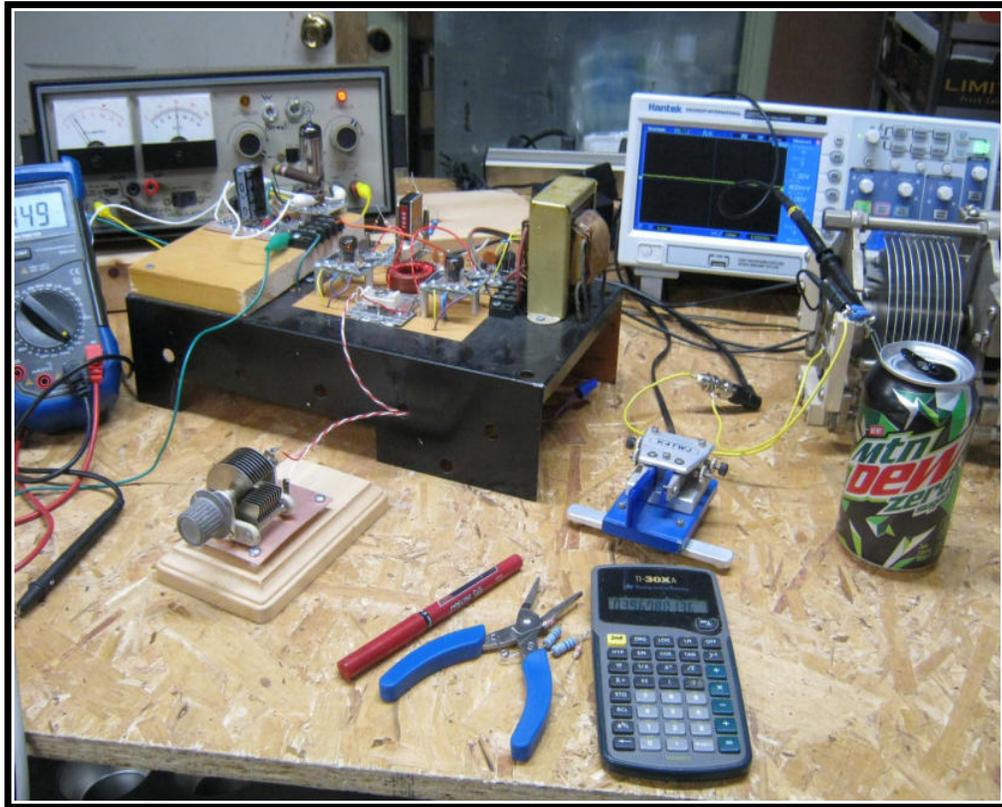


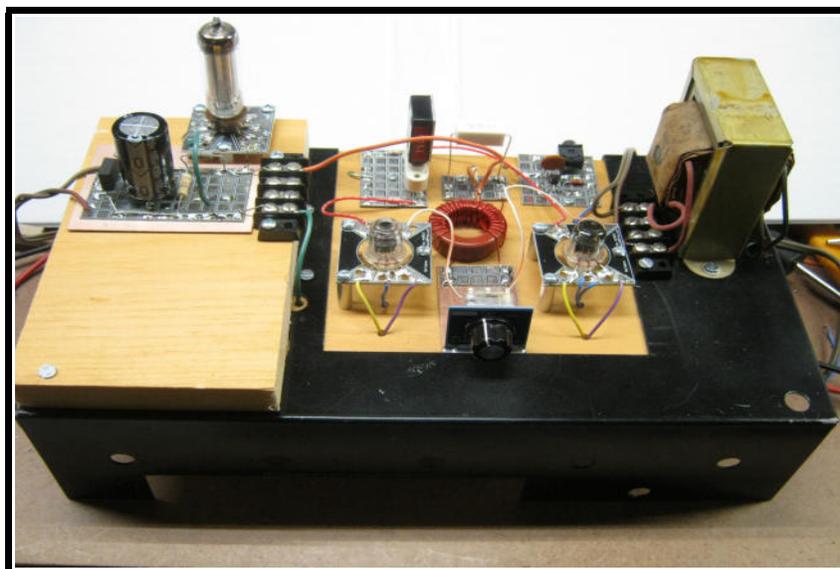
# Acorn Tube 2 Transmitter Progress Report



## The Prototyping & Testing Bench

Here is a nice picture of the current state of affairs for the AT2 FDIM 2020 Buildathon project. DVM is displaying the plate voltage to the AT2 acorn tubes. The power supply is a newly purchased Heathkit IP-17 Variable output high voltage power supply. I burned up lots of wall warts and cheezy filament transformers trying to get something to work on this prototype. Several months ago, I knew nothing about vacuum tube circuits and operation. I had a couple of guys (Chuck & Colin) to lean on and I've come a long way. As a kid, I used to buy broken TVs (vacuum tubes in those days) at the local Lion's Club auction and strip them for parts for my other electronic projects. I didn't do anything with the vacuum tubes & high voltage stuff other than collect it in boxes. I discovered computers and programming in high school and

radio stuff fell by the wayside. I went to University of Maine to study Electrical Engineering with a major emphasis in computers and programming. I never saw a vacuum tube in college and hardly a transistor for that matter. Integrated circuits were all the rage and Fairchild Semiconductor was a major contributor of equipment and parts for the curriculum. Half my class studied semiconductor fabrication etc, and the other half was primarily power generation. I was the one lone student working his way through every programming and advanced math class I could cram into my schedule. After graduating from college with an EE degree in hand and LOTS of computer knowledge, I spent the last 47 years in the computer field. I started my career in Houston with Texas Instruments and as I departed Maine for Texas, all my good stuff departed my garage workshop for the Cape Elizabeth town dump! My parents wanted their garage back... So my knowledge of vacuum tube circuits and construction is pretty slim. Still, I always wanted to design a glowbug to fit into my collection of FUN offerings at QRPme. So I pitched it to the FDIIM crew with a couple of other ideas and they liked the glowbug project best. Of course, it was the most difficult project for me to design. I had to learn a whole new skill set! But it is working as of this past evening. It had been limping along with the output under 100 milliwatts and not anywhere near my target. I wanted it to be at least as POWERFUL as the venerable TT2 transmitter that everyone knows and loves. To my knowledge, most current glowbug kits that are out there are fairly expensive due to the costs for both the tubes and transformers. A store bought high & filament transformer is going to set you back in the neighborhood of \$30 to \$40. I chose the acorn tube because NOBODY uses them so I thought I could get a good deal on them...and I did!

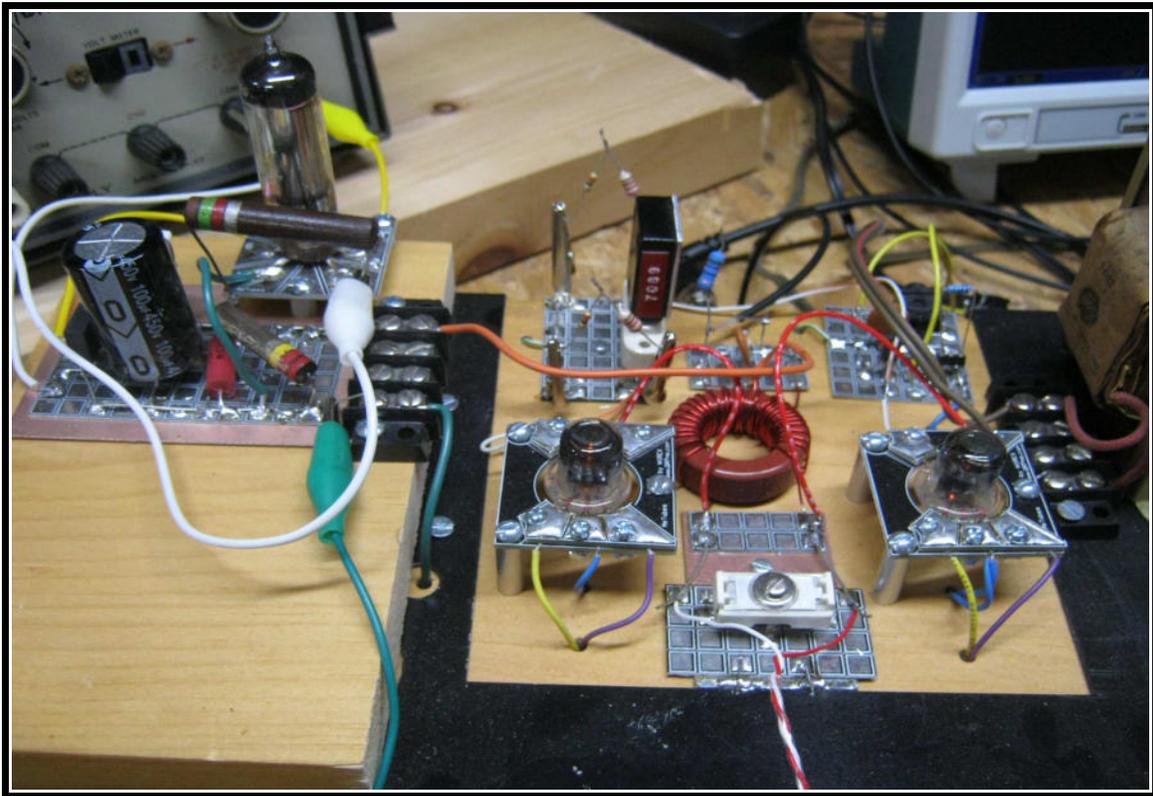


**My AT2 prototype**

The chassis for my prototype is taken from an old Heathkit Laboratory Generator that was laying around in a heap as a basket case. I stripped it down to a bare chassis, painted it black and mounted a couple pieces of pine as work zones. The transformer is the original from the kit and has a dual winding output for the plate circuit and 6.3 vac for the heaters. The original power supply circuit only generated 108 vdc of plate voltage which would barely allow the electrons to leave an antenna. So the transformer is unused in the current prototype.

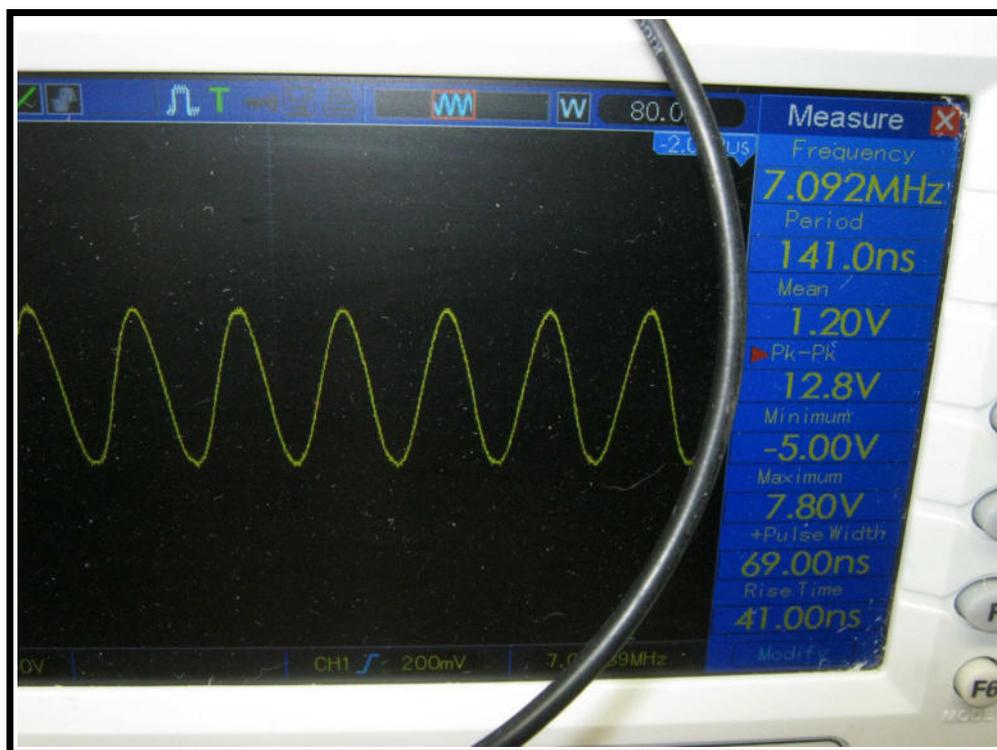
As you can see in the picture, I finally had a reason to use the MeTubes paddyboards for the OA2 voltage regulator tube and the 2 acorn tubes. The MeTubes are mounted on standoffs and simply screwed down to the pine. No chassis punches were 'armed!

The power supply circuit is mounted on the left sideboard and the AT2 transmitter occupies center stage.



### AT2 closeup

All the sub-circuits were built up using MeSquares and MeTube paddyboards. The power supply on the left will take a high voltage, up to 400 volts, make a regulated DC plate voltage using an OA2 tube. I burned up a bunch of wall warts and cheapo filament transformers trying to make the supply 'happy'. A big design goal was to use wall warts to make a reasonably priced power supply that wouldn't break anybody's pocketbook. I started at the plate circuit and worked my way back using calculations based on informal hearsay..... I started out with transformers I thought were sized right but smoked them for one reason or another! When it came down to making it work, the adage 'More POWER!' really was the answer. I quit working my way up the VA ratings (ie cheap to more expensive) and went right to the top! I finally ended up buying the transformers with the highest ratings I could find! No more smoke (and fire!) and stink...



### The RF Output Signal

Here is a closeup of my scope showing the keydown output signal.

Peak to Peak voltage of 12.8 volts into a 50 ohm load calculates to 409 milliwatts of RF output.

There is 200 VAC at the input of the power supply with the OA2 making a regulated 150 VDC.

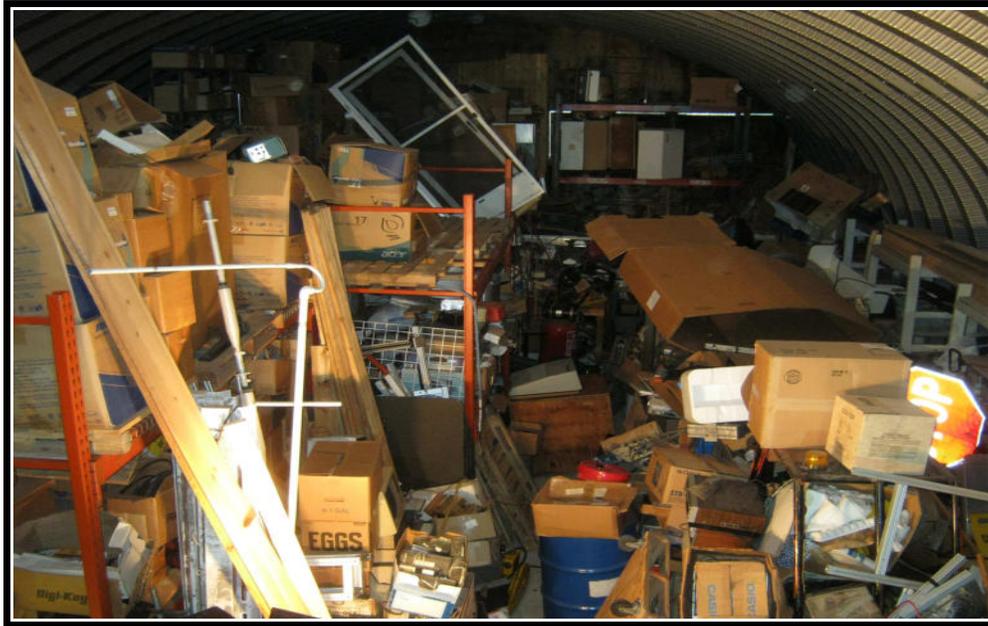
I am powering it here from the Heathkit power supply but that is what I measured from the back to back wall wart power supply I finally managed to build using the description in Dave Ingram's, K4TWJ, acorn tube column in CQ magazine some years ago.

The overall power supply design is a mash-up of BOTH George Burt's, GM3OXX, original PP2 dual acorn transmitter power supply and Dave Ingram's, K4TWJ, design in CQ.

Now for the Buildathon update....

I had planned of holding a LIVE streaming Buildathon on the very same day it was to take place at FDIM, which would have been Friday the 15<sup>th</sup>? Due to **LOTS** of unforeseen problems, I have had to make some changes to my plan.

From prior experiences, I know that this project is relatively simple in parts count but it is a major undertaking. I don't think we can build the whole thing in one session.....so I hope everybody is with me when I say, that we should do it in maybe 3 sessions. Build the power supply first, move on to the prep work on the transmitter section with a final wrap-up putting the pieces together. I have been working on this thing for weeks, making what seemed like incremental baby steps in progress. I have about \$200 in burned up wall warts, transformers and acorn tubes in a box under the bench. Once I parted with some serious cash and bought the Heathkit high voltage power supply, progress came quickly.



### **A Stuffed Quonset Hut!**

Another device that helped immensely was my AADE inductance & capacitance meter. I moved my entire 1500sqft. shop last July 31<sup>st</sup> and hadn't seen the AADE meter since the move. I had a good friend and his wife come to my shop every afternoon for a couple of weeks helping me pack up my stuff. I have a LOT of stuff! Anyway, Marion was a packing fool. BOY! Could she pack! Only problem was that she had no idea what she was packing! My friend Tony was the marker. He would look inside the box, see what was packed in there, and mark the outside with a Sharpie what was inside. Only problem is that Tony is 95 and when he looked inside MOST of the boxes, he didn't recognize any of the stuff. And of course, Marion just grabbed stuff and packed it. SO I have about 500 boxes marked MISC. Elect. on the outside! It took me a long time to find that AADE meter and I stumbled upon it quite by accident looking for something else! I still haven't found the box that has my HW7, HW9, my really GOOD RF power meter and other good stuff off my old test bench!!

Anyway, once I had the PROPER equipment, things went from bad to pretty good fairly quickly. I am working on the circuit boards now but the turn around from the FAB houses is pretty bad right now. Transit times have gone from 3 days to 2 weeks. If I really hustle the design and pay extra for fast FAB and delivery, I could have the pcb back here in maybe 8 to 10 days. I'm thinking another 8 to 10 days for transit time to the builders puts kits on builder's benches around the end of the month. I know that is not what everyone signed up for but that is the reality of the situation right now.

I have already bought a bunch of new video equipment for doing the LIVE stream but haven't had a chance to install it in my hambulance yet. Once the pcbs go to FAB, I'll work on the video equipment setup.

I welcome any and all feedback on this project. So if you have any comments, questions, suggestions or new colorful sayings you want to fling my way, please do so. I can take it!

Rex W1REX