

FEEDBACK

MAY 2019



The JCRAC met at its Field Day site, the Hutton Farm next to Shawnee Mission Park on April 26. Members conducted business, socialized and made decisions about where to put its Field Day stations.

Tom Wheeler, NØGSG, conducts a clinic for ailing radio equipment at the Ararat Hambash as Rod Rodriguez, K6TBJ, and Jaimie Charlton, ADØAB, look on. -- Photos by Charilie, NØCVW



MAY MEETINGS

May 10 -- Foxhunt equipment practice., north of the Church. Bring equipment to use and share.

May 26 -- Raspberry PI set up and Ham applications - Bill Gery, KA2FNK.

The Johnson County Radio Amateurs Club normally meets on the 2nd and 4th Fridays of each month at 7:00 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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-> FEEDBACK <-

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Johnson County Radio Amateur Club, Inc.*

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***Welcome new ham Glenda
Broughton, KEØUTK
attended her first JCRAC
meeting on April 12.***

***Suzanne and Drew,
KEØVHU, Lane visited on
April 12 and brought their
son Jake, KEØVHK to the
Field Day site on April 26.***



PRESIDENT'S CORNER

The Field Day 2019 location is looking good even without the buildings.



There is actually more open area for antennas.. The basic station locations will be the same. With May here, Field

Day is a lot closer that you think. Several of us plan to camp out Friday night June 21 at the site. Come an join us. As Jay would ask “ When is Field Day ?” June 22-23. We will start setting up on Friday June 21 at 1 pm.

The Club provides volunteers for Ensor museum. The museum is open only on Saturday and Sunday. Please sign up of one the the slots. It is really easy duty. This year as last we will have a drawing for the gift certificate for those that cover a shift.

Hope you have looked at Larry's list and selected a few public service event to volunteer for. These event are a good way to support these groups while having fun with your equipment.

– Bill Gery – WA2FNK

Johnson County Radio Amateurs Club - April 12, 2019

Meeting Date: Friday April 12, 2019. The meeting Started at 7:00PM.

Attendance: Self introduction with name and call sign. 32 signed the check in sheet. This was followed by the Pledge of Allegiance.

The Minutes from the March 22, 2019 meeting were read and accepted with 1 opposed vote.

The Treasurer's report, as follows, was read and accepted unanimously.

Cash on Hand	\$ 135.00	Repeater Operating Reserve	\$ 1,273.83
Checking Account	\$ 271.01	Memorial Fund	\$ 310.00
Savings Account	\$ 11,393.62	Active Members	137
PayPal Account	\$ 61.54		
Total	\$ 11,861.17		

Old Business:

- We welcomed all 1st time visitors to the meeting.
- Repeater Update – All are working well.
- Field Day 2019 – The next Club meeting on April 26 will be out at the Field Day site.

New Business:

- None.

Reports:

- 6 m – NR.
- 10 m SSB Roundtable – 1 participated on April 11.
- 40m SSB Roundtable – 3 participated on April 10.
- Fusion Digital 440 net – 14 Check-ins on April 10 and 22 Check-ins on April 3.
- 2m Wheat Shocker net – 12 Check-ins on April 11 and 17 Check-ins on April 4.
- HF Activity – Mauritius Island on 40m CW.

Announcements:

- HamBash April 20.
- Santa Fe Trail Commemorative Special Event May 18 -19.
- See Larry's List for upcoming Events.

Business meeting adjourned at 7:43 PM.

Program:

- The Program for this evening was a presentation by Steve Everley KC0VYS on the upcoming special Event Station Commemorating the Santa Fe Trail by William Becknell May on 18-19.

Submitted by Ted Knapp, N0TEK, Secretary.

Johnson County Radio Amateurs Club - April 26, 2019

Meeting Date: Friday April 26, 2019. The meeting Started at 7:00PM.

Tonight's meeting was held at this year's Field Day site.

Attendance: Self introduction with name and call sign. There was no check in sheet passed around and no Pledge of Allegiance.

The Minutes from the April 12, 2019 meeting were read and accepted with 1 opposed vote.

The Treasurer's report, as follows, was read and accepted unanimously.

Cash on Hand	\$ 86.00	Repeater Operating Reserve	\$ 1,296.83
Checking Account	\$ 429.30	Memorial Fund	\$ 310.00
Savings Account	\$ 11,393.62	Active Members	137
PayPal Account	\$ 42.12		
Total	\$ 11,951.04		

Old Business:

- We welcomed all 1st time visitors to the meeting.
- Repeater Update – All are working well. Two Fusion Digital Repeaters have been added. One in Blue Springs and the other at Longview Metropolitan Community College.

New Business:

- None.

Reports:

- 6 m – NR.
- 10 m SSB Roundtable – 4 participated on April 25.
- 40m SSB Roundtable – NR.
- Fusion Digital 440 net – 24 Check-ins on April 24.
- 2m Wheat Shocker net – 17 Check-ins on April 25.
- HF Activity – Germany and Bulgaria on 40m CW.

Announcements:

- WW1USA on July 6th.
- Santa Fe Trail Commemorative Special Event May 18 -19.
- The Kansas Amateur Repeater Council is now using Repeater Book as the official public listing of coordinated repeaters in Kansas. They no longer maintaining our own web listing of repeater information
- See Larry's List for upcoming Events.

Business meeting adjourned at 7:15 PM.

Program:

- The Program for this evening was Field Day Station planning at the Field Day site.

Submitted by Ted Knapp, N0TEK, Secretary.

Hambone Goes Too Low

"Hey, Hammy, do you hear those sirens? There must be a fire or something," said Dude as he turned from his laptop and looked idly out the frat house window. Hambone, oblivious to his little brother's comments, did not reply. He seemed to be in a trance, but actually was totally engrossed in catching some weak CW signal amid the sea of radio noise.

Dude was not a member of Hambone's fraternity nor of the ham radio club that was loosely associated with it. But he was very interested in radio and often accompanied Hambone as he worked on projects or just "played radio", as he liked to say.

"Hey, it must be close," Dude continued, "I can see some red lights turning onto this street."

Heavy pounding on the door and the shouts of "FBI, open up!" broke through the radio noise. Before Dude could reach the door, it flew open and a black uniform pushed him to the floor and held him there.

A second armed uniform forced Hambone down while others grabbed pieces of electronic equipment and loaded them into a truck. The boys, too dazed and frightened to say anything, were only dimly aware that they were being handcuffed and loaded into a black van.

Within thirty seconds, the uniforms, the boys, the van, the truck and the gear were gone. Only the shattered door and the abandoned ham shack remained.



Later that evening, the cool, late-spring breeze blowing across the courthouse steps wasn't enough to chill the boys' joy at being released from custody.

"Thanks Dad, Mom, Uncle Elmer for getting us out of there. That was awful!"

said Hambone as they walked towards the parking lot.

"Yeah!" blurted Dude. "I thought they were going to kill us. They handcuffed me to a table in a little room and shouted questions at me. I couldn't answer any of them. I didn't even know what they were talking about. Thanks for getting us out!"

"They did the same to me," added Hambone. "Thanks!"

"Well, you two aren't really out," said the boys' dad. "You're only out in our custody until you can appear in court tomorrow. We assured the magistrate you wouldn't run away."

"We're not going anywhere and I wanna know why those thugs broke into our ham shack and grabbed us and our stuff," said Hambone becoming more belligerent as he got farther from the courthouse.

"Yeah!" added Dude.

"They said you were attempting to cause wide-spread outages by disrupting the power grid and, were illegally communicating with a submarine by transmitting powerful very low frequency radio signals.

At least, that's what their search warrant says," said Elmer.

"Those thugs are wrong! My General Class ticket says I have the right to work those new VLF, Very Low Frequency, bands. I want an apology and I want my stuff back!" demanded Hambone.

"Okay, okay. Now that you're out, let's start working on your defense. We only have one day. When we get home, you've got to show me exactly what you were doing," said Elmer, trying to calm things down.

"Oh, and you'd better stop referring to the officers as 'thugs'. They don't like that and it won't help you in court. They were from the Department of Homeland Security and the FBI and they did have a warrant."

Early the next morning with the dew still glistening on the antennas, boys and their uncle Elmer are in the frat's ham shack fixing the door and cleaning up the mess from last night's raid.

"It looks like they took a bunch of ham gear. The new transceiver is gone along with the SWR meter and microphone. A handy talkie is gone, too," observed Hambone as he took inventory.

"It was nice of them to leave the stereo," said Dude.

"Hey!" interrupted Elmer. "That looks like my old stereo amp. I don't remember anyone asking to use it."

see HAMBONE on page 6

from HAMBONE on page 5

"It is. I just borrowed it for a while. I was going to give it back, eventually," confessed Hambone.

"Well, next time, ask."

Changing the subject, Elmer continued, "What exactly were you doing when you were raided?"

"Dude was over there staring at his PC and I was trying to make contacts on the 2200 meter band. I was using this straight key right here," explained Hambone as he tapped the old J-38 a few times.

"I was not staring, I was doing research," snapped Dude, who suddenly appeared sunburned.

"Anyway, I guess with your equipment gone, you won't be able to show me exactly what happened."

"Oh, that's not a problem, Unck," replied Hambone. "Those thugs, er, officers took our HF stuff but completely missed what I was using."

With that Hambone walked over to the stereo amplifier and turned it on. "My VLF transmitter and receiver are both still right here. Your amp is the transmitter. This old Heathkit signal generator is the VFO (Variable Frequency Oscillator) and this multimeter has a frequency counter function which I use to measure its frequency. My receiver is this little breadboard circuit. I re-worked that bat finder to be a direct conversion receiver.

I can send CW by turning the signal generator on and off or send amplitude modulated CW using the generator's built-in tone generator. I can even send AM voice by just connecting a microphone to the generator's audio input."

"Hammy, I am impressed," exclaimed Elmer. "You did a great job making a VLF station. I'm surprised that my old amp's frequency response extends up to 137 KHz."

"Thanks, Unck. Originally it didn't. I took out a low-pass filter that was in the input circuit. Now the amp works fine to over 500 KHz. That's what I call very hi-fi."

This was a new experience for Elmer. Normally, he's the one explaining some electrical principle or new piece of equipment to his nephews, but this time the tables are turned. Hambone is explaining VLF to his uncle and his uncle is loving it.

"What are you using for an antenna? A half-wave dipole for the 2200 meter band is over a half-mile long," asked Elmer.

"I'm using the club's inverted L antenna. It's the longest antenna around here. To match it to the amplifier I made a combination matching transformer and loading coil by wrapping a couple of thousand feet of wire around that plastic bucket over there," said Hambone pointing to what looked like an oddly woven rattan waste basket.

"Very nice," said Elmer marveling at his nephew's ingenuity. "So, what were you doing when you were raided?"

"This is the first time I ran the station here. But I've had it at home for a long time. That's where I talked to the boat. I called CQ and he answered and said that was on a boat in the Patuxent River."

"That's in Maryland, where the Navy is," said Dude, chiming in.

"I wanted to show the frat guys my VLF station so I brought my stuff over here," Hambone went on. "I was trying to contact that boat guy again so I could show the station in action. But he wasn't answering. That's when those thugs, er, cops broke in screaming something about submarines and power companies. It's still all a blur."

"I don't know," mused Elmer. "It seems to me that if a QSO with the boat guy broke some rule, it's his problem, not yours. But the power company interference is another thing."

I was checking the FCC rules for VLF operation and they say that you must have permission from your utility to operate on those bands."

"Got it!" stated Hambone.

"You also can't run more than one watt. I think your, I mean, my, amp puts out about 200 watts. That's a bit over the limit, don't you think?"

"No Unck," said Hambone becoming more insistent. "The rule actually says one watt EIRP and the antenna must be at least one kilometer from power lines that are carrying PLC signals. Power Line Carrier signals are used by the power companies to monitor and control their equipment."

Due to the extreme antenna system inefficiencies, my actual EIRP is less than 500 milliwatts. That's why I don't see what the fuss is all about and I want my equipment back. I'm completely legal!"

"Maybe not," whispered Dude.

"What! What do you mean, 'maybe not'?" snarled Hambone.

see HAMBONE on page 7

<p>from HAMBONE on page 6</p> <p>Dude explained, "I saw you weren't having any luck hearing anybody and I know the frat's antenna is much smaller than ours at home so I thought I might help."</p> <p>"What'd you do?" demanded Hambone glaring at his kid brother. "Fess up!"</p> <p>"Not much. I just remembered how much better my little one-tube radio worked when I wrapped its antenna wire around a lamp cord. So, I wrapped your antenna wire around the power line coming into the frat house."</p> <p>"You idiot!" exploded Hambone. "You completely violated the VLF antenna requirements! Instead of being more than a kilometer away from power lines, you put us right on top of them! No wonder they were pissed! Besides, you nearly got us killed by those, er, officers. Not to mention being blamed for sinking a boat and blowing up power lines. I hope they put you in jail for a hundred years!"</p>	<p>"Cool it boys," ordered Uncle Elmer. "We'll see what happens in court tomorrow."</p> <p>"Yeah, we'll see," smirked Dude. I'm just a little boy, but Hammy, you're the guy with the license who is responsible for operating illegally."The next day the boys - dressed in their Sunday best - along with their parents, a lawyer and Uncle Elmer appeared in court before a judge. Of course, the arresting officers were there as was a representative from the FCC and a power company lawyer.</p> <p>Dude was disappointed in the lack of courtroom drama. It was nothing like in the movies. The judge and the lawyers seemed to know each other as they exchanged legal babble and a few documents. There was no jury, no gallery of reporters and no surprise witnesses.</p> <p>The hearing lasted several hours during which it was revealed that nobody was quite sure what boat or submarine was involved or even if the mysterious operator had anything to do with a boat.</p>	<p>It was also discovered that the power company suffered no actual damage or outage due to Hambone's signals. All that happened was their control center received a radio interference indication. Something that occurs every now and then. A rookie operator was on-duty that night and thought someone was trying to hack their system. That's why he sounded the alarm.</p> <p>Finally, the FCC representative testified that even though Hambone's equipment was a bit odd, it was in compliance with the rules for VLF operation. He especially commented favorably about the clever use of a rattan waste basket as a loading coil.</p> <p>In the end, the boy's equipment was returned and Hambone continued to make a few VLF contacts, some as far as Europe. But his interest in demonstrating VLF to his fraternity brothers seemed to have waned.</p> <p>So, on VLF, a half-watt can provide world-wide QSOs and can also provide a world of hurt.</p>
<p align="center">Make Your Homebrew Look Professional John Raydo - KØIZ</p>		<p align="center">Author's note:</p> <p><i>Although Hambone stories are fiction loosely based on my personal experiences, I strive to make them technically accurate. To help me achieve that goal, I have four proofreaders and critics whom I would like to acknowledge and thank for their valuable assistance:</i></p> <p align="center">Tom Wheeler, NØGSG Bill Brinker, WAØCBW Charlie Van Way, NØCVW Don Warkentien, WØDEW</p> <p>Thanks, Guys, Jaimie AD0AB >> JCRAC FEEDBACK <<</p>
<p>You need to look professional!</p> <p>Making a homebrew project look professional can be a real challenge. Panel and chassis labels tend to be hand-labelled, dymo taped, pasted paper, or non-existent. I have just come across a very interesting product. These are 8 1/2 x 11 sheets of decal paper. You can use your inkjet or laser printer to do anything you like. The product for a laser printer is called "Laser Clear Waterslide Sheets". The inkjet version is appropriately called "Inkjet Waterslide Decal Paper - Clear". Either is available from</p>	<p>PAPILIO.COM. Less than \$2 a sheet. For an example of homebrew projects using this product, go to KG7TR.COM and click on his "KG7TR Homebrew SSB" link.</p> <p align="center">* * *</p> <p><i>John is looking to buy old FM 10.7 Mhz IF transformers, a vintage Shure hand-held ceramic or dynamic mic, some ceramic coil forms for a VFO, and an old AM broadcast variable for plate loading for a transceiver project. Can anyone help?</i></p>	

Powering the Super-Powered Go Box - Tom Wheeler, NØGSG

In the last installment we saw the details of a 500 watt portable ham station. Such a station needs a compact and reliable source of power. In the field, 12-volt batteries (charged by solar panels or other means) are a good source of power. In a fixed installation (such as a shack), an AC power supply is needed.

Constructing an AC power supply powerful enough to run the station and compact enough to fit into the Go Box requires some creative thinking. The HF transceiver and linear amplifier require about 1000 watts DC input on peaks. That's some serious power--so a switching power supply is the order of the day.

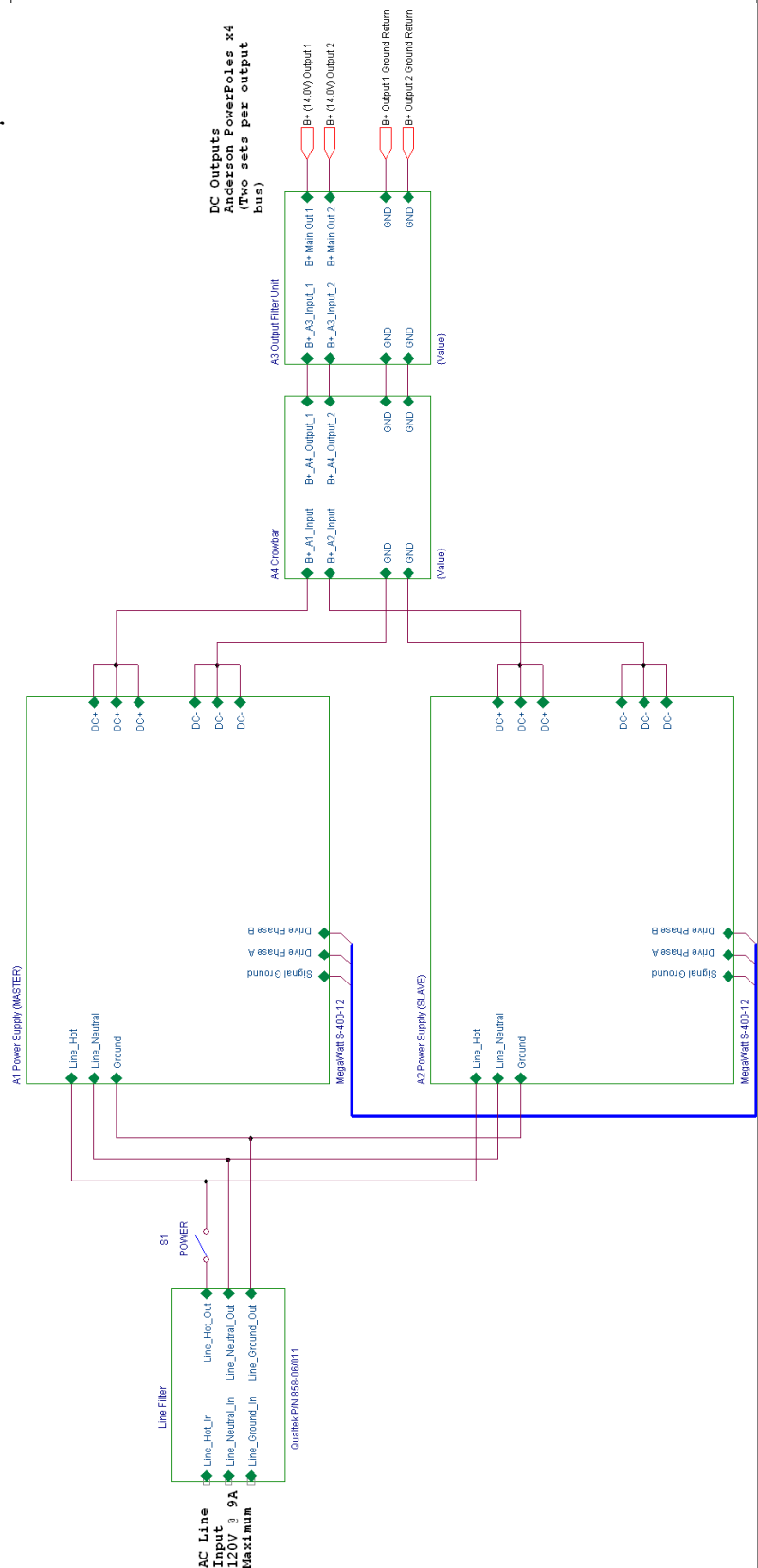
An extensive review of available rack-mount switching power supplies turned up no simple solution. The closest matching supply found was the MFJ-4275MV which is rated at 80 amperes peak. It would work well, but it's much too big to fit into the Go Box rack. It's also relatively expensive at \$250.00.

In searching for power supply components, I found a series of modular industrial power supplies sold under the MegaWatt brand. The MegaWatt S400-12 can supply 14.5 volts @ 40A intermittently, and 36A continuously. A pair of these supplies will easily fit into the Go Box and cost about \$140. If mated correctly, they can supply more than 80A of peak current.

There are two primary problems that must be overcome to pair up these power supplies:

(1) The supplies won't equally share the load current. Traditionally, connecting power supplies in parallel to get more current is usually a bad idea. No two power supplies will ever have exactly the same output voltage setting, and because of this, they won't equally share the load current.

(2) Industrial power supplies are not made for powering radios--they can generate significant radio frequency interference (RFI). The MegaWatt power supplies have some filtering, but not enough to prevent radio interference. More filtering must be added to suppress RFI.



see GO BOX on page 9 -- Figure 1 (above)

from GO BOX on page 8

There's also a safety issue. A combined power supply can provide enormous current, and a minor malfunction in either of the two supplies could cause the output voltage to skyrocket, damaging the radios. To prevent this from happening, a crowbar circuit is added to protect the radios from excessive voltage.

Power Supply Construction and Component Parts

The power supply is not difficult to construct. It consists of four major units:

- (1-2) Two MegaWatt S400-12 industrial switching power supplies (12-15 volts @ 40A maximum each) equipped with a power switch and AC line filter
- (3) A low-pass filter unit to remove RF hash from the power supply output before it's fed to the transceivers
- (4) A crowbar unit to protect the transceivers from over-voltage in the event of a failure

Figure 1, on the previous page shows how it's all hooked together. Essentially, AC power passes through the line filter (which stops any RF hash from leaving via the AC line and getting radiated) and into the two Mega Watt power supplies. The outputs of the two power supplies are joined and provide power to the Go Box.

Normally it's a bad idea to connect two power supplies in parallel. But have no fear; the two power supplies (A1 and A2) are modified to work together using shared control signals (Drive Phase A, Drive Phase B) to work in this fashion.

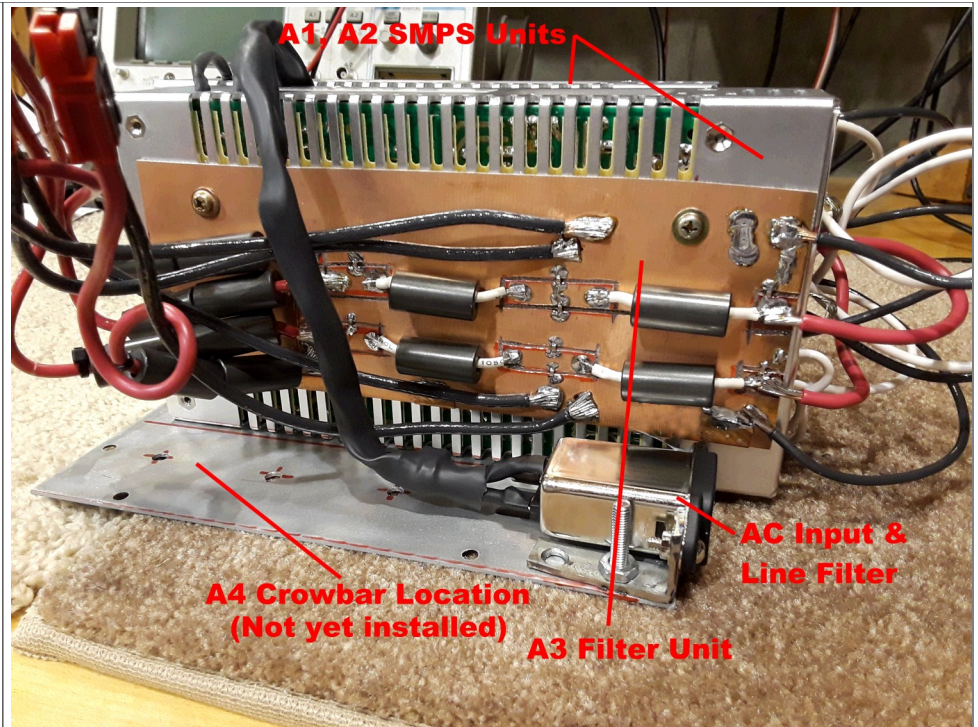


Figure 2

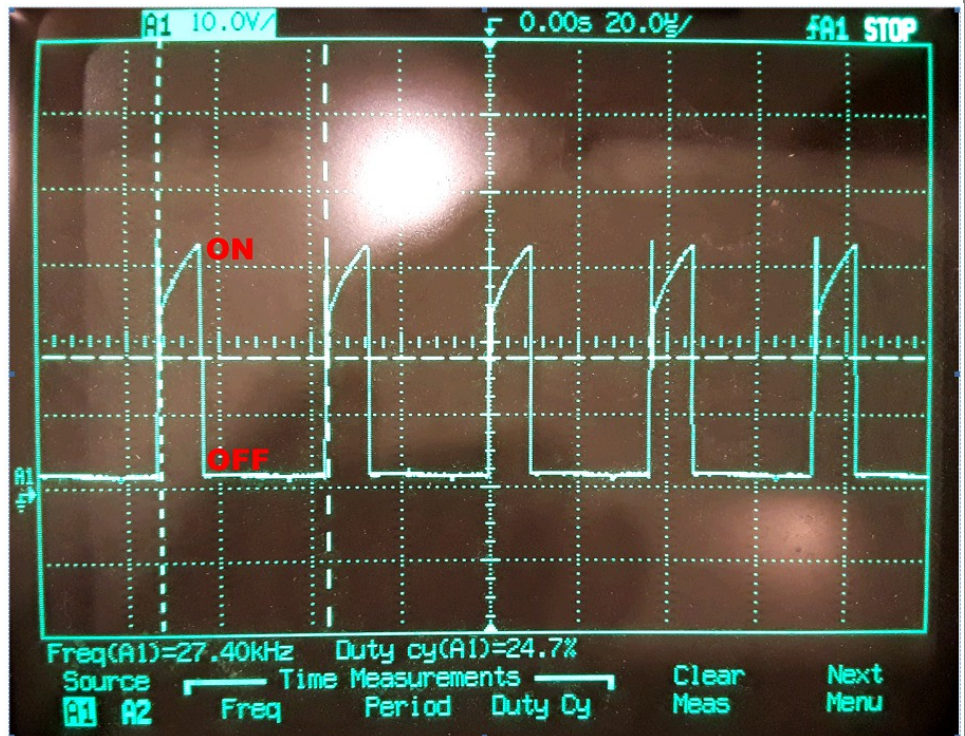


Figure 4

The DC output of the two supplies passes into the A4 Crowbar Unit, which will short the DC output to ground in the event that more than 16 volts is present. This protects

whatever equipment is connected to the supply. The DC then passes into the Filter Unit.

see GO BOX on page 10

from GO BOX on page 9

The DC output from the two switching powers supply units has spurious (unwanted) RF energy. This energy can cause interference for HF reception in the form of multiple spurs or "birdie" signals appearing throughout the bands at multiples of 25 kHz, the switching frequency.

To eliminate these signals, the DC is passed through the A3 Filter Unit, which is a simple low-pass filter. The low-pass action is obtained with ferrite beads (inductors) in series with the current, and shunt capacitance to ground. This unit is shown in **Figure 2** on the previous page; a Dremel tool was used to cut out the circuit paths, and the circuit components were then soldered to the board using "Pittsburgh" style construction.

The two power supply units are mounted on a bit of scrap sheet metal to form a sub-chassis. This makes it easy to install and remove the entire power supply as a unit.

The final output from the Filter Unit is divided among four Anderson PowerPole connectors for distribution to the various components in the Go Box.

Teaming Up the Power Supplies

In order to strap the switch mode power supplies together, they must be synchronized so that their output voltages are *exactly* equal. Otherwise, the two supplies will not share the DC load current equally. Think of a team of two horses pulling a wagon--synchronizing the power supplies is the same as harnessing the horses to work together as a unit.

Switch mode power supplies work by controlling the percentage of ON time (duty cycle) for a high-speed switching element. This results in a pulsating DC output which must then be filtered into smooth DC. *The higher the duty cycle, the more current (and voltage) that is supplied.* This is called pulse-width modulation (PWM).

There are two signals, Drive Phase A and Drive Phase B, that must be shared for the power supplies to be "yoked" together. (If you're thinking that A and B are like the opposite phases in a regular push-pull amplifier, you are right. The power supply control circuit emits a pulse on

see GO BOX on page 11

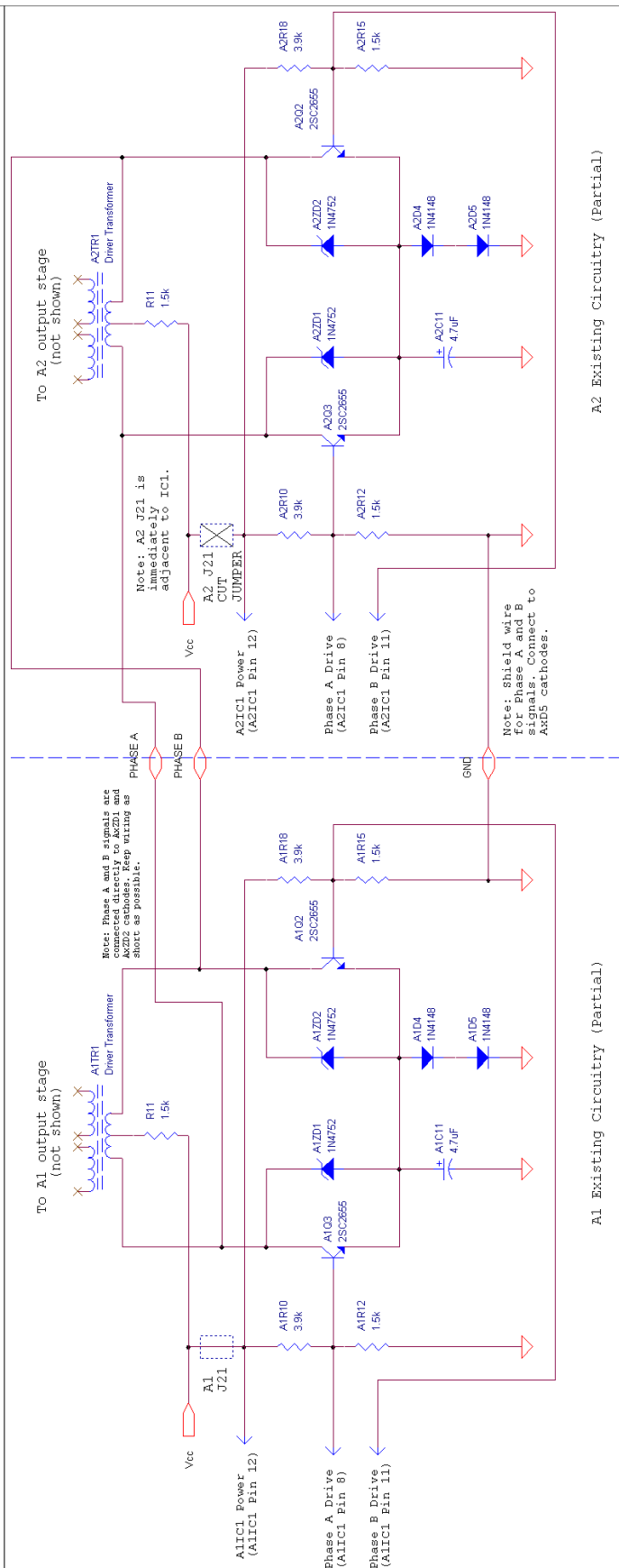


Figure 3

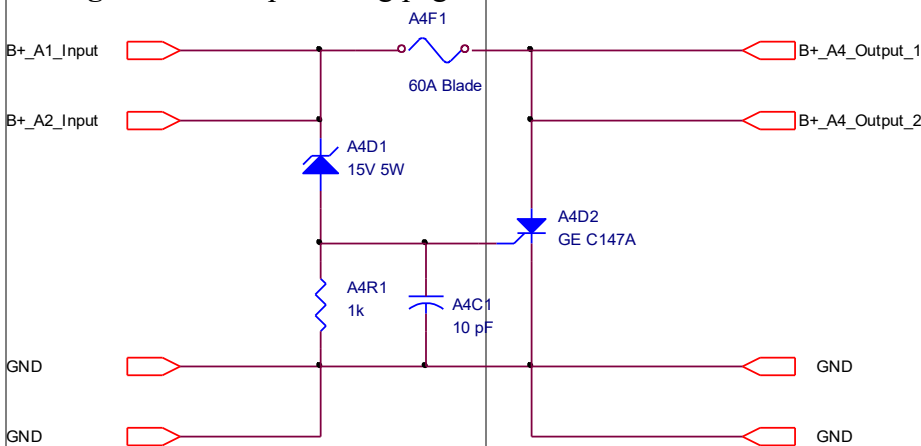
from GO BOX on 10

Drive Phase A, then does the same on Drive Phase B. The width of these pulses controls how long the output switching transistors in the supply are turned on during each half-cycle, thereby controlling the DC output.)

Since only one of the supplies can be "boss," we cut jumper J21 on the SLAVE supply to disable its control circuit. The MASTER supply acts as pacemaker and runs both itself and the slave through the Drive Phase A and B outputs. At the same

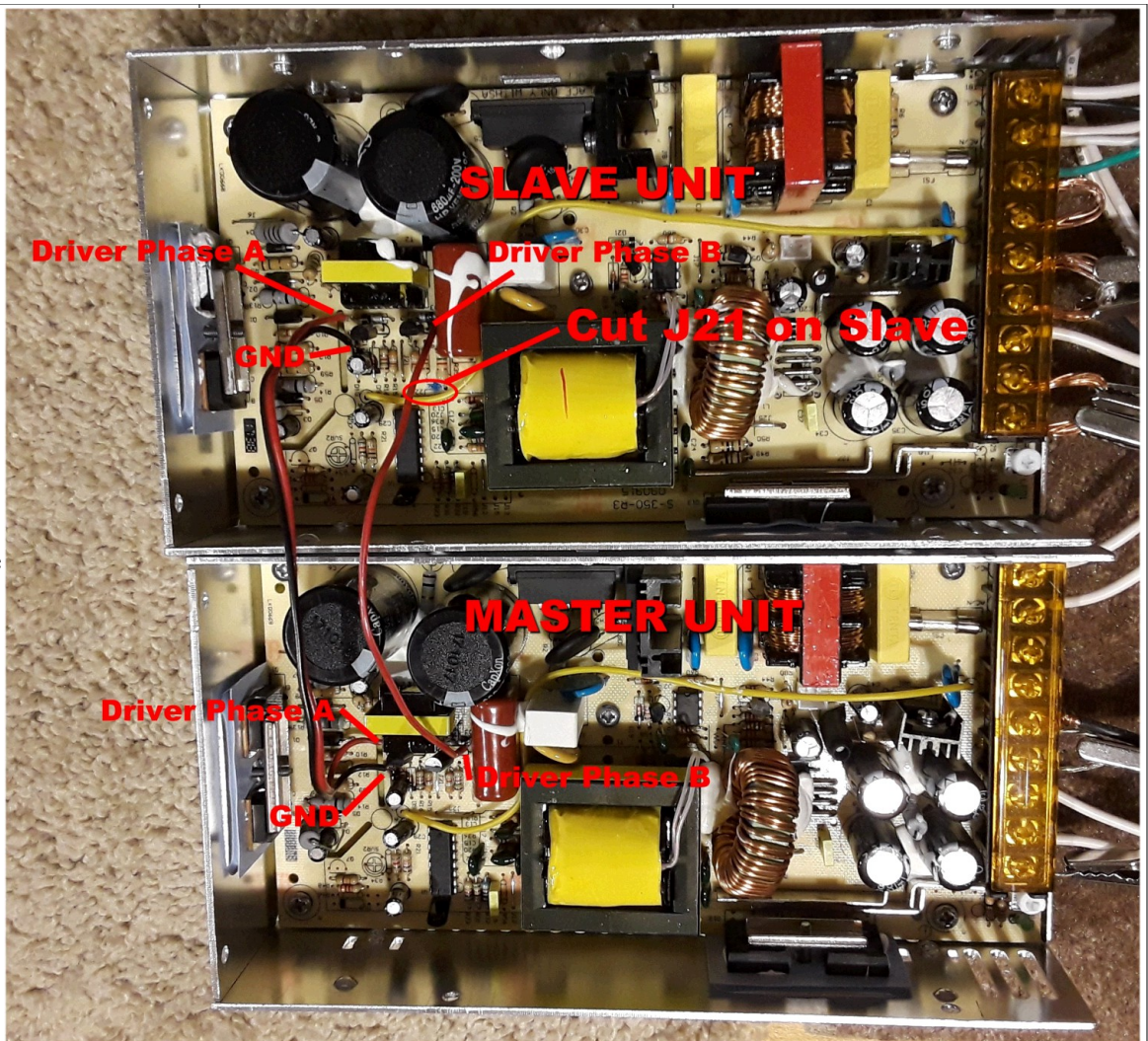
time, both supply's DC outputs are strapped together, essentially combining the output currents into one. Each individual supply only shoulders half the total load current--simplicity itself!

The interconnections are shown in the Figure 3 on the preceding page.



One of the drive signals is shown below right in Figure 4 (a couple of pages back). This particular supply is "loafing" along with a 25% duty cycle on the output transistors.

The interconnections are straightforward as shown above in Figure 5--the MASTER and



SLAVE supplies have been opened up so that you can see the shared control wiring. Be sure to insulate these wires well (use shrink wrap to protect them as they pass between the units), and keep them short -- they're passing 25 kHz pulsed switching signals that must retain accurate timing.

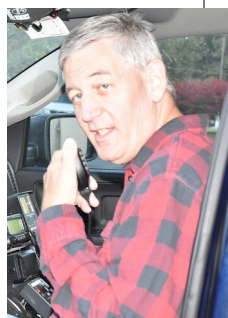
Preventing Carnage

The 80+ ampere peak output of the two combined power supplies can easily destroy equipment if the voltage gets out of control. The Crowbar Unit prevents this from happening as shown in Figure 6 (to the left).

see GO BOX on page 12

from GO BOX on page 11

In electronics, a crowbar is a circuit that shorts out a power source, just as if a metal crowbar is dropped across its output terminals. In the Crowbar Unit, Zener diode A4D1 begins conducting when the input voltage rises above 16 volts. This rapidly turns on the silicon controlled rectifier A4D2, which then effectively shorts the B+ bus to ground. The current limiter in the power supply should then engage and shut down the power. If that fails, then fuse A4F1 will blow to prevent an overload and a possible fire. This may sound complicated, but as you can see the circuit is quite simple and effectively does the job.



Cleaning it Up

Industrial-grade switching power supplies are usually filtered well enough to operate computers, but not radios. Switching power supplies generate radio frequency energy, and additional filtering is mandatory to attenuate (weaken) this energy to prevent interference with the radios in the Go Box. The Filter Unit independently filters the outputs of each power supply unit, then combines them. This is done independently to limit the maximum DC current that flows through each inductor.

The DC current flowing through each inductor produces a magnetic field. At high values of DC current, this magnetic field can become strong enough to saturate the ferrite core of each inductor, which would cause its inductance to plummet, defeating the filtering action.

Conclusion

Construction of the Super-Powered Go Box and its power supply is quite a project, but the outcome is well worth it. This Go Box is a 500 watt output HF station that works equally well in the field or shack. With an appropriate antenna, this Go Box will allow you to work almost anything you can hear.

The power supply is the most difficult portion of the construction. Many hams believe that switching power supplies work by black magic. The fear of the unknown prevents them from delving into these interesting units. With careful design and construction technique it is actually easy to modify switch mode supplies to do our bidding.

>> JCRAC FEEDBACK <<