FROM THE WORKBENCH

By Darrell Davis, KT4WX

Welcome to the somewhat belated Fall issue of the WCF EXPERIMENTER. Do not blame Jim Weslager K3WR, our newsletter editor, for this issue being somewhat tardy. You can blame me for that one. I have been struggling with various minor health issues that have slowed me down. I am starting to get back on top of the game so to speak. Your prayers and thoughts for me are sincerely appreciated. And at times my other duties as your Section Manager just get in the way. I am not complaining but sometimes there are not just enough hours in the day to get things done. I hope that the contents of this issue made it well worth the wait. We have another paper that was presented at the 2016 ARRL TAPR Digital Communications Conference, another great article by Geoff N1GY, and my next Bits and Bytes Column and more.

However it takes good content to make the WCF EXPERIMENTER a viable newsletter. If you have a project you have designed, or a modification to a piece of amateur radio equipment that you have done, or even a tip or trick you have learned, write it up and send it in. Jim Weslager K3WR, our newsletter editor can take your text and any related figures you create (pictures, schematics, etc.) and make them look great in print. Please send Jim any content via email at weslager@gmail.com.

Being this will be the last editorial for the WCF EXPERIMENTER before the holidays, I want to take this opportunity to wish all of you a Happy Thanksgiving, a Merry Christmas, a Happy Hanukkah to my Jewish friends, and a Happy New Year to all of you. Do not forget to spend some time away from your workbench with your families and friends during these respective holidays.

6th ANNUAL
TechCon 2020
WCF Country
West Central Florida Section
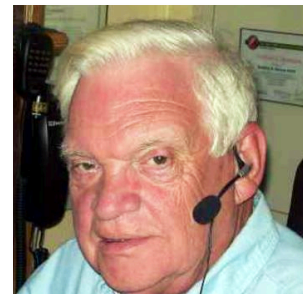
Remember to get this event
on your calendar now!

February 21-22, 2020

TechCom 2020

3-D PRINTING AND HAM RADIO

By Geoff Haines, N1GY
ARRL Technical Coordinator - West Central Florida Section

Geoff Haines, N1GY

Recently, I had occasion to visit my son and his family for a few days. While there, I discussed my desire to have a neater and more sophisticated radio installation in my personal vehicle, a 2014 Dodge Grand Caravan. The main problem was hiding all the various wires and cables to and from an Icom IC-706MkIIG and a Jetstream 220 mobile rig. My preference has always been to put any additions to the car such as radios, navigation units like GPS's, and any accessories such as USB chargers, CB radios and the like on a separate switched circuit so that when the radio or other device is turned off it is completely disconnected from the vehicle battery. It may come as a shock to some, but the IC-706, for example, does not really turn off when you hit the "power" button. Because the 706 is basically a computer driven radio, certain circuits stay on in the background in order to respond to the power button being pushed to "turn the radio on". This current draw can be significant. It has been measured at greater than 0.2 ampere hours. If one turns the radio off using the "normal" switch on the radio and then departs for a two or three week vacation, one may come back to a vehicle with a dead battery. It is for this reason that I always power any vehicle mounted radio through an outside switch. The radio will still come alive when the switch is thrown, but it will not place any drain on the battery when the switch is off.

Between my son and I we came up with a design for a switch box that could hold up to 4 switches and power, in my particular case, three separate circuits all fed from a single source from the vehicle battery and protected at the battery with a 30 amp fuse. I chose to wire all three switches and feeds with 12 gauge red/black zip cord, mainly because it would mean that any of the three switches could be used to power high current (<20 amps) without having to redo the wiring. In fact only one switch is used for high draw situations at the moment. It powers the IC-706MkIIG and the 220 radio. The second switch controls power to an auxiliary connection with three PowerPole outlets in one of the storage compartments in the center console. One of those PowerPole connections is used to power a triple USB charger module for charging cell phones or tablets etc. The other two PowerPole outlets are available to power whatever I might need. My FT817ND for example or a CB set for occasional use to get traffic updates while on long trips. The third switch controls power to a dashboard mounted GPS navigation display. There is a fourth switch position in the design which will require drilling out the hole to accept a manual switch for my screwdriver type HF antenna. Right now the antenna is automatically controlled by a Turbo II Tuner unit but I did want to keep my options open. That fourth position could of course be filled by another illuminated switch to control an additional circuit.

Once the design for the switch enclosure was finalized, the next question was how to construct it. My son suggested 3-D printing and informed me that he had just such a printer at his office. He down loaded the software to convert my rough sketches into a polished drawing that the printer would need and with lots and lots of help from him, we got the design whipped into shape. As luck would have it, the printer was equipped with a black filament so the color was appropriate for combining with the amateur radios which usually come in some variation of basic black. After the printer was done, no short process believe me, it took some 14 hours to print a tapered box about 5 and ½ inches wide, 2 inches tall and about 4 inches deep. The back end of the box was only about ½ inch deep hence the taper I mentioned before. This was done deliberately to fit better into the storage compartment at the front of the center console. As a final touch, my son added the labels for the three switches "RADIO   AUX   GPS above the switch positions and my call sign N1GY underneath the switches. All of this was integral to the printing process. Once the print was done we had to remove a fair amount of "structure" that the printer adds to the job to support flanges at the bottom of the enclosure. The box was actually printed upside down with what would be the top of the box on the bottom of the printing space and the eventual bottom of the enclosure at the top of the print. This "structure" is very frail framework to support the flanges which would otherwise have nothing to "stand on" without this framework. After the print job, a few minutes were spent with a chisel scraping out the "structure" and leaving the desired openings clear and available for the next step.

That next step I just mentioned was the installation of three 30 amp rated illuminated rocker switches purchased from Radio Shack. I standardized on these switches long ago since they are well rated for the task and are available at any Radio Shack store should one misbehave. And as a matter of fact one did. The very next day I noted that the illumination had disappeared from the GPS switch. The switch still worked but the indicator was dead. It was a pretty simple matter to replace the switch with a spare and carry on.

The underside of the box was closed up with a properly sized piece of thin foam similar to mouse pad material. It is

held on with double sided foam tape and when the box is installed the foam "lid" rests against the top surface of the Jetstream 220 radio.

The other fabrication done for this project was the creation of a suitable bracket to hold the 220 radio and the switch box together and reasonably secure both to the center console. For obvious reasons I wanted to keep screw holes to a minimum and certainly not in high visibility locations. I used a material that is available from many plastics suppliers although it may be easier to buy smaller quantities from a local sign maker. Not the kind that appear to be on every second street corner, but the kind of firm that builds the big signs in front of offices and hotels. This material is called ABS sheet and it is about 1/8" thick and has a smooth side and a textured side. It comes in 4' x 8' sheets just like plywood. I find it is easiest to put together a group of 2 to 4 hams and split the cost which will run about $60 to $70 per 4 x 8 sheet. Often the sign maker will agree to cut the sheet up into more easily handled 4 x 4 0r 2 x 4 pieces. One 2 x 4 or quarter sheet of this ABS plastic will supply many projects. In this most recent project I made a paper pattern after measuring the box and the 220 radio and the distance and angle to the pair of cup holders between the two storage compartments. The front compartment holds the 220 radio and the switch box, the rear compartment will hold the CB when used and also holds the USB charger module. The brackets for both the 220 radio/switch box and the CB have two "fingers" which fit into the cup holder are in such a way that the cup holders are still fully useable. The "fingers" keep the radios from moving around and yet they can still be easily dismounted when needed. The brackets were cut out of the ABS sheet using the aforementioned paper pattern. A combination of clamps and lumber to form a bending jig was aided by a heat gun available from several sources such as Harbor Freight. After sufficient heat was transferred to the ABS it was easy to push the plastic around the lumber form to get a nice tight bend. The bracket was then bolted to the radio in the usual manner, albeit with only two bolts instead of the usual four. The arms that were attached to the radio extended beyond the radio far enough to allow the switch box to be attached in a similar manner.

As one can see from the accompanying photos the installation is quite neat and as my first experience with 3-D printing it opens a lot of options for amateur radio in the future. I can see 3-D printing being used for enclosures, for insulating materials and devices, for brackets to mount radios and accessories, the list just goes on and on. The only limitation is the imagination and the size of the printing platform in the printer. #-D printing with metal is on the horizon and just like with plastic the costs will come down as the technology expands. Within my lifetime I expect that hams will be 3-D printing not only the enclosure but the complete circuit inside the enclosure. The technology is in

its infancy right now, in a few years I expect most of us will have a 3-D printer in our workshops just like we have an ink jet printer next to the computer in our radio room.
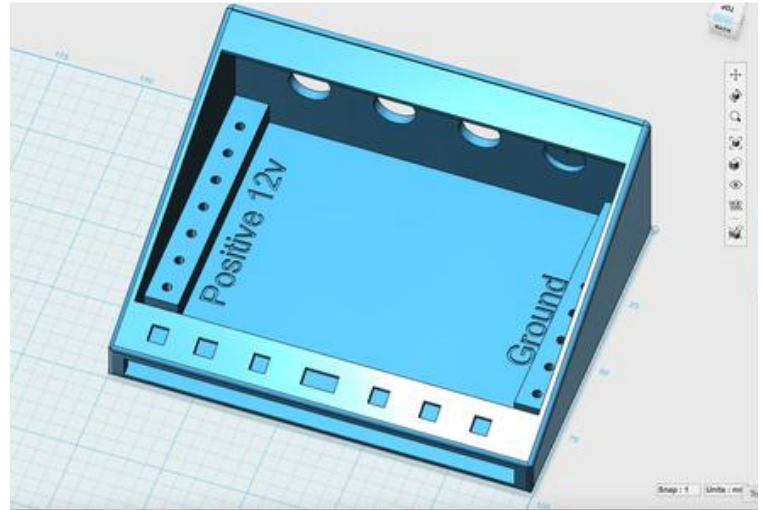
This is a screen shot of the electronic design we used to print the switch box for my mobile installation. In this view it is upside-down.
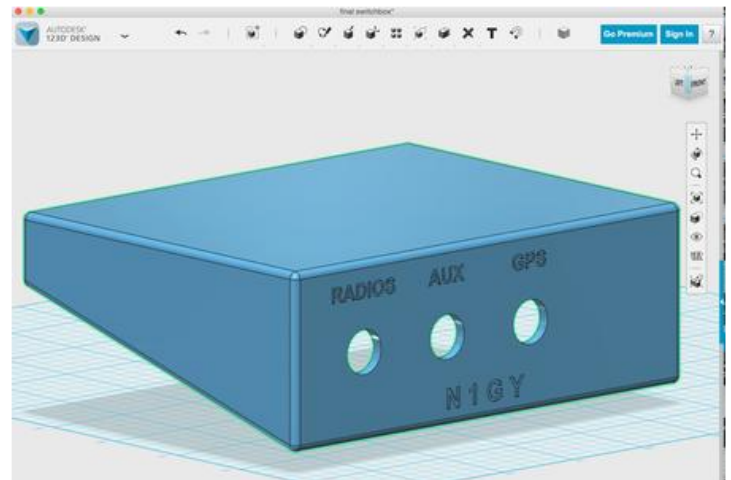
Another screen shot showing the switch box right side up and with the labels for the switches and my call sign included in the 3-D printing process.

Here is a photo of the switch box being created in the 3-D printer. Note the large amount of "structure" at the front and back of the box. You are looking at the back of the box in this shot. The "structure" is there to support the spans at the front and the back of the box. Without this automatically added material there would be nothing to hold up the spans and they would sag to the floor of the printer. This "structure" is easily removed with a chisel after the printed object has had time to set fully rigid.

AUXILIARY, GPS. There is space for a fourth switch but I don't have any plans to add another switch at the moment.

This is a view that has not been seen in these pages before. The new shelf is above the bending brake with the 3 green patches on the edge. As you can see, it is already full of tools and supplies. THe area beneath the new shelf now holds the bending brake. Behind that is the storage spot for the drill packs and spare batteries for the drill and the circular saw. To the right of the brake is a ring of welding rod that holds the container for more rods and aluminum flat stock. Next is the hanger for the heat gun on another bookcase that holds heat-shrink, Power Pole connectors etc. Below that are files, rasps etc. Under that is more storage, mainly for stuff I don't know what to do with right now.

A new tool has been added to the workshop. As I age I find it harder and harder to make use of a tool that I use very often, a nibbling tool. The hand operated nibbler that I already have just took more effort than one hand could provide. I have now upgraded to a power nibbling tool operated by a corded electric drill. I have mounted the entire assemblage on a board so everything will stay aligned and I have tested it. It works very well except that it lacks a table on which to feed the work through the nibbler head kind of like a router table. My son has volunteered to assist in building such a table when he comes to visit next month so that will add to the usefulness of the new tool. It certainly makes short work of cutting aluminum sheet or angle.

Pictures to follow when we get it completed.

This photo shows the final placement of the switch box on top of the 220 radio. The main radio is an Icom IC-706 MkIIG and the control head is on a stalk mount out of the picture to the top. The CB set on the other side of the cup holders is only used on very long trips when it would be nice to find out why we have been in a parking lot on I-95 for the last hour.

The three switches that are illuminated in this photo are, from left to right (or bottom to top if you prefer) RADIOS,

THE DAILY DOUBLE
A 75M MIXED-MODE TRANSCEIVER

By Walter Legan KA4KXX

As an old retiree with reduced physical capabilities, amateur radio has become a large part of my life, so I like to make at least a couple of contacts every day, and I still get a thrill every time, especially with CW QRP.   This simple transceiver enables me to easily check-in to nets twice a day on average, every day, lightning storms or not, at a tiny cost (compared to the rigs most hams own these days) hardly worth mentioning.

Unfortunately, the only HF band currently with predictable, robust propagation here in the Southeastern United States is 80 meters. However, participation on the CW portion of this band is so low that making contacts is too much like work, which I happily retired from eight years ago.

So with my life-long emphasis on building projects with a high degree of utility1, I noticed on the Phone portion of the 80 meter band (often called "75 meters") the ARES (Amateur Radio Emergency Service) Nets that operate on 3950 KHz at convenient times in the morning and evening every day that not only accept check-ins on CW QRP, but also usually invite these at the very beginning of the net. so waiting time is eliminated. Also, the Saturday Net at 9:00 AM on 3940 KHz that is run by the Ocala QCWA presents another QSO opportunity. Other advantages of this mixed-mode approach are easy copy for me, and also I can answer any questions very directly without all the usual CW-only protocol.

The DAILY DOUBLE by Walter KA4KXX: The VFO, Coarse and Fine Frequency Controls, Frequency Counter, RF Receive Pre-Amp, and RF Mixer are inside the black enclosure, while everything else is outboard.
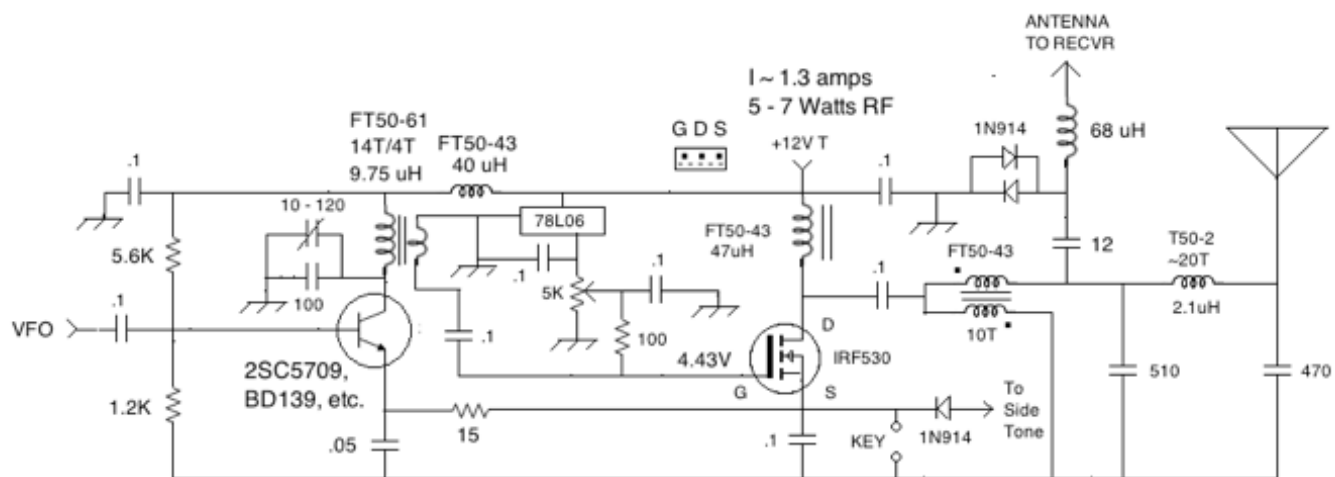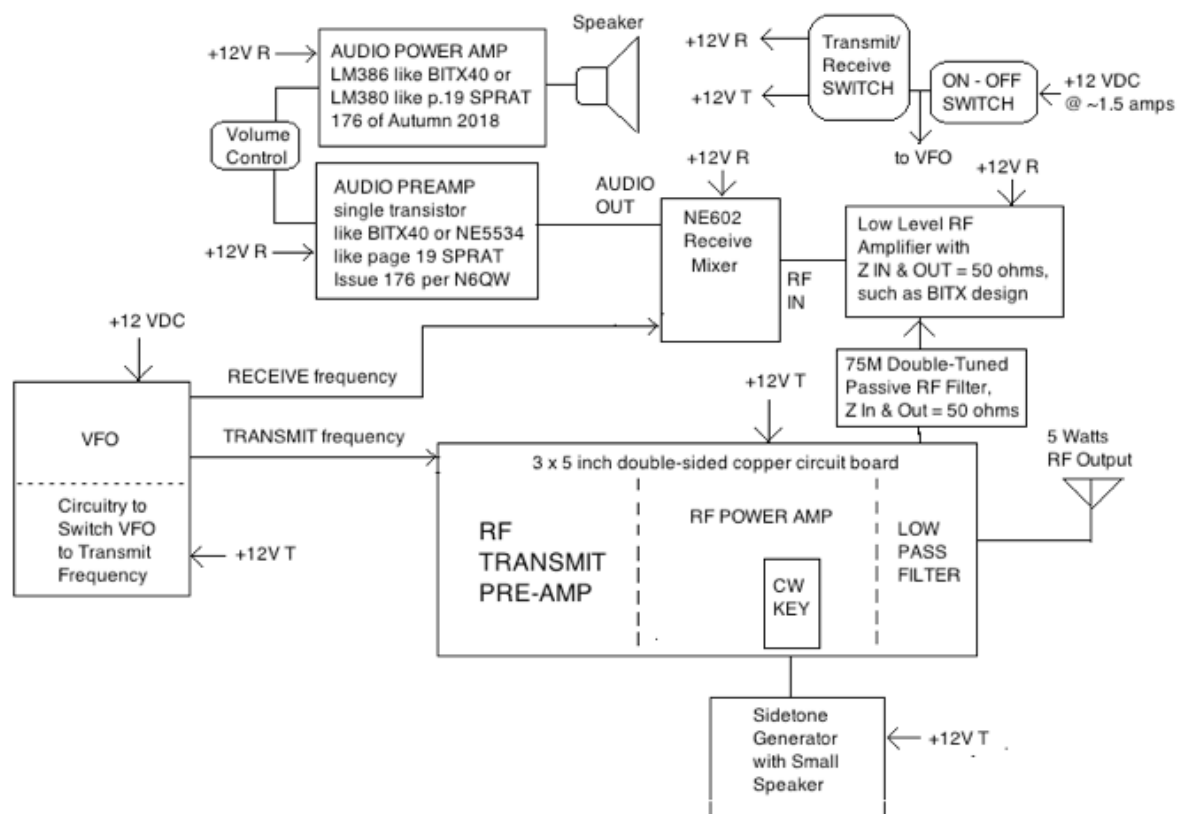
The concept is to have a single drive a Direct Conversion Phone Receiver tuned exactly to the frequency of interest, but the VFO is switched to approximately 900 Hz lower in CW Transmit mode. That way my fellow Phone Net members can hear my CW note on their lower sideband phone radios. Unfortunately, some modern commercial receivers cannot normally hear CW when operating in Phone mode, but I have found that most ARES and QCWA Net operators do not own equipment that is afflicted in this manner.
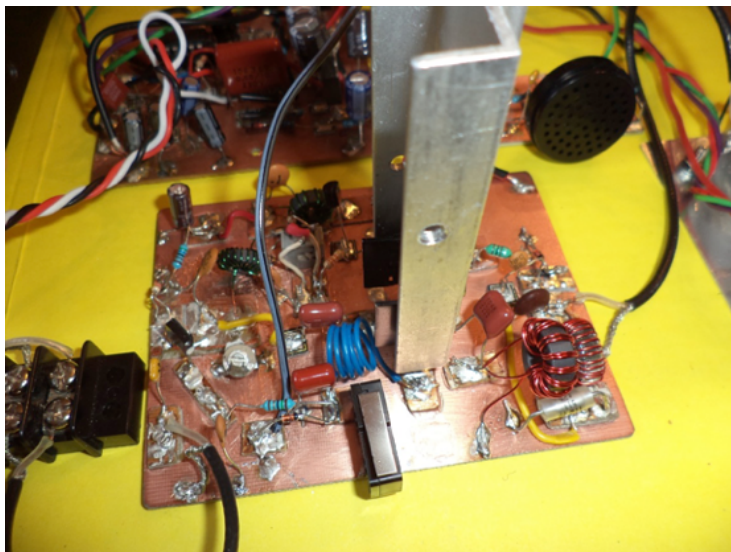
The DAILY DOUBLE Transmitter section showing Micro-switch Code Key at bottom and Side-tone Speaker at upper right

Note that the VFO needs to include buffer and amplifier stages such that the RF output is approximately 1.5 VRMS into 50 ohms to achieve results similar to mine. The VFO can be analog homebrew, salvaged from an old radio no longer in use, or one could build a DDS kit such as the Si5351A VFO from QRP Labs. Since we are transmitting in CW for short periods any frequency drift will probably not be noticeable, and on receive if listening for an extended time the VFO can be periodically adjusted to suit your taste.

All the circuits in this design as shown in the block diagram are originally by others, and very familiar to most home-brewing hams. Therefore I have only included a schematic for the one circuit board (transmitter) that was customized significantly to make this rig a success. This transmitter was inspired by several "twofer" sources, including the Iron Fist article by Andy G0FTD in SPRAT 174 of Spring 2018, and a 10W transmitter circuit found on www.qsl.net/va3iul.

Block Diagram (upper):

+12V R → AUDIO POWER AMP LM386 like BITX40 or LM380 like p.19 SPRAT 176 of Autumn 2018 → Speaker

Transmit/Receive SWITCH → +12V R, +12V T

ON - OFF SWITCH ← +12 VDC @ ~1.5 amps

to VFO

Volume Control

AUDIO PREAMP single transistor like BITX40 or NE5534 like page 19 SPRAT Issue 176 per N6QW

+12V R →

AUDIO OUT → NE602 Receive Mixer

+12V R

RF IN

Low Level RF Amplifier with Z IN & OUT = 50 ohms, such as BITX design

+12V R

+12 VDC → VFO

RECEIVE frequency → (to NE602 Receive Mixer)

TRANSMIT frequency

Circuitry to Switch VFO to Transmit Frequency ← +12V T

+12V T

75M Double-Tuned Passive RF Filter, Z In & Out = 50 ohms

5 Watts RF Output

3 x 5 inch double-sided copper circuit board

RF TRANSMIT PRE-AMP | RF POWER AMP | LOW PASS FILTER

CW KEY

Sidetone Generator with Small Speaker ← +12V T

Schematic (lower):

ANTENNA TO RECVR

I ~ 1.3 amps 5 - 7 Watts RF

G D S

+12V T

1N914   68 uH

FT50-61 14T/4T 9.75 uH   FT50-43 40 uH

.1

5.6K

10 - 120

78L06

FT50-43 47uH

FT50-43

12   T50-2 ~20T

2.1uH

VFO   .1

100

2SC5709, BD139, etc.

.1

5K

100

4.43V   IRF530

D

G   S

10T

510   470

1.2K

.05   15

.1

KEY   1N914

To Side Tone

Transmitter portion: for best results, build on one circuit board, with integral microswitch as the KEY (Omron SS-5GL-F)

For any questions please feel free to contact me at my email address as listed on QRZ.com - https://www.qrz.com/db/ka4kxx

1 Note that my homebrew transmitter pictured on the cover of Summer 1981 SPRAT #27 (see below) is still operable 38 years later, with latest QSO having been in June of 2017 when 15 Meter propagation was still good!

SPRAT

THE JOURNAL OF THE G-QRP CLUB

DEVOTED·TO·LOW·POWER·COMMUNICATION

| ISSUE NR. 27 | © G-QRP CLUB | Summer 1981 |

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WQF – QRP World News

Walt Legan KA4KXX

The simple, but fine, QRP Station of KA4KXX. On top of the Heath Receiver are: left - Stablised P.S.U., right- 15 metre Transmitter based on the Goober Whistle circuit. See Walt's article on page 3.

NOTES ON USING YOUR GENERATOR

by Larry Gispert KR4X
ARRL Official Emergency Station

Many amateur radio operators have portable generators to provide backup power when the electrical service goes away. Current city/county/national electrical codes require that homeowners use an approved manual or automatic transfer switch to interface portable generators to household electrical panels for backup emergency power. They also require that this transfer switch be installed by a licensed electrician. The cost of purchasing and installing such a switch is considerable and approaches over $500. Although it is not code compliant, most hams either run long extension cords and plug in a few devices or they "Back Feed" their electrical panels either through a separate 220V breaker or through plugging into an existing 220v outlet such as clothes dryers. I personally interface my generator through the electrical panel and a separate 220v 50 amp breaker.

When interfacing backup generators to your electrical panel you will run into an issue with the neutral wires. Portable generators come with two possible electrical configurations: Some of the older generators have what is called a "Neutral Floating" setup and the newer generators are usually "Neutral Bonded to ground/frame" The "Neutral Floating" setup does NOT hard connect the electrical circuits neutral wire to ground/frame. The "Neutral Bonded to ground/frame" has the neutral wires hard connected to ground/generator frame. Either one of these setups will work but if you back feed your electrical panel and the generator is neutral bonded you will setup a dual grounding situation which would normally cause ANY GFCI outlets in the house and/or generator to trip. You can tell which setup your generator has by, be sure the generator is OFF then take an ohmmeter and place one lead in the large vertical slot (usually the left) and the other lead to the half-moon shape slot on the bottom of a normal three wire 120vac outlet. If there is continuity then your generator is neutral bonded. If not then your generator is neutral floating. Sometimes the owner's manual tells you how to disconnect the neutral bonding. You can also get this information from the generators manufacturer.

If you are interested in my generator setup send me an e-mail and I will forward the operations manual I made up for my setup so my wife or anyone else could properly hookup and operate my 5000 watt generator.

Electrical Safety E-Learning

Learn about electricity in an interactive environment. This e-learning experience is focused on electrical safety and is designed for all audiences. The module narrates and navigates you through a variety of interactive learning exercises, video clips and knowledge check questions. The intent is to increase your understanding and awareness about electricity and safety.

The training module covers five chapters:

Chapter 1: Electricity Basics - The Properties of Electricity and Key Terms

Chapter 2: Important Facts about Electricity

Chapter 3: The Anatomy of an Electric System

Chapter 4: Hazards and Safety Precautions

Chapter 5: How to Respond to Electrical Emergencies

Note: The module should take about 30-45 minutes to complete.

The ARRL TIS has a page that addresses this issue at http://www.arrl.org/electrical-safety.

The ARRL TIS page links to the following Electrical Safety E-Learning course that teaches all about Electrical Safety: https://www.appalachianpower.com/safety/HowElectricityWorks/ElectricSafetyE-Learning.aspx

Editors Note: Larry is correct that electrical codes do require the installation of a transfer switch and that work has to have a permit in most places and has to be done by a licensed electrician. If you install one yourself do you so at your own risk!

PI-GATE EMERGENCY E-MAIL SERVER

By Mark Griffith, KD0QYN

This paper was first published in the 2016 ARRL TAPR Digital Communications Conference Proceeding and reprinted here with permission of the author.

Abstract
Imagine an emergency communications system that is very small, self-contained, easily deployed, requires minimal power, and can be managed by anyone with the skills to connect to a web site. Disaster victims can then use their own tablet computer, smartphone, or other device to connect to this device and send e-mail to their family and friends, or any other e-mail address in the world, or even send a text message to their brother's phone.

Introduction
Amateur radio has a long history of providing communications during disaster situations. Ham operators spend a lot of time and lots of their own money to be able to help in times of need.

In the past, amateur operators have setup portable radio stations in all sorts of environments, and using, at first, Morse code (known in the amateur world as "CW") and then voice communications, they were able to provide a much needed capability when all other forms of emergency communications were unavailable.

As communications in our increasingly complex world have evolved, and as a result of the needs of emergency agencies that are served by the voluntary amateur radio force, digital methods of communications are becoming more necessary, for speed and, more importantly, accuracy. The demands that can be placed on a volunteer amateur operator to correctly transmit a list of much needed emergency equipment or medications using voice methods is staggering.

Additionally, people today are more "connected" than they have been at any time in history. Tens of millions of people in the world know about and use e-mail. The vast majority of these people also have smartphones and use them constantly. The notion of instantly being able to communicate with those you wish, no matter where you may be, is no longer a dream. Amateur radio itself seems to be an archaic or quaint way to talk to people around the country or world when all anyone needs to do is pick up their smartphone and verbally tell it to call their mother, or whomever else they wish, and the connection is made in seconds. This type of instant communication is greatly missed during a disaster situation when hundreds or thousands of people cannot connect to any of their family or friends just to tell them they are OK.

The challenge, then, is to try and bridge this gap, using amateur radio, an old, tried and trusted service, in a way that will give people an accurate, fast, and easy digital way to communicate using e-mail, a method that nearly everyone knows.

The Winlink 2000 System
As stated on Wikipedia, "Winlink, also known as the Winlink 2000 Network, is a worldwide radio messaging system that mixes internet technology and appropriate amateur radio frequency (RF) technologies. The system provides radio interconnection services including: email with attachments, position reporting, graphic and text weather bulletins, emergency relief communications, and message relay. The system is built and administered by volunteers without pecuniary interests. Winlink 2000 is a project of the Amateur Radio Safety Foundation, Inc. (ARSFI), a charitable entity and 501c(3) non- profit organization registered with the US Internal Revenue Service."

The Winlink2000 system is the backbone of the PiGate. In June 2016, Winlink handled over 65,000 email messages. There are currently nearly 1,000 Radio Message Server (RMS) stations around the world that are ready 24/7 to support the Winlink system. The ability of the PiGate to connect to that system, either via local Ethernet (if available in a disaster area), PACKET VHF radio, or PACTOR HF radio gives the PiGate the capability to handle emergency communications in any shelter or other site where disaster victims may be gathered.

VHF RMS Station Network
Many disaster scenarios in the past have be localized enough that the needs of responders would have been greatly enhanced if reliable communications was available just a few miles from the disaster site. Amateur radio operators using VHF voice communications has been most often used as the method that "always gets through". Amateur radio clubs and other organizations have been erecting new repeater sites all around the country. In many locations, there are so many repeaters that it is difficult to add a new one that can fit into the local repeater frequency allocations. As cheap and easy to use RMS software is developed and released by the Winlink development team, it is relatively simple to add RMS capability to an existing repeater. Expanding the Winlink RMS station list can do a great deal to help emergency communications, and with enough PACKET RMS stations throughout the country, any area should have reliable emergency communications.

The Raspberry Pi Minicomputer
The recent development of the Raspberry Pi computer at an extremely low cost allows something like the PiGate to be developed cheaply to be within the purchasing range of nearly all amateur radio licensees. This very small, fully functional computer, with very low power requirements, allows virtually unlimited ability due to its programming capabilities and the pre-built software packages that are available freely via download from the internet. In addition, the Raspberry Pi computer is very stable and reliable, two features that are very much needed in disaster scenarios.

The TNC-Pi
John Hansen at Coastal Chipworks developed a companion board for the Raspberry Pi that contains a fully featured KISS TNC. This board, in conjunction with the Winlink2000 PACKET RMS station network allows the PiGate to work in a majority of potential disaster locations, and provide quick, easy, and reliable email capability.

Prepackaged Software
Several software products are freely available via the GNU Copyleft license and are integrated into the PiGate device. The integration of these products are what makes the PiGate work.

- AX25 radio communications protocol that uses the KISS TNC.

- Paclink-unix developed by a team of part time programmers. This provides the method of transmitting and receiving email via AX25 and other protocols.

- Exim4 mail transfer agent for sending and receiving email that are specially formatted for the Winlink2000 system.

- Hostapd to configure and bring up the WiFi hot spot.

- Dovecot to provide WiFi login authentication to the PiGate email server.

- Apache for the web service.

- A customized version of SquirrelMail to provide the email server.

Web Based Administration Software
Integrating all these products to work together also required a way to manage it all as there are a number of configuration files that need to be setup correctly for it all to work. Even with a complete knowledge of how this was done, making changes can easily lead to misconfiguration and the system failing. Creating a simple web interface that

can be used from the web browser of a smart phone or tablet gives the PiGate administrator the ability to make changes needed during a disaster situation without having to resort to logging into the PiGate and edit numerous configuration files. This same interface is used to monitor the status of the PiGate as users (disaster victims) use the system to send email to their family and friends.

The PiGate can be mostly automated, where there is little or no action needed by the station administrator once the initial setup is completed to allow disaster victims to send email. Configuration of some items, like the master RMS station list, are done through the web interface, upon demand and before deploying, while an internet connection is available. (see fig. 1)

PiGate Emergency E-Mail Server

Amateur Radio Emergency Service

MENU

- Return to the Home page
- Change the PiGate admin user password
- Set the PiGate Clock
- Set the PiGate Timezone
- Change the PiGate WiFi SSID and password
- Set Default WL2K Callsign
- Edit the list of RMS stations
- Set Default WL2K RMS station
- Add a new PiGate e-mail user
- Delete a PiGate e-mail user
- View the PACKET log
- View the PACTOR log

Figure 1

How it all works
The basic premise of the PiGate is to provide users (disaster victims) with the ability to send email to their family and friends without needing someone to do it for them, which also provides them a measure of privacy. The key components are the WiFi hot spot, web based email server, the paclink- unix software and the AX25 protocol to do the actual connection to a Winlink2000 RMS station.

Once the initial station configuration is done by the amateur radio administrator, users are given the information to login to the WiFi hotspot, connect to the email server, and compose and send their email. Each user is normally given a separate login account to the email server. The user can use their smartphone, tablet, or laptop computer to make the connection using a web browser application and compose their email. This, of course, relies upon their having these devices and the batteries are good. If not, the amateur operator can choose to type in their email, or

provide them with a device to use, or provide them the ability to charge their own devices. (see fig. 2)

Figure 2
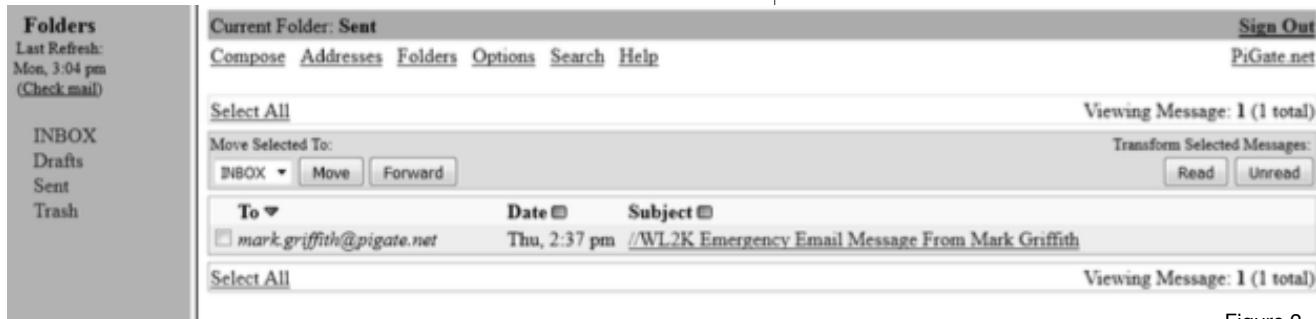
To conform to normal message traffic protocols within a disaster area, the PiGate, by default, does not allow return email. Each email sent has the Reply To field set to NOCALL so return email will not be accepted. Each message composed is formatted so as to be acceptable to the WinkLink2000 system. Also, each one has a footer attached informing the recipient that this message was transmitted via amateur radio as a service to the community. Messages can also be sent as a text message to a recipient's smartphone, and the PiGate will detect these messages and format them differently to better use the SMS text message system. Everything was designed to be used from a smartphone and the touch screen system works well. Once an email is composed, it is placed in the outgoing message queue to be sent during the next radio transfer session.

Radio Transfer

The amateur administrator during the initial setup would have determined the RMS station to connect to for message transfer and tested this connection. This setup is then used for all future message transfers unless changed by the amateur operator. The operator can choose either PACKET VHF RMS stations, or PACTOR HF RMS stations. Connections to PACTOR stations are highly dependent upon many factors, so PACKET connections normally work much better, although the range with a VHF connection is limited. Even so, a great many locations within the USA have a PACKET RMS station within reasonable range and can be used for emergency email message transfer. Use of high gain antennas and digipeater relays can greatly extend that range. Consulting the Winlink2000 RMS station maps will be useful.

Winlink2000 Email Transfer

Once the message or messages are transferred to the RMS station, they are processed though the Winlink2000 global email system. Messages are sent either via internet connections between the several CMS servers or via radio links if the internet is not available. This insures email capability in even the most widespread disasters. Email messages appear in the inbox of the user they are addressed to just like any other email. Messages can also

be sent as a text to a smartphone. Each cellular service provider has a method of sending an email as a text message, so simply using that method allows text to phone capability.

Conclusion

The PiGate system is designed to be portable, require minimum power, and ease of use. Combining these features with the capabilities provided by the Winlink2000 global email system provides a simple, robust platform that can be deployed in nearly any disaster scenario to provide "last mile" communications to emergency responders and disaster victims. People can use the device on their own, with little or no training, using their own smartphone or other device they are familiar with.

The PiGate software is provided free of charge to anyone that would like to download it and build a PiGate system. Regular updates are available from the PiGate web site. Even the nifty case is a downloadable 3D printer image which can be printed on nearly any 3D printer.

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Biography

Mark Griffith, KD0QYN
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Mark has been an active amateur radio operator since February, 2012. Prior to that, Mark received his first Technician class license in 1969 at the age of 16 and worked 2 meter AM in the New Jersey area as WA2HHF. After joining the USAF in 1971, he let his license lapse and only was re-licensed in 2012 after a 40 year break. Mark spends nearly all of his on-air time using digital modes such as JT65, JT9, and some PSK and RTTY during contests. As a member of the local ARES chapter, Mark developed a desire to help improve the ability of amateur volunteers to use digital modes from disaster areas to improve the speed and quality of service.

Editors note: Link to the Presentation Slides at the 2016 ARRL TAPR Digital Communications Conference: https://tapr.org/pdf/DCC2016-PiGate_Portable%20Emergency_E-Mail_Gateway_Mark_Griffith_KD0QYN.pdf

Link to the Presentation Video recorded at the 2016 ARRL TAPR Digital Communications Conference and shown on HamRadioNow.tv: https://www.youtube.com/watch?v=qO8lnRP5SE8

TOM'S TECH TIPS:
By Tom Shrilla, W8QJF

Here is an interesting TECH TIP provided by Tom, W8QJF. We hope you find Tom's shared insight interesting and informative.

Tom, W8QJF

Windows 10 God Mode: There's a special folder you can enable that exposes most of Windows admin, management, settings, and Control Panel tools in a single, easy-to-scroll-through interface. It's really impressive.

To enable it:

1. Right-click on the Windows 10 desktop and "Create a new folder."

2. Right-click the new folder and rename the folder:

"GodMode.
{ED7BA470-8E54-465E-825C-99712043E01C}" (without " marks), press enter and you're all set!

Courtesy of The Communicator, a publication of the Tamiami Amateur Radio Club, Venice, FL

Editor's Note: Additional information can be found on-line about this feature by Googling "windows god mode"
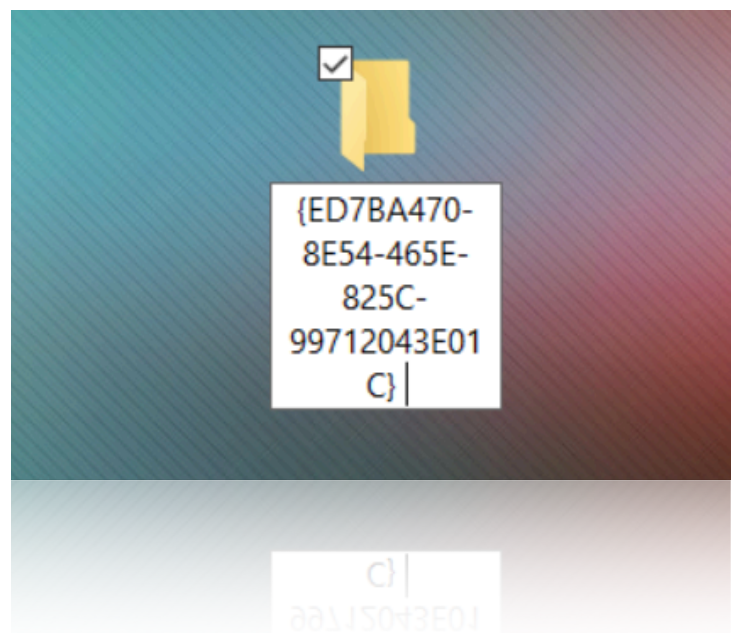
BITS AND BYTES – All About Microcontrollers

By Darrell Davis KT4WX

ARRL WCF Section Manager and ARRL Technical Specialist

Welcome back to our next installment of Bits and Bytes. It has been a busy summer and early fall, so I am late doing this column this time. So let us get right to it.

MICROCONTROLLER TERMS: We will introduce a few more "new" terms to you this month.

Internet of Things (IoT): This is a general term to define the technology and or techniques used to connect different devices to the Internet typically for the purpose of gathering data from devices or to control remote devices via the Internet without direct human intervention. This is somewhat a broad definition and the world of the Internet of Things is constantly changing and expanding. This is probably one of the largest areas of growth in microcontroller applications today. How many of you have an alarm system that you monitor from your smartphone? This is an example of the Internet of Things. For amateur radio operators controlling a repeater or an echolink node remotely is an example of the Internet of Things. At TECHCON 2020, Jon Pellant W1JP, is schedule to do our four hour Friday afternoon workshop on Introduction to the Internet of Things, which should be very interesting.

Integrated Development Environment (IDE): In the earliest days of microcontroller programming, in the early to mid 1980's, code would most commonly be written in hexadecimal format and use the microcontroller opcodes directly and then be compiled into machine language and burned onto the microcontroller. Thankfully this is no longer common practice. In the early to mid 1990's the first C++ compilers became available by the microcontroller manufacturers for their various microcontroller IC's. One would write the C++ source code, open it with a compiler program for that particular microcontroller. The compiler would compiler (and link the needed header files typically for hardware configuration) and then one would use the appropriate microcontroller programming hardware interface and appropriate microcontroller programming software package to program the microcontroller. Approximately around 2000 is when the first Integrated Development Environments (IDEs) started to become available for the various microcontrollers on the market at that time. An Integrated Development Environment (IDE) combines source code writing, compiling, linking, and programming into one

software package. An example of this is MPLAB X for the line of PIC microcontrollers by Microchip and Atmel Studio 7 for the Atmel microcontroller line. Ironically Atmel Semiconductor is now owned by Microchip and Microchip is retaining the Atmel Semiconductor line of products for the time being, which I think is a very wise strategy on their part.

If you are interested in more information about these IDEs you may go to their websites:

MPLAB X: https://www.microchip.com/mplab/mplab-x-ide

Atmel Studio 7: https://www.microchip.com/mplab/avr-support/atmel-studio-7

NEW PRODUCT HIGHLIGHT: ST Microelectronics STM32MP1 – Microprocessor/Microcontroller

ST Microelectronics earlier this year introduced a micrcontroller that contains either a single or dual ARM Cortex A7 Microcontroller core along with an Arm Cortex M4 core. This allows the designers to put more processor intensive tasks on the ARM Cortex A7 core while separately programming less intensive tasks on the ARM Cortex M4. The web page for the STM32MP1 is located at https://

This line of microcontrollers are sold in Ball Grid Array (BGA) packaging only. This typically means that one cannot hand solder one of these chips onto their own printed circuit board. BGA chips are typically used on a mutilayer printed circuit board. One can hand solder LQFP, QFP, and QFN package ICs onto a single sided printer circuit board, but this is almost impossible with a BGA chip. The great news is one can buy a low end evaluation board or development boards made by STMicroelectronics for reasonably inexpensive cost and simply integrate that board into your own project.   There are three processors in this line: STM32MP151, STM32MP153, and the STM32MP157.

There are two versions of the Discovery Kit for the STM32MP157: The STM32MP157A-DK1 Discovery Kit (figure 1) is at the present time $69.00 plus shipping and the STM32MP157C-DK2 Discovery Kit (figure 2) is $99.00 plus shipping. They both have the same processor, the STM32MP157 but the higher price kit contains a small touchscreen.

Next time we will begin our series in this column on how to program the low end 8 bit Microchip PIC series of microcontrollers. Jon Pellant W1JP and I recently talked about having an online style workshop teaching you how to get started with these series. That way we can get more participants by conducting the workshop online and travel is not a concern, as long as one has a good internet connection.

Unfortunately that is all for this column. Keep your soldering iron hot and keep that microcontroller code coming.

Figure 2: STM32MP157C-DK2

Figure 1: STM32MP157A-DK1

6TH ANNUAL TECHCON FRIDAY 2/21/2020 AND SATURDAY 2/22/2020

The 6th Annual TECHCON will be held on Friday February 21, 2020 and Saturday February 22, 2020 at the Charlotte County Emergency Operations Center located at 26571 Airport Rd, Punta Gorda, FL 33982.

For a Google map of the directions you may go to the TECHCON page on the Section website at http://arrlwcf.org/wcf-special-events/wcftechconference/.

The TECHCON general schedule is as follows:

Friday Afternoon Seminar:

- 1300 - 1700 hours - Introduction to the Internet of Things by Jon Pellant W1JP, one of our ARRL Technical Specialists and ARRL Emergency Coordinator for Charlotte County.

- *1200 hours - The facility will open for attendees to come and get setup for the seminar (computer program installations, etc.)*

Friday Evening Social:

- 1800 - 2100 hours - At a local restaurant to be announced

Saturday Main Session: 0900 - 1700

- 0800 hours - The facility's doors will open

- 0845 hours - Opening remarks will be delivered

- 0900 - 1150 hours - Morning presentations

- 1200 - 1315 hours - Lunch

- 1330 - 1630 - Afternoon presentations

- 1630 - 1700 hours - End of the day door prizes and closing remarks

There will be two presentation tracks planned throughout the day.

If you plan on attending TECHCON in 2020, registration is now open. You may go to the TECHCON registration page at http://arrlwcf.org/section-forms/wcftechconfregistration/.

Registration is free and attendance is free. There will be door prizes given away at the end of each presentation track and at the end of the day as well.

We are calling for presenters to present at TECHCON 2020. The topic of presentation is entirely up to the presenter, as long as it is amateur radio and technology related. We have alumni returning from past TECHCON's. However we are always looking for new speakers for TECHCON as well. If you are interested in being a speaker for TECHCON, please fill out the Contact Form on the Section website at http://arrlwcf.org/section-forms/contact-info/ and Darrell Davis KT4WX, our Section Manager will get in touch with you about being a presenter at TECHCON. TECHCON needs presenters to stay vital and interesting.

Many thanks to those of you who plan on presenting at TECHCON in 2020.