny Slodkevich, UA3AHM/OH5HM, and
Dieter Kuckelkorn, DL1DBY

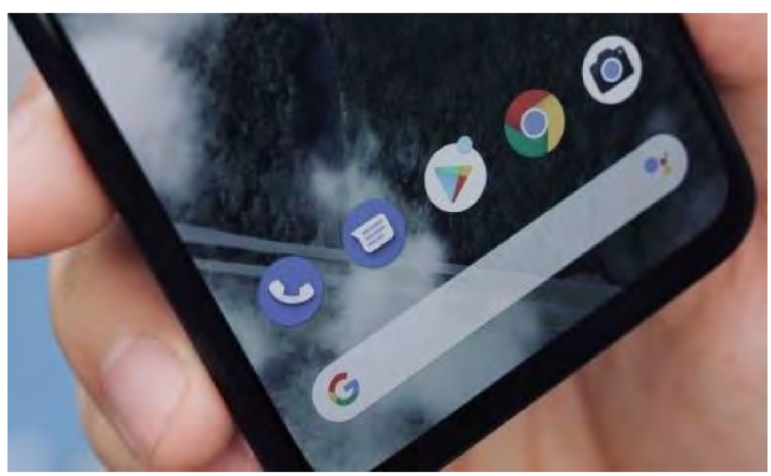
Using your smartphone on shortwave

A highly capable HF Data Mode for Android Phones

When going to an outdoor camping trip, we find that in many parts of the world there is no cell phone service available in the back country. To make matters worse, in these areas there is almost never a VHF/UHF ham radio repeater in range when we need wide-area coverage. Apart from strictly local communications using VHF/UHF simplex radio, how do we send messages to friends and family over great distances? How do we call for help? A similar problem can even arise in an urban environment if a major disaster strikes like the break-down of the power grid.

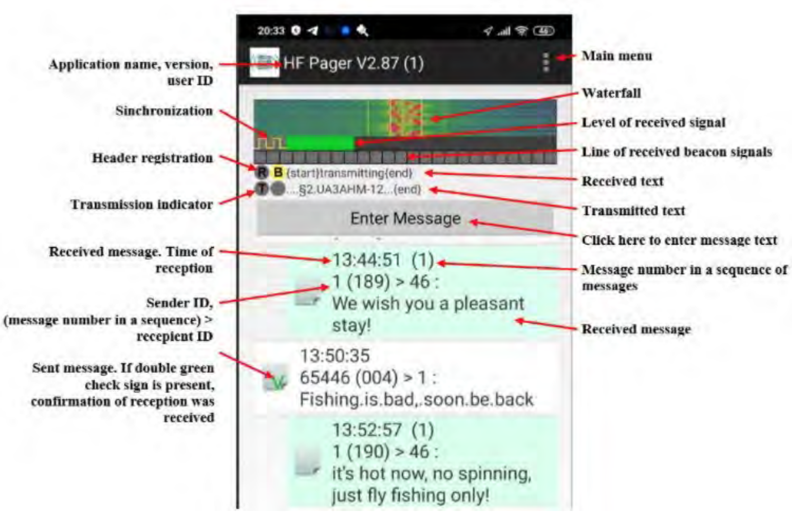
In activities like back country trips in areas without cell phone coverage or in a widespread emergency with the loss of our normal means of communication we can use satellite phones, but this technology is very expensive, requires subscriptions and there is no guarantee that the complex infrastructure of satellite communications will work under all circumstances. The obvious solution for Ham Radio operators will be to switch to shortwave communication using battery operated radios and often NVIS modes of operation. NVIS stands for Near Vertical Incidence Skywave, which means transmitting with special antennas straight up to communicate with other stations 30 km to 300 km (20 to 200 miles) away with low power - which would be the most useful communications distance if help is needed. We could use SSB voice communications, but this requires that the person we want to reach is sitting constantly at his or her radio to be able to receive the message. This can be a problem: In a real emergency we probably won't have time for this.

We could instead use capable digital modes with automatic message handling capabilities like JS8Call, but these require notebook computers or other complicated setups in the field which consume a lot of energy and can be difficult to recharge off- grid on a reliable basis.



Evgeny UA3AHM/OH5HM and Sergej UA9OV have developed another mode of digital shortwave communications, which aims to be easy to use, capable and - most importantly - friendly to the operator's resources. Apart from a low power battery operated transceiver and a small digital interface, only an Android smartphone is needed, which can be recharged with cheap and readily available consumer-grade solar chargers. Evgeny and Sergej have created an app called "HFpager" which allows to use the smartphone's sound chip to encode and decode audio signals in the SSB audio passband of the transceiver - similar to PC based modes like FT8 and JS8Call. It uses rates of transmission of 1.46, 5.86, 23.44 and 46.88 baud. Modulation is 18-tone Incremental Frequency Shift Keying (IFSK) with forward error correcting Reed-Solomon code RS(15,7) and a superblock by 4 RS blocks with interleaving.

It is possible to send text messages and GPS position reports with the position being instantly visible in Google Maps or Maps.me, a service with allows the map to be stored on the smartphone and to be used off-line. All message are automatically stored on the phone to be retrieved later, if desired. The sender can request an automatic confirmation by the receiving station. There is the possibility to send and receive



automatic beacon transmissions including the GPS position in regular intervals, to let the outside world know that our station is still "alive and kicking" or to share the progress we make on our way with our friends.

The app allows text messaging between two stations operating on the same frequency, like in a SSB or CW QSO. There are no group calls like in JS8Call, nor is there a kind of rudimentary networking possible like in JS8Call, to keep things as simple as possible. In contrast to JS8Call not only latin letters are allowed, but also cyrillic letters. The app includes an audio frequency waterfall display well known from FT8 or JS8Call software.

The app was tested by the two authors of this article on 20m over a distance of 2100 km (1300 miles) using only 1 watt of transmitting power and a ground plane antenna hanging from a tree in a public park in Frankfurt (Germany). On the other side near Moscow a 3-element beam and 20 watts were employed. This represents a typical configuration with one station somewhere in the "great outdoors" and the other representing a home base. On the German side an Elecraft K2 transceiver and a DigiLink Nano interface by HB9ZHK were used, on the Russian side an Yaesu FT-450 and a RAIS-1 interface. The DigiLink Nano interface has its own sound card build-in which is reliably recognized by Android. It was chosen because it draws very little current. The RAIS-1 interface and a special version RAYS-4 for Yaesu transceivers use the smartphone's sound chip, but have their own vox circuitry integrated. The RAIS-1 does not need an external voltage nor draws any current, the DigiLink Nano and the RAYS-4 receive the required voltage from the smartphone.

It was easily possible to stay in contact using this setup for the whole test period of three hours. The 1 watt signal was received with S3 near Moscow. It would have been possible to significantly reduce transmitting power or use a less efficient and smaller portable antenna, as HF Pager should be theoretically able to decode signals up to 27 dB below noise level.

In further testing it was possible to employ only 0.5 watts to keep the connection stable in a slightly different configuration as described above. This time a dipole antenna in sloper configuration and 5 watts of transmitting power were used on the other side near Moscow. As the 20m band was heavily congested due to a major HF contest and as the ionospheric conditions were pretty bad, so sometimes a lower transmission rate of 1.46 Baud had to be used. This proved to be reliable over a period of several hours. In these difficult band conditions HFpager appeared to be as capable as JS8Call.

The current draw of the app was moderate. Over a time frame of three hours with intensive use of the app and full brightness of the display the battery indicator off their smartphone phone went down from 100% to 63%. The app never crashed even when using a cheap Chinese smartphone that has problems in this regard. The user interface of the app includes a waterfall display known from FT8 and JS8Call applications and indicators for receiving and transmitting. Text sent by other stations other than the operator's correspondent will be decoded and and displayed as well, if the station is on the same frequency, as all forms of encryption would be illegal in Ham Radio.

In Android, switching on OTG capabilities can be required as well as allowing for external sound chip support (look in developer settings). It is essential that audio notifications are temporarily switched off in Android when using HFpager for obvious reasons. It can be necessary to disable battery-saving mode for the app in the Android battery settings. As with all HF digital modes it is important to switch off transceiver TX voice compression and to be careful not to overdrive the transmitter as HFpager is a 100% duty cycle mode like FT8 and JS8Call. To be on the safe side 25 watts when using a standard ham radio 100-watts transceiver and around 5 watts with a 10-watts QRP transceiver are recommended TX power levels.

The user experience is meant to be as close as possible to popular messaging apps like Whatsapp and Telegram, because HFpager is not only targeted at the Ham Radio community. In the Russian Federation, only 16 percent of the territory have cell phone coverage due to the enormous size of the country. Huge areas in Siberia and the Russian Far East can probably never get sufficient coverage. A solution like this is therefore very useful for outdoor enthusiasts, geologists, hunters etc. Having this in mind the app developers chose numerical station identifiers, like in DMR. To operate legally, the ham radio enthusiast has to transmit his or her call sign as message text every 10 minutes. The automatic beacon feature has the capability to include the call sign automatically in CW at the end of every transmission. As non-ham operators usually don't own radio gear and as not all ham gear is up to the task, Evgeny has developed a very small and light battery operated low-power HF transceiver called "Uleyma-80" (named after a river in Russia) with three fixed-frequency channels for net or emergency frequencies that must be specified while ordering. Included is a 12 Volt Li-Ion battery that allows operation of the transceiver for very long periods of time, a carrying case and shortened dipole antenna tuned to the desired frequency. The antenna can simply be thrown into the next tree, as NVIS communication does not require great antenna heights. The transceiver uses only 30 mA of

current on receive mode and is extremely simple to operate and is specially designed for this purpose as it allows connecting a smart-phone with a regular and widely available audio cable. It also allows use of a typical smartphone headset with microphone for SSB voice transmissions, should the user prefer to communicate this way. Non-ham users have to obtain a commercial radio license to use the transceiver, according to the resident's laws.

Apart from the Android app available in Google Play there is now a Windows base station software available and, as the newest development, an Android-based gateway that allows messages to be relayed to and from the regular SMS mobile phone service, to communicate with GSM phones around the world in both directions. Check your local laws whether this service may be used by Amateur Radio operators in your country. Also under development is a HF/VHF crossband repeater.

This repeater can be placed at the outskirts of a settlement or city outside the urban high RF noise environment to relay the HFpager messages on VHF to a home base in the center of the village or town. Please note that setting up an unmanned ham radio station may require a special licence in many countries.

Click here for the latest developments from the website.

The Android app website:
https://nvis.club/en/hfpager/android

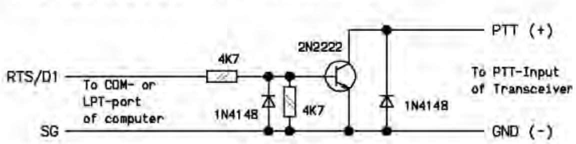
The Windows app website:
https://nvis.club/en/hfpager/android

~ Our thanks to Stephen, G7VFY and Southgate Amateur Radio news for this item

Connecting your computer sound card and your transceiver

You may already have an interface for digital modes, but this is a simple one to make yourself. Audio output of the transceiver should be connected with the line or microphone input of the sound card, and one of the sound card output channels should be connected with the microphone input of the transceiver. The transceiver should be run in SSB mode. This method of signal generation is AFSK (audio frequency shift keying).

The simplest PTT-interface



Used pins of COM-port

Signal Name	Pins of DB-25	Pins of DB-9
RTS	4	7
SG	7	5

Used pins of LPT-port

Signal Name	Pins of DB-25
D1	3
SG	18

It is VERY important to avoid overload of the sound card input or the microphone input of the transceiver. Use external attenuators to reduce output levels of the card and transceiver. If you overload the sound card pre-amplifier, you can't eliminate the overload with the sound card controls! The same is also true for the microphone input of the transceiver.

For TX/RX switching you can use the transceiver's VOX or a simple circuit connected between the COM- or LPT-port of the computer and PTT input of the transceiver. Some USB interfaces can be used also. The simplest schematic of a PTT interface is shown below. When LPT-port is used, a good way is to use a pin that has low voltage level after a computer reboot.

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Ham radio in Yachting Monthly magazine

Yachting Monthly magazine looks at the use of amateur radio on the ocean waves and interviews Bill Walker M0WTW

The magazine article by Barry Pickthall says:

“Bill Walker [M0WTW], a retired electronics engineer and life-long ham Radio enthusiast who sails a Halberg-Rassy 37 with his wife Judy out of Chichester, has his radio shack in his back garden, high on a hill in Tunbridge Wells where he gets a 90-mile signal range on VHF and worldwide coverage on HF frequencies when propagation is good.

‘There is no restriction on listening to broadcasts over the ham net, but the authorities are now very proactive in policing rogue ham radio operators,’ he says.

For a start, there is an international language code to be learned when abbreviating common phrases to make it easier to understand when the signal strength is poor.

An amateur radio licence opens up a range of communication types, including free access to a network of amateur satellites and worldwide radio connectivity via the internet.

These types of communications are not affected by the vagaries of HF radio propagation.”

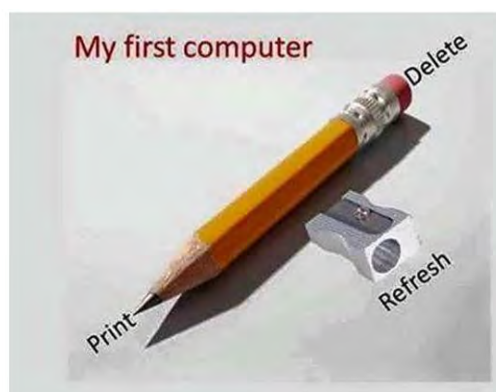
Read the full article at:

https://www.yachtingmonthly.com/gear/hf-radio-or-sat-comms-communication-at-sea-79067

A Kickstart for Cycle 25?

The solar scientist who’s been bucking the tide of pessimism from most of his colleagues and predicting a huge sunspot cycle (see News Bytes, Sept. 2020 issue) continues to see lots and lots of spots in the future. According to spaceweather.com, Scott McIntosh of the National Center for Atmospheric Research in Colorado, along with colleague Bob Leamon of the University of Maryland / Baltimore County, are predicting that a “terminator event,” in which oppositely charged magnetic fields collide near the sun’s equator and annihilate each other, will be occurring soon. This is a normal occurrence between solar cycles, they say, but the key to predicting the strength of the new cycle lies in the timing between terminator events — the longer the time between them, the weaker the new cycle will be. They are predicting a short 10 years between the previous terminator event and the upcoming one, and McIntosh says, “If the Terminator Event happens soon, as we expect, new Solar Cycle 25 could have a magnitude that rivals the top few since record-keeping began.”

Asked about the fact that most other solar scientists feel the new cycle will be a weak one, like its predecessor, McIntosh replied, “What can I say? We’re heretics!”



2 meters

Bob Witte K0NR

GMRS: Basic Radio Communications

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](#).

Note that this article was written for US readers, in Canada the rules are different as they may be in your country. For Canadian regulations, please see the article that follows.—Ed.

Lately, I've been talking with people in search of basic radio communications for their friends or family. They end up talking to me because someone steered them to ham radio as a solution and I teach ham radio license classes. Of course, I am happy to pull them into the wonderful ham radio world but sometimes the General Mobile Radio Service (GMRS) might be a better way of meeting their needs.

I have a GMRS license and have written about it. See [GMRS: The Other UHF Band](#). GMRS is a good fit for local communications, perhaps just using simplex or with repeaters, if available in your area. FCC regulations (Part 95) require you to have a license (and pay a fee) to use GMRS. Unlike ham radio, the license does not require you to pass an exam and the license is valid for you and your family members.

Common Uses

GMRS works well for family communication "around town" or some local area. Depending on the type of equipment used, simplex range of 10 or 15 miles is achievable, maybe more. The use of repeaters can extend this a lot further. You might even decide to put a GMRS repeater on the air, which is not too difficult of a project.

Another common use of GMRS is when a group is traveling down the highway in multiple vehicles. Yes, you might be able to just use your mobile phone to stay in touch but a two-way radio may be a better solution (especially when mobile phone coverage is poor or non-existent). Many off-road vehicle clubs have discovered GMRS and use it for communicating during trail rides.

GMRS is also a great tool for outdoor activities such as camping, hunting, hiking and skiing. It is a handy way of staying in touch with your tribe, while not depending on the mobile phone network.

GMRS Is Not FRS

A GMRS handheld transceiver made by Wouxun.

GMRS often gets confused with the Family Radio Service (FRS). They both include the use of inexpensive, low-power handheld radios and they share many of the same frequencies. When the FCC authorized FRS, GMRS was already an established radio service and it squeezed FRS into the same band. FRS radios were limited to lower output power, so many manufacturers decided to offer combination FRS/GMRS radios, which operated at higher power levels. The user was supposed to obtain a GMRS license to use this type of radio but most people didn't bother with it. (Most people probably didn't even know of the requirement.) The FCC also specified 2.5 kHz (half deviation) FM for the FRS radios on the same channels as the existing 5 kHz deviation GMRS radios. Intermingling an unlicensed radio service with a licensed service was probably not a wise move. In general, the FCC regulations caused a lot of confusion between the two services.

In 2017, the FCC adopted a major revision to the GMRS rules to clean up some of the problems with the service. In particular, the regulations now prohibit the sale of combination FRS/GMRS radios. A great idea but a bit too late in the game.

The US GMRS rules are pretty easy to understand, so take a look here: FCC Part 95 – Personal Radio Services.

Equipment

There are basic handheld transceivers for GMRS. They look and act a lot like the FRS radios that are widely available, but GMRS can provide more capability. An advanced handheld radio will have support for using repeaters (transmit offset) and higher power (up to 5 watts).

This GMRS radio has the display and controls integrated into the microphone, for easy installation.

To dramatically improve the radio range, you can use GMRS mobile and base stations that can run even more power, up to 50 watts. More importantly, you can use external antennas on your vehicle or your house. These can make a huge difference in performance. (FRS is limited to handheld transceivers and the permanently-attached rubber duck antenna.)

For radio amateurs, this should all sound pretty familiar. GMRS looks and acts a lot like an FM transceiver on the 440 MHz (70 cm) band. It is a great alternative for local radio communications for people not interested in a technical hobby such as amateur radio.

~ Bob KØNR

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.

GMRS in Canada

There are big differences in GMRS rules between the US and Canada. If you understand the rules, you'll understand what you need to look for when purchasing GMRS radios, and you'll understand what channels to use to get better range. And you'll understand why you could get in trouble for using some US radios that are not approved for use in Canada – and vice versa.

Radios must be approved in the country of usage

Every GMRS radio has to be approved by the authorities of the country where you will be using the radio – Industry Canada (IC) and the FCC in the US. There are also rules for usage. If the radio does not have an IC number, it's not approved for use in Canada. If the radio does not have an FCC number, it's not approved for use in the US.

Industry Canada has a lot of information here.

GMRS – FRS with more channels, and *maybe* more power

GMRS is an evolution of FRS that is compatible with older FRS radios on the FRS channels. But there are significant differences between Canada and US regulations.

Licensing, power limits, antennas and repeaters

In Canada, GMRS users do not require a license. In the US, radios above 0.5 watt require a GMRS license. In Canada, you're limited to 2 watts power on the GMRS and combined GMRS/FRS channels, and 0.5 watts on the GMRS channels. In the US, if you have a license, you can go to 5 watts on the GMRS/FRS and GMRS channels.

Repeaters. There is no provision for legal usage of GMRS repeaters in Canada. In the US, licensed users can us GMRS repeaters and GRMS radios with repeater capability.

Antenna. In Canada, the antenna must be fixed on the radio. It cannot be removed, and it is illegal to replace or modify it. In the US, licensed users can change the antenna.

What's the range of my radio? How is it affected by power?

Most of the radios you buy in big box stores in Canada and the US are designed to be legal for unlicensed usage in both US and Canada – which means you will be limited to 0.5 watts, a quarter of the power you're allowed to use in Canada. The ranges they advertise are generally ridiculous, varying from 20 km to 80 km (50 miles).

Finding the power rating for the radio is not always simple. Most manufacturers don't tell you. We've checked the packaging, manuals and web sites for the two biggest manufacturers, and it was either not there or very difficult to find. We've never seen a radio rated for the full 2 watt maximum. The closest we've seen is 1.92 watts, advertised with a 80 km/50 mile range. We've seen 1.6 watt advertised with a 50 km range. So everything is approximate.

Another hint is the batteries. A 0.5 watt radio might have a battery compartment for 3 x AAA batteries. A radio with 1 watt, 1.5 watt or just under 2 watts might have 3 or 4 AA batteries to handle the extra load.

...more 2 meters

Bob Witte K0NR

Can you hear a 1dB change?

Decibels are commonly used in electronic communications to describe and compare signal levels. I've often heard that one dB is considered to be the smallest change that a typical person can detect by ear. I recently came across this website audiocheck.net that is set up to generate different audio tones and to do a blind test of how small of a change you can detect.

I started with testing for 6-dB and 3-dB changes. Easy Peasy. Then I tried the 1-dB test. I could detect the change in level fairly consistently but I did have to concentrate. Continuing on to the 0.5-dB change, I had a very high failure rate. It was very difficult to detect that small of a change. So I have to conclude that 1 dB is about the limit for a change I can hear.

How about you? Take the test on the website and let us know how you did.

There are many other audio tests to explore on that site, including the highest frequency you can hear, the minimum pitch change you can hear, etc. Check it out: www.audiocheck.net

~ Bob K0NR

Need more reading material?

If you're looking for some additional reading, we have a solution for you. All of our past issues of **The Communicator** are available via our blog site. Over 10 years of Amateur Radio related articles, reviews, projects and much more.

Just scan this QR-code with your cellphone camera or click on https://ve7sar.blogspot.com/search/label/The%20Communicator

Ham News

Does the future of CW look like this?

The Premier Morse Translator/Transceiver?

Tired of trying to learn Morse code? Searching for a state-of-the-art decoder/encoder companion for your station that keeps right on working when the band gets noisy, and doubles as a portable QRP transceiver? Stop looking! It's here!

The DMX-40 is revolutionizing amateur radio CW communications with its extraordinary ability to decode in noise, and delivering you more features than you think could be contained in this handy, ingenious little piece of equipment.

Hear CW in noise

PreppComm's customers are impressed with its intuitive functions and ease of use. Finally you can extract clear text from CW in the noisiest of conditions. Really! And its built-in receiver is considered to be better for CW than transceivers costing much more!

As well as allaying the frustrations of seasoned operators listening to code, this fascinating pioneer product supports learners—either as they hear it coming in and see it translated into text on the interactive GUI, as they hear their keyboard-entered text translated to Morse code, or as they watch the decoder process their manual keying to sharpen their sending skills.

Any license level CW

Whatever your license level, within your band limitations, you now have access to CW communications that you could not previously interact with for lack of proficiency in Morse code. The included keyboard provides a type-ahead feature, accesses frequency-memory lists at a stroke and quickly executes commands or unlocks commonly shared information via single-key shortcuts.

Your ham radio programs

You can define your own micro programs to focus on your chief ham radio interests and access them on the touch screen or keyboard. Calling and answering are automated and displayed, or replaced with your own micro programs. Touch screen convenience gives you a view of what's in the type-ahead buffer and rapid entry into comprehensive help menus.

https://preppcomm.com/dmx-40-transceiver-2/

Videos: https://preppcomm.com/product-review-videos/

~ *Stephen G7VFY*

Solder Splatter

Wayne Getchell VE3CZO

Yaesu Transverter Sequencer in a Mini DIN

Version: This document is for printed circuit board version 2.2

Overview & Features

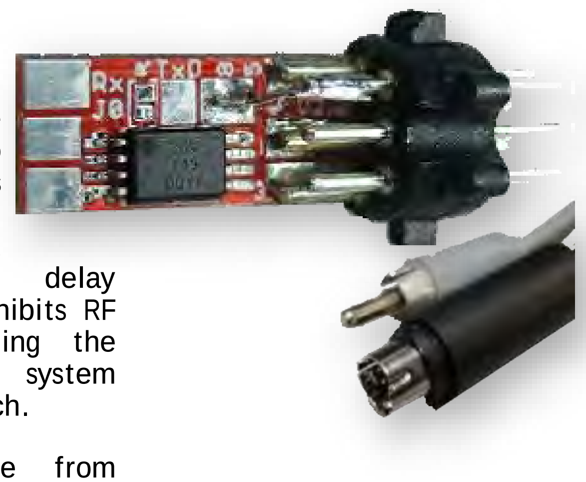
The key function of a transverter sequencer is to make sure the transverter, and associated equipment, such as a transmit – receive relay or power amplifier, have time to safely switch to transmit before RF power is applied.

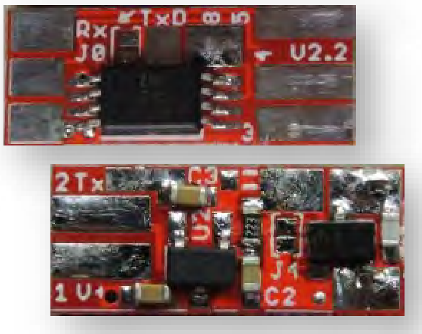
Then, on switching from transmit to receive, the sequencer will also insure RF power is removed before transitioning and provides a delay that is long enough to prevent relay chattering during CW operation. This microprocessor controlled circuit does that while fitting into the 8-pin Mini DIN connector used with the Yaesu ACC port. This sequencer has the following function and features

- Uses the ACC Tx-Gnd open collector output to sense a request to change state between transmit and receive.

* On changing state from receive to transmit, it drives the PTT output while also creating a programmable delay (StartDelay) that inhibits RF power by controlling the TxInh pin until the system has had time to switch.

* On changing state from transmit to receive, it provides a delay (Hangtime) extending the transition to avoid excessive Tx/Rx relay switching during CW operation. After Hangtime expires the PTT state is changed. Four default Hangtimes are provided in the firmware. These delays are programmed as defaults in the firmware and can be selected at build time dependine on the mode being used and CW speed. 25 ms is used for SSB or digital modes, 300 ms is recommended for code speeds greater than 30 words per minute, 650 ms for





Important Note

This controller provides only two delay times, one while transitioning from receive to transmit and a longer delay when transitioning from transmit to receive. If your set-up requires a multi-stage sequencer, for instance, removing power to a pre-amp then keying the transceiver then enabling a power amplifier, the additional delay sequences must be done elsewhere.

code speeds greater than 15 words per minute and 1000 ms for code speeds greater than 10 words per minute.

- The PTT output is an open drain configuration that, during assembly, can be populated as either high or low during transmit.
- StartDelay is programmable and defaults to delaying TxInh for 25 ms after PTT changes state when transitioning from receive to transmit.

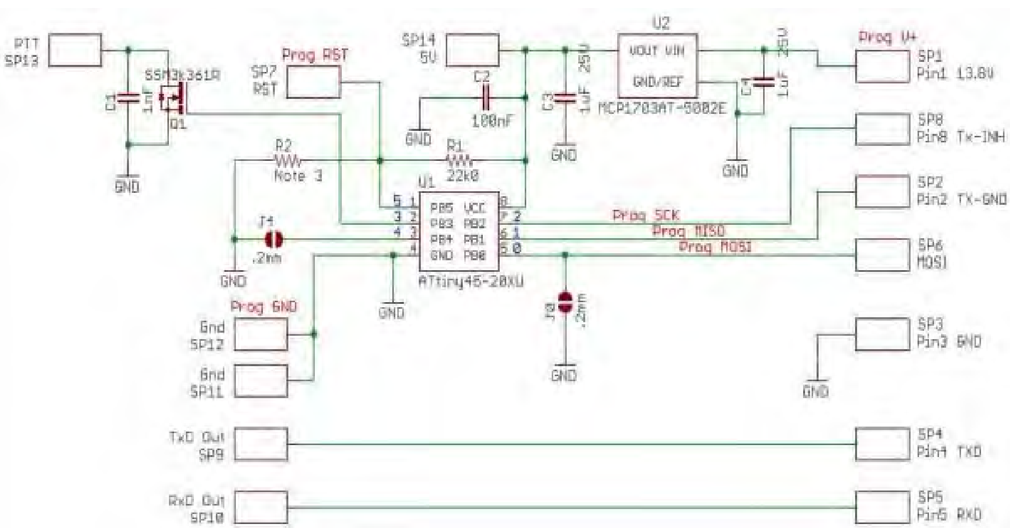
∗ Hangtime delay can be selected to be 30, 300, 650 or 1000 milliseconds by shorting solder jumpers when populating the PCB.

∗ Provides pins for TxD, RxD, and GND at the rear of the PCB to allow easier connection to external rig controllers through the Mini DIN connector.

∗ Operates over a wide voltage range, six to fifteen volts, and uses minimal current, about 1.5 mA.

Circuit Description

Mini DIN Sequencer V2.2 Circuit Schematic



Hardware

The circuit is powered by the ACC port's 13.8V supply pin. A MCP1703 five volt low drop out regulator U2 provides the supply voltage for the microcontroller. C3 and C4 provide bypassing for the regulator to insure its stability.

U1, an Atmel ATtiny45 processor in an 8 pin small outline package, is the heart of the controller. This micro has six I/O pins and the design uses 4 as inputs and 2 as outputs.

Pins 2 and 7 are programmed as outputs. Pin 2 (PB3) drives the gate of Q1, a 100 Volt 3 Amp N channel FET. The drain of this device is the Push to Talk (PTT) output. C1 is an RF bypass capacitor.

Pin 7 (BP2) connects to the ACC pin 2, Tx-Inh. Tx-Inh is used to prohibit or enable the transceiver's RF output.

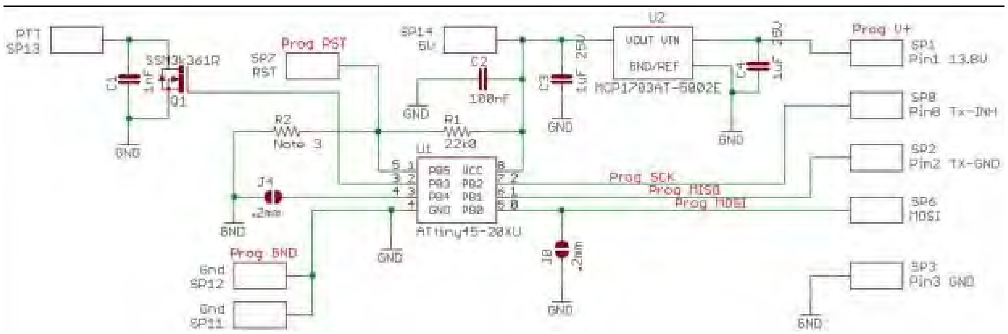
Pins 1, 3, 5, and 6 are programmed as inputs. Pin 1 (PB5) is programmed as an analog input, and is connected to a voltage divider formed by R1 and R2. The voltage at pin one determines whether the PTT output is active high or low. If R2 is not installed, the voltage at Pin 1 will be five volts and active low is used. If R2 is present it lowers the voltage measured at pin 1 and active high is used. Pin3 (PB4) and pin 5 (PB0) are configured as inputs with internal pull-up's enabled. The two inputs are programmed to form a two bit binary word with PB4 set as the most significant bit. Together they are used to select Hangtime. If jumpers J0 or J4 are left open the internal pullups will take the inputs high, if the jumpers are soldered closed the inputs are held at ground. Hangtime delays are programmable. The default values chosen are:

J0	J4	Hangtime (ms)
Open	Open	25
Short	Open	300
Open	Short	650
Short	Short	1000

Pin6 (PB1) connects to the ACC port's TX-GND pin (pin2) and is used to sense a request to transmit. The input is configured with its internal pull-up on so is high until the TX-GND pin is pulled low by the transceiver. Solder pads are provided on the PCB so that in circuit serial programming can be used to program the processor. Separate documents are provided describing the wiring hook-up and programming procedure.

Firmware

The ATtiny uses the Arduino programming environment. Install a copy of the Arduino integrated design environment and load the sequencer ino file into it to follow along as you go through the firmware description.



Circuit Schematic version 2.2

Inputs

1. TX-GND on PB1 – senses a request to transmit high= key-up or Rx, low=key-down or Tx.
2. Jumpers J0 on PB0 and J4 on PB4 set hangtime during initialization
3. Analog voltage on PB5 is used to sense whether PTT is active high or active low. R2 (33k Ohms) must be installed for active high.

Outputs

1. PTT on PB3 – an open drain is used to indicate transmit or receive state to the connected transverter. If active low is selected high, or off = Rx; low, or on =Tx. Opposite is true if active high.
2. Tx-Inh on PB2 – inhibits RF output power from a connected transceiver when high,

and enables transmit power through the setup when low

Notes on Routines & Variables

1. The 'elapsedMillis' routine is used to allow input state changes to be monitored while the StartDelay or Hangtime is being counted in the background.

2. The variable 'StartDelay' is used to hold back RF power until the transverter has had time to safely switch from receive to transmit.

3. The variable 'Hangtime' is used to prevent the transverter from changing states from transmit back to receive in between Morse characters. Hangtime selected will depend on the user's code speed. A Hangtime of 25 ms is provided for digital or SSB work, and it is the 'default' i.e. both J0 and J4 are open.

Setup

1. The voltage at PB5 is measured. If <= 3.5V, but higher than digital LOW, R2 (33k Ohms) is installed so PTT transmit mode is set to active high otherwise the measured voltage without R2 will be at the supply voltage and the transmit mode will be set to active low. The PTTState is initialized.

2. Inputs PB0 and PB4 form a two bit word used to select the hangtime from four possible options. These digital inputs have their pull-ups enabled so if the jumpers attached to these inputs are open the input will be high, if soldered short to ground the input will read low. PB4 forms the MSB. A switch routine is used to select the hangtime.

3. To minimize current consumption after initialization, the internal pull-ups and the analog converter are turned off.

Loop

1. Tx-Gnd is monitored and the program loops until TxGnd goes (or is) low.

2. PTT is toggled and routine monitors for a TxGnd state change while waiting for the StartDelay to expire. If TxGnd changes before StartDelay expires the StartDelay timer is reset.

3. StartDelay expires (TxGnd has remained low for StartDelay), so TxInh is taken low to enable RF through the system

4. The firmware monitors Tx-Gnd for a state change to high, indicating request to transition from Tx to Rx (key-up).

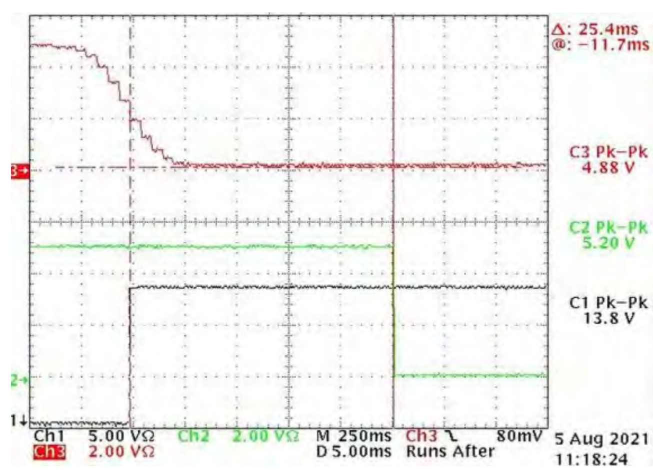
5. When a Tx-Gnd high is sensed, the Hangtime counter is started.

6. If Tx-Gnd goes low during the hangtime (key-down sensed), the Hangtime counter is reset.

7. If Hangtime expires, TX-GND has been high for longer than the Hangtime, so TxInh is taken high, preventing RF from entering the system, then after a short delay, the PTT state is toggled into the receive state.

8. The firmware loops back to the beginning of the loop routine and waits for TX-GND to go low.

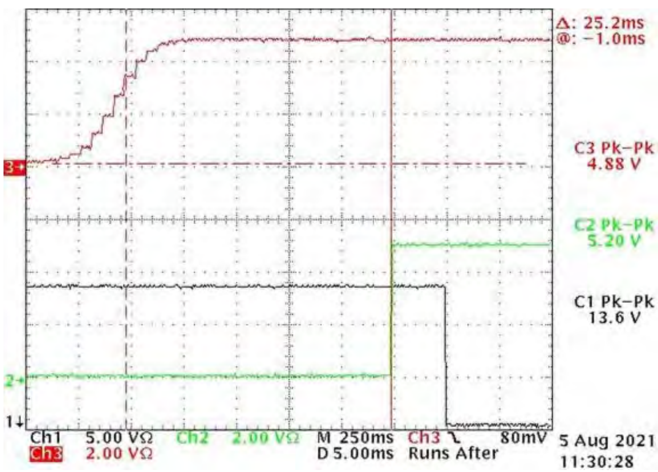
Timing Measurements



StartDelay (PTT active high)

In the above scope trace records, trace 1 is the sequencer's PTT output, trace 2 the TxInh output to the ACC connector pin 8, and trace 3 is TxGnd input from the ACC connector pin2.

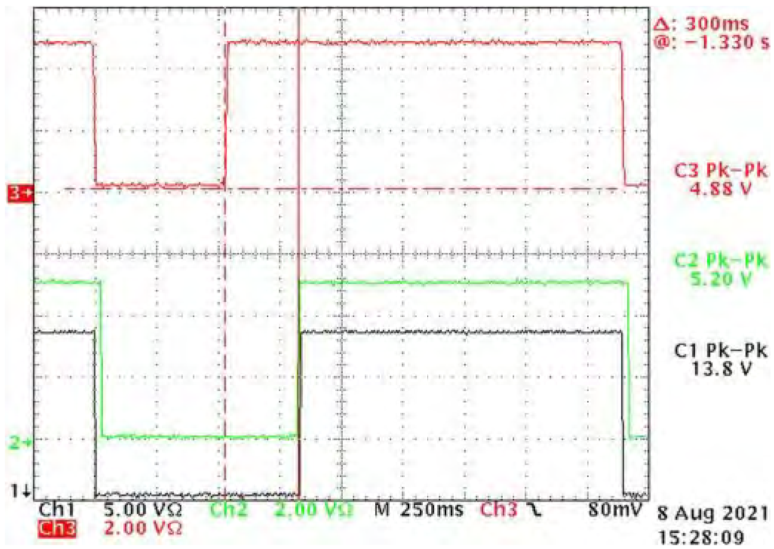
StartDelay is programmed to be 25ms. PTT is active high. The transceiver's TxGnd open collector output goes low indicating a request to transmit. PTT goes hi telling the transverter to set up for transmit mode, and TxInh delays RF output from the transceiver for 25 ms giving the transverter time to change state to transmit before RF is allowed though the system.



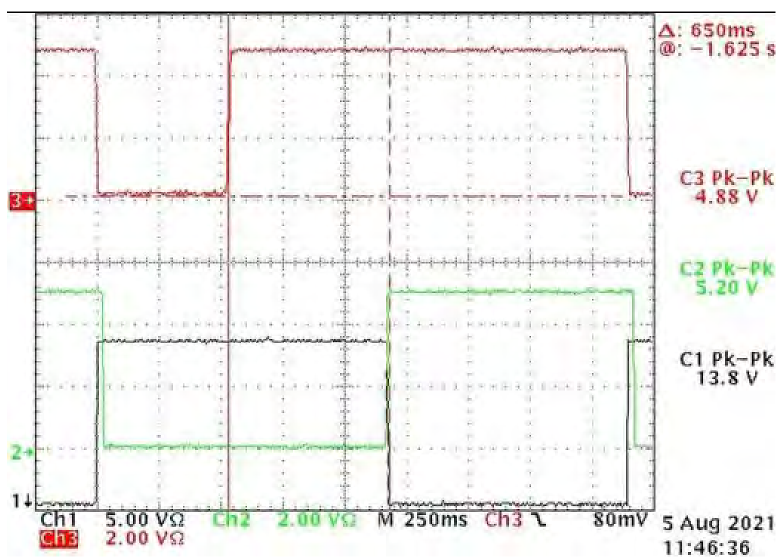
Hangtime Delay 25 ms (PTT active high)

Hangtime delay is programmed to be 25ms. PTT is active high. The transceiver's TxGnd open collector output goes high indicating a request to return to the receive state. Hangtime delays the start of a transition to receive for 25 ms. At that time TxInh goes high disabling the transceivers RF output. A further delay of 5 ms is built into the system to insure that TxInh always inhibits RF before the transverter is allowed to switch state back to receive. After the further 5 ms delay, PTT goes low, allowing the transverter to switch to the receive state. The 5 ms delay is arbitrary. It insures that TxInh always precedes PTT to insure that there is no RF in the system when PTT commands the transverter to change state back to receive. If TxGnd is re-triggered before TxInh goes high the Hangtime delay is extended until TxGnd once again goes low. If TxGnd is retriggered after TxInh goes high, a StartDelay is invoked. The 5 ms delay is the same for all Hangtime and therefore has the most impact with the 25 ms Hangtime making it 30 ms.

Hangtime can also be configured for 300,650, or 1000 ms.



300 ms Hangtime Delay (PTT active low)



650 ms Hangtime Delay (PTT active high)

Assembly Guidelines

Start by dry fitting the PCB in the Mini DIN connector. It's a tight fit and the PCB was Vcut so the edges are not as precise as routing would be. As a result the PCB may be just a bit longer and wider than desired. The PCB must NOT extend past the end of the metal shield surrounding the DIN connector.

Disassemble the 8 pin Mini Din connector. The Mini Din has 3 rows of pins, 2 pins in the first row (1, 2) and a second and third row of three pins (3, 4, 5, & 6, 7, 8).

Fit the PCB into the DIN connector pushing it all the way into the connector while aligning it carefully between the first two rows of pins with pins 1 and 2 to the PCB bottom and 3, 4, 5 to the PCB top.

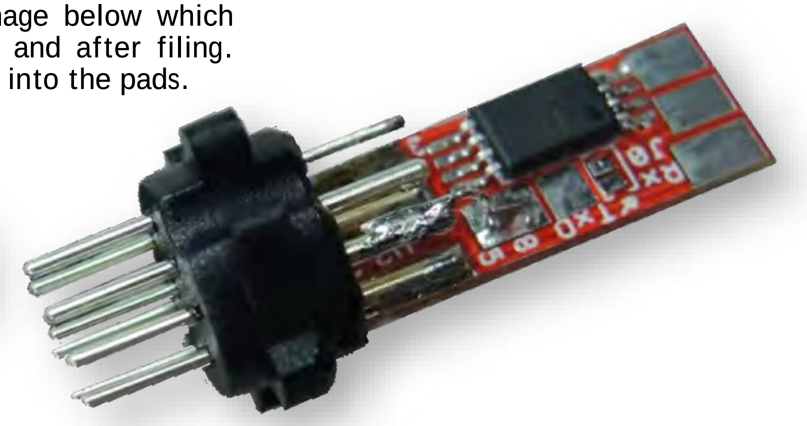
Place the metal shield around the PCB and check for clearances. If the board is too long or wide, file a bit off the PCB like the image below which shows a PCB before and after filing. Be careful not to cut into the pads.

Populate all the components on both sides of the PCB. As the PCB is small, there wasn't room to provide identification for all components on the silk screen, so use the PCB top and bottom layouts below to identify part locations. The PCB top side has three Mini DIN solder pads. The bottom has two.

Components are fairly tightly packed on this board, and when they share a common connection area solder pad like C2 and R1, soldering can be a bit tricky as the solder tends to spread into the adjacent component's pad area.

For best results solder the end of the component that abuts the already installed component first.

~ *Wayne VE3CZO*



Important Note

The assembly instructions are not included in this article, nor are additional diagrams. To download these documents, please go to:
https://www.dropbox.com/s/7s73zk36wrfd1ms/Mini%20DIN%20Sequencer%20V2.2.zip?dl=0

Measurements With The NanoVNA

Arie Kleingeld PA3A

Part 6—Measuring the input impedance

The 'sacred' 50 ohm value

Our coaxial cables are 50 ohms, our SWR meters work at 50 ohms, the nanoVNA works at 50 ohm, the antenna tuners convert everything to 50 ohms and so my receiver also has a input impedance of 50 ohms. But is that really so? Measuring it is a nice job for the nanoVNA. The measurement charts presented in this article were created with nanoSAVER.

Measurement challenges

Measuring an impedance with S11 R+jX is easy, and displaying the S11 SWR gives us a familiar insight about the adjustment to 50 ohms. My nanoVNA version H3.2 is signaling of -5dBm (S9 +68dB) in the HF range, but other VNAs can reach 0dBm (s9 +73dB or 1 milliwatts). The latter means a voltage with a peak value of more than 0.3V.

A possible The problem may then be that something unintentionally conducts or does not conduct (e.g. switching diodes). There is a chance that you will then measure just a different value than when you measure it with somewhat weaker values signals would say lower than the S9 +60dB maximum value of your S-meter. For example, you could attenuate the VNA signal by 10 or 20 dB. But can you with a attenuator between the nano and the receiver still correctly measure the input impedance? That's the question we answer first before connecting the nanoVNA to the input of the receiver.

Making an attenuator

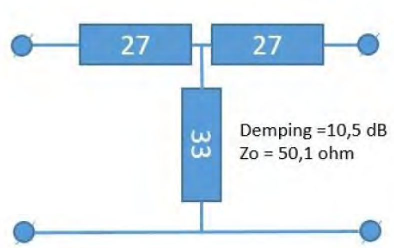
I make the attenuators from the junk box. If you search for '50 ohm attenuator' there is a lot to find. From the many websites with attenuator documentation I choose the site of John M0UKD. He has collected several calculators on his site where resistance values are calculated for you for a desired attenuation. Nice to be able to use that. (https://m0ukd.com/calculators/)

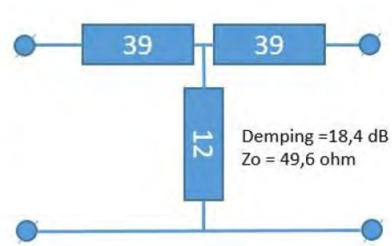
Which attenuator I make depends on the following four criteria:

1. Must be able to be made with only 3 standard resistors (from E-12 series)

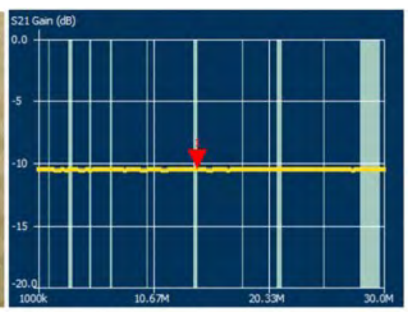
2. Characteristic impedance (Zo) of the attenuator should be close to 50 ohms
3. Near 10dB and/or near 20dB attenuation
4. T-shape or PI-shape is not important

The following T-attenuators come pretty close, after some attempts at the attenuator calculator:





In practice, the attenuators look simple *[see photo above].* Making attenuators for HF is easy and not critical. When measuring, the damping of both attenuators turned out to be correct, as an example see the S21 Gain of the 10.5 dB attenuator. The 18.4 dB attenuator was also spot-on.



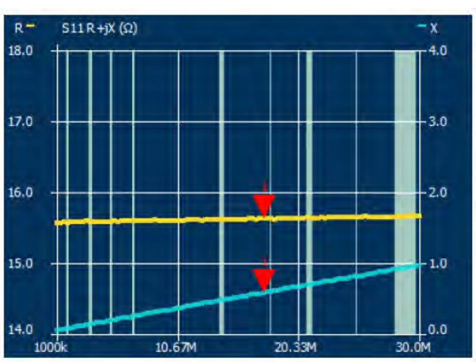
Measuring with the nanoVNA via the attenuators, the test

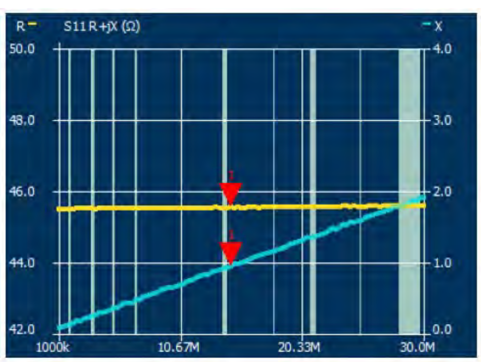
First we measure the S11 R+jX of an approximately 16 ohm resistor with the standard nanoVNA. The value turns out to be more than 15.5 ohms *[see the graphs page bottom, left].* Without further fuss we then switch the 10dB attenuator in between and measure the 16 ohms again, and we get the middle graph. We see an incorrect value here (approx. 46 ohm).

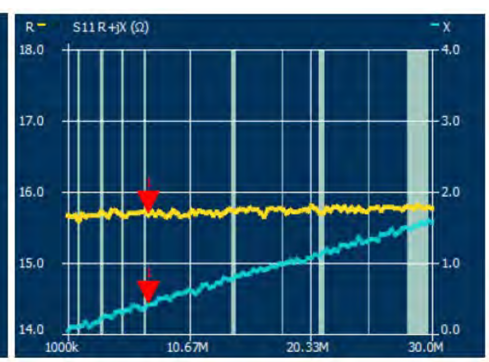
Then we calibrate the nano in the usual way with the attenuator included in the chain. If we then measure the same 16 ohms again we get the graph on the lower right. We clearly see the 16 ohms returns. This is pretty much a copy of the left graph with no attenuator.

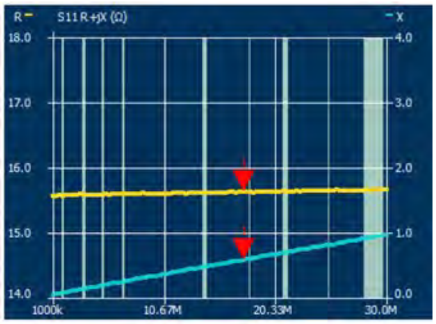
This is the power of the nano's calibration capability! Provided the attenuation is not too great, and you have recalibrated for the task, you can make a proper measurement. With a different load (e.g. 75 ohms), I could achieve the same result.

I also measured the 16 ohms through the 18dB attenuator. At the top left of the next page you will find the two measurements: first without the attenuator, and second with an 18dB attenuator and new calibration. We can see that the calibration for the 18dB attenuation is also neatly processed, but some noise has entered the measurement. But this is not really a problem.

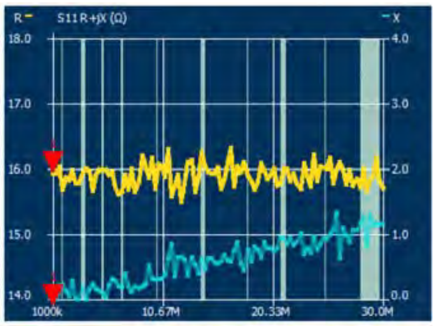




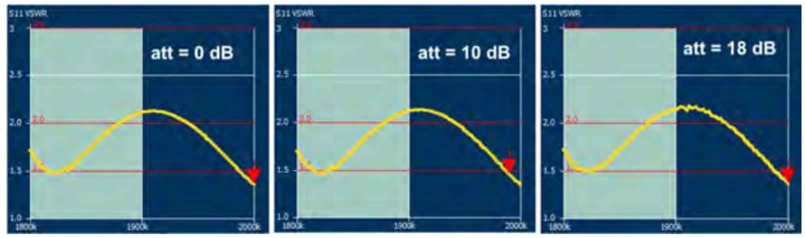




Left: No attenuator



With 18dB attenuator



SWR curves

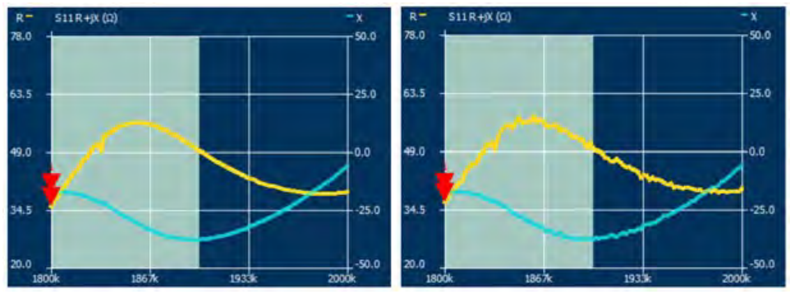
With this we have established that we can safely measure through the attenuators, provided the attenuation used is not too high.

Measuring the input impedance of a receiver

The receiver in use is an Elecraft K3. In this case I chose the SUB RX (2nd receiver) and tuned it to the 160m band. Measuring other bands is similar, with or without different impedance and SWR values. We measure S11 successively without the attenuator (att = 0 dB), with the 10dB attenuator (att = 10 dB) and with the 18dB attenuator (att = 18 dB). In all 3 cases, the nano was first calibrated.

First of all, the S11 SWR curves *[shown top right]*, are best known to us radio amateurs. The receiver's SWR input at 160m turns out to be between 1.5 and 2. There is hardly any difference between the three measurements. Therefore, if we use an attenuator, we can properly measure in a practical application.

Next, we look at the S11 R+jX values to give a more in-depth picture. The measurements are done with 0 dB attenuation *[below left]* and with 18 dB attenuation *[below right]*.



0 and 18 dB attenuation

Here too we see that the measurements are equivalent, although in the case of the 18dB attenuator it is clear again that noise is seen on the measured values.

Conclusions

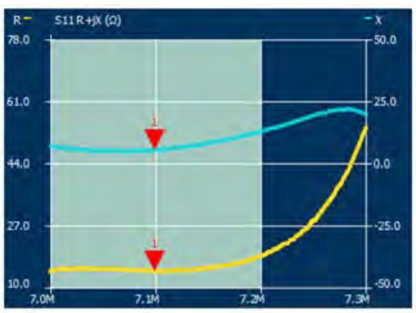
1. We see that we can confidently measure the K3 at the full capability of the nanoVNA. With or without attenuator produces the same results. With 10dB attenuation you can barely see the difference. We do see some noise in the measurements with the 18dB attenuation, but that is acceptable. So if you want to protect the input of the receiver, you can use an 18dB attenuator. The measured values will simply work if you have calibrated first. Using a higher attenuation will make the readings inaccurate. In my case, 25dB was too much for a good measurement.

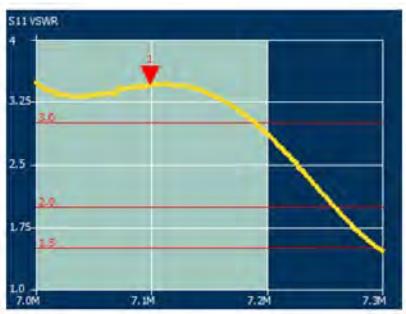
2. At 160 meters, the K3's SUB RX is pretty close to 50 ohms, SWR between 1.5 and 2.

3. Calibration before measurement is *really* important. If the attenuator is not completely symmetrical, the measured values will vary if you connect the attenuator the wrong way around. Keep that in mind because it can make a lot of difference. Don't ask me how I know ;-)

4. On other amateur bands, a receiver input may behave differently.

To demonstrate point 4, I measured the S11 at 40m in the example below. The difference at 160m is clear. On the left the measurement S11 R+jX, on the right the S11 SWR.





In short, a receiver input of exactly 50 ohms is not an issue in my case. This can vary by band. If I went the royal road to connect my 75 ohm receiver antennas to the input of the SUBRX, then I should actually make an adjustment per band. That is something for the competitive contesters and purists.

The receiving antennas that I use here and there myself and that enter the shack with 75 ohm TV coax come without modification to the connected receiver. It turns out to be no problem in my specific situation.

You can also repeat these measurements yourself with your own receiver while, for example, you turn on the pre-amp or conversely turn on the attenuator. Maybe it will make a difference in input impedance for your transceiver.

Have fun measuring. Questions or remarks? Let me know. Contact details can be found on QRZ.

~ *Arie Kleingeld PA3A*

Online groups on NanoVNAs:

https://groups.io/g/nanovna-users

https://groups.io/g/NanoVNAV2

https://groups.io/g/nanovna-f

https://groups.io/g/nanovna-f-v2

Minimizing anxiety with your electric car

NanoVNA Article correction

In the article *Measurements with the nanoVNA Part 5: Measuring low impendances* in the July-August 2021 SARC Communicator, one of the formulas in Box 2 (calculate S21 with a parallel Z to Z=R+jX) was incorrect.

The correct formulas are presented here. A big thank-you goes out to Philippe Levionnais who saw the mistake in the original formulas and for pointing this out to me.

73,

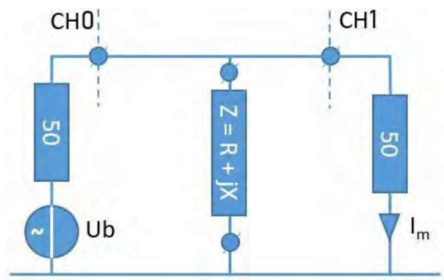
~ Arie PA3A

Box 2

S21 = Dr + j Di .
Dr and Di values are exported directly from nanoSAVER by

$$R = 25 * \frac{Dr(1-Dr) - Di^2}{(1-Dr)^2 + Di^2} \qquad X = 25 * \frac{Di}{(1-Dr)^2 + Di^2}$$

means of an **S2P** file. R+jX can be calculated using the formulas below.



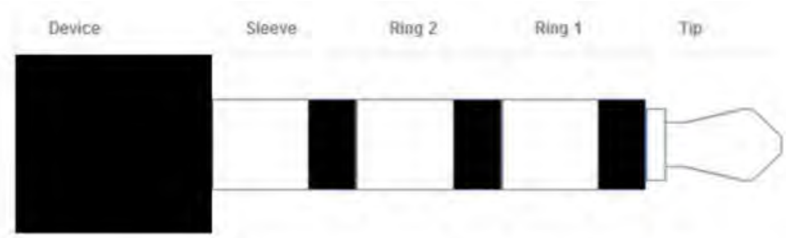
Are You Confused About Your A/V Cables?

Recently on the Boulder ATV net there was a discussion about the proper connections on 1/8" A/V plug cables. Jack, K0HEH, did some research and came up with some answers. I have added a few entries covering the specific devices we are using.

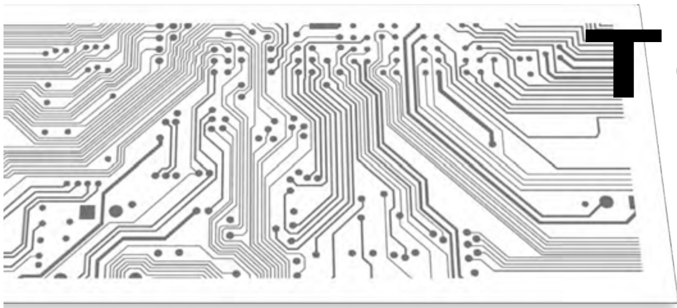
Note: For RCA plugs, the standard color code convention is: Yellow = Video, Red = Right Audio Channel, & White = Left Audio Channel

If you have an unknown cable, then use your Ohm-meter to determine which of the above you have.

~ Courtesy TV Repeaters REPEATER Newsletter



Device	Sleeve	Ring 2	Ring 1	Tip
Raspberry-Pi	Video	Ground	Right Audio	Left Audio
Apple	Video	Ground	Right Audio	Left Audio
MP3 Players	Ground	Video	Right Audio	Left Audio
Camcorders	Right Audio	Ground	Video	Left Audio
Canon Camcorders	Right Audio	Ground	Video	Left Audio
Media Player	Ground	Video	Left Audio	Right Audio
Hi-Des DVB-T Receivers	Ground	Video	Left Audio	Right Audio
RC-832 5.8GHz, FM-TV Receiver	Ground	Video	Audio	Not Used



Tech Topics

Rick K8CAV

The VOM-DVM workshop

Here at The Communicator we regularly receive newsletters from other organizations. One is the Portage County Amateur Radio Service (PCARS) who publish their informative newsletter, The RADIOGRAM monthly. PCCARS has invited us to reprint articles of interest and this one struck me as an excellent workshop to teach basic skills to members.—Ed.

On Saturday July 24th, the Portage County Amateur Radio Service (PCARS) held at VOM/DVM workshop at the club site. The purpose of the workshop was to introduce participants to the principles of the VOM (volt-ohm-ammeter) and DVM (digital volt-ohm-ammeter), and how to use them.

The workshop started with a presentation that covered a number of different topics. Safety was the first, and most important topic presented and talked about how to make measurements while minimizing the possibility of shock, injury, or damage to the instrument or circuit being measured. Each instrument was described along with listing their capabilities. Advantages and disadvantages of each instrument were presented and more in-depth discussion about things such as resolution and accuracy were presented. The concept of instrument impedance was discussed, and how an instrument's impedance might affect presented measurements in circuits. Finally, the use of probes with instruments was talked about, and how such probes might expand the usefulness of the instruments.

When the presentation was complete, participants moved to a hands-on portion of the workshop. Six stations were established that required each participant to make and record measurements at that station. Each station had a test setup, along with the required instruments, calculators and scratch pads. At some stations, participants were asked to make some basic calculations using Ohm's Law, using the measurements they made along with other given information to come up with answers to questions posed for that station. In all cases, participants needed to use the information they learned during the presentation to set their instrument to the correct mode and range to make the required

measurements both safely and to obtain the required accuracy and resolution for that station's purpose.

At **Station 1** participants were asked to make and record ten different DC voltages ranging from approximately nine volts to approximately ninety volts.

Station 2 required participants to measure and record, using three different instruments, a DC supply voltage across two resistors forming a voltage divider network, and also the voltage across one of the two resistors in the network. Possible explanations were asked for if there were different readings between instruments.

Station 3 participants were asked to measure the current in a circuit using an instrument, then to remove the instrument and measure the voltage and resistance in the circuit and use Ohm's law to calculate the current, and explain any differences. VOM-DVM Work Shop

Station 4 involved measuring the voltage produced by a solar cell into a given load to calculate the amount of power produced by the solar cell.

Station 5 participants measured the value of three resistors and calculated the difference between the measured and nominal value of each resistor. They then calculated the percent of difference to determine if the resistors were in tolerance based on the color of the tolerance band on the resistor.

Station 6 was comprised of four precision, calibrated resistances and one precision, calibrated voltage. Participants measured the resistances and voltage, calculate the error in percent, and then compared the error to the specifications for the instrument to determine if the instrument met published specifications.

By the end of the workshop, all of the participants finished with a greater knowledge of the VOM and DVM, and were more fully able to use them to make measurements involving voltage, current, and resistance. Those who participated were Nick AC8QG, Ben AD8FQ, Agnus KE8LWP, Rick KD8WCK, Bob N8QE, and Mike KB8TUY.

~ Rick K8CAV

Courtesy of the Portage County

Amateur Radio Service newsletter

—The RADIOGRAM

https://www.portcars.org/wp/newsletters/

Ham Hardware

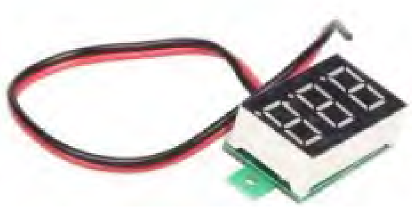
Al Duncan VE3RRD

A Boost/Buck DC-DC Converter for use with the KX3 or

I wanted to use my KX3 as a portable transceiver powered from whatever battery power was available to me. For the full output power of 10 to 12W, or to charge the internal batteries, a 13.8V (or slightly greater) supply is needed; so some means of converting voltages that are too low or too high is required.

On eBay, I found several boost/buck converters that would work to supply a continuous 13.8V at 2.5 to 3A. The one I ordered can operate from any input voltage between 5 and 32VDC and can supply the required output at 3A continuous (5A peak).

http://www.ebay.com/itm/DC-DC-Boost-Buck-Converter-5-32V-to-1-25-20V-5A-Power□Supply-Voltage-Regulator-/181516035122



I also ordered a compact DC voltmeter module to monitor the battery voltage so I would not discharge it too far and cause permanent damage.

http://www.ebay.com/itm/Mini-DC-2-5-30V-Red-LED-Panel-Voltage-Meter-3-Digital-Display□Voltmeter-LS4G-/131051474424

This voltmeter is powered by the voltage it is measuring, and operates over a range of 2.5 to 30VDC.

The finished converter allows me to use 6V, 12V or even 24V batteries to power my KX3.

A toggle switch allows the voltmeter to monitor either the input (battery) voltage, or the output voltage. The KX3 has a series diode in the power supply line, so I adjusted the converter output voltage to obtain the desired voltage as displayed on my KX3. An output of 14.1V resulted in a displayed value of 13.9V on my KX3.

I used 18 AWG wire for both the input and output cabling to minimize voltage drop. At maximum output current and lower input voltages, the converter can draw as much as 8A intermittently from the battery.

Everything fits inside a Hammond 3.3 x 2.2 x 1.5 inch (1591LSBK) box. There is just enough room between the edge of the PCB and the wall of the box to fit the subminiature SPDT switch and the compact DVM board. The DVM is secured in its opening with a few drops of cement.

I monitor the battery (input) voltage while I am operating; as I mostly use 12V gel cell batteries (two 6V – 7AH in series), if I see the battery voltage drop much below 11.5 VDC during transmit, I will switch to a new set of batteries (or call it a day).

~ Al VE3RRD

Article reprinted with permission from the author.

Transporting a 5Mb (yes, 5 Megabyte) hard drive was a serious job back in 1956

British Columbia QSO Party 2021

Behind the Scenes

Contesting in with-COVID era

There is light at the end of the proverbial tunnel—the COVID-19 tunnel, that is—brighter in some places than in others but nonetheless an indicator that we will all get back to some semblance of normal soon. For ordinary folks, the pandemic will be remembered for inconveniences, for lockdowns and curfews and travel restrictions, and for limited access to friends and family. For anyone who was personally affected by COVID-19, the pandemic might be remembered as an uncomfortable time possibly tinged with sadness, too. My condolences to anyone who lost a loved one during this time, whether COVID-related or not. It was a difficult time to grieve.

The downsides of the pandemic get more attention, and not to trivialize the enormous consequences of the pandemic on just about everything that makes the world turn, but there were some upsides, too. Many people have had more time at home, and they've crossed off multiple items on the to-do list that had been left untouched for years and years. People with a hobby—maybe even a dormant hobby—finally had time to enjoy that hobby more fully.

Case in point—radio. And to be more precise, contesting. True, the usual weekend DXpeditions to islands in the Caribbean for the big contests didn't happen due to border closures and restrictions on international travel. But many of those weekend DXpeditioners were on the air from their home stations, so participation levels were still good, but DX content was down. Another noticeable trend in 2020 and at least until April 2021 and maybe through May as well was a tremendous increase in QSO party activity.

Part of the reason is surely because more people were stuck at home, and whether the event was a casual QSO party or a cutthroat international marathon contest, it was an enjoyable way to spend the afternoon or longer. The question then is, will QSO parties continue to draw large crowds, or will activity backtrack to pre-COVID levels once stay-at home/stay-close-to-home recommendations are fully lifted? Will QSO party time be usurped by a honey-do list or family get-togethers? I'm thinking, hoping, that the newfound (refound?) fun of QSO parties sustains interest going forward.

BCQP 2021 participation WAY up

QSO party participation was also fueled by the State QSO Party Challenge, which includes the two parties in Canada—BCQP and the Ontario QSO Party.

There were a lot—a LOT—of operators, primarily in the United States, who were keen to begin the year-long competition with as many Qs as possible across the first three parties—BCQP, MNQP and VTQP. Having three parties on the same weekend helped keep operators engaged even when activity waned in the contest of focus, so the bands were buzzing, particularly on Saturday.

There was great depth to participation in BCQP 2021, with a few new BC callsigns in the mix and more operators spending hours upon hours calling "CQ BCQP" on both Saturday and Sunday. The results by BC stations reflect perseverance amid challenging CONDX. Operators who stayed the course had FUN! and kept the BCQP profile high.

Several times, I looked at the cluster, mostly to make sure that VA7ODX had not been busted. If it was listed as VE7 or DOX, I would have moved. I often saw several other BC stations above and below. Great stuff! Makes S&P a lot easier and more fun for everyone near and far. The CW operator saw the same. A terrific development.

CONDX

Rotten. Challenging. Discouraging. And yet, for operators who put in the time, the pileups were pretty constant.

CONDX on Saturday was better than on Sunday, and QSO counts reflect this. Based on the content in all logs received, the total number of QSOs reached 17,347, with 12,029 or 69.3%, on Saturday and 5,318 or 30.7% on Sunday. The Sunday segment is four hours shorter than the Saturday segment, but the difference between Saturday and Saturday is quite large regardless.

2021 highlights

The number-crunching section, beginning on page 10 of the full report at:

[http://orcadxcc.org/content/pdf/bcqp/BCQP_2021_report.pdf],

goes into considerable detail, but let me provide a few notable highlights that underscore the depth of participation in 2021.

- Number of logs received hit 363, up 131 or 55.8%, from 233 in 2020.
- Enormous increase in number of logs received from outside BC, up 110 or 54.1%, and an impressive improvement in the number of BC logs received, up 19, or 67.9%, to 47.
- Much higher number of BC stations on the air—up 54, to 135.
- Big rise in number of BC operators involved—up 48, to 144.
- More districts activated—35 of 42, for a coverage ratio of 83%.
- CW again the popular mode by far.

Interesting development, comes with caveat

On numerous occasions, as I was looking for a running frequency, I came across U.S. and Canadian stations outside BC calling "BCQP. Looking for BC stations." A nice strategy. It does have a downside though—the outside-BC station often gets responses from other stations outside BC, which aren't worth points—but it absolutely has an upside as well. BC operators who only do S&P will throw out a callsign.

Often, these S&P-type BC operators aren't fully committed to BCQP. A few are, of course, but many aren't. They hadn't planned to participate in BCQP or weren't aware of the event and are likely unprepared for the required BCQP exchange. If pressed for their federal electoral district, they may not know it, get it confused with the provincial riding or (gasp!) give out an incorrect district name.

Since BCQP's growing popularity may lead to more non-BC stations calling CQ, let me offer some suggestions on what to do.

Ideally—and repeat BCQP participants already know this—during the QSO, the CQing operator can guide the BC operator through the elections.ca website to find/confirm the federal electoral district and then check the BCQP multiplier list to get the three-letter abbreviation for BCQP purposes. Or, the CQing operator can do the search if the other operator provides a postal code. Confirming the district DURING the QSO ensures that the CQing station gets the correct exchange AND it ensures that the BC station will be giving out the correct district on subsequent Qs, because continued participation by an accidental participant is certainly a possibility.

Some CQing operators use QRZ post-BCQP to find an address and then plug the postal code into elections.ca to find the federal electoral district. This is problematic. For many reasons. First and foremost, it's not really the right thing to do in contesting. Aside from fixing obvious issues, especially in the log header (name, address, category of entry, name of QSO party!!, etc.), the log is what it is, mistakes (mis-entered callsigns, etc.) and all, when the contest ends.

But more specific to the unknown or iffy district issue, the BC operator who didn't know his/her district may realize several Qs later that the district given out earlier was wrong and switch to the right one. Our BCQP log-checking process will go with the correct district, and the incorrect district will relegate the QSO in the earlier CQing station's log to busted status. It's unfortunate and sometimes rather maddening, if the CQing operator was simply entering the info as provided. But these things happen.

Another problem arises when the callsign itself is busted, and the potential for a busted callsign rises exponentially when CONDX are rotten and/or operators are struggling with QRM, QRN and QSB and, on PH in particular, operators aren't using phonetics. Looking up a busted callsign on QRZ will result in a busted district designation. More often than not, a busted callsign is either a unique, not showing up in any other submitted logs, or is revealed as busted because the QSO appears in a reciprocal log with the CQing station's callsign. There's also always the possibility that the QRZ address is incomplete or the individual has moved or maybe s/he was operating from a location different to the QRZ-listed location. Consequently, the district remains a question mark, and will essentially invalidate the QSO.

Personally, I hate it when I've tried really hard to complete a QSO correctly, whether it's for a rather rare multiplier in a contest or an ATNO for my DXCC collection… and then it turns out I'm not in the log or the other operator has busted my callsign. So don't lose out on BCQP QSO points and/or mult. If you're CQing, do the best you can to get the correct information if you encounter a BC operator who doesn't know his/her district. Work together to figure it out BEFORE the QSO ends.

Phonetics on PH, please!

When CONDX is awful, when auroral creep makes over-the-pole Qs nearly impossible, when local QRM/QRN and QSB obliterate the same "question mark" again and again, when callsigns and exchanges are truly just whispers in the wind and it's more ESP than listening skills that put a callsign in the log… phonetics are oh-so important. This doesn't really apply to CW but on PH… essential. B can sound like P or even G. S like F. M like N. Well, a similar issue does occur with CW. A missed "dit" or "dah" is a completely different letter, isn't it? And when there are so many similar callsigns, phonetics boost accuracy and QSO efficiency.

Looking at BC stations in BCQP 2021, there was VA7ODX, VA7DX and VE7DX; and VA7RN and VA7RR; and VE7XFA, VE7XF and VE7UF; and VE7ES and VE7EU; and VA7VK and VA7VX; and VE7KW and VE7KX; and VA7OM and VA7MM; and VE7SAR and VE7JAR. Relying on a cluster spot or logging software database—in any contest, not just in BCQP—could lead to a busted callsign, incorrect multiplier and lost points. Some of the above-mentioned BC stations were CW-only or PH-only, but a few were mixed mode themselves or had QSOs with other stations that were mixed mode. It was obvious during the log-checking process that the similarity in callsigns caused some operators to mis-enter data beyond the typical "A" vs "E" in the prefix.

From outside BC, quite a number of callsigns differed only by a number or letter as well. Don't over-rely on your logging software database and/or cluster spots.

Rewards for perseverance

BCQP offers many incentives for getting on the air, from the camaraderie of team operation—albeit socially distanced in 2021—and the chance to polish skills or help others learn about HF operation to potential pileups and surprise DX (for BC participants able to contact anyone anywhere).

For operators seeking tangible rewards, BCQP has lovely BC scenery- or notable landmark-inspired certificates and plaques, different every year and therefore collectible. Certificates recognize top scores by stations in BC and outside BC in all categories of entry by state, province and DX entity. A certificate category recognizing top score, overall, in each BC district is maintained to spur greater participation from operators throughout BC since VE7/VA7s are quite literally the life of the party.

Note: The only requirement for certificate and plaque eligibility is that the submitted log has at least 10 valid QSOs.

~ Rebecca VA7BEC

Contest Coordinator BCQP

Read the full report at:

[http://orcadxcc.org/content/pdf/bcqp/BCQP_2021_report.pdf]

Complete line scores are here:

BC: http://orcadxcc.org/content/pdf/bcqp/2021_BCQP_BC_scores.pdf

Outside BC: http://orcadxcc.org/content/pdf/bcqp/2021_BCQP_outside_BC_scores.pdf

Plaque Winners in 2021

Team VE7IO (+VA7QD VA7NF VA7TU VE7FO VE7TI VE7WJ) captured the Top BC (multi-op) plaque, with a score of 1,140,434.

Gary VA7RR broke the single-op record by a long shot, with a score of 1,734,000 to capture the Top BC (single-op) plaque.

VE7UF (OP: VE7JH) is awarded the mixed mode plaque, with a score of 1,221,872. Note: Plaque category renamed "Excellent Achievement: Mixed Mode."

Les VA7OM takes the top CW plaque, with a score of 273,632.

Elizabeth VE7YL kept the Top YL plaque with a CW-only score of 10,964.

Axel KI6RRN held on to the Top US plaque, with a score of 26,916.

Dale CE2SV reclaimed the Top DX plaque, with a score of 5,716.

Allen VY1KX returned to top Canada outside BC position, with a score of 4,976.

Pete VE7CV will receive the plaque for districts contacted, renamed "Excellent Achievement: Districts Contacted."

ORCA DXCC maintained top club status, with an aggregate score of 6,694,706 from 29 submitted logs with Orca DXCC as the participant's affiliated club. Note: This does not include sponsor call VA7ODX results. results.