Self contained portable VHF base station

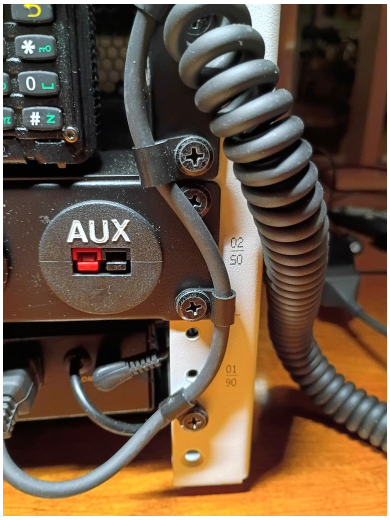
Brian Cook – KT4BCA – East Alabama Amateur Radio Club



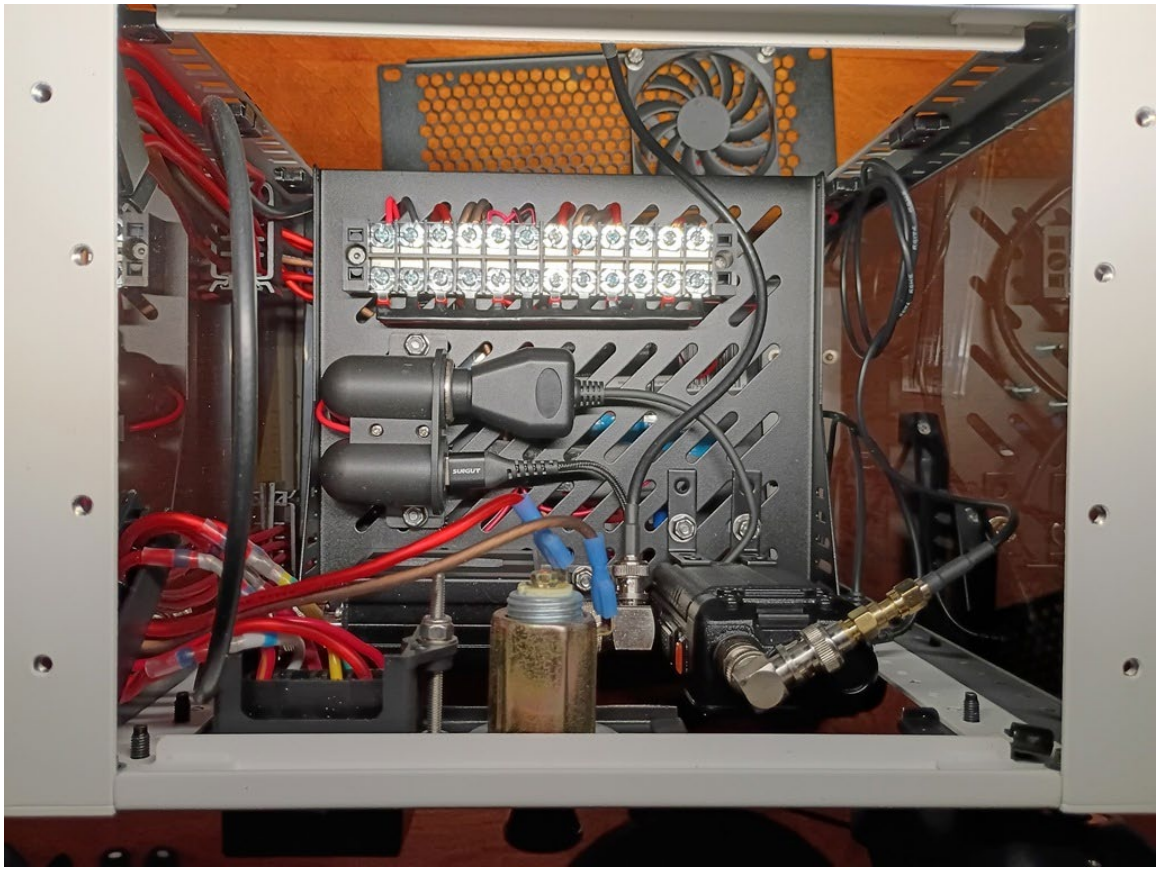
This unit is built around an HT, specifically the Baofeng BF-F8HP PRO. I especially like that it can display both the frequency and whatever name I program for that frequency with enough characters to give it a reasonable description.



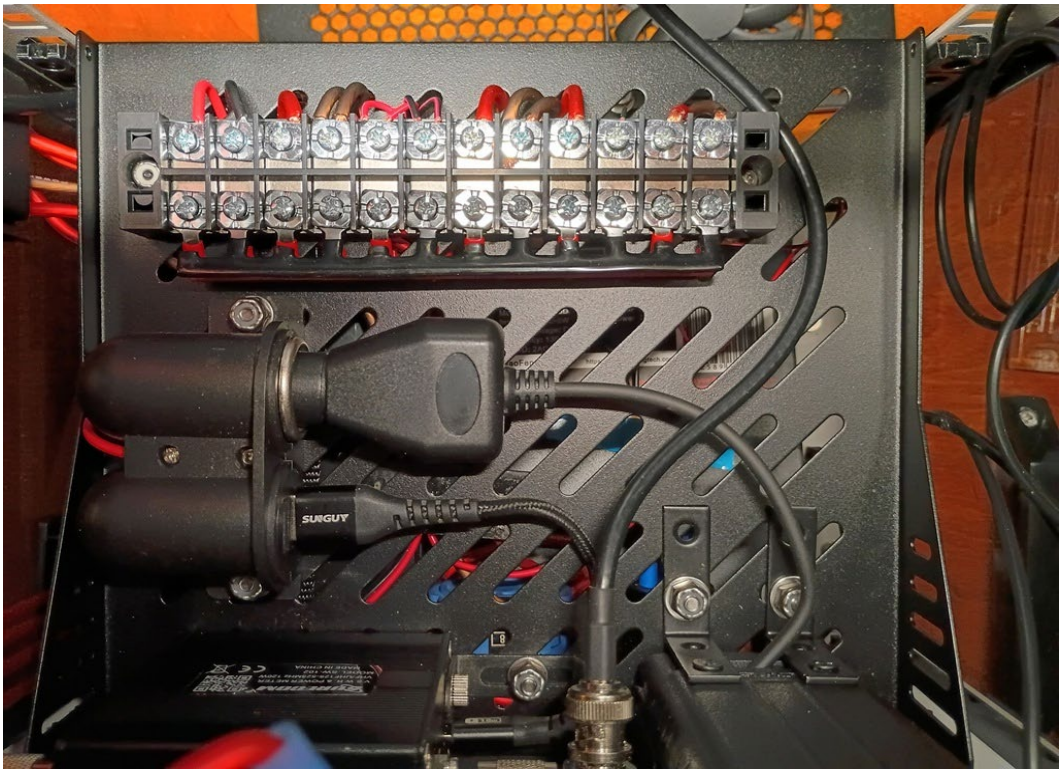
Almost all of the parts were acquired from Amazon, with the exception of some miscellaneous hardware which I got at Lowe's. Amazon links are at the end of this write up.



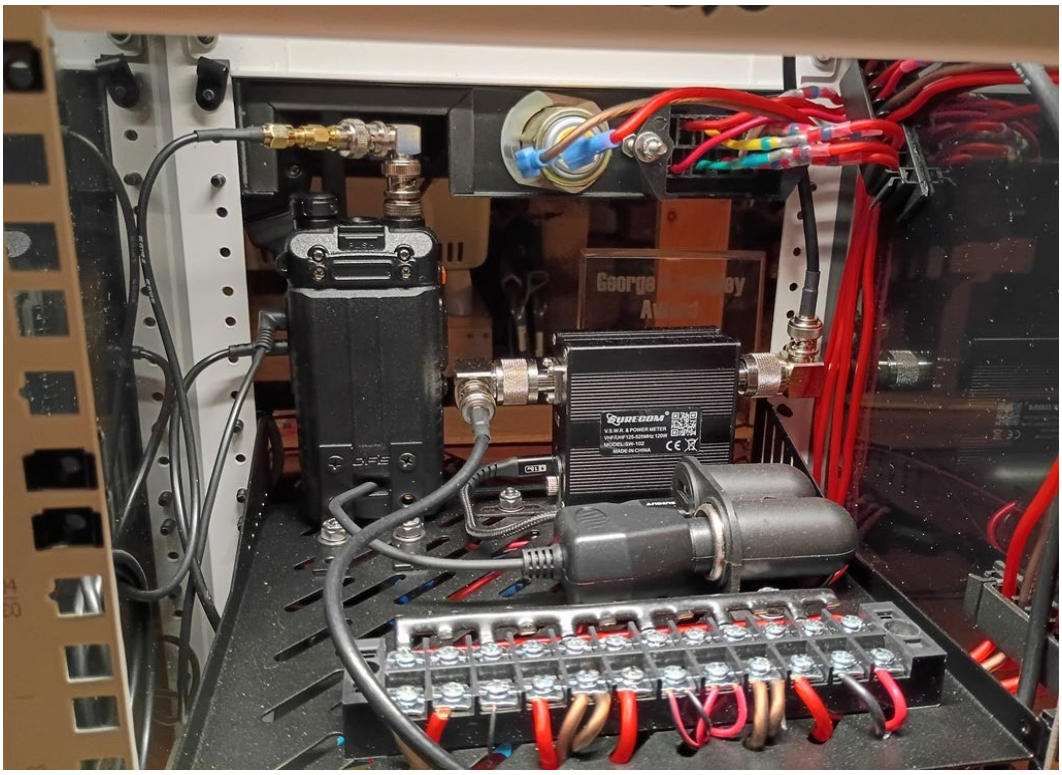
In the picture above are some plastic wire clips routing the mic cable. It keeps the cord away from the controls and takes up some of the excessive slack of the coil to keep most of it within the overall nominal dimensions of the frame (not drooping and having the excessive slack catch on anything near it when I grab the mic and start talking on it).



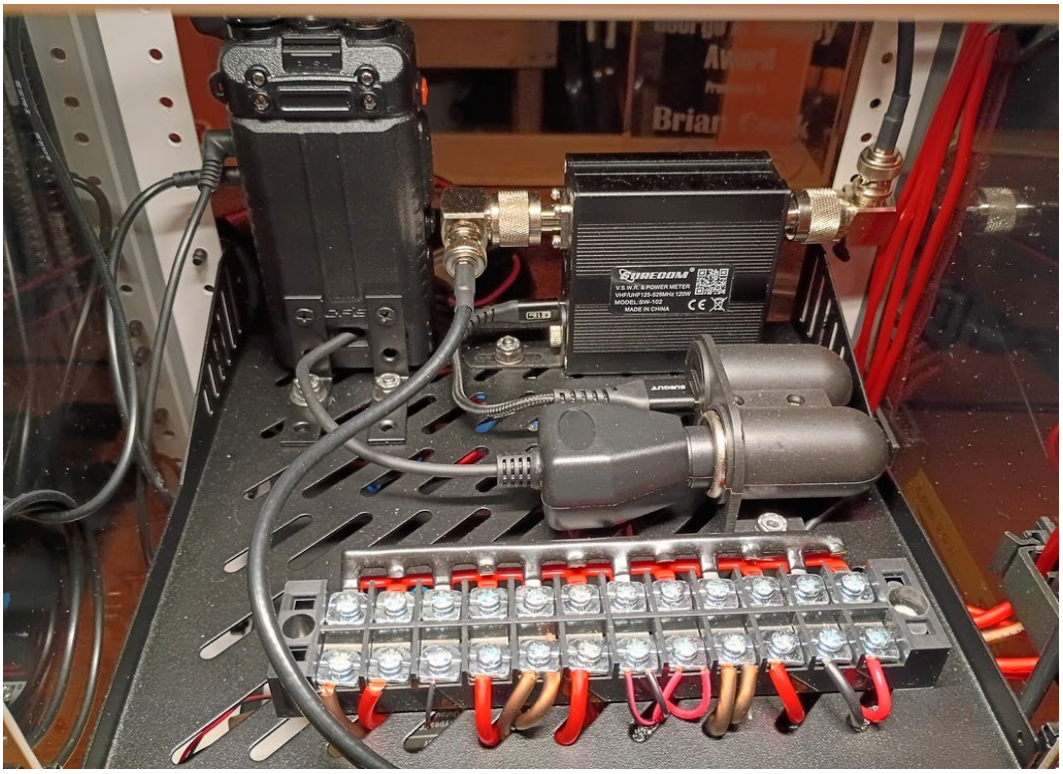
This is with the top cover removed looking down from above.



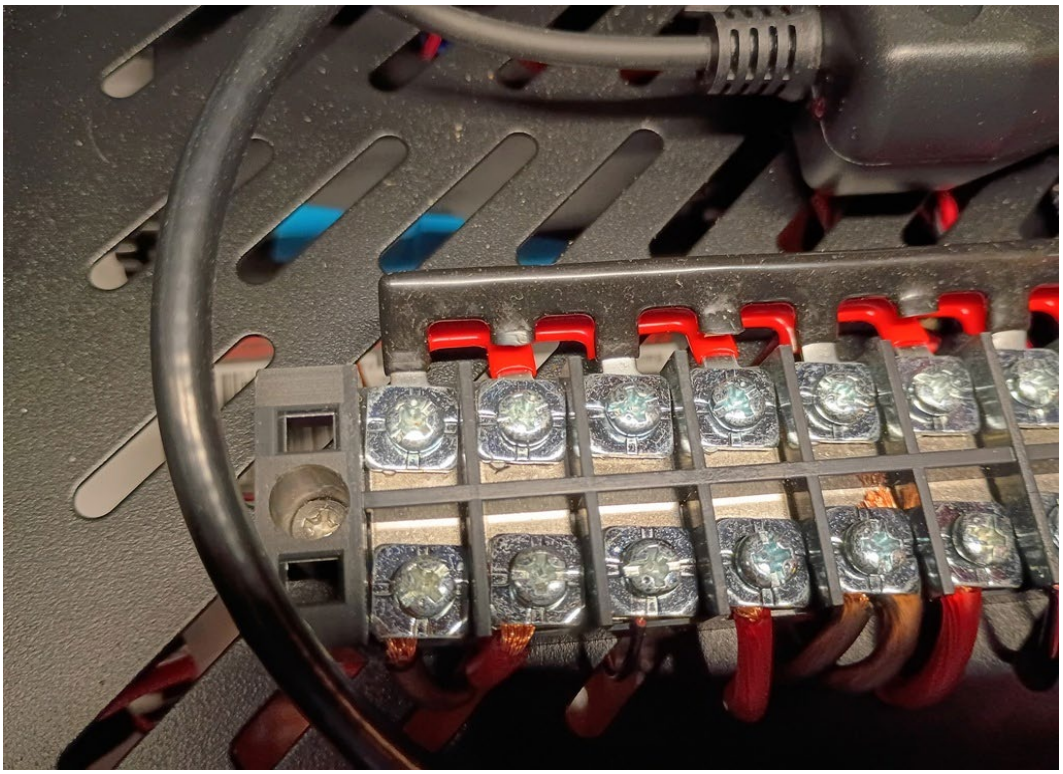
And here it is a little closer up.



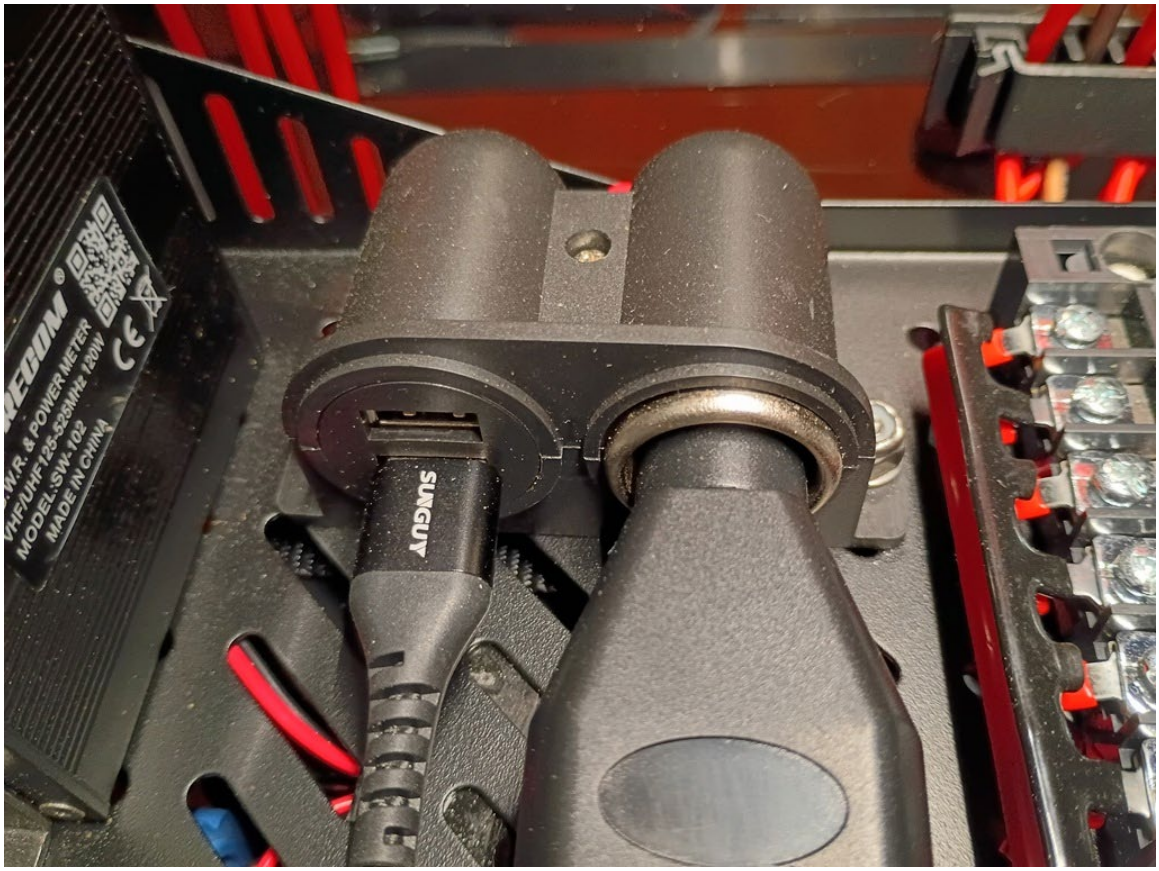
And from the back.



Another from the back at a slightly different angle.



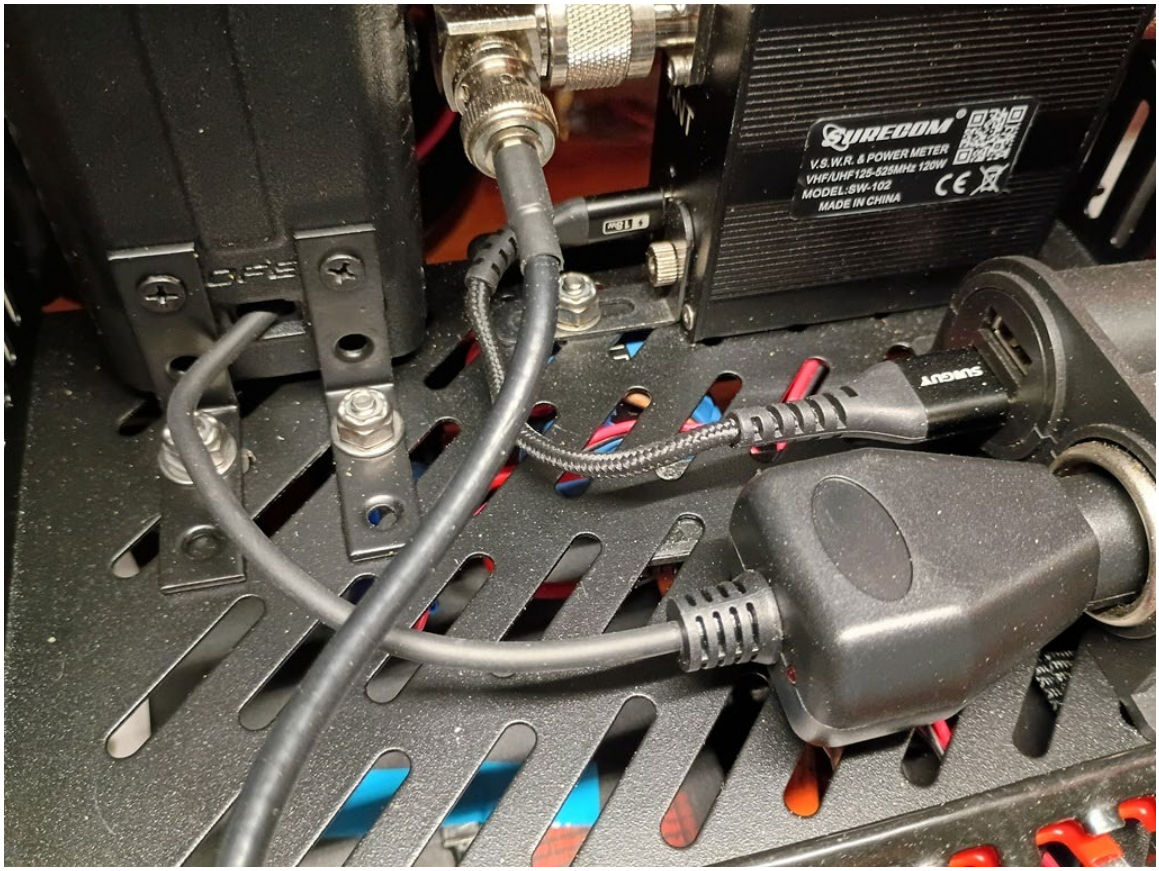
I wanted alternating positive and negative terminals, so I cut every other connection on the strip connectors and staggered the positions.



The Surecom SWR meter has a built in battery that recharges from a usb A port to a (now fairly obsolete) micro-usb port. If the SWR meter is running on internal battery, it won't stay illuminated and shuts down automatically after some period of no use. If it is actively connected to a usb power supply, it stays on and illuminated.

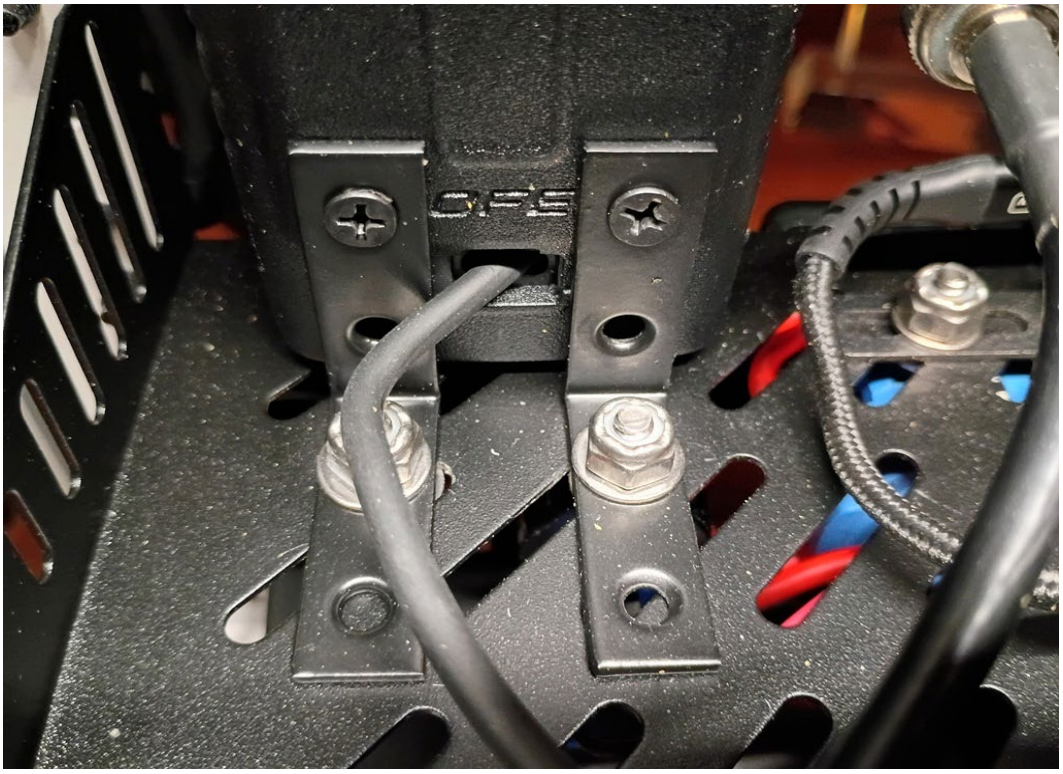
The Baofeng Battery Eliminator comes with a cigarette lighter adapter. All of the electrical conversions from 12 volt DC to a baofeng compatible power supply are in the wider, semi triangular shape portion of the adapter which makes that part of the adapter a necessary part of its function. In other words, it can't be cut out and wired directly to a 12 volt power supply...unless some other conversion device is substituted.

Fortunately, a combination usb/cigarette lighter power port is readily available for anyone that wants such a thing in their car...or a custom built HT.



This shows how combination power ports connect to their respective devices. The SWR meter is held in place only by a single angle bracket that can be seen just before the micro usb power input. I believe that finger screw is intended as a ground lug. The only other things holding it in are the input and output RF cables which have been located to favor its position.

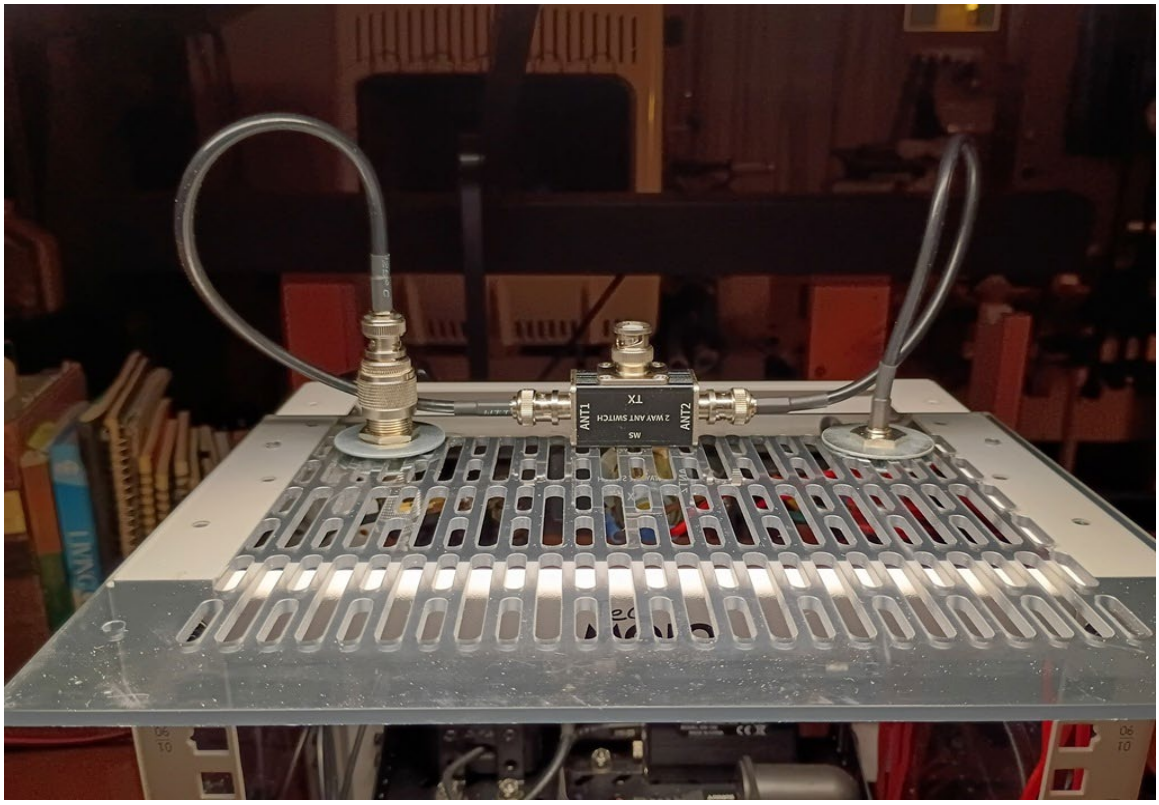
The battery eliminator has been significantly modified. I was able to crack the seam of the battery case by squeezing the sides of it gently in a vise...and it is really empty! Only two thin wires come from the feed wire that are then soldered on internally to what are the external radio power contacts. Aside from curiosity, the reason for cracking it open was to cut off the long coiled wire that originally came attached the battery eliminator so I could make it only as long as necessary for this application and then reconnect it to the internal part of the contacts. But also, the power feed wire originally fed in from the bottom. The battery eliminator seems to use an actual battery case, so I popped off the little rubber cover that was on the back (in a real battery, it would have been the cover to the usb C charging port) and fed it in from there instead. Also there are two angle brackets securing the battery eliminator in place. Because inside the body of the eliminator is truly empty space, I was able to drill a couple of tiny holes and screw it in to the upright portion of the brackets.





The upper portion of the HT and attached battery eliminator. Like a regular battery, the HT unit can be detached from the battery eliminator by pressing the button that is labeled 'PUSH'.

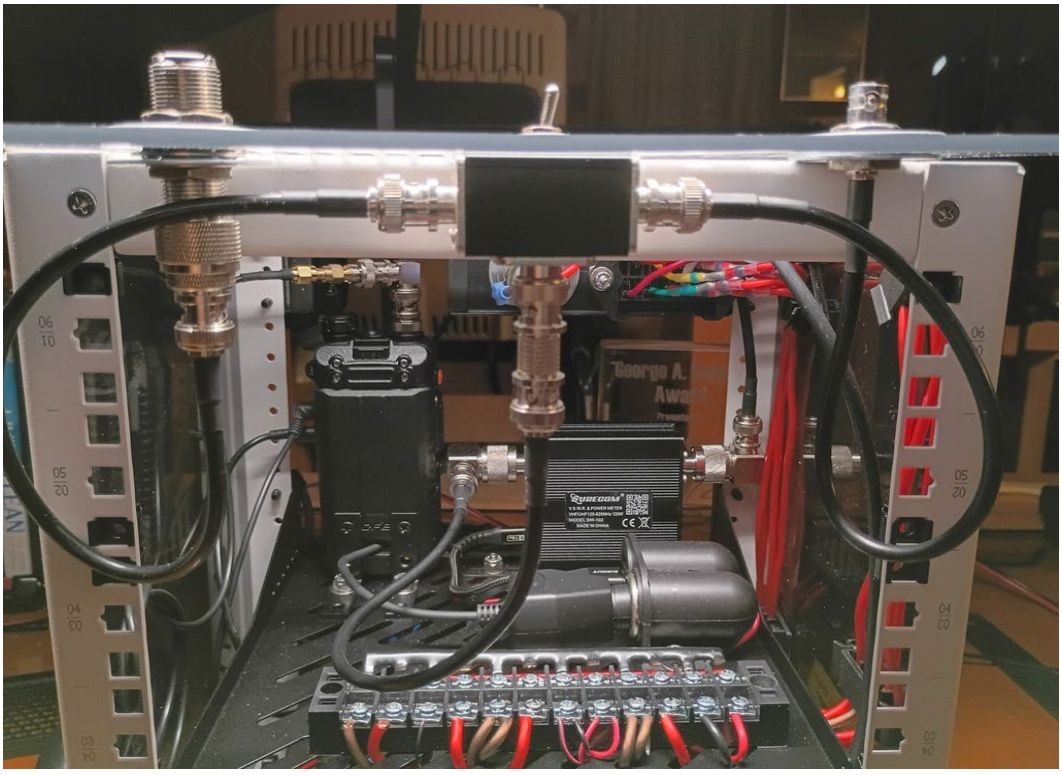
There are two different antenna output connections I installed with different formats and purposes. One of the outputs is a BNC female, which gets connected to the fixed antenna I have at my house. The other output is an SO-239 (UHF Female) which I use for a direct attachment of a more portable antenna, but I suppose it could also get attached to a wire with a PL-259 for an external application as well. They are not simultaneously active. There is a selection switch to choose which output to use.



This is the plastic top that attaches to the frame, but unscrewed and turned upside down to illustrate the antenna output arrangement.



This is a close up of the switch. It was listed as being good for up to 100 watts and frequencies between 0 – 50 MHz. All of these types of switches seem to be listed with those operating parameters. Obviously that is way below VHF frequencies, but I thought I'd take a chance on it anyway...and it seems to work fine. Mine has BNC connections, but they also come with SO-239 connections as well.



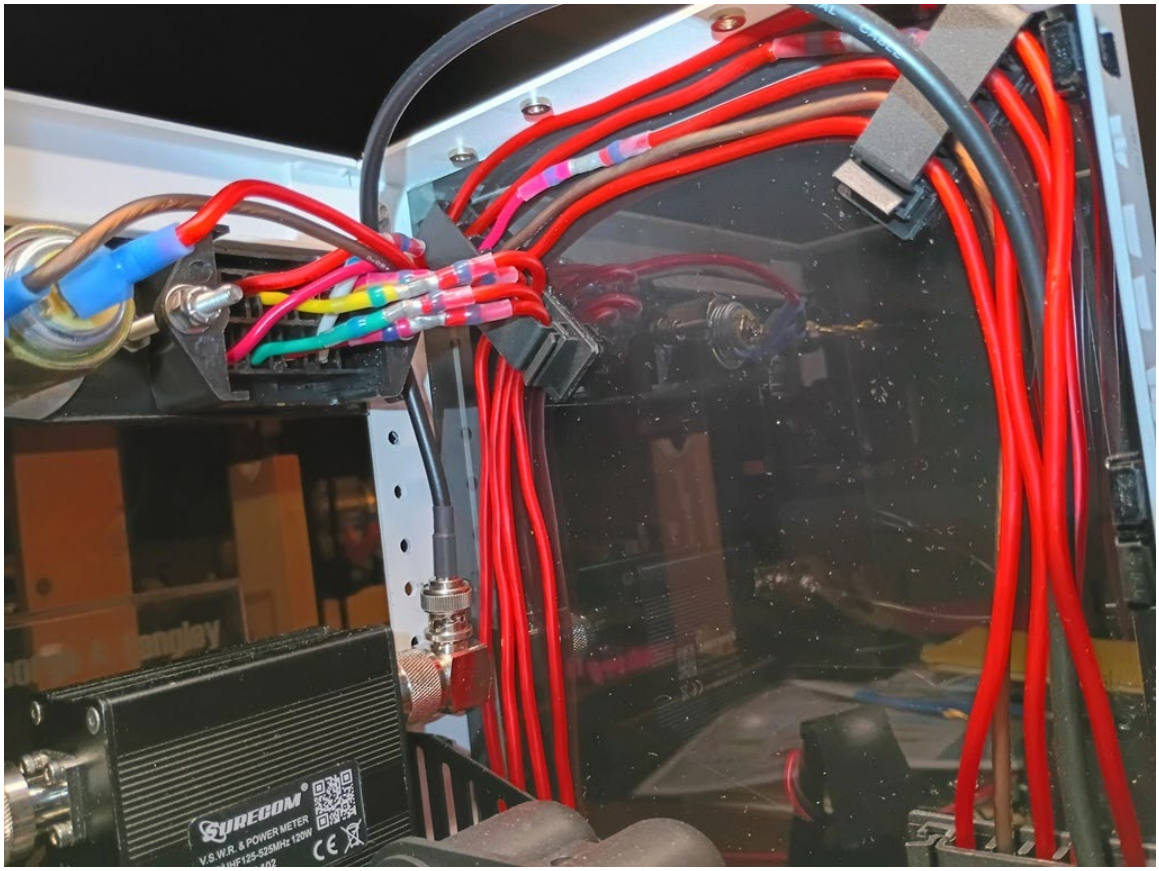
Here it is placed right side up on the frame, but offset just a little to show the connections and orientation.



And that's what it looks like when assembled.

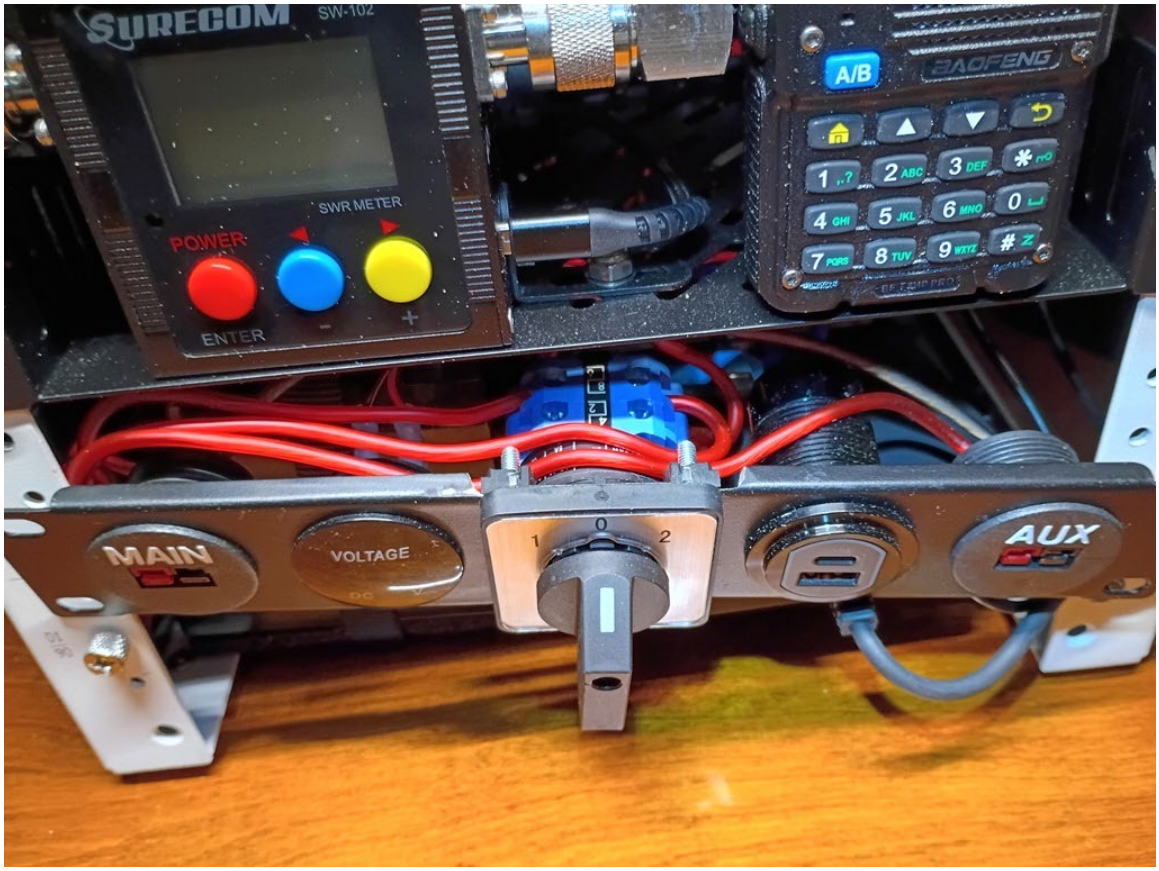


The whole device is powered by this battery. I don't know how long it will last without recharging because I recharge it when the voltmeter installed on the face gets somewhere in the 12.x range (x being some mid-range decimal value). In my case, it hasn't gone dead on me, though on one occasion it may have come close, but if I keep after it, I can easily go a week or more without worry.

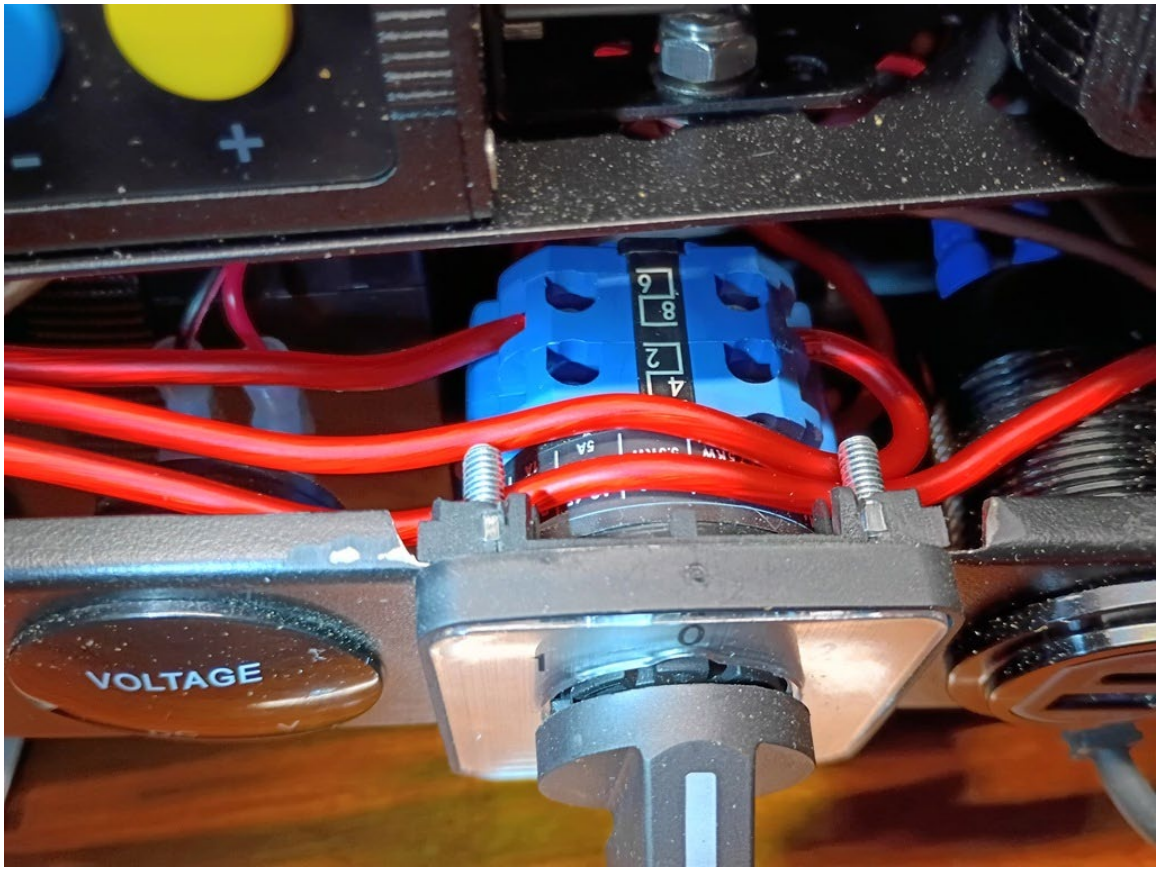


This looks messy and sloppy, even though it is after I cleaned it up with wire routers.

The wires with color are coming from the fuse block and are connected with heat gun activated solder joints and heat shrink tubing connectors. The battery positive goes directly to one of those fuses. The wires coming down in the center of this picture go to the controls on the face of this unit. The wires coming down on the right of this picture go to the terminal block.



This is the face of the unit with the control panel slightly removed. Some of the wiring prevented much more movement. The main switch in the center functioned exactly in the manner I needed it to. Turning to the “1” position turned on the unit by connecting to the onboard battery power. Turning it to the “2” position turns the unit on from power supplied to the “AUX” input on the far right of the panel. If you hadn't already guessed, this is so it can be operated if the onboard battery runs out of juice. The “0” position disconnects the unit from all power turning it off completely. By the way, turning it on (either source) turns almost everything on automatically with the only exception being the SWR meter. The SWR meter will receive and transmit like it should without being turned on, but turning it on lets you see the SWR ratio, power output, frequency being measured, etc., which is a wildly useful reference and the reason it is there.



Unfortunately, the main switch was just slightly bigger than the height on the panel, so some more modification was needed. The top of the panel was sanded to allow the backside maximum height. However, maximum height was limited by the metal shelf just above it (where the HT, SWR meter, and backside electric connections live). So...I had to sand down the backside of the main switch retainer. If you look close, you can see where the molded in nuts are just showing through the sanded plastic. The bottom of the switch and panel are uncompromised.



This is one of the critical components of this setup and a big part of the reason I constructed this whole unit. It is an amplifier specifically designed for HT use. It's rated for a maximum input level of 10 watts. There are four versions of this amplifier made by BTECH (an American arm of Baofeng specializing in the better products offered by Baofeng). The versions are VHF, UHF, VHF with digital capabilities, and UHF with digital capabilities. I opted for the VHF amplifier without digital capabilities. The downside is that I am limited to VHF only. In this amplifier, UHF seems to be completely filtered out, both TX and RX.

That's okay. I have another radio that can still function on both bands, and the vast majority of my use is on VHF anyway (exclusively if you don't count the weekly ARES net).

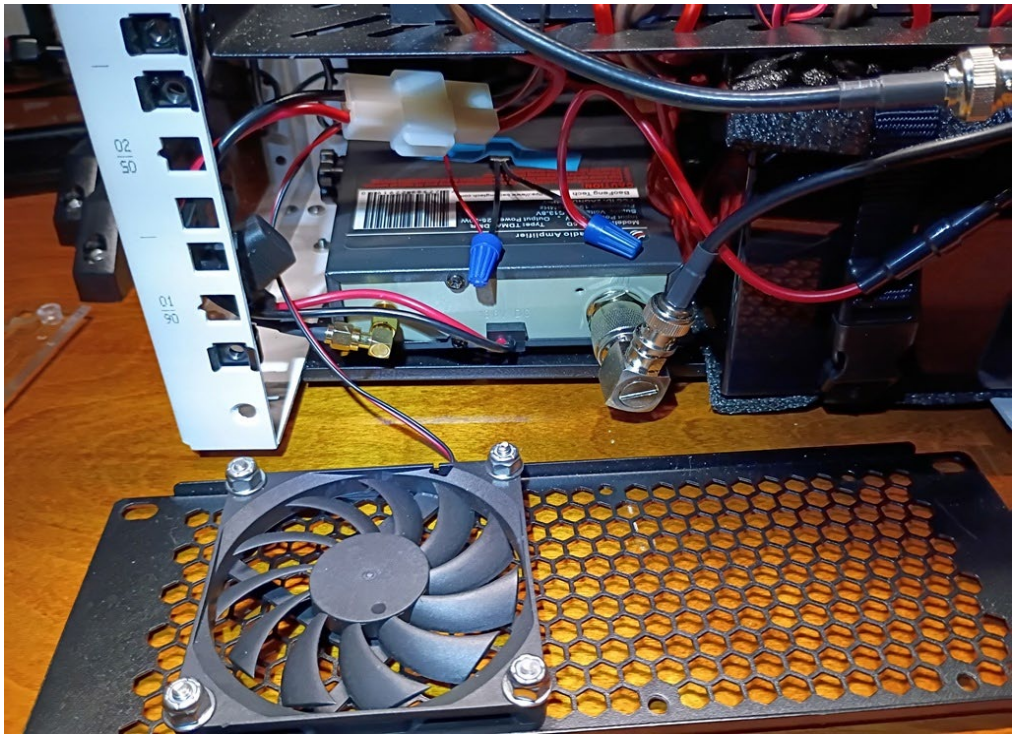
The trade of is SO worth it. At max output, my signal gets very close to 50 watts, like 48 and 49 watts. That makes a world of difference and now transforms my unit into a viable base station when connected to my home antenna. Also, because it has the capability to select a second antenna output (again in my case, a directly connected antenna) and is otherwise self contained, it is equally as much a portable unit.



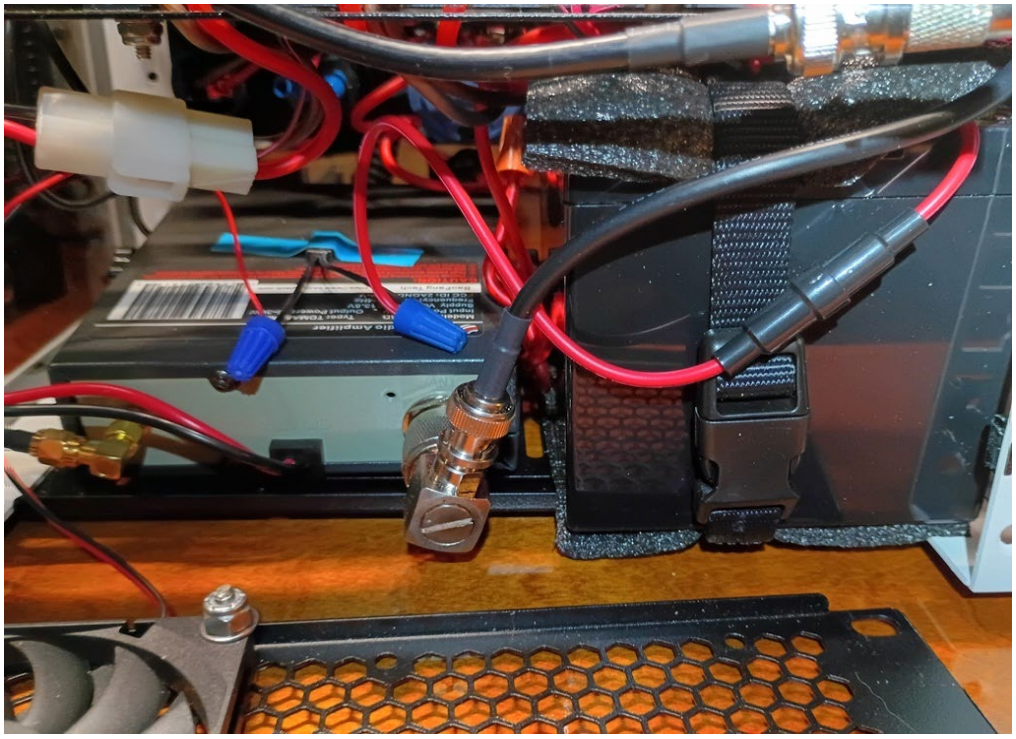
Top view and specs of the amplifier. It lists input and output power a bit lower than I reported, but my inputs and outputs are actual measured values. Also, I think the user manual says something to the effect of “don't exceed 10 watts input power” or something similar, so I feel comfortable pushing it that far, and I haven't seen any smoke!



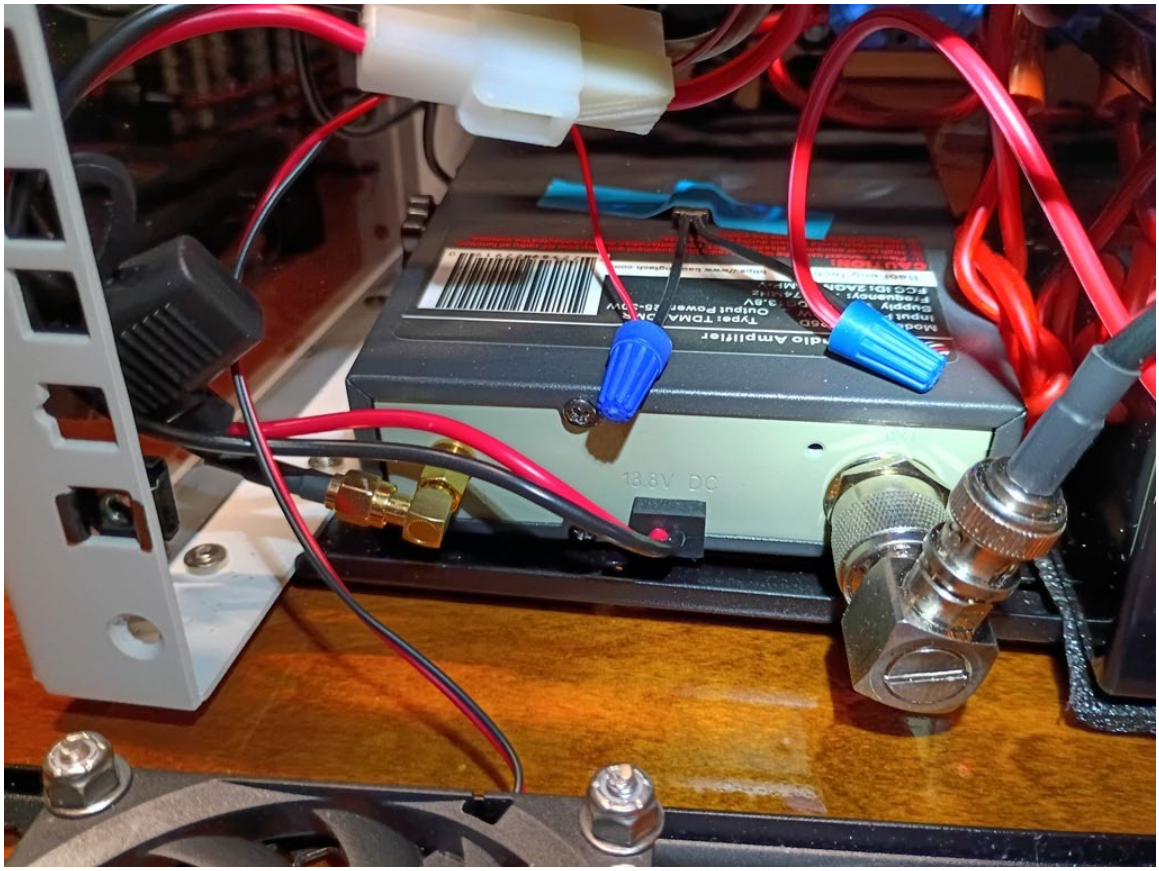
An unobstructed view of the face.



This is the lower part of the backside.



Here's a closer up view of that portion. On the right is the battery. I used packing foam that I acquired somewhere along the way as a cushion underneath and an insulator on top. The strap holding it all together is a small dog collar I bought at Walmart for a few bucks. It turned out to be the perfect size!



The backside of the amplifier. The SMA is input from the HT. The PL-259 is amplified output going to the SWR meter. If you look at the wire nuts, you'll see they're connected to something under a blue piece of tape. That something is a thermal switch which is normally open. At a certain temperature, it closes and turns on the fan bolted to the bottom rear perforated panel. That's wired (and fused) directly from the battery so it stays on even if the unit is turned off, until it gets below a certain temperature.



This is the antenna normally attached to the SO-239 on the top of the unit. The “GI” designation is part of Comet's 'Ground Independent' series of antennas. This one is rated for dual band (VHF/UHF) and is 38” tall.



This is my home antenna setup. Both antennas are dual band and both wired into the house. This way I can run two radios both with good reach...and I often do. The higher one is a Comet GP-6 and is about 10 feet tall on its own. I forget what the other one is.

The mount is two 10 foot sections of 2” PVC. The union was put together in such a way that an elbow and secondary mount was available. This mast has gone up and come down three times so far to get it in its current configuration. I'm sure it will happen again, especially once I dip my toe into the HF world.

Amazon Links (some seem to have expired or discontinued as I tried them recently)

Box Frame - Tec Mojo - Several Sizes
https://www.amazon.com/dp/B0F4JZ9YJW?ref=ppx_yo2ov_dt_b_fed_asin_title

Box Frame add ons - Front Panels, Rear Vent Panels, Fan, Thermal Switch
https://www.amazon.com/dp/B0F4K2SR5T?ref=ppx_yo2ov_dt_b_fed_asin_title
https://www.amazon.com/dp/B0F4K2SC5Q?ref=ppx_yo2ov_dt_b_fed_asin_title

BTech BF-F8HP Pro
https://www.amazon.com/dp/B0DHSS2NNF?ref=ppx_yo2ov_dt_b_fed_asin_title

BTech Amplifier - 4 types - VHF, UHF, analog & digital/analog of both bands
https://www.amazon.com/dp/B07BDKR61J?ref=ppx_yo2ov_dt_b_fed_asin_title

SWR Meter
https://www.amazon.com/dp/B01D86IKIQ?ref=ppx_yo2ov_dt_b_fed_asin_title

Battery - LiFePO4, 20 Ah
https://www.amazon.com/dp/B0DZWVL92J?ref=ppx_yo2ov_dt_b_fed_asin_title

Baofeng Battery Eliminator
https://www.amazon.com/dp/B0DT7LK52C?ref=ppx_yo2ov_dt_b_fed_asin_title

Fuse Block
https://www.amazon.com/dp/B079DLY3F4?ref=ppx_yo2ov_dt_b_fed_asin_title

Terminal Block
https://www.amazon.com/dp/B0BN55WVDB?ref=ppx_yo2ov_dt_b_fed_asin_title

Power Poles
https://www.amazon.com/dp/B0DXKHRFLK?ref=ppx_yo2ov_dt_b_fed_asin_title

Volt Meter
https://www.amazon.com/dp/B0DY4KFRR2?ref=ppx_yo2ov_dt_b_fed_asin_title

USB Outlet
https://www.amazon.com/dp/B0G2LM5S29?ref=ppx_yo2ov_dt_b_fed_asin_title

Main Power Switch
https://www.amazon.com/dp/B07ZV8DSHR?ref=ppx_yo2ov_dt_b_fed_asin_title

Antenna - Comet GI-250 (ground independent) – DX Engineering
https://www.dxengineering.com/part/comet-antennas/gi250nmo/8657580

Antenna Switch
https://www.amazon.com/dp/B0FF15THTL?ref=ppx_yo2ov_dt_b_fed_asin_title

Internal Power Outlet - USB Lighter Combo
https://www.amazon.com/dp/B0CJN8M7KT?ref=ppx_yo2ov_dt_b_fed_asin_title

Wiring
https://www.amazon.com/dp/B0G9LXHX84?ref=ppx_yo2ov_dt_b_fed_asin_title

Cable Management Clips - 2 kinds
https://www.amazon.com/dp/B0BZCVQ77H?ref=ppx_yo2ov_dt_b_fed_asin_title
https://www.amazon.com/dp/B07QWKG1KT?ref=ppx_yo2ov_dt_b_fed_asin_title