

Adventures with Linear Amplifiers

How to Build Your Own

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Amplifier Comparison

Tube

- Manual / Automatic
- Pros
 - Tolerates higher SWR
 - Typically, lower \$
- Cons
 - Very Heavy
 - Lethal Voltages (3 - 4KV)
 - Warm up required
 - Slow band Change

Solid State

- Typically, Automatic
- Pros
 - No Warmup
 - Rapid Band Change
 - High Efficiency
 - Lighter weight
 - Max Voltage 50VDC
- Cons
 - More susceptible to SWR
 - Likely requires antenna tuner

What's right for you? Levels of Buy/Build

Assemble & Tested

- New / Used
 - Alpha
 - Amcom
 - Ameritron
 - Elecraft
 - Mercury IIS
 - SPE Expert
 - Many others

Build Kit

- Heathkit
- Mercury IIS
- VK3AMP
- RFKIT pre-assembled modules
- W6PQL components and modules

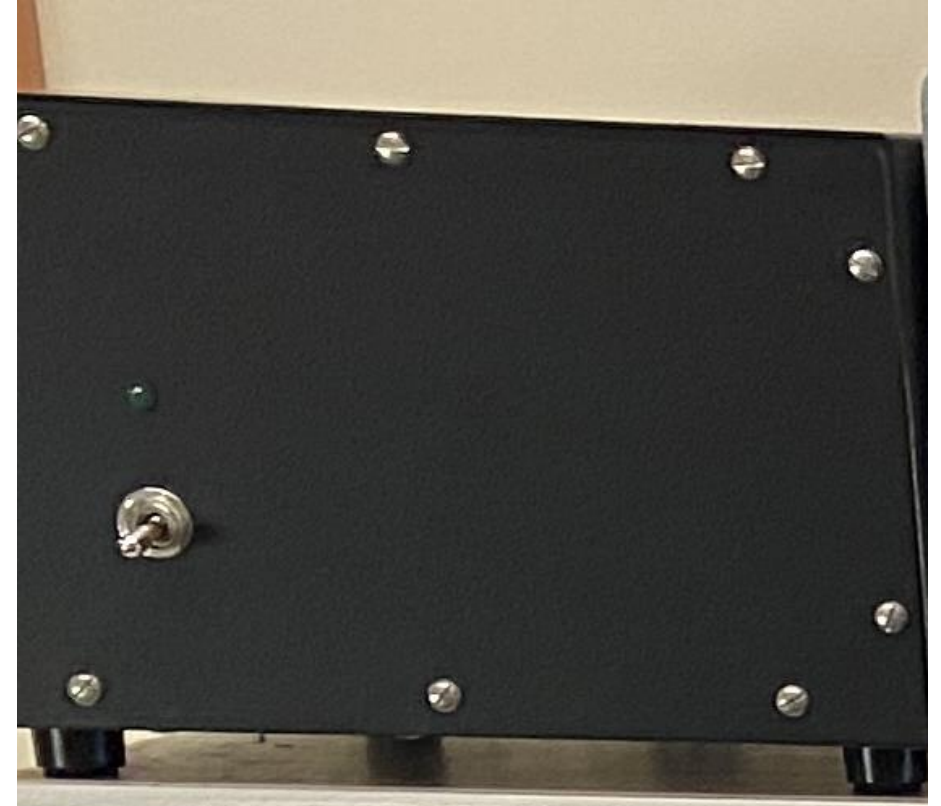
Homebrew

- From scratch – total hand built from parts
- Combination of subassemblies (W6PQL) and hand build

2M Kilowatt Linear – Separate RF Deck and Power Supply



12"W x 12"D x 6"H



9"W x 12"D x 6"H

BLF188XR Push-Pull LDMOS Amplifier

General description: A 1400 W extremely rugged LDMOS power transistor for broadcast and industrial applications in the HF to 600 MHz band.

Features and benefits

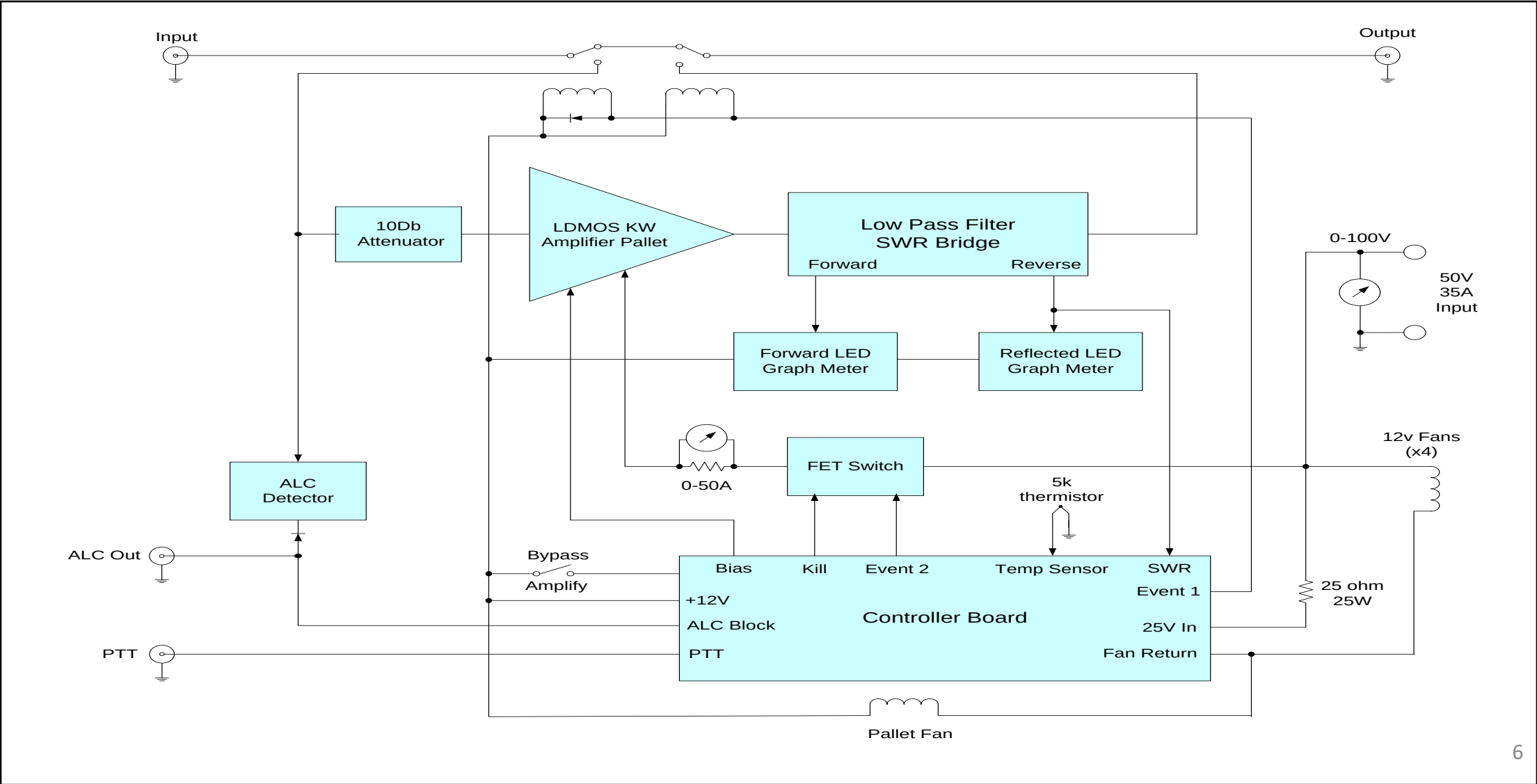
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (HF to 600 MHz)

Applications

- Industrial, scientific and medical applications
- Broadcast transmitter applications



2M 1KW Solid State Amplifier Block Diagram



Home Brew Process

1. Develop Bill of Materials (BOM)

2. Develop Preliminary Physical Layout

- Circuit flow
- Serviceability
- Single box / multi box
- Thermal & RFI Management

3. Secure Parts

- Junk box
- Fellow Hams
- Ham fests
- Purchase

4. Refine Layout with actual Parts

- Graph paper

5. Fabricate and Machine enclosure and mounting hardware

6. Assemble and Test Sub-Assemblies

- Build a little / test a little

7. Integrate sub-assemblies into enclosure

8. Conduct system level test

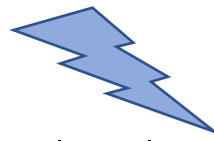
- Current limit PS to avoid catastrophic failure

9. Final Assembly / Paint

10. Install in Operating Position

Bill of Materials

Description	Part #		Qty	Source	Each	Total	Ordered	Notes
#10 THHN stranded wire, black			15ft	Ace hardware			stock	
#10 THHN stranded wire, red			15ft	Ace hardware			stock	
#14 THHN stranded wire, blue			5ft	Ace hardware			stock	substitutue yellow
#14 THHN stranded wire, red			5ft	Ace hardware			stock	
#18 THHN stranded wire, red			5ft	Ace hardware			stock	
Rubber feet, 4 per pack			1 pack	Ace hardware			stock	
multi-conductor hook-up wire, 10ft	10cs22		20	Allelectronics	0.68	13.60	Y	
meter, panel, 100V DC	PMD-100V		1	Allelectronics	13.50	13.50	Y	
meter, panel, 50A DC	PMD-50A		1	Allelectronics	13.50	13.50	Y	
meter shunt, 50A	snt-50		1	Allelectronics	13.00	13.00	Y	
5mm led, red	LED-1		2	Allelectronics		1.00	Y	10 for 1.00
5mm led, yellow	LED-3		1	Allelectronics		1.50	Y	10 fro 1.50
5mm led, green	LED-2		1	Allelectronics		1.50	Y	11 fro 1.50
60mm fan, 17cfm, 12v	CF-583		5	Allelectronics	2.65	13.25	Y	
flat washer, #4	90126a505		box of 100	McMaster-Carr			stock	10.48
flat washer, #6	90126a509		box of 100	McMaster-Carr			stock	10.96
flat washer, #8	90126a512		box of 100	McMaster-Carr			stock	11.36

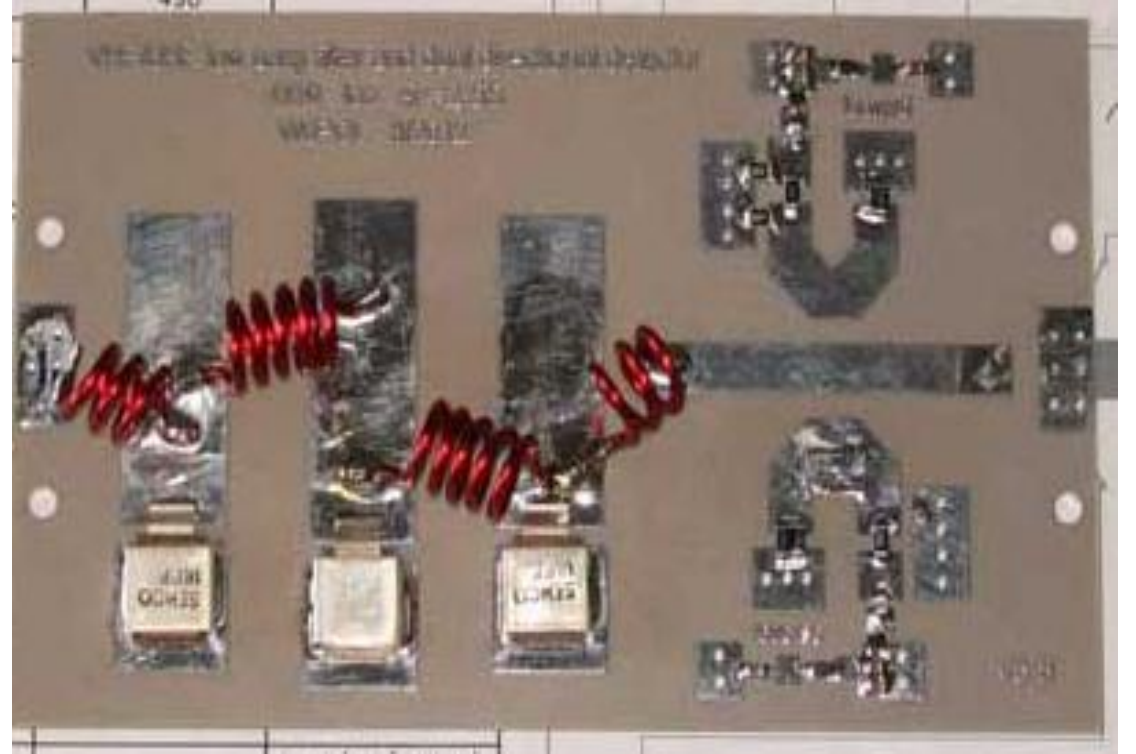


SO238 connector, bulkhead for RG142	with 6' cable			Ebay		23.09	Y	
SO238 connector, bulkhead for RG316	with 10' cable			Ebay		14.95	Y	
heat sink, 10 x 6 x 3.5, 6 pounds weight	HS-machined		1	Heat Sink USA	46.44	46.44	Y	
Bar graph display support bracket	supplied with cabinet fitting		2	W6PQL		0.00		
copper spreader, 3 x 5 x 1/2	CS-machined		1	W6PQL		0.00		
input attenuator, 6, 10, 13 or 16db	INATTEN		1	W6PQL	35.00	35.00	Y	
Kit, bar graph display, red, green, or tri-color	BARGRAPH		2	W6PQL	27.00	54.00	Y	
kit, basic 2m kw amplifier	2MKWAMPKIT		1	W6PQL	471.00	471.00	Y	
kit, control board	CTRL-v6.2	Assm	1	W6PQL	85.00	85.00	Y	
kit, high current fet switch	HCFS	Assm	1	W6PQL	21.00	21.00	Y	
kit, low pass filter w/dual detectors	LPF		1	W6PQL	75.00	75.00	Y	
kit, ALC board	ALC	Assm	1	W6PQL	20.00	20.00	Y	
LED pcb, 4 position	LEDPCB	Assm	1	W6PQL		0.00		
LPF support bracket and shield	supplied with cabinet fitting		1	W6PQL		0.00		
relay, rf input	relayin	Assm	1	W6PQL	20.00	20.00	Y	
relay, rf output w/2m comp capacitors	relayout2m	Assm	1	W6PQL	22.00	22.00	Y	
						1038.02		

Major Components: Kits

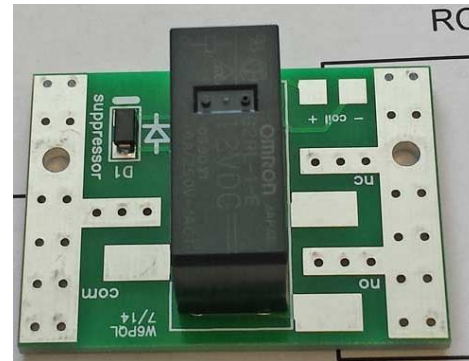
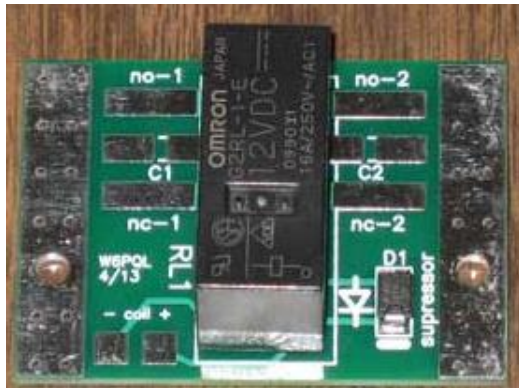
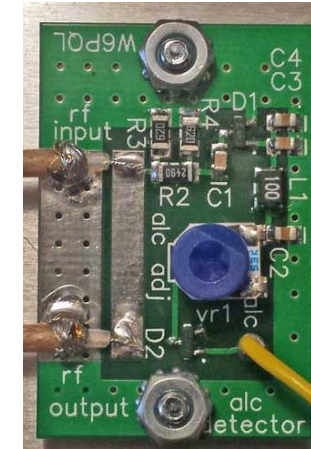
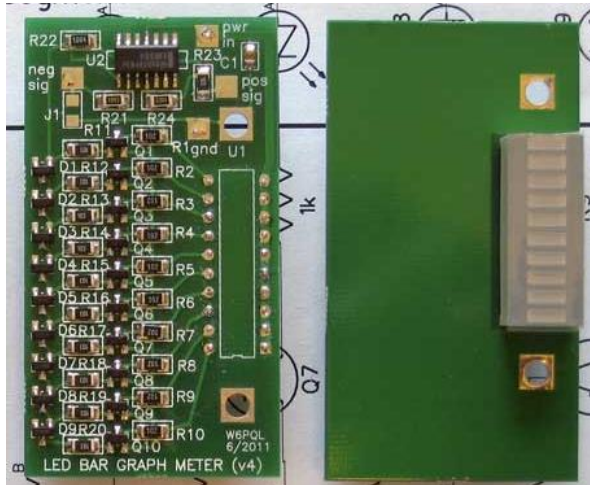


RF Pallet



Output Filter Board

Support Components: Pre-Assembled



Sheet metal Order for Enclosure & Brackets

Norm Cantin

978-505-1031

16ga (.0625") aluminum sheet metal

- Qty 2 1.5" x 6.0"
- Qty 1 4.375" x 6.0"
- Qty 2 0.375" x 4.0"
- Qty 1 4.75" x 9.5"
- Qty 1 7.0" x 9.5"

14ga (.0781") aluminum sheet metal

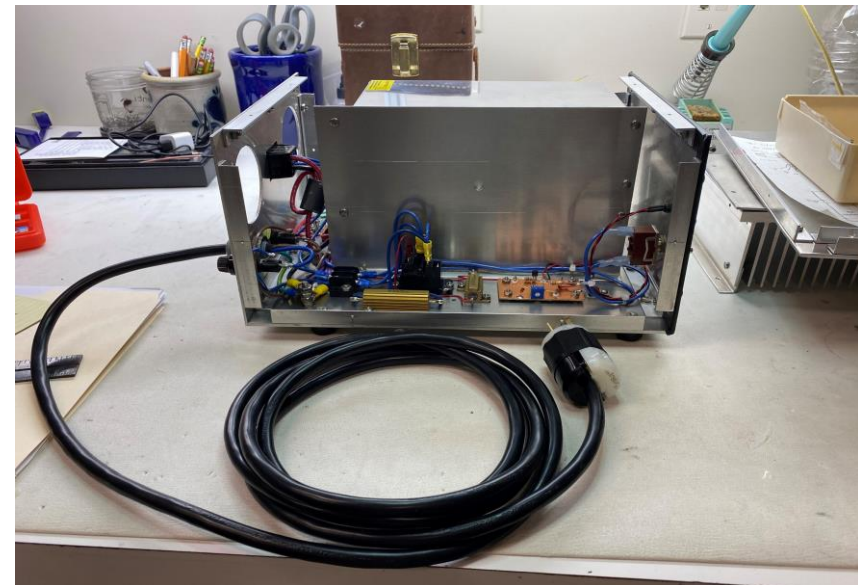
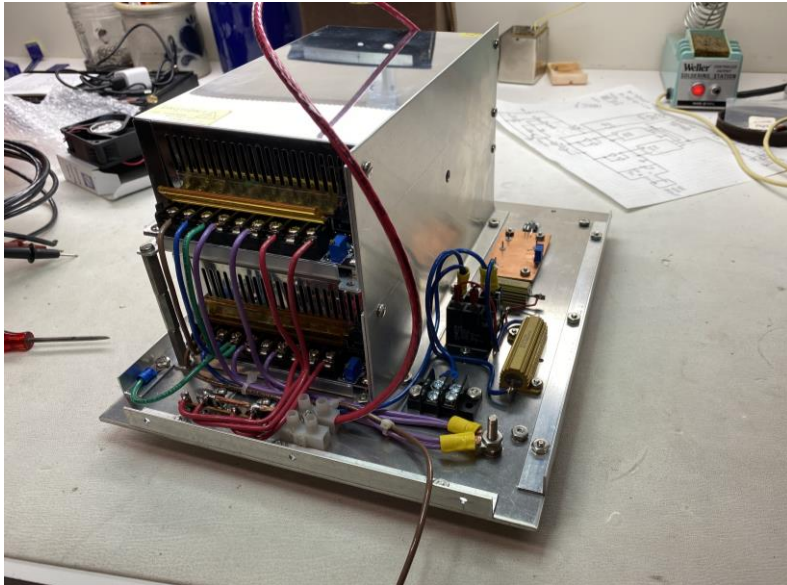
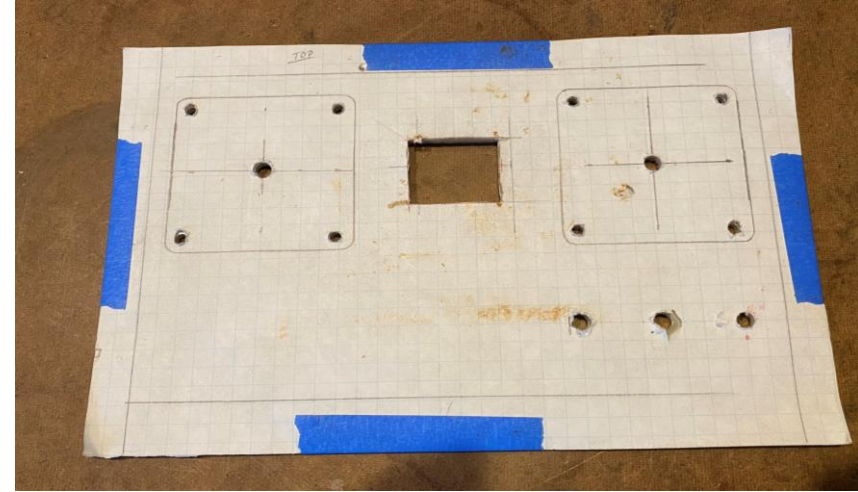
- Qty 1 6.0" x 9.0"
- Qty 1 6.0" x 12.0"

11ga (1/8") aluminum sheet metal

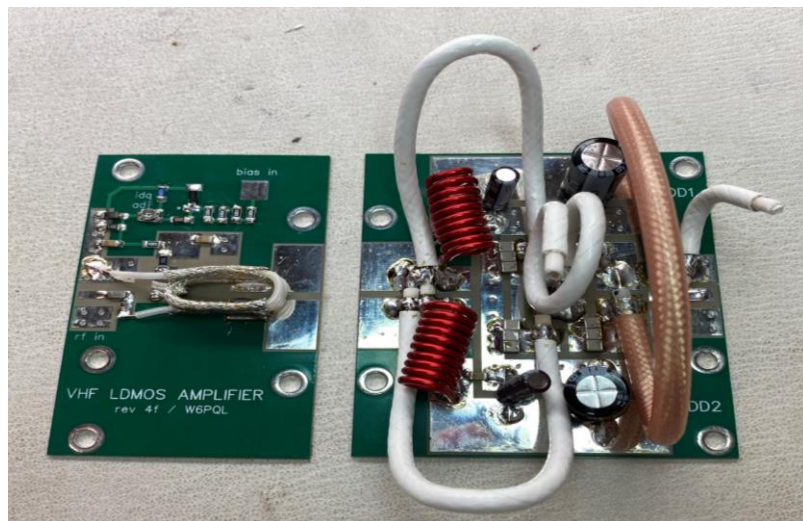
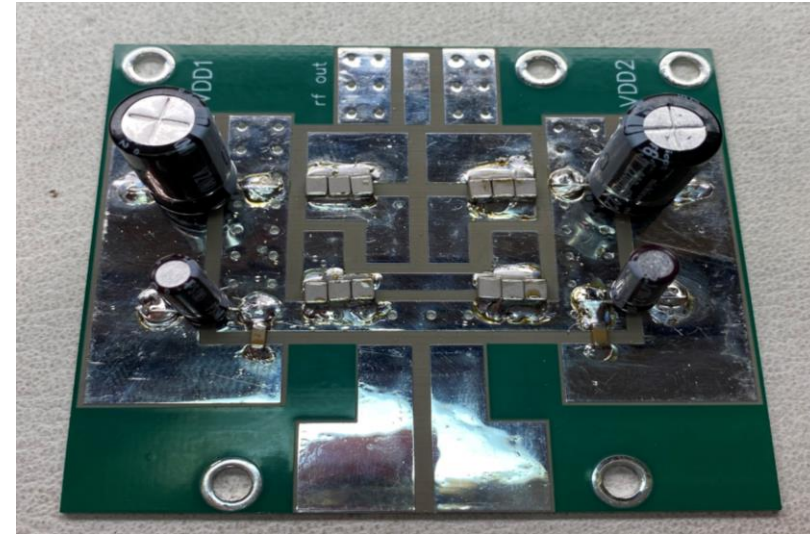
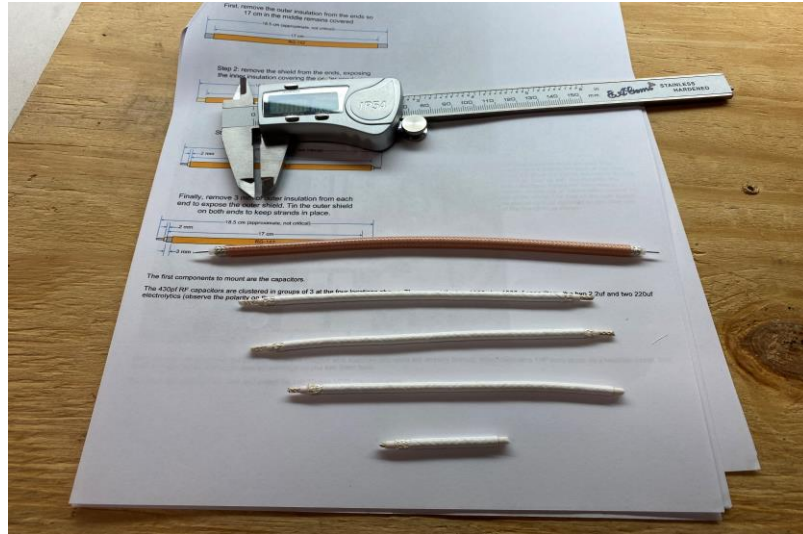
- Qty 1 6.0" x 9.0"
- Qty 1 9.0" x 12.0"
- Qty 1 12.0" x 12.0"



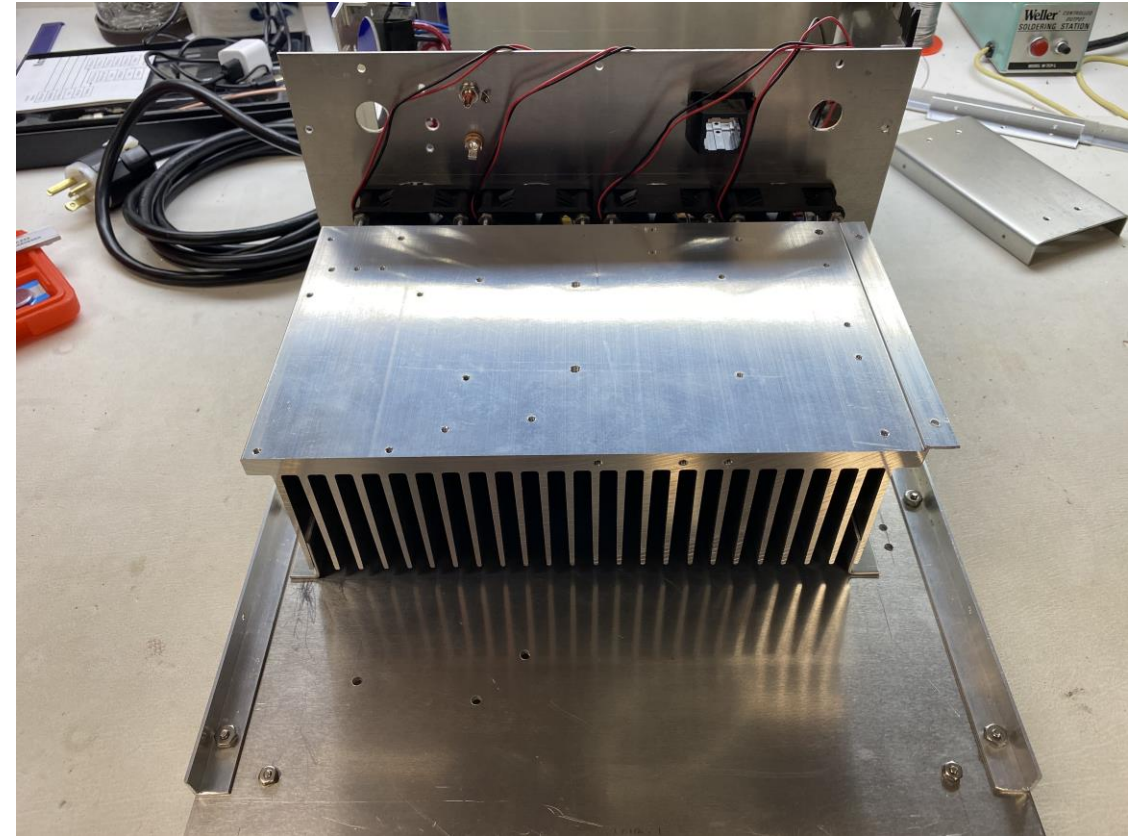
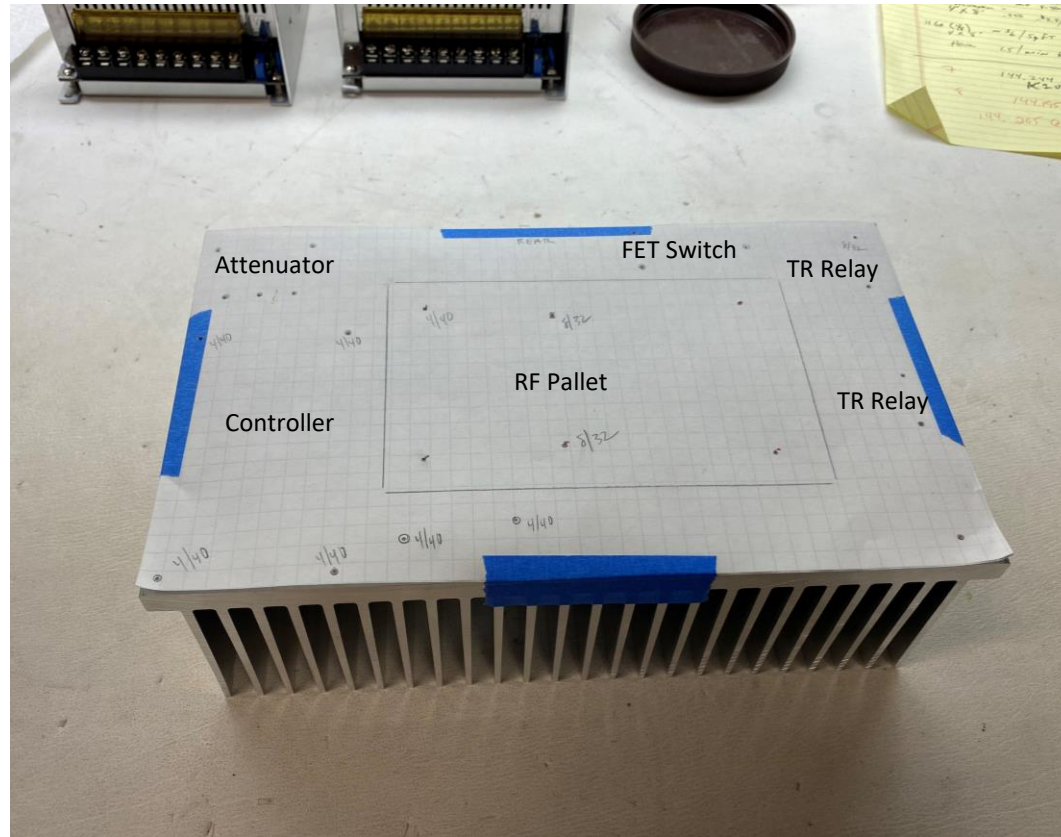
Power Supply - Preliminary Layout



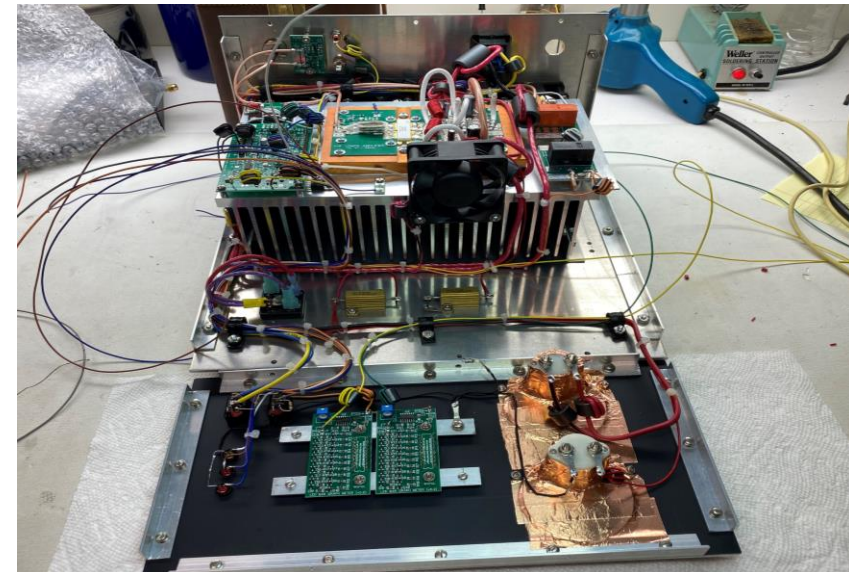
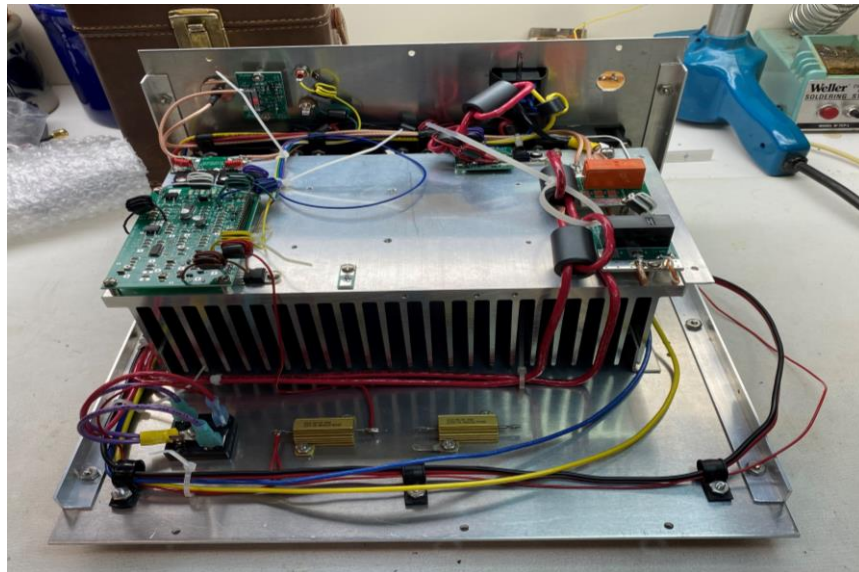
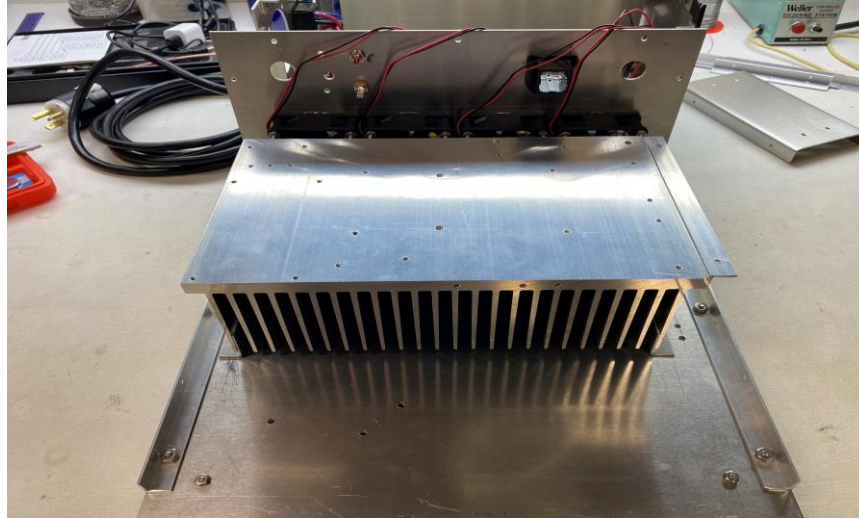
RF Deck Build



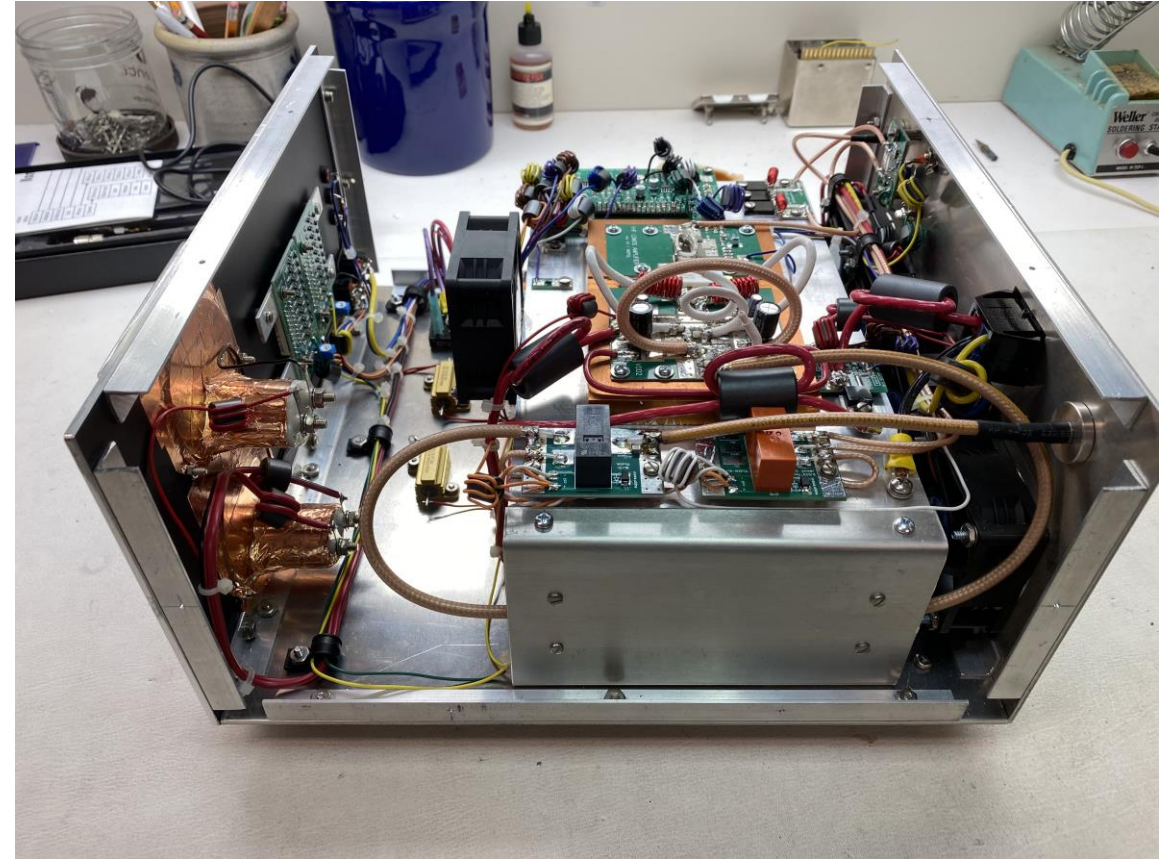
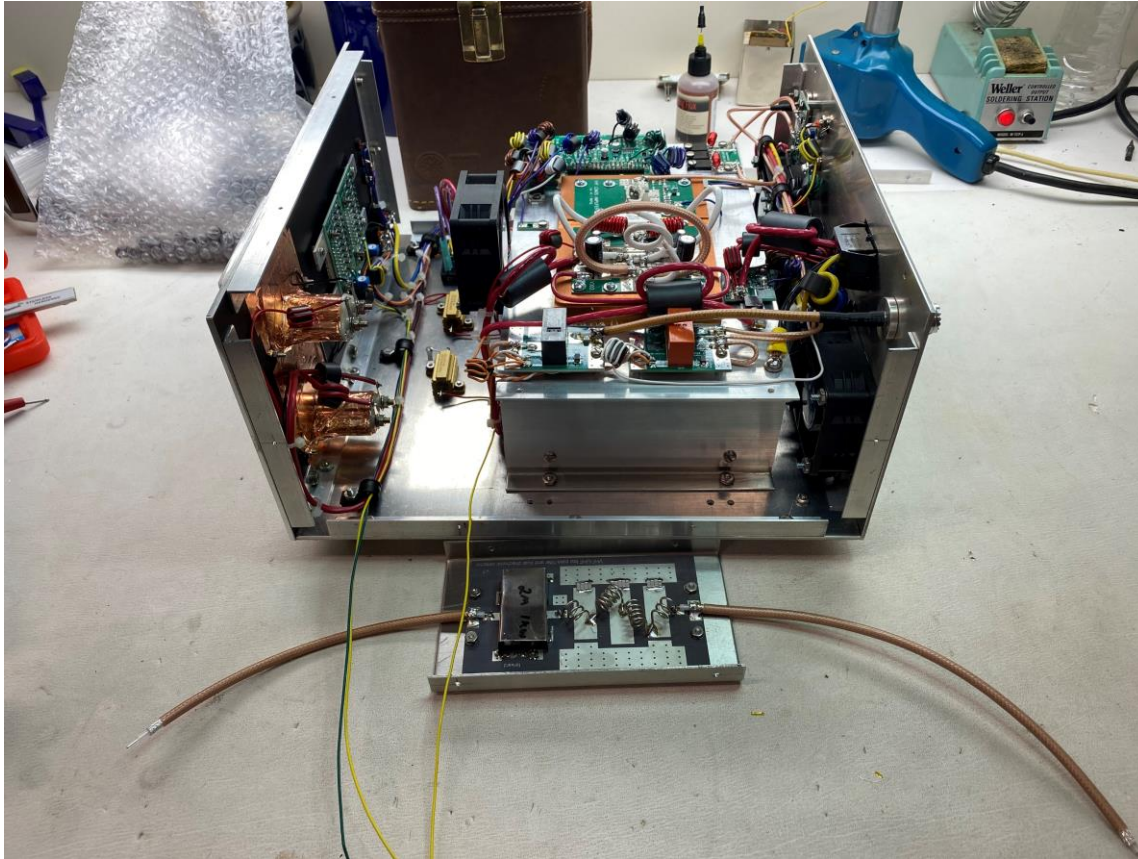
Machine Heat Sink – Initial Layout



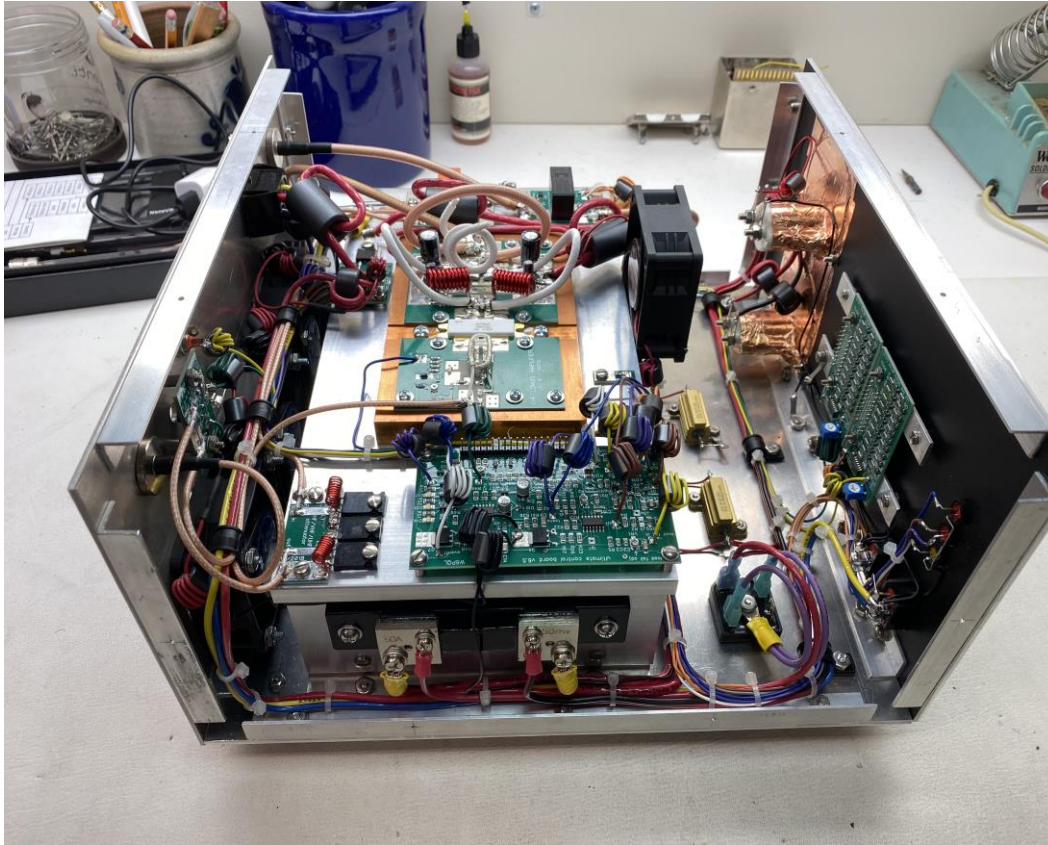
Sub-Assembly Integration



Installation of Filter Board



System Level Test – 1KW Output



Paint and Final Assembly



Integrated into the Ham Shack

2M KW Amp

HF-6M KW Amp



Additional Resources

- Sheet metal - All Cape (metal) Welding www.allcapewelding.com
- Fasteners – McMaster Carr www.mcmaster.com
- Electronic Components - All Electronics www.allelectronics.com
- Electronic Components – Mouser www.mouser.com
- Custom panel designs - Front Panel Designs www.frontpanels.com
- LDMOS based Linear amp Components & Assemblies www.w6pql.com

Questions?

Thank You