

FEEDBACK

FEBRUARY 2019

Operate Portable with a "Go Box" - Tom Wheeler, NØGSG

To be a ham is to be a communicator. The service of amateurs in providing both emergency and public-service communication is legendary, and in fact is one of the primary reasons for the existence of the amateur radio service.

Many hams greatly enjoy operating in the field. This goes beyond normal VHF and UHF mobile operation - we've all used hand-held and mobile radios on the go. Operating portable means establishing the operation of a station in a location other than your home.

To operate portable, there are few factors you'll need to consider:

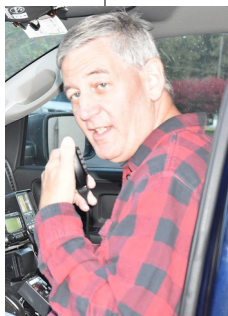
- What equipment will I need to operate in the field?
- How will I transport the equipment to and from the remote location while keeping it organized and safe?
- How will I power the equipment once I'm in the field?
- Will I need to budget power to operate for a specified period of time?

These are important questions, and I'm sure you can think of many more, such as choice of antennas. A

"Go Box" is a collection of gear that's meant to be readily transported to and used in the field.

Design for Portability

A well-designed and built Go Box makes portable operation a pleasure and also adds a professional touch to your operation. As an example, two different hams, Joe and Larry,



were asked to provide demonstration stations of HF communications at a public service event that was highly visible to the public. Joe packed up his favorite HF rig, an antenna tuner, a wire antenna, a small battery, all the necessary wires

and cables, and even a solar panel for his station. Joe arrived at the site at 0700 and began packing out the equipment one piece at a time onto his operating table. But Joe forgot a microphone and had to return home to get one; he had also forgotten a coax jumper, but fortunately Larry had an extra. Joe's station wasn't operative until 1000.

Larry had built a Go Box and also had a checklist for portable operating that he used each time he deployed. Larry arrived around 0700 just like Joe, but Larry's station was up and running in about half an hour. Because Larry's Go Box contained just about everything needed to run his station, all he had

to do was focus on getting the power and antennas connected. (You might guess that Larry also put his power supplies into a second Go Box - - and you would be right!)

see GO on page 6

FEBRUARY MEETINGS

February 8 -- Ham Radio at the Vatican - Fr. Michael Hermes, NØLBV
February 22 -- The New Version of Yaesu Wires-X Software - "Van" Van Deveer, WØHCV

The Johnson County Radio Amateurs Club normally meets on the 2nd and 4th Fridays of each month at 7:30 PM at the Overland Park Christian Church (north entrance), 7600 West 75th Street (75th and Conser), west of the Fire Station.

Much of the membership travels to the Pizza Shoppe at 8915 Santa Fe Drive for pizza buffet and an informal continuation/criticism/clarification of the topics raised at the meeting ... or anything else.

LEAVE THE CHURCH, TURN RIGHT (WEST) ON 75TH. TURN LEFT (SOUTH) ON ANTIOCH. TURN RIGHT (WEST) ON SANTA FE. PIZZA SHOPPE IS JUST PAST THE SONIC ON YOUR LEFT

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>> THE FEEDBACK <<

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January Minutes

The January 11 meeting was cancelled for inclement weather.

There are no minutes available for the January 25 meeting, at which members suggested ideas for programs for the coming year.

PRESIDENT'S CORNER

The heavy wet snow in January caused many to lose power for



an extended time. I hope you were not one of the unfortunates. The snow left about an inch of snow build up, not only my power

lines, but my wire antenna. The antenna survived with out any problems.

We have a good number of suggested programs for 2019. Many of us were interested in kit-building programs. There were several excellent ideas for kits presented. More details on how we will be doing the kits progrms to come.

Larry Staples, WØAIB, has published the list of 2019 public service events. More events will be added as time passed. Keep an eye for the events as they are added.

These events need volunteers and constitute a proven why to prepare for disasters.

Select a couple to support and contact the event ham coordinator.

- Bill Gery - WA2FNK

Hambone Puts Safety Second

A Hambone Adventure by Jaimie Charlton, ADØAB

It was a nice warm, sunny January day here in Kansas. A gentle breeze swayed the naked trees and raised the aroma of dried leaves that had escaped the pre-winter cleaning frenzy of only two months ago.

“Warm, winter?” you ask? Yes. It’s because of our location here right smack dab in the middle of fly-over country.

You see, we are not far enough north to enjoy a full course winter, like Wisconsin or Minnesota, where the ice that freezes in October is still there in May. Nor are we far enough south, like Key West, where we can enjoy warm days regardless of the season.

So, all that is to explain why it was a balmy 57 degrees and the reason I forsook my basement treadmill and went for a trot around the ‘hood instead.

My walk was pleasant and quiet as I expected it to be since it is always quiet around here. So, I was startled out of my reverie when I heard a loud thunk followed by, “#@!!%& geeze that hurt,” and “Ha ha ha, you looked so funny when that thing kicked you butt!”

The noise and epithets seemed to be coming from the house next door to mine where my brother, his wife and two sons, Hambone and Dude, live. I knocked briefly and let myself in through the back door. None of us stands on formality between our families.

Following voices, I headed straight for Hambone’s ham shack in the



basement. There I found Hambone nursing his shoulder and ego while his little brother, Dude, enjoyed a moment of schadenfreude at his older brother’s expense.

Resting precariously on the edge of the work bench was the innards of an old transmitter which appeared to be the source of the commotion.

“Oh, hi Unck,” grimaced Hambone. “What’s going on here, Hammy?” I asked. “I heard you all the way outside and what I heard wasn’t good.”

“I’m trying to fix this old boat anchor of a transmitter that just refuses to work.”

“Yeah, he said he was going to teach it a lesson,” added Dude. “But it taught him a lesson. It kicked his butt good.”

“That’s what you get when you put safety second,” I said. “Anyway, what seems to be wrong with it?”

Hambone continued, “I think it’s the power transformer because it keeps blowing fuses and capacitors. All the tubes checked good, so, I think it must be the transformer. Besides, that’s the most expensive part. Expensive parts always fail first.

I don’t suppose you could help, could you, Unck?”

“Well, okay,” I replied, trying to sound disinterested. But I really was anxious to get my hands on that

thing. Boat anchors are like puzzles from the past. Solving them lets us old guys use some of that practical experience we got as kids by doing things we didn’t know we couldn’t do. “Bring it over to my shack with whatever spare parts you have. I don’t have a lot of antique components.”

Right after lunch, Hammy and Dude appeared in my shack and plopped their transmitter pieces on my bench. “Here it is, Unck,” said Hambone. “The guys at the club couldn’t fix it and it just kicked me good, I think it’s got ghosts and will never work.”

Ignoring the disparaging remarks, I said, “Wow! That is one very nice Globe Scout 65 kit transmitter. It looks to be in great shape.”

“What do you mean by kit transmitter?” asked Hambone.

“Back in its day, this transmitter was sold as a kit, mainly to new novice hams. Back then most hams built some or all of their equipment. Kits were very popular as they provided a hands-on way to learn how radios worked and the builder ended up with a nice piece of equipment. This transmitter was especially desirable because it worked both CW and AM voice modes. Whoever built this one was a real craftsman. It looks great!”

“It doesn’t work great. What cool test instruments are you going to use to bring this beast back to life?” asked Hambone.

“Take it easy, Hammy,” I said.

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from HAMBONE on page 3

"I was trying to show the boys not to jump to conclusions, but to gather facts and then figure out what's happening. Actually, I already knew what at least one problem was. I noticed it when Dude put the chassis on the bench. But, I wanted them to discover it by themselves."

"Let's analyze the problem first. Put a good fuse in the holder and hook this voltmeter between the rectifier tube filament and ground and turn on the power."

The boys followed my instructions and the pilot light came on when they flipped the switch.

"At least the light works," enthused Dude.

After a few seconds the voltmeter started to show some voltage. Then, a soft pop was heard and the light went out. Hammy pulled the fuse and said, "Yup, we blew the fuse. Just like I said."

"Okay boys, what happened and what did this little test tell us?" I asked.

"Same as before," moaned Hambone. "The fuse blew and probably the capacitor did, too. I still say it's a bad transformer."

"Not so fast," I continued. "Let's look at what really happened. We applied power and the pilot light lit immediately. That told us that at least its transformer winding was neither shorted nor open."

The fact that the fuse did not blow immediately tells us that it is unlikely the transformer has any shorted turns or shorts to ground. The fact that the rectifier tube's filament began to glow tells us that

its winding is good. The fact that the voltmeter read some voltage before the fuse blew tells us that the high voltage transformer winding is not open. That's good.

Finally, the fuse didn't blow until the voltmeter read over a couple of hundred volts. Why do you suppose that happened?"

"Maybe the transformer's magnetism took time to build up?" asked Hambone now realizing that his bad-transformer theory was being proved wrong.

"Wrong!" I said. "I'm pretty sure it was the rectifier tube warming up that caused the delay. As the tube warmed up, it started to provide high voltage and that's when the problem occurred. It has nothing to do with the transformer. To confirm that, replace the fuse and pull the rectifier tube and turn the power back on. That way, only the transformer is in the circuit. If it's bad, the fuse will still blow."

This time the pilot light lit, but no voltage registered on the voltmeter and the fuse didn't blow.

"Now that we've eliminated the transformer, let's look further along the power distribution part of the circuit. And we don't have to look very far. It looks like the filter capacitor, C16, is fried," I said.

"Yeah," said Hambone. "That's the bad capacitor. We've replaced twice but, it keeps blowing."

"It keeps blowing," I said, "because it is receiving too much voltage. Here's what's happening."

Sensing a teaching moment I grabbed my yellow pad and drew a simplified version of the power supply and filter circuit.

"This is the basic rectifier circuit. The power transformer converts the 120 volt line power to around 600 volts AC which is rectified to DC by the 5U4 rectifier tube. The high voltage is filtered by the choke, CH1, and the series combination of capacitors C16 and C17. Both are 16 microfarad 350 volt electrolytic filter capacitors. The 50 K-ohm bleeder resistor is just there to discharge the capacitors when the power is turned off.

So, you see, if the capacitors are shorted, they will short the B+ high voltage to ground and that will blow the fuse. But, not until the rectifier tube warms up and starts providing the high voltage."

"Why are the two capacitors wired in series, doesn't that reduce their total capacity?" asked Dude.

"They're in series to increase their voltage rating. Putting the two 350 volt, 16 MFD caps effectively makes a single 700 volt cap. You're right, the total capacity is then only 8 MFD, but, that's enough."

Hambone interrupted my eloquent dissertation, "That's nice, Unck. But we've replaced those caps twice and they still burn up and the fuse still blows. Now that I look at it, I think the choke may be the problem."

Pretending to consider Hambone's idea, I continued, "Yes, the choke could be shorted to ground, but then there would be no voltage to burn the caps. The real problem is you have been replacing the wrong cap!"

"No way!" countered hambone. I replaced the burned one, C16, twice!"

see HAMBONE on page 6

<p>from HAMBONE on page 4</p> <p>Enjoying my approaching moment of intellectual victory, I continued. “Yes, the burned cap was definitely bad, but it is the one above it, C17, that you have installed backward that has caused it to burn.</p> <p>You see,” I continued grabbing my red pen for additional emphasis, “You have installed C17 with its negative terminal connected to the B+ voltage. But the diagram shows the positive terminal should be connected to the B+. When you apply voltage backwards to an electrolytic capacitor, it almost becomes a short circuit. That’s what happened to C17. Being shorted, C17 let the full B+ of</p>	<p>around 500-600 volts hit C16. Since that capacitor is only rated for 350 volts, it burned out.</p> <p>If you would be so good as to replace both capacitors – carefully observing the polarity – I think the problem will be solved.”</p> <p>With that, I poured myself another cup of coffee and settled back to watch my nephews through a cloud of solder smoke.</p> <p>I think the world of my nephews and I’m sure they both will be excellent engineers, someday. But not today. They think they know everything and don’t really like to listen to their ole unck. “Be careful, you’re working with high voltage, there,” I said as they were turning</p>	<p>on the power and secretly hoping the fuse would blow, again. It didn’t. The tubes lit up, the voltages all came up and everything seemed to be fine.</p> <p>“Don’t worry, Unck. We know what we’re doing. We are always careful,” replied Hammy.</p> <p>“Okay, I’m just sayin’.”</p> <p>"By the way, Hammy, before you put the case on, exactly what did you do to get shocked back in your shack?" I asked.</p> <p>“Simple, Unck. I was going to turn the chassis over and grabbed it like this, OUCH! #@!!%& dammit!”</p> <p>Yup, safety second.</p>
<p>from GO on page 1</p> <p>A Go Box should have the minimum equipment needed to do its job. Additional equipment adds unnecessary weight and power consumption.</p> <p><i>Three Important Equipment Specifications</i></p> <p>There are several important specifications you should know when choosing radios for field operation. These are the standby power, transmit power, and minimum operational voltage requirement.</p> <p>Standby power is almost always overlooked by hams. It's almost always given in the owner's manual. A unit in standby is not sending or receiving; it's just turned on. This specification might be given in terms of current draw from the power source (remember that power is voltage times current, or $P = V \times I$). Most modern VHF and UHF radios use less than one ampere of current when in standby;</p>	<p>for example, the Yaesu FTM-400XDR, a popular dual-band Fusion radio, draws about 0.7 A from a nominal 12 volt battery, or 8.4 watts in standby. Not bad. By contrast, the Icom IC9100, a "shack in a box" that covers HF through UHF, draws about 2.5 A (30 watts) in standby. Quite different!</p> <p>Transmit power is what most hams look at. Most radios use the greatest energy from the power source during transmit, and it's generally closely related to the power output selection made by the operator. For example, that FTM-400XDR will draw anywhere from 3A (low power, 10 watts output) to 8A (high power, 45 watts output) during transmit. The Icom IC9100 will use about 6A minimum at the lowest power (1 watt), and up to 25A on peaks (100 watts out). That power has to come from somewhere.</p> <p>You will have to budget the power, based on the battery or other power source you decide to use to run the station.</p>	<p>Finally, minimum operating voltage must be considered. This is usually around 11 volts, but for some radios it might be higher. As batteries discharge, their voltage output decreases. At some point, the battery voltage will droop too low to correctly operate the radios. You may not even know a malfunction is taking place. It's a good idea to place a digital voltmeter on your Go Box for this reason. You'll always know the state of the power supply (good or not) when operating. Such voltmeters are available for under \$20.</p> <p><i>Go Box Construction</i></p> <p>The primary rule for building a Go Box is to keep it as functional as possible, while at the same time, keeping it light and transportable. These two constraints are opposing. For example, you may want to have HF, VHF, and UHF radios at your disposal. That's great, but more gear</p> <p style="text-align: right;">see GO on page 6</p>

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means more weight. Weight is the enemy, especially if you have to carry equipment any significant distance, as might happen in a disaster.

Many hams use 19" portable rack cabinets to build Go Boxes. These are effective and versatile platforms for construction. Many rack cabinets have a built-in grounding system in the form of metal rails for bolting in standard 19" shelves. The radios are simply mounted directly to the shelves.

Keith KEØAEP built a Go Box to cover HF, VHF, and UHF in a Gator-brand portable rack cabinet as shown below. His design goal was to have a system that would do double-duty as both a main system for his shack as well as serve for portable operation in the field.

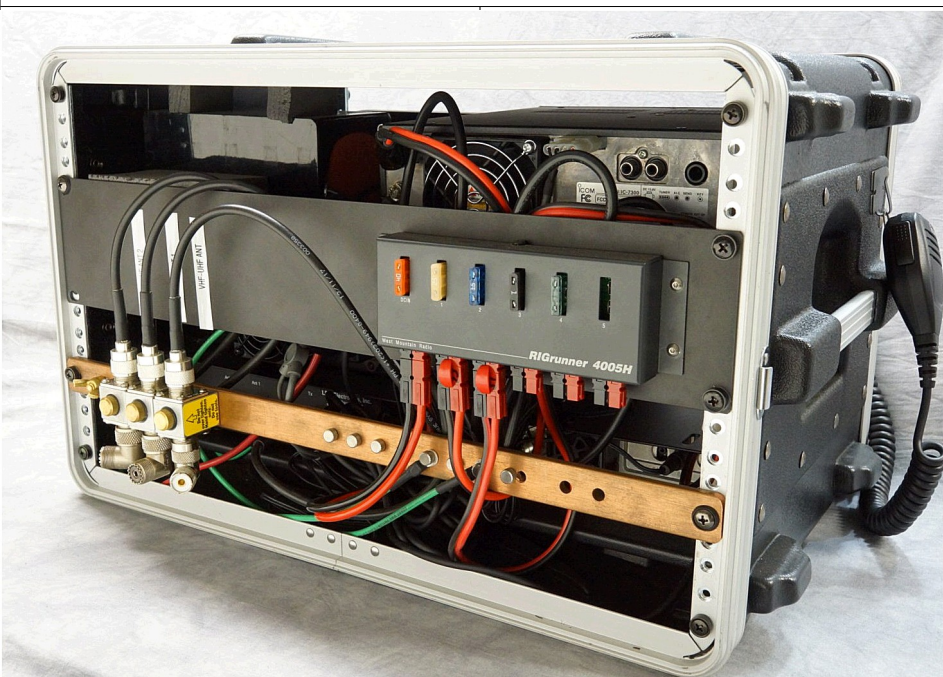
In operating HF, he wanted to be able to operate with antennas ranging from random wires to resonant dipoles, so he chose an LDG external antenna tuner. The HF transceiver of choice was the ICOM IC7300, a modern unit that has an excellent receiver and very informative display. The IC7300 sips power during standby, drawing less than 0.8 A.

For VHF and UHF operation, Keith chose the ICOM ID5100 dual-band (DSTAR) transceiver (standby current consumption 1.2 A).

Rounding out the installation is an internal speaker (important for hearing well in the field) and a power supply for operation from the AC mains if desired. Keith chose an Astron SS30 switching power supply which is very lightweight (under five pounds) and compact, while delivering more than enough



*KEØAEP's HF/UHF/VHF/ Go Box (Front) and (Rear)
photos by Keith McKinney, KEØAEP*



power to run the equipment. It's a very effective portable station.

Note the use of Anderson PowerPoles for power distribution. PowerPoles have become the connector of choice for amateur radio power connections (as well as many other uses). When you use PowerPoles, be sure to assemble them into the ARES standard

configuration as shown on the following page. This will help to ensure that your equipment will interoperate with that provided by others --critical when a team is deployed. Reversed polarity quickly destroys equipment not to mention team morale!

see GO on page 7

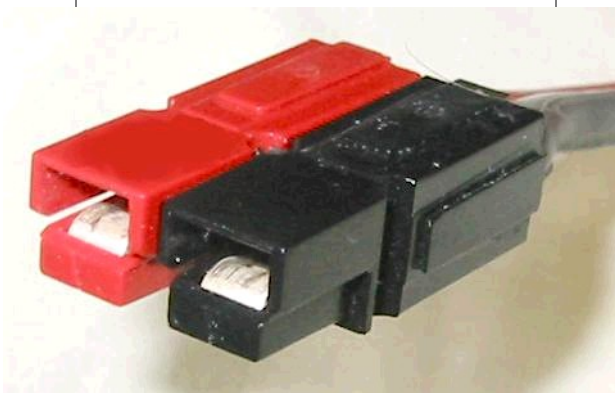
from GO on page 6

Earlier I mentioned that Keith placed other power supply components in a separate Go Box. The second box contains a power inverter for operating equipment requiring 120V AC, a DC power conditioner to hold power to the radios at a constant 13.8 V (even during battery voltage sags) and a solar charge controller, with all power connections readily accessible. This second Go Box to augments the power capabilities of the station.

Lithium-ion batteries deserve strong consideration for portable operation. Although they're much more expensive than lead-acid types (about 4 times the initial cost for a given nameplate rating), they bring many advantages for portable operation:

- Light weight. A Li-ion battery usually weighs about 1/3 of a lead-acid battery of comparable (labeled) energy capacity (Ampere-Hours). For example, a Bioenno BLF-1220A 20 A-H Li-ion-phosphate battery weighs 5.4 pounds and costs about \$200. A comparable lead-acid unit, the Power Sonic (Panasonic) PS-12200 20 A-H battery weighs 13 pounds and costs about \$50.
- Greater useable capacity for a given nameplate rating. A lead-acid battery's life depends on how deeply it is discharged (and how often). Experts usually recommend to never discharge lead-acid batteries below 50% on a regular basis. This means that to get a reliable 20 A-H

capacity, you must build in 40 A-H of nameplate capacity. In contrast, Li-ion-phosphate batteries can be deeply discharged without damage. Nearly 100% of the Li-ion A-H rating is available, and as a bonus, most commercial Li-ion batteries have built in battery management



electronics to protect the battery from overloading and overdischarge. So if you need 20 A-H of useable and reliable battery capacity, you need 26 pounds of lead-acid batteries (\$100 cost), or 5 pounds of Li-ion batteries (\$200 cost).

- Very long life, low self-discharge, and low maintenance. A quality Li-Ion battery can sit on the shelf for a year and easily hold 90% or more of its charge. In contrast, a lead-acid battery loses 5% of its charge each month it sits idle; after a year, an unattended lead-acid battery will have lost nearly 50% of its charge and will have experienced irreversible capacity loss due to sulphation. Lead-acid batteries must be kept

charged, with most manufacturers recommending monthly topping-off, or continuous float charging.

Building Your Own Go Box

As you can see, it's not hard to construct a Go Box. In fact, you may decide that the Go Box configuration is ideal for your primary station - - which could save you the expense of purchasing duplicate equipment.

Keep the basics in mind when you build your Go Box:

- Carefully choose what needs to be in the box by deciding what the box will be used for.
- Pay attention to power budgeting.
- Keep weight to a minimum by eliminating things you don't need.
- Use good quality components (case, batteries, shelves, etc.) and mount equipment securely.
- Wire things neatly. If you use PowerPoles, wire them according to the ARES standard.
- Make sure your team members share the same usage pattern for all connectors.
- Use a check list when preparing to operate in the field - and don't forget about operator needs.

In our next installation, we'll take a look at a different Go Box with unique design constraints.