

Building K.I.S.S. LDMOS Amps For Moonbounce 6M, 2M, 1.25M, 70CM, 33CM, 23CM Bands

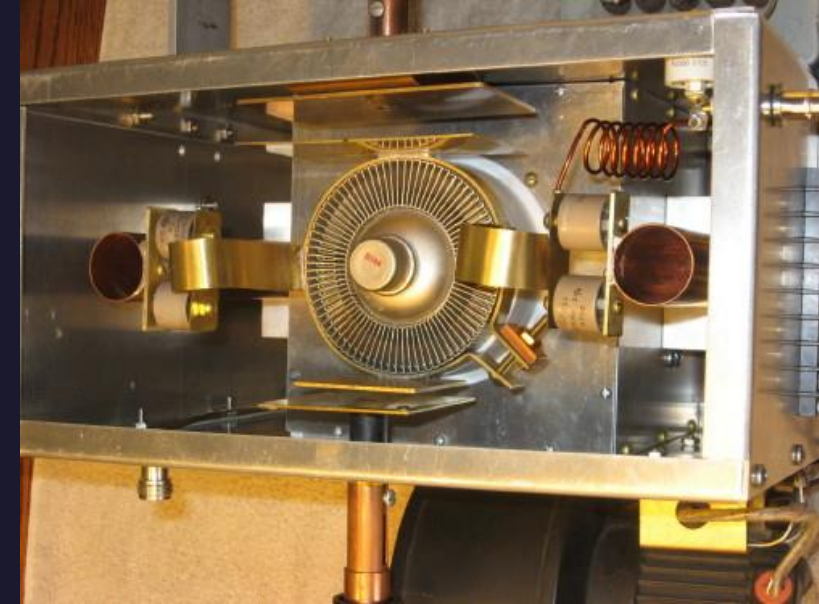
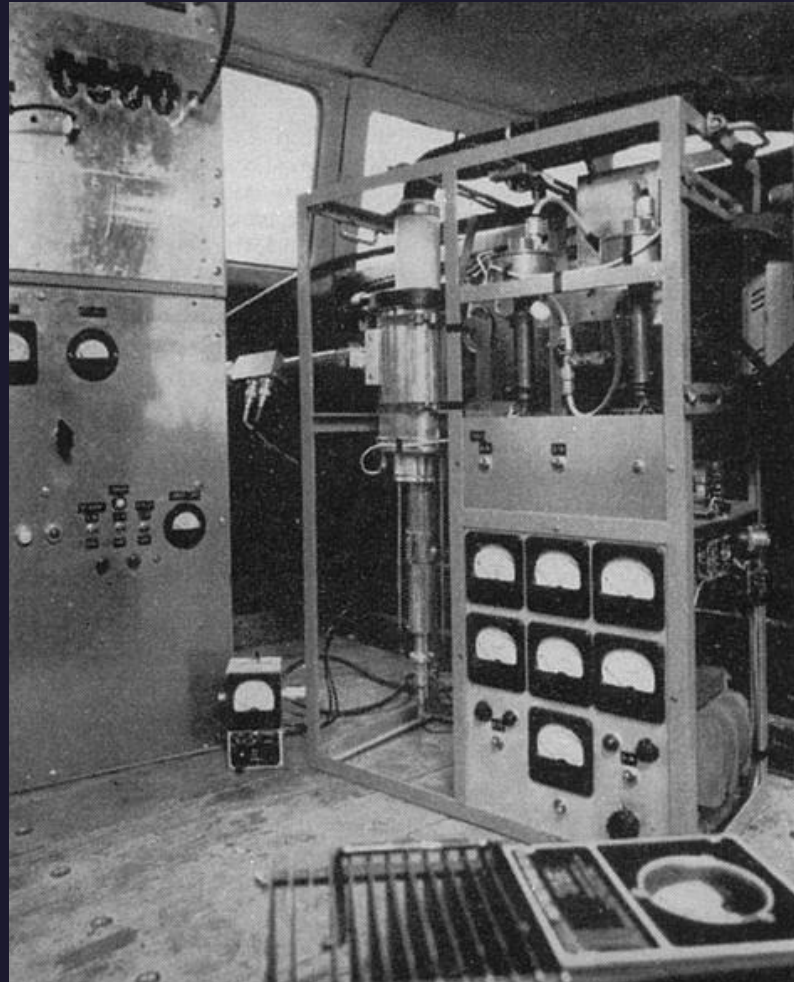
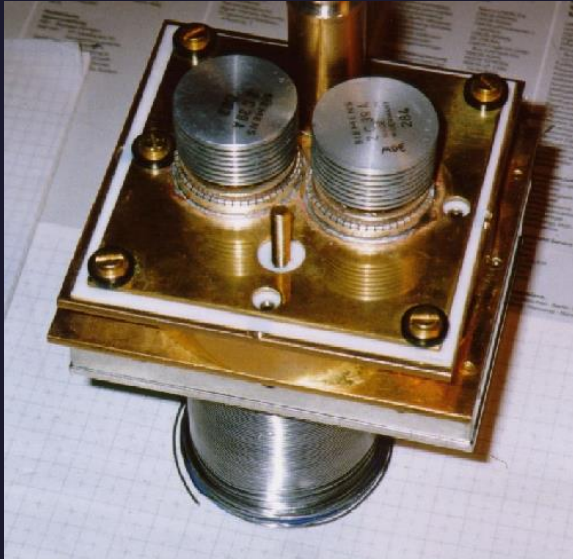
Gene Shea, KB7Q



I've built a few amps.



Perspective – back in the day you really had to have EME fever!



DANGER

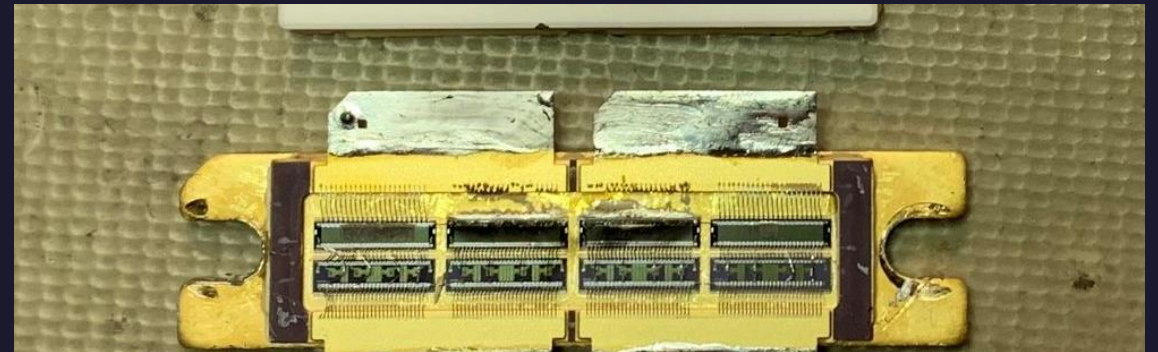
DO NOT TOUCH ANYTHING,
TURN ANY KNOBS,
SIT ON ANY EQUIPMENT, ETC
I HAVE LOST SEVERAL VISITORS BY
ELECTROCUTION IN THE PAST SEVERAL WEEKS

Behold the LDMOS Device

50 volts DC @ 25 amps + 10 watts drive = 650 watts @ 1296 MHz



|<----- 1.625 inches (41 MM) ----->|



\$200 gone puff!

Design Criteria

10 to 20 hours of build time – GOTA!

Handle 65:1 SWR, yes but ...

As cheaply as possible +- \$1,000

No High Voltage, beware of high current however

500 to 1000 watts output depending on band

Hand Tools Only

Readily available parts

Light (4.5 kg) and reliable for DXPEDITIONS



Meet the LDMOS device's needs – avoid over driving or over heating, **ALWAYS**

Mostly Hand Tools



The K.I.S.S. schematic

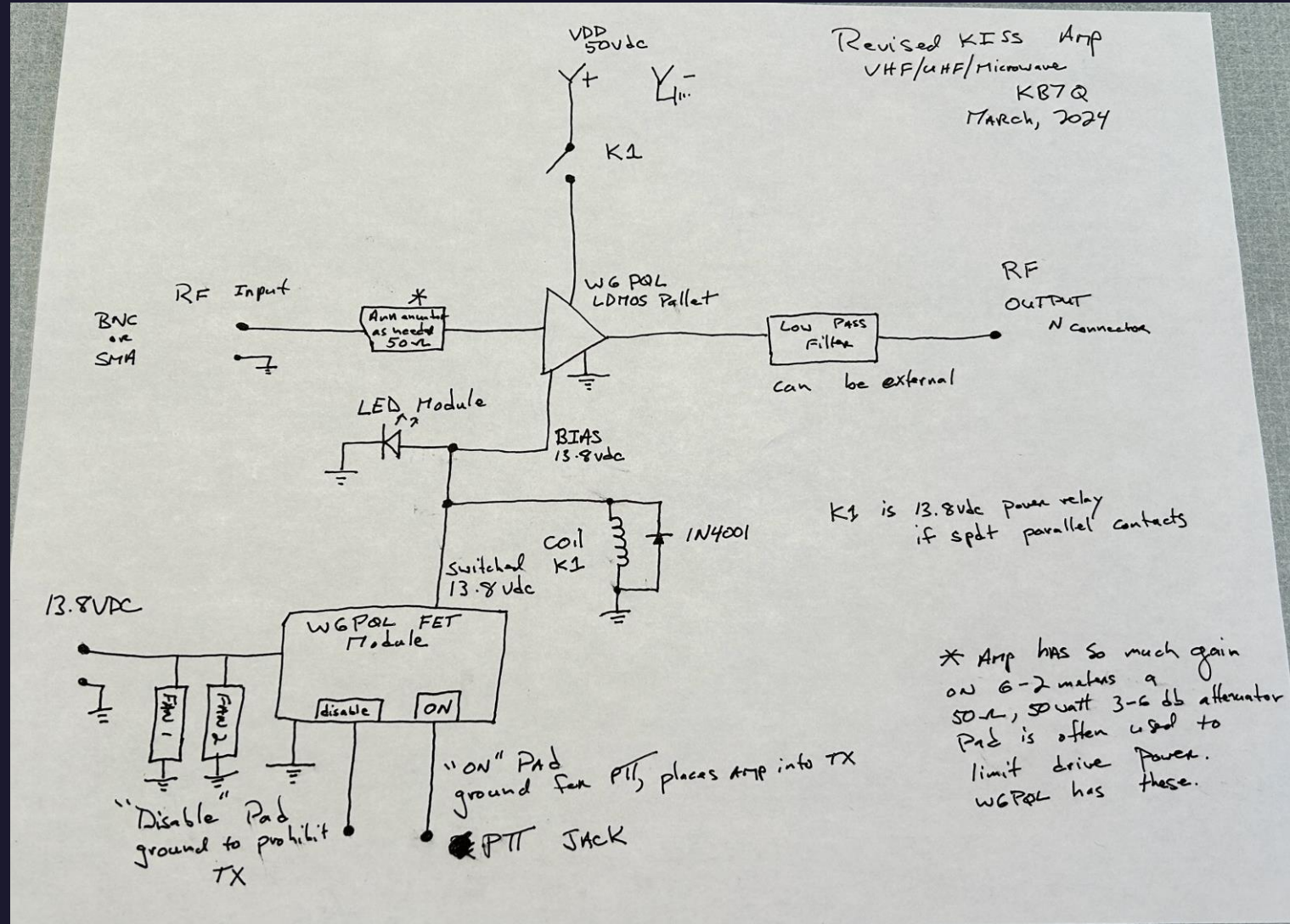
Mechanical relay v. Power FET for 50VDC

Optional – attenuator resistive pad on input

Wire both fans to run 100%

Low Pass Filter on output can be external

Wire VDD to both sides of the pallet



Behold the W6PQL assembled and tested pallet

Things to note:

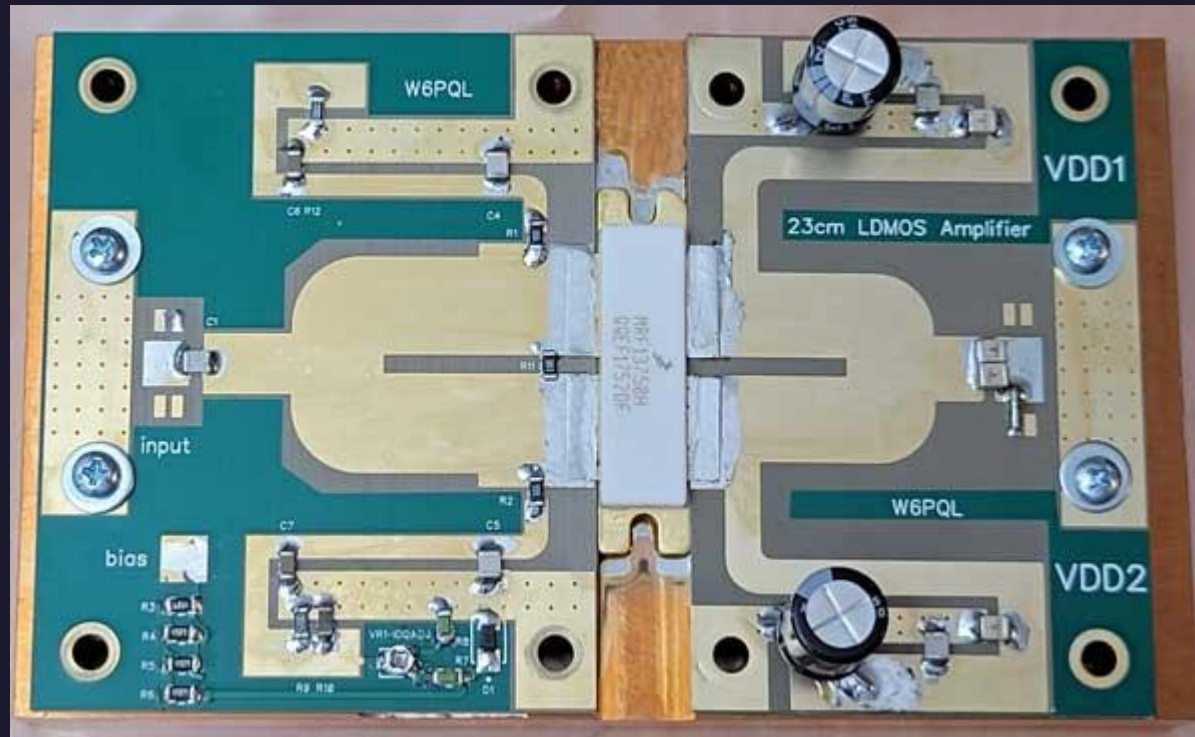
LDMOS Device is soldered to the heatsink! Why?

Two 50 vdc VDD connections

Trick to soldering RF I/O connections

Bias connection

Copper Heat Spreader

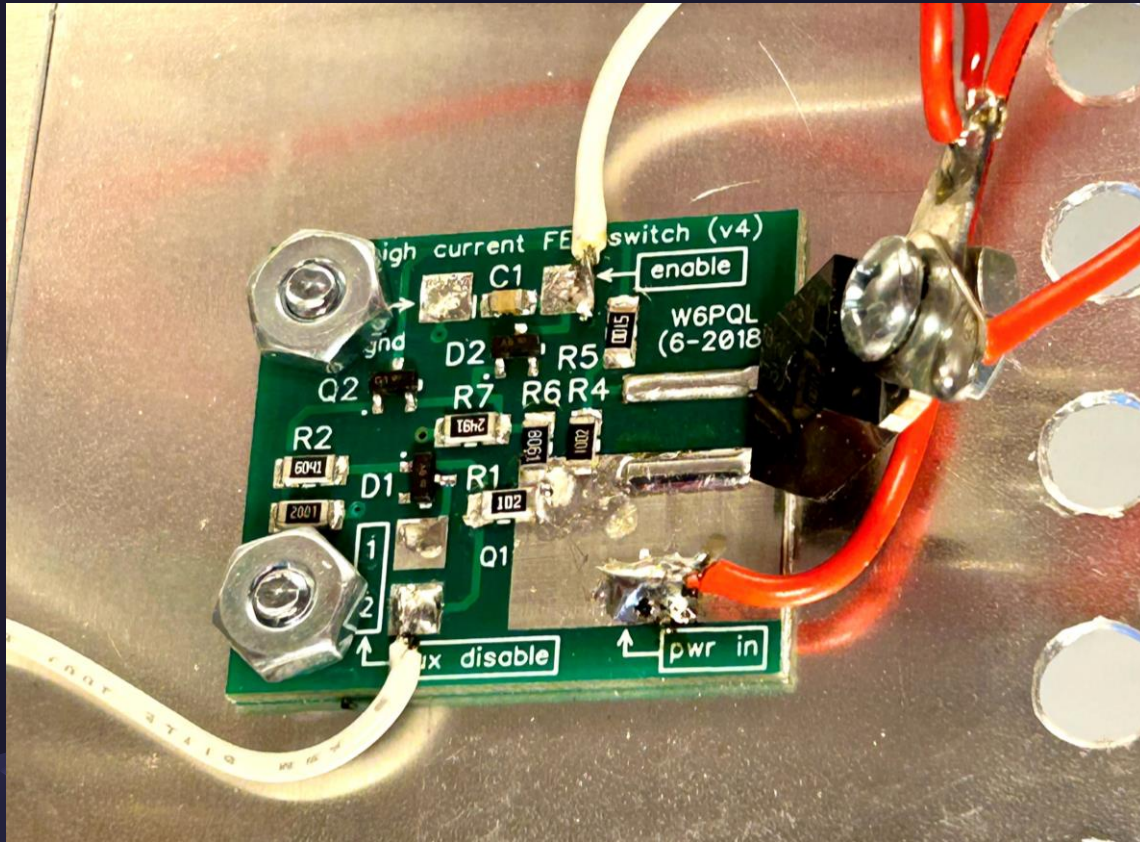




Another example - 2 Meter Band Pallet

The Second Key Piece

W6PQL FET Power Switch w/ basic logic



The best \$24 you'll ever spend

Manages the 50VDC VDD and bias switching via power relay

Provides Push To Talk (PTT) logic interface for transceiver

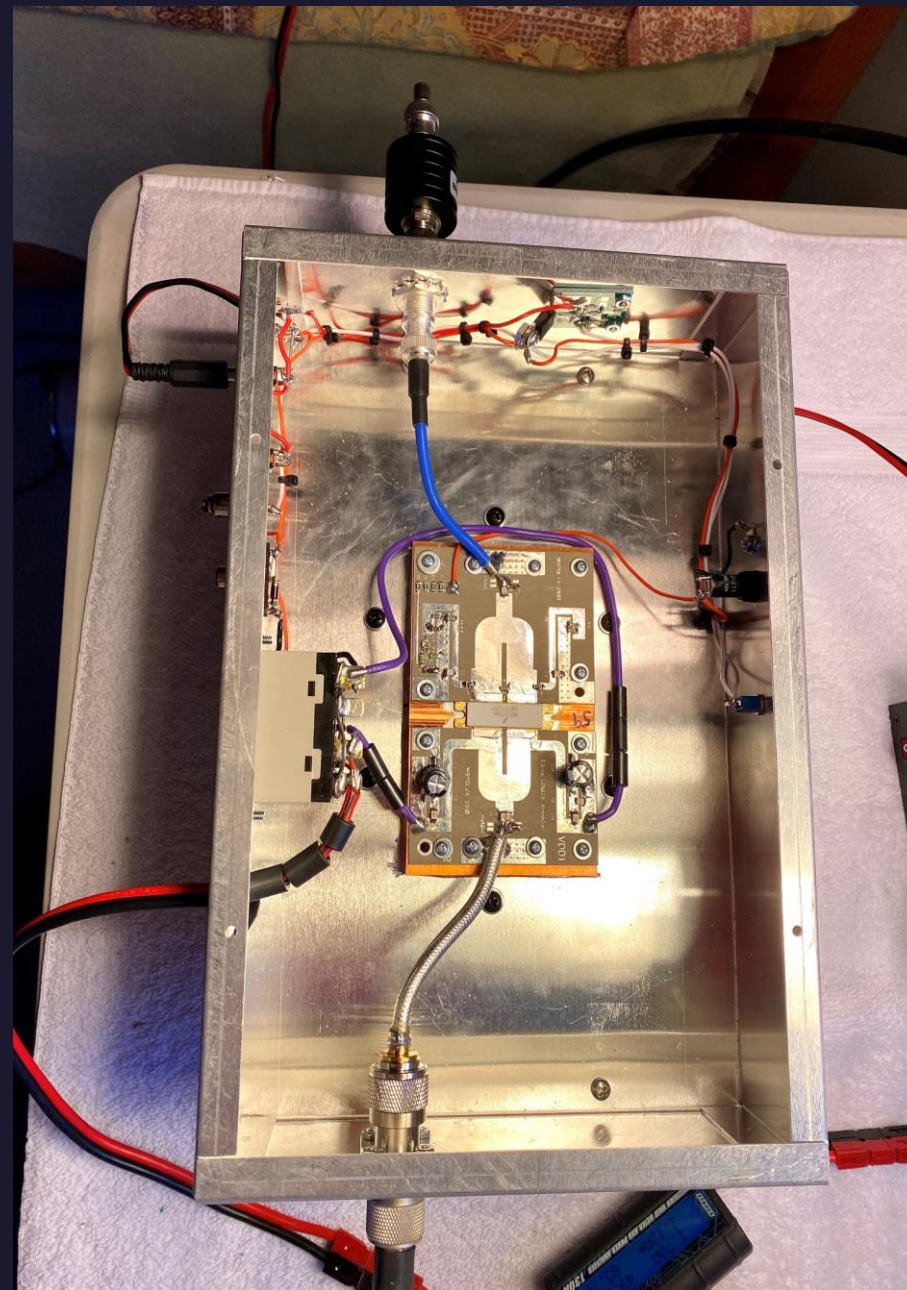
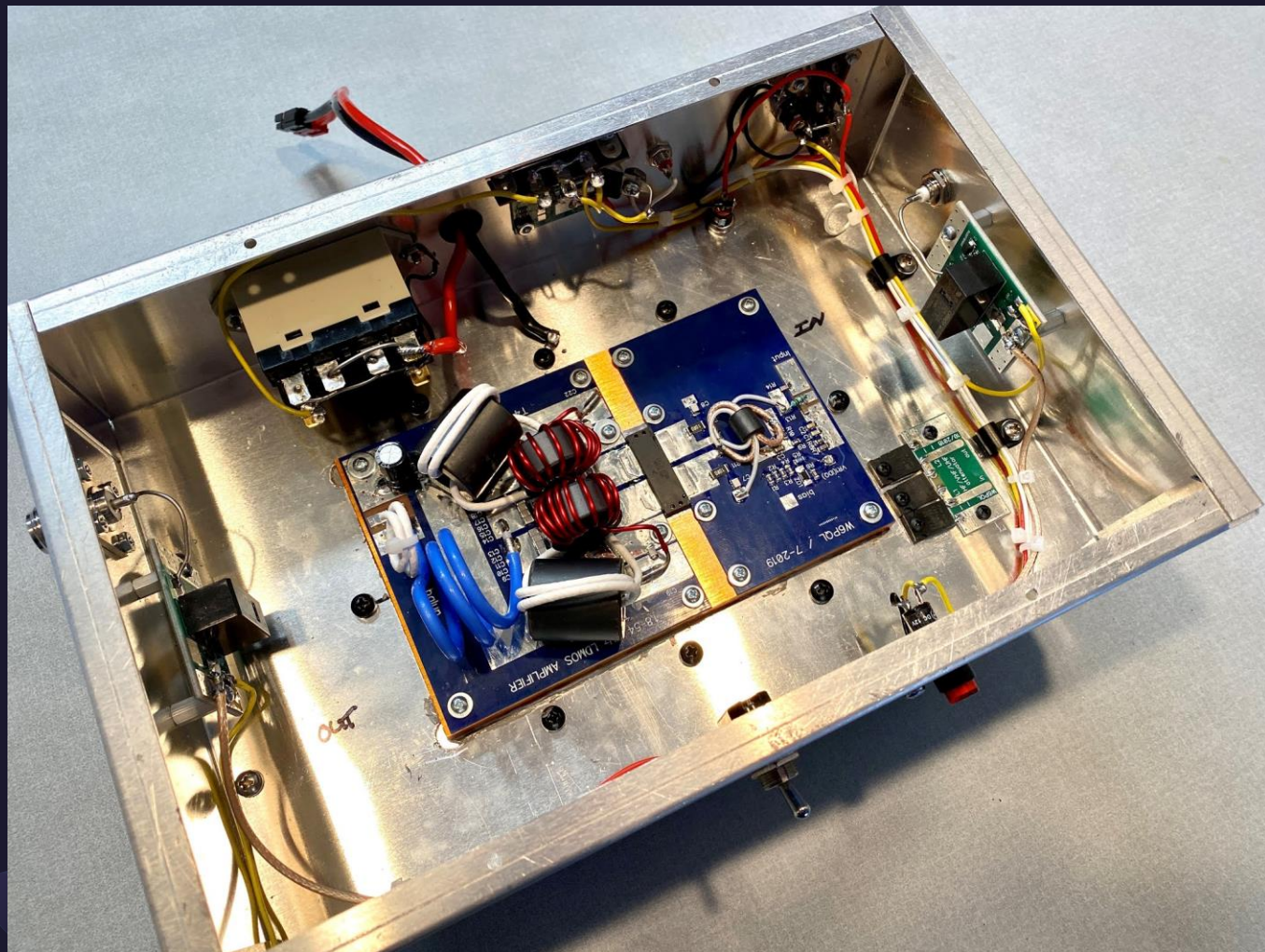
Provides PTT lockout

Heatsink not needed < 1 amp switched current

Layout 12x8x3 inch Chassis

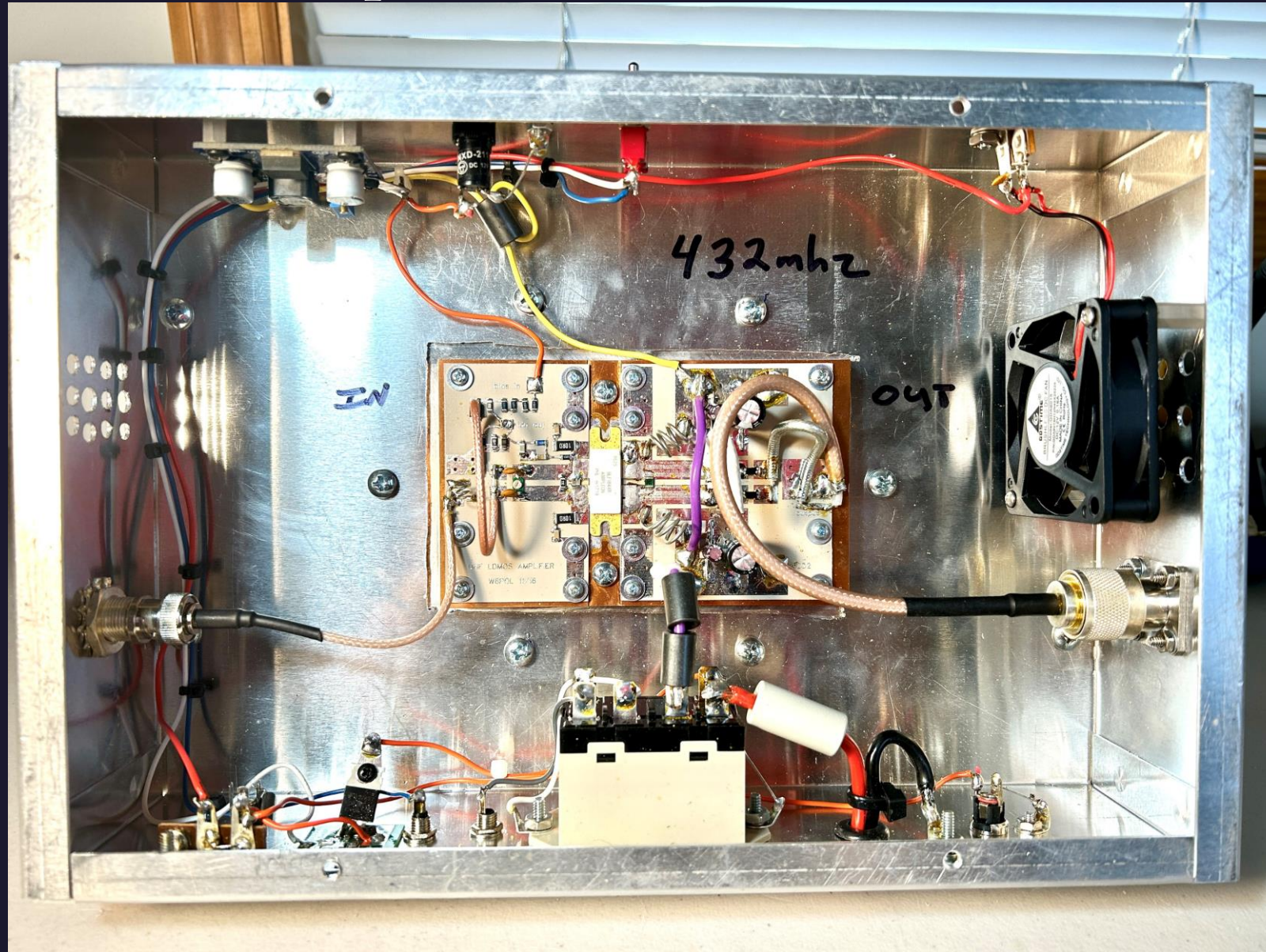
Left: 6 Meter Amp

Right: 23CM Amp

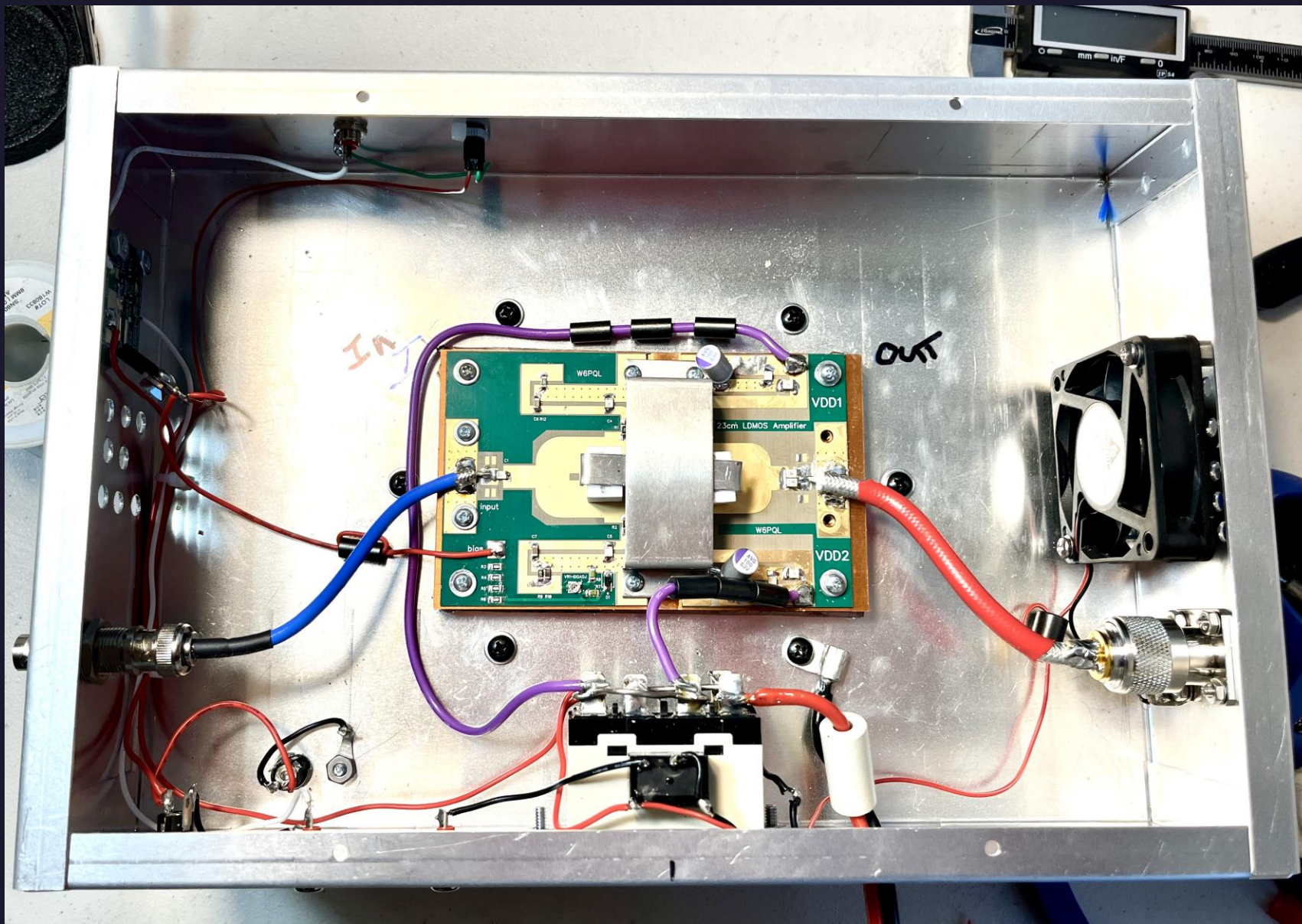


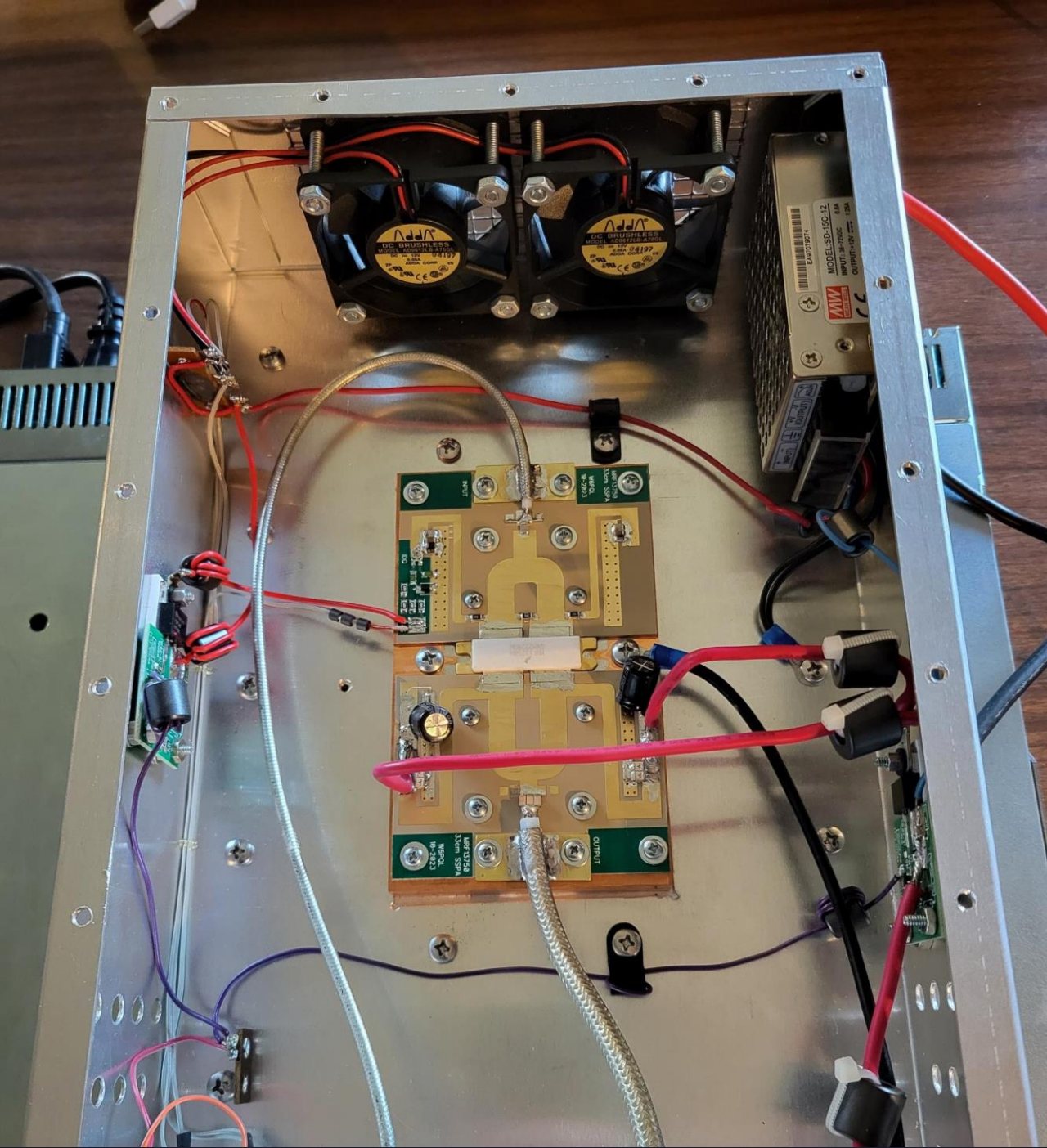
Chassis Bud AC-424 Cover plate Bud BPA-1519

432 Mhz 500 watt Amp



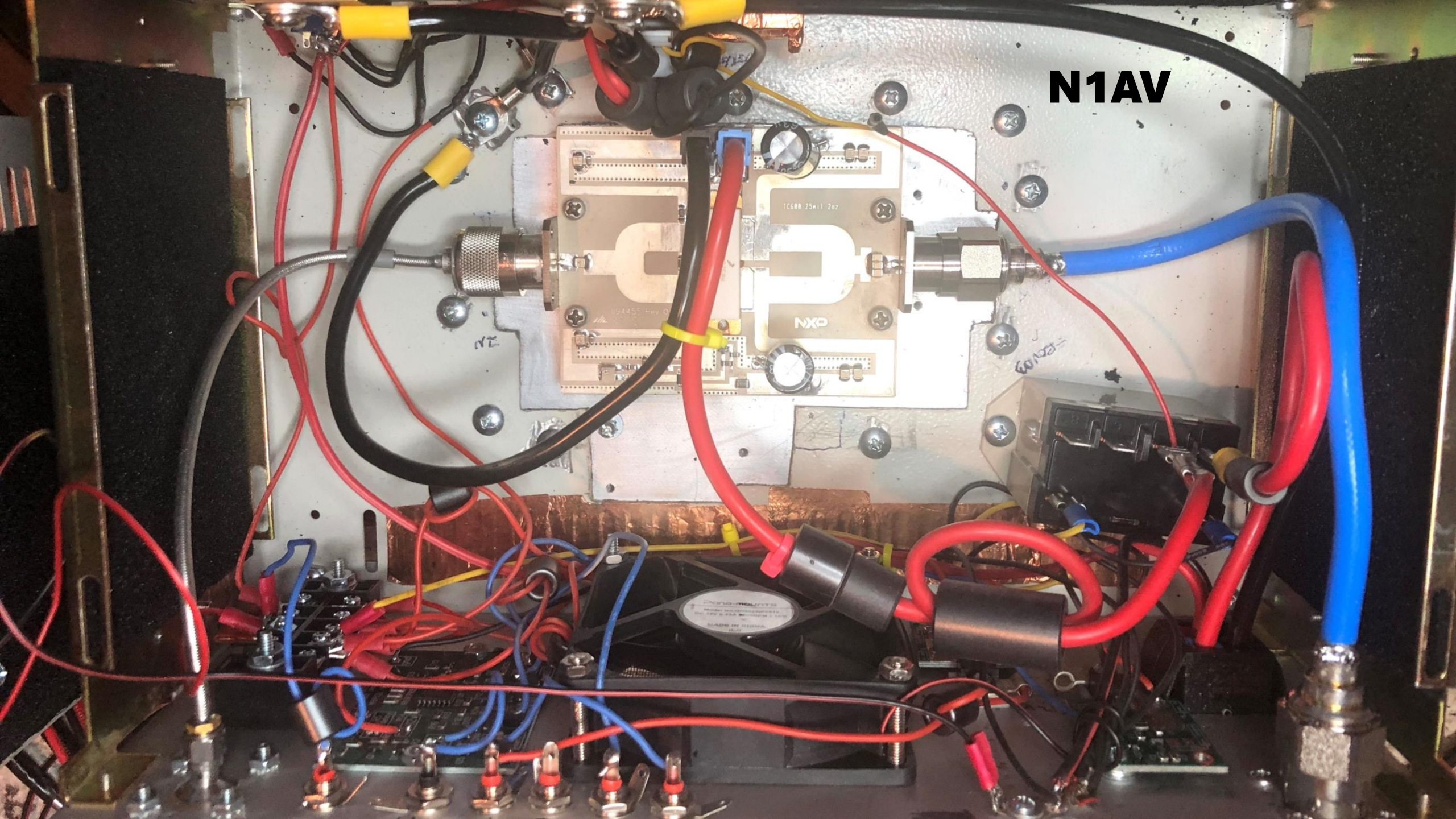
Another 23 CM Amp



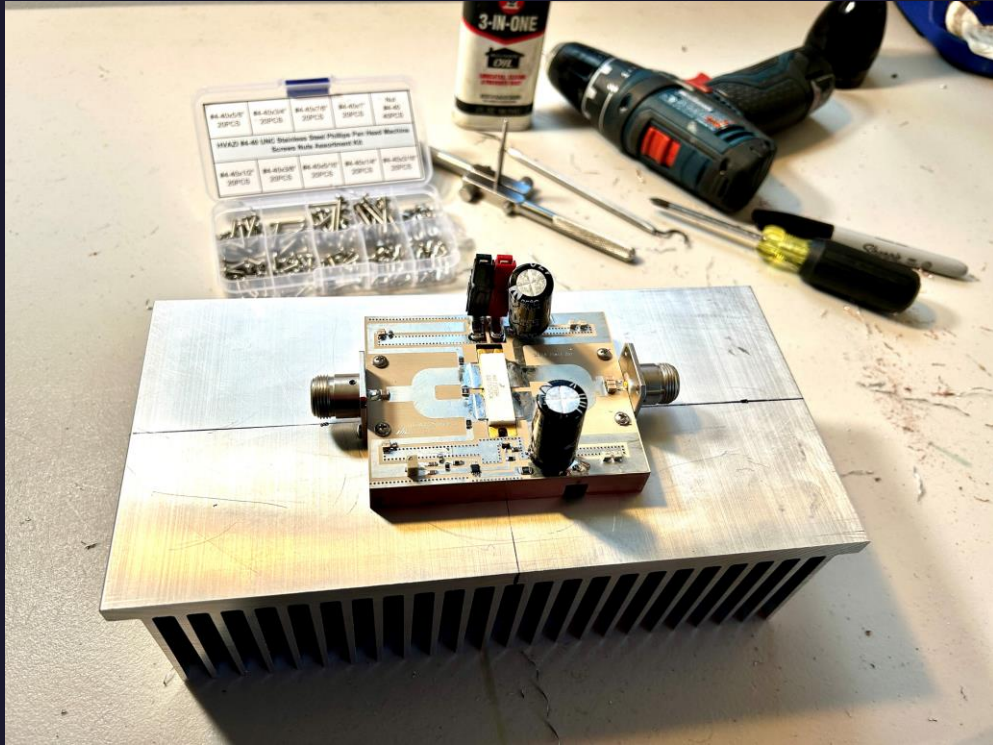


KODSP 33cm amp

N1AV



It begins – laying out the chassis and heatsink



- Use painters tape
- Mark out center lines
- Mark pallet to heatsink holes – my method
- Mark out heatsink to chassis holes
- Layout holes for parts mounting – see addendum

Locating pallet to heatsink holes



Drill and tapping

Yes, you can screw this up – ask me how?

Use new drill bits and taps –always
Mark desired depth on drill bit
with tape

Use a decent tap handle

Use lube

Clear the tap often

Did I mention clear the tap often?

Back the tap out all the way if
needed.

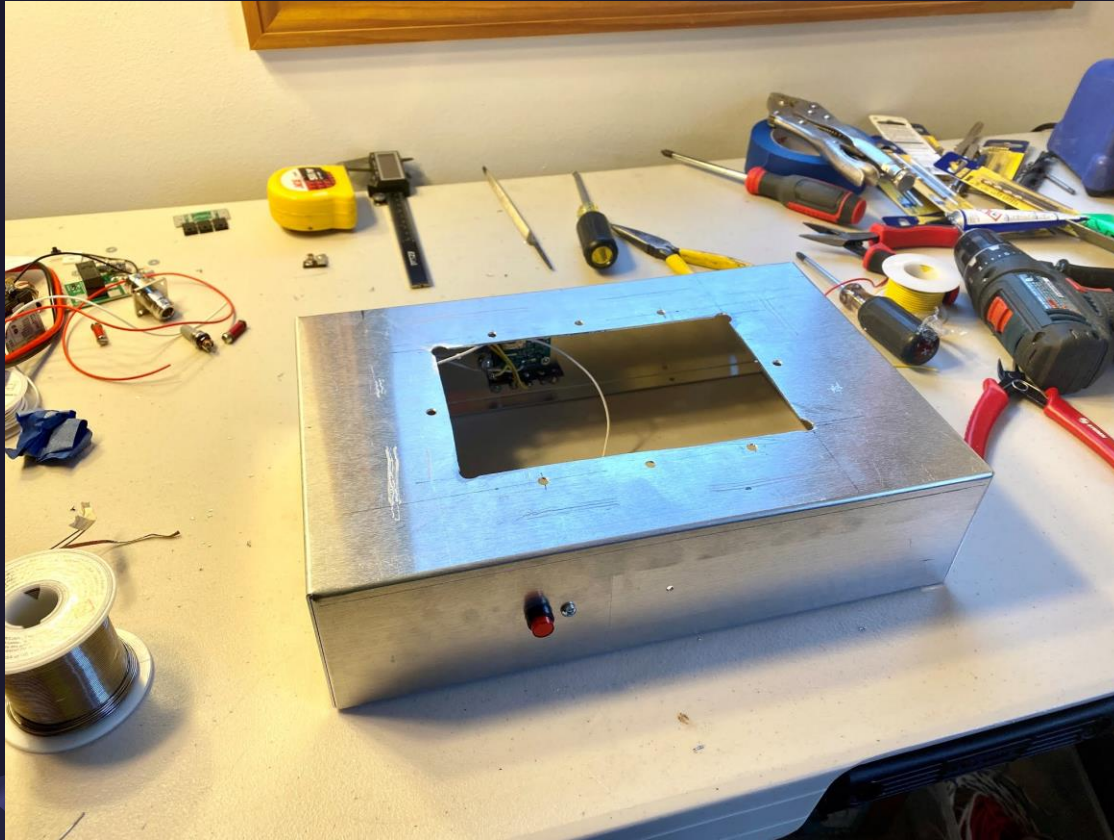
Slow is smooth, smooth is fast!

Size 4-40 v. 6-32 for pallet to
heatsink

Size #8 for heatsink to chassis



Jig Saw fun and games



The 6M pallet requires a bigger hole!

Use cardboard template to locate lines to cut along

Drill corners out

Use fine metal blade, moderate speed

Note headsink to chassis mounting holes

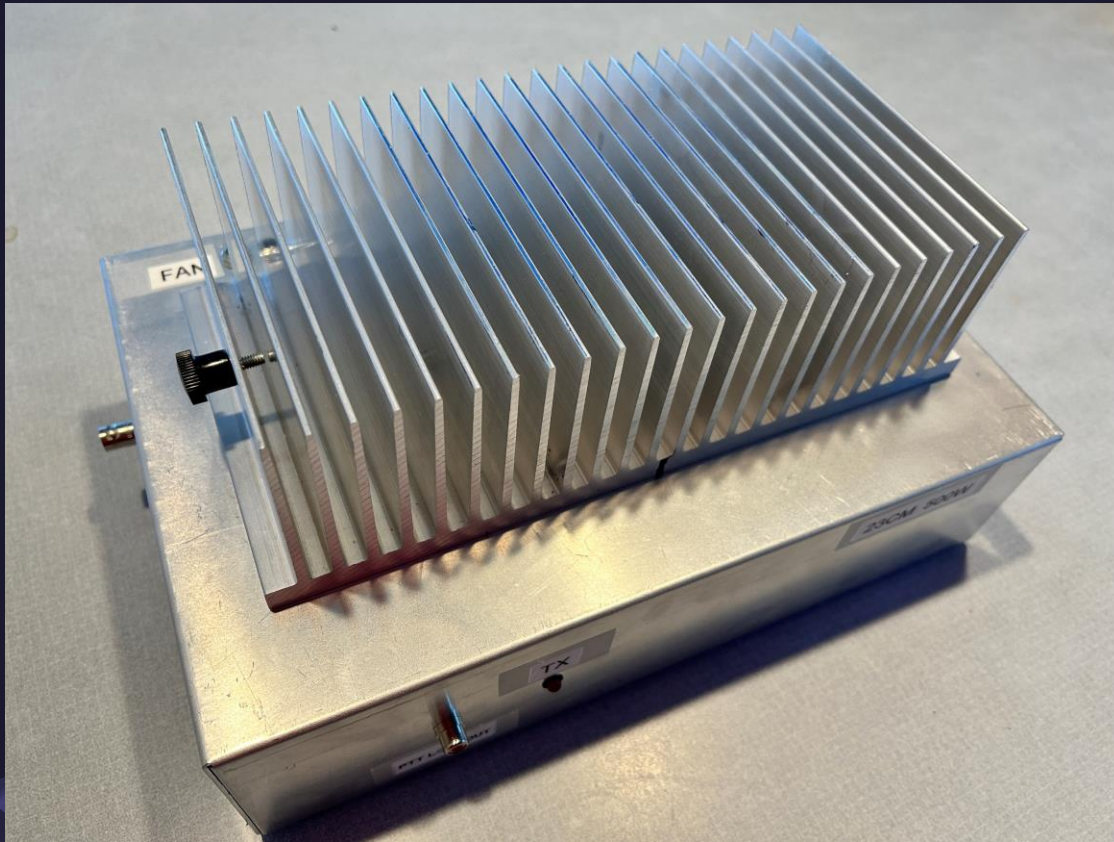
Chassis Bud AC-424

Cover Plate BPA-1519

Heatsink – heatsinkusa.com

sku #10.08

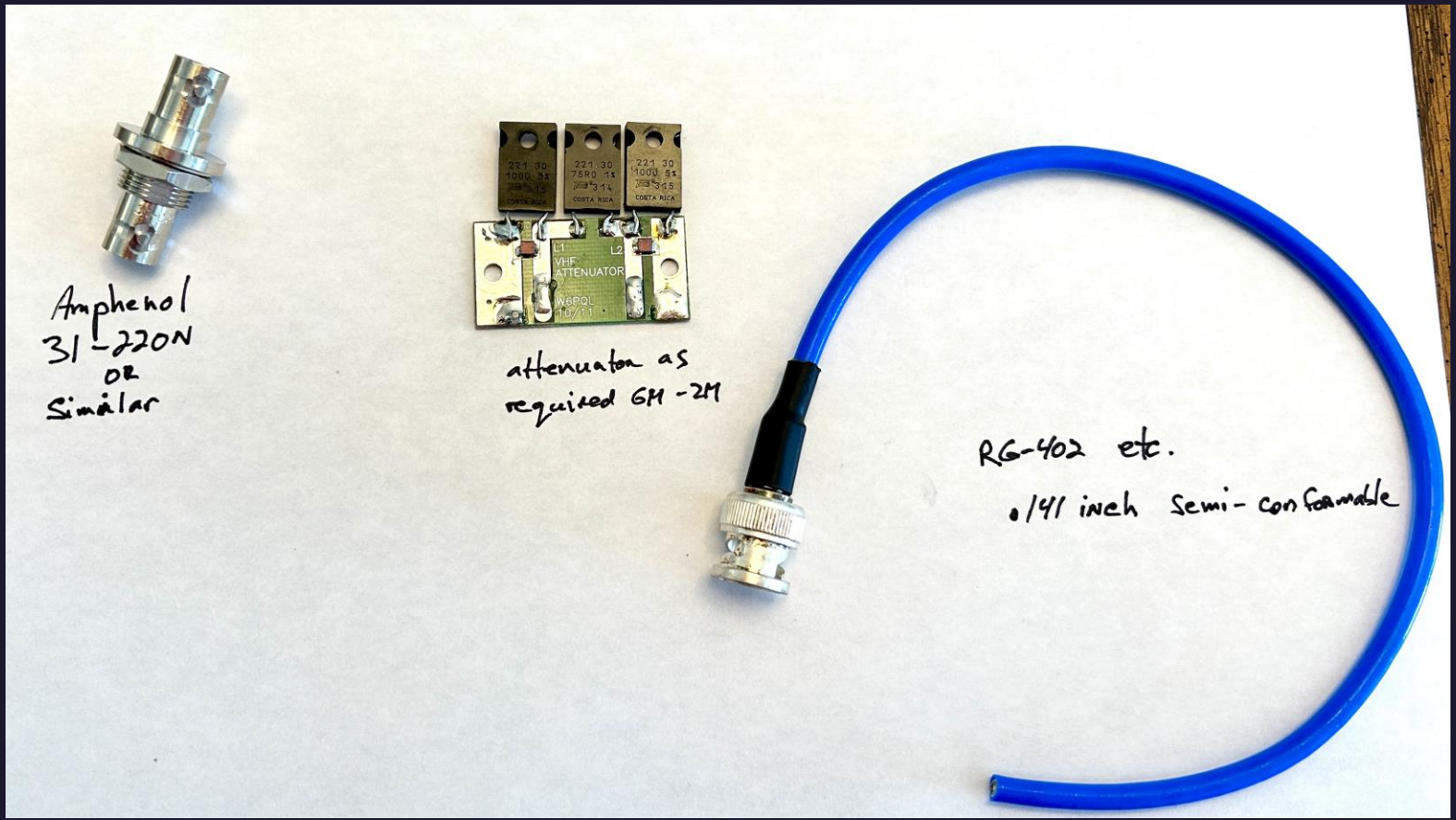
5 inches long for 500 watt amps 6 inches long for 800+ watt amps



A thin coating of thermal paste goes between the heatsink and heat spreader during final assembly.

Quick and dirty carrying knobs – Ace Hardware

RF Input Specifics



Amphenol
31-220N
OR
Similar

attenuator as
required GM-2M

RG-402 etc.
.141 inch semi-conformable

BNC or SMA bulkhead connector – DigiKey RF attenuator (optional) – W6PQL
.141 inch semi-flexible coax jumper trimmed to size - eBay

RF Output Specifics

Handwritten: **.250" Semi-flex Coax RG-401**

Handwritten: **Amphenol 172278**

Handwritten: **Amphenol 172139**

NOTE:
1. CRIMPED CONTACT PIN
HEX CRIMP SIZE .100"
OR SOLDER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS (DIMENSIONS IN [] ARE IN INCHES AND FOR CUSTOMER REFERENCE ONLY.)				APPROVALS	DATE
				DRAWN	G.R.S. 04/31/03
				CHECKED	
				ISSUED	
				SHEET	1 OF 1
				CAD FILE	C:/172/172139.DWG
				DWG. NO.	172139.DWG
				REV.	A
				SIZE	A

DESCRIPTION	MATERIAL	FINISH	QTY
COUPLING NUT	BRASS	NEXCOTE	1
BODY	BRASS	GOLD	1
CONTACT PIN	BRASS	GOLD	1
INSULATOR	TEFLON	NATURAL	1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS (DIMENSIONS IN [] ARE IN INCHES AND FOR CUSTOMER REFERENCE ONLY.)

UNLESS OTHERWISE SPECIFIED TOLERANCES FOR MILLIMETERS ARE:
0.5 - 8mm ± 0.20mm
8 - 30mm ± 0.40mm
30 - 120mm ± 0.50mm

UNLESS OTHERWISE SPECIFIED TOLERANCES FOR INCHES ARE:
.020 - .315 = ± 0.007"
.315 - 1.180 = ± 0.015"
1.180 - 4.724 = ± 0.020"

DO NOT SCALE DRAWING

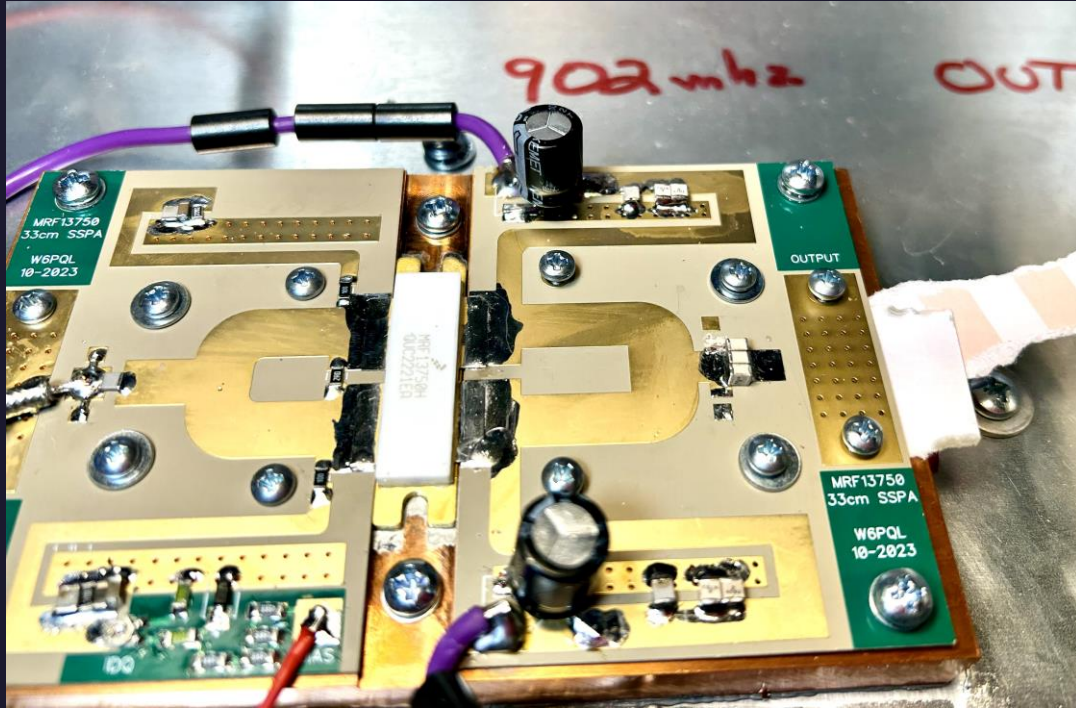
PART DESCRIPTION
**N DIRECT SOLDER PLUG
(.250" SEMI-RIGID CABLE)**

PART NO.
172139

.250 inch conformable (semi-flex) coax RG-401 – eBay

Amphenol Connectors – DigiKey

Soldering the input and output connections

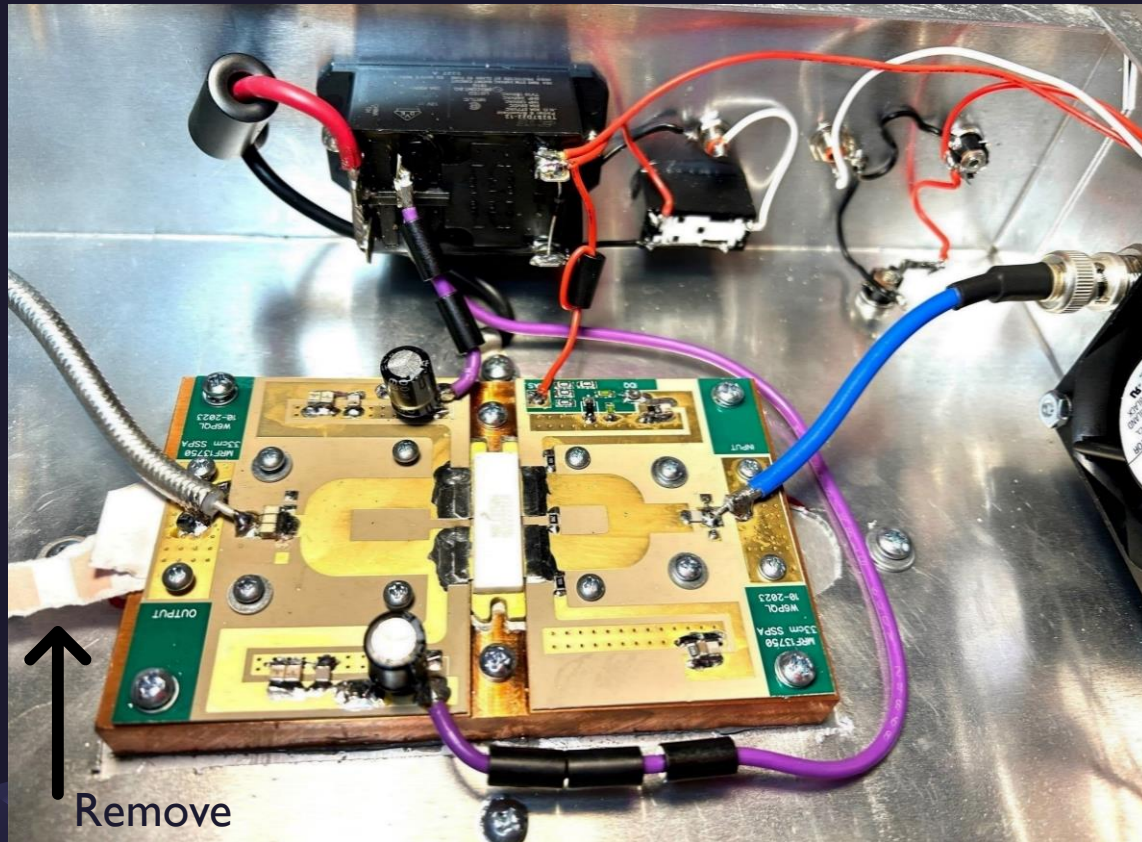


You're battling the copper heat-spreader and heatsink!

Loosen or remove screws

Carefully slide one or two layers of index card stock under the ground pad between the circuit board and heat-spreader

Soldering Success

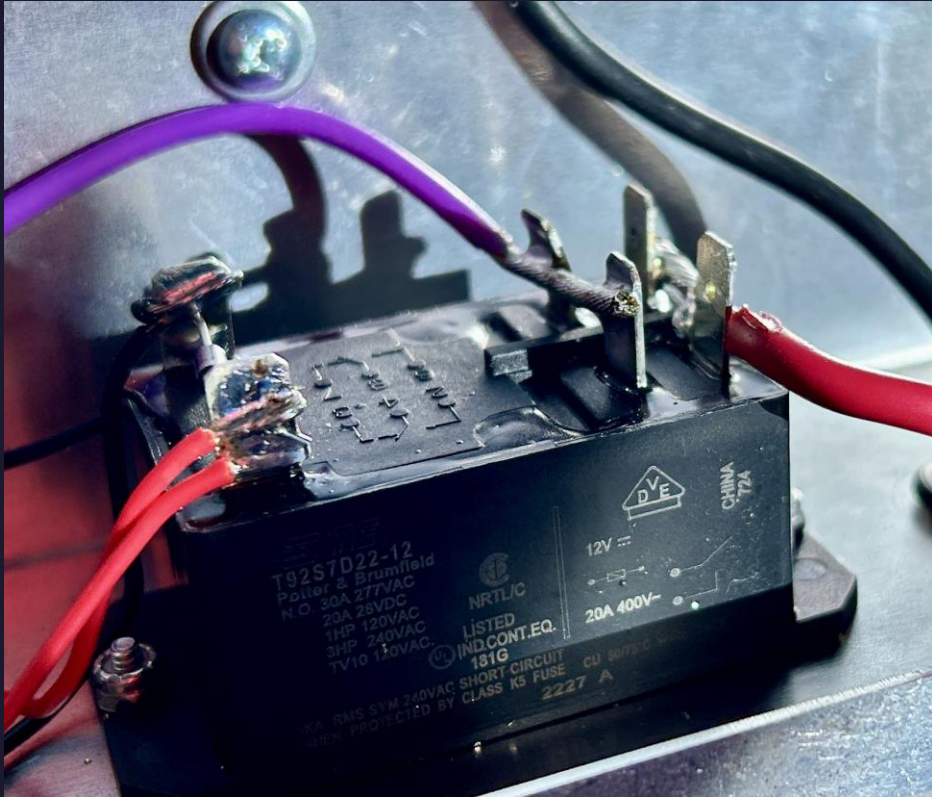


Remove paper insulation

Tighten screws

Remove any solder flux around output pad on 33cm or 23cm amps. No literal smoke test needed!

50 vdc (VDD) switching



Wire contacts in parallel to increase current capacity

Use 1N4001 diode across coil, cathode to +

Controlled by W6PQL FET board

Liberal use of Ferrite slip-on beads on VDD lines

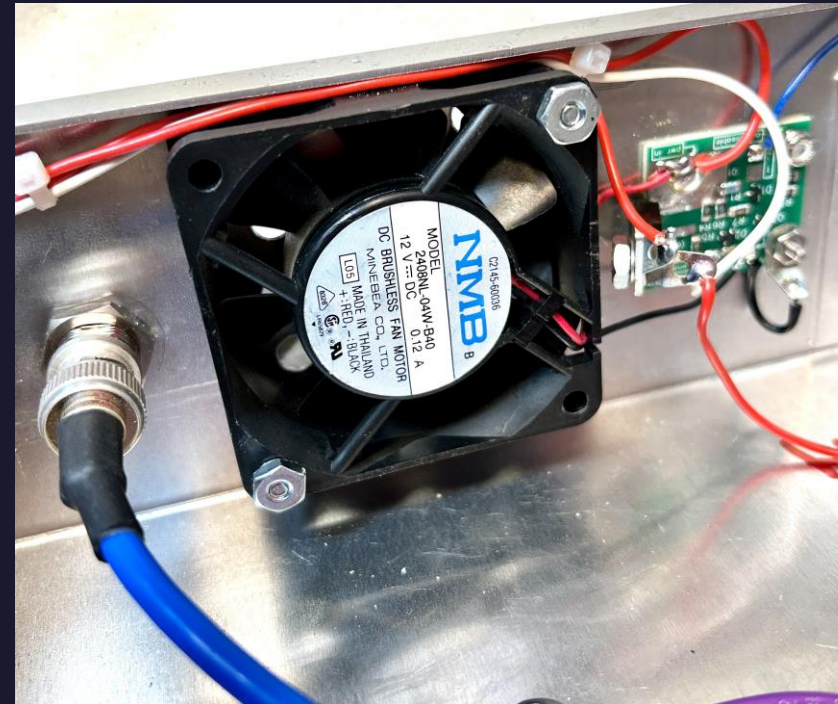
Potter Bloomfield T92S7D22-12 or SPDT equivalent – eBay or DigiKey

120mm Fan – This one is quiet and moves lots of air

Sunon EEC0381B2-0000-A9 Amazon

Orientation – flow air up off heatsink

Use a fan guard



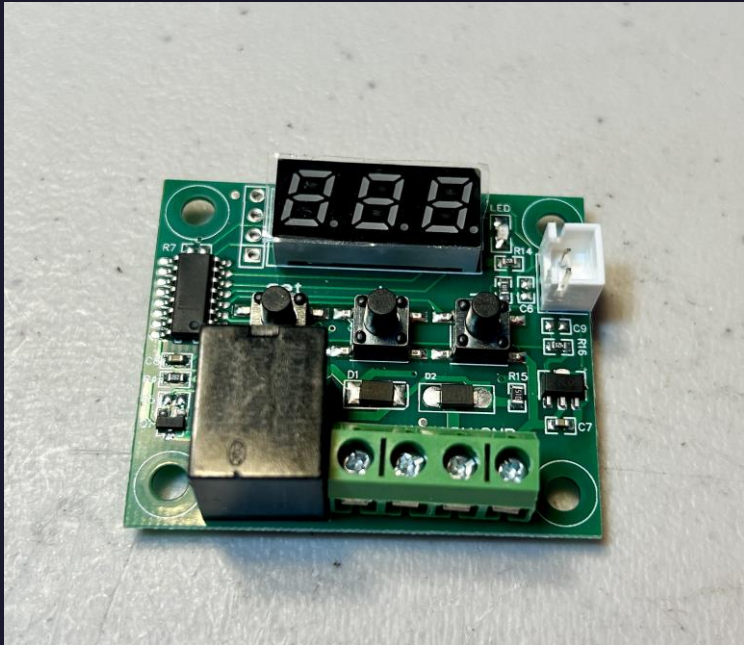
40 or 60 mm internal fan all amps.

What might this be?

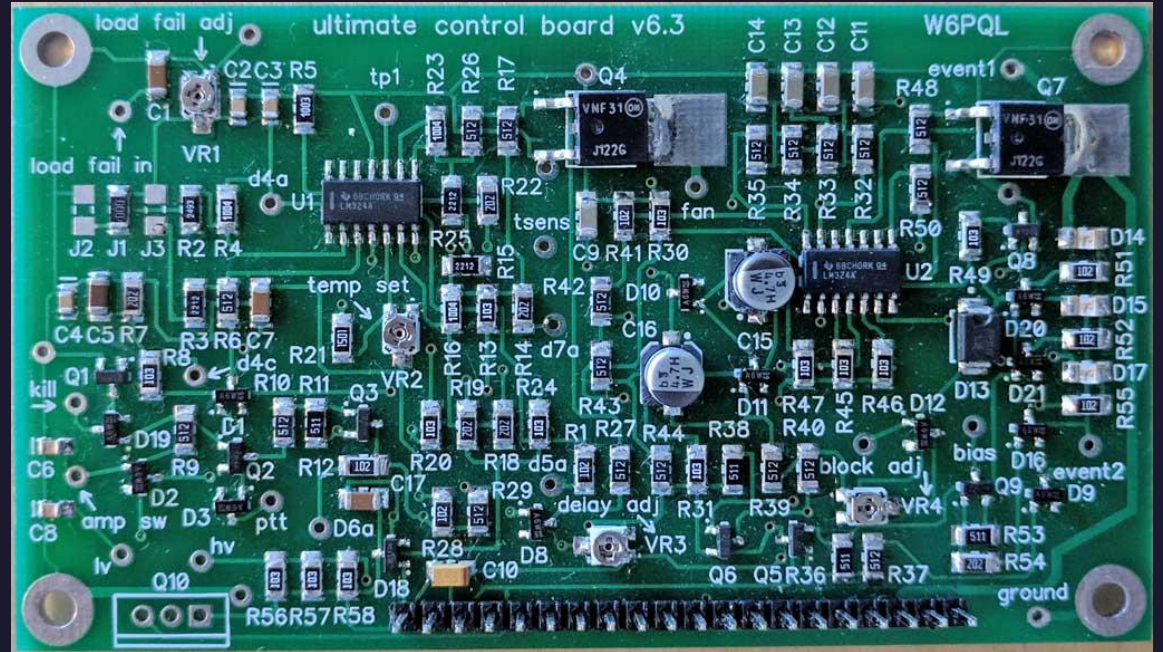
Hint – specific to 33cm and 23cm bands



Options – from the simple to the sublime



Simple thermometer - Amazon



W6PQL Control Board
SWR protection, high temperature protection, and a sequencer besides.



There are turn-key options for multiples of kilo-bucks!
<http://www.w6pql.com/>

50 VDC 2KW Power Supply

Meanwell RSP-2000-48
Handles either 240 or 120 vac
input

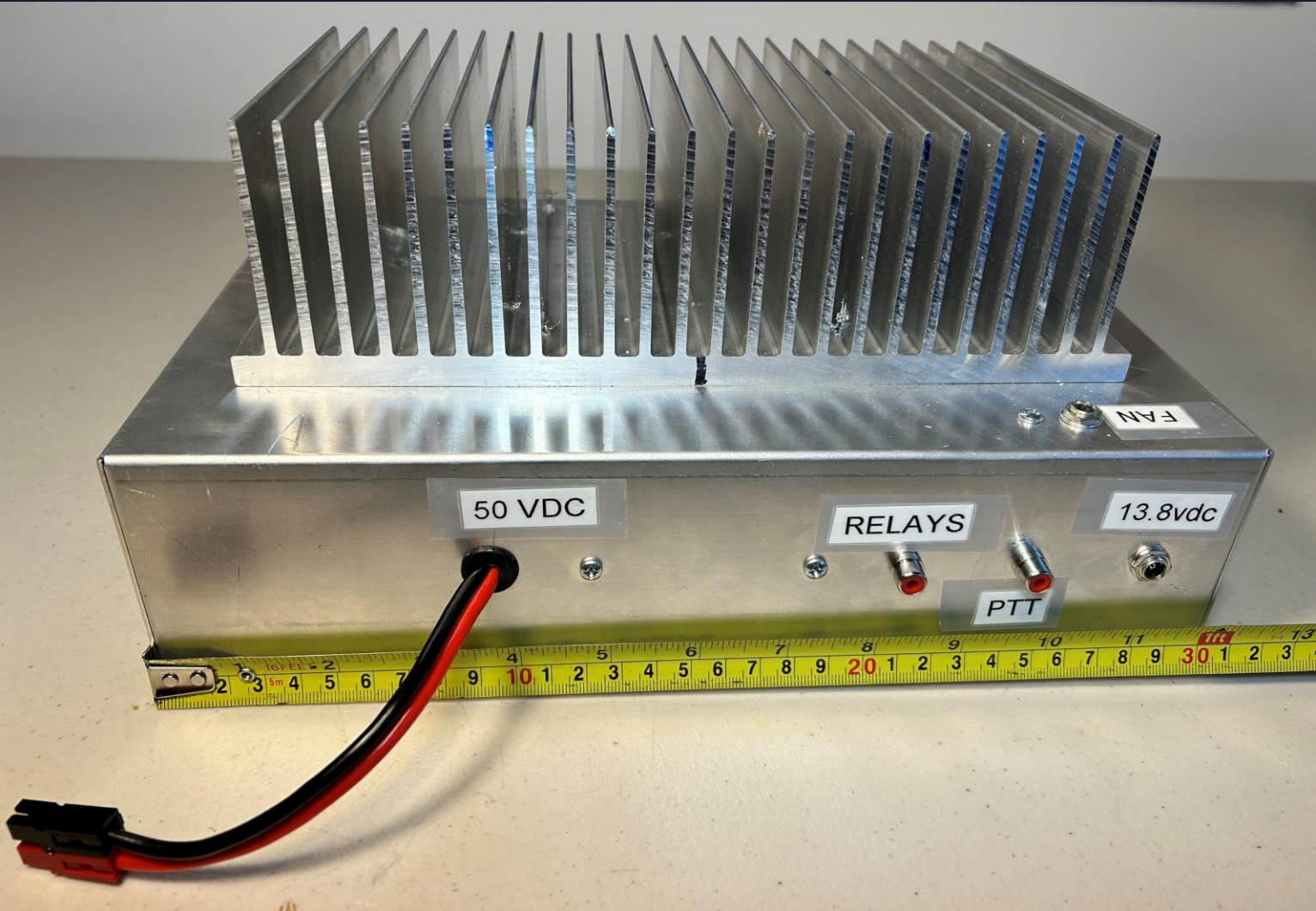
Weights 1 KG
Dxpediton Friendly



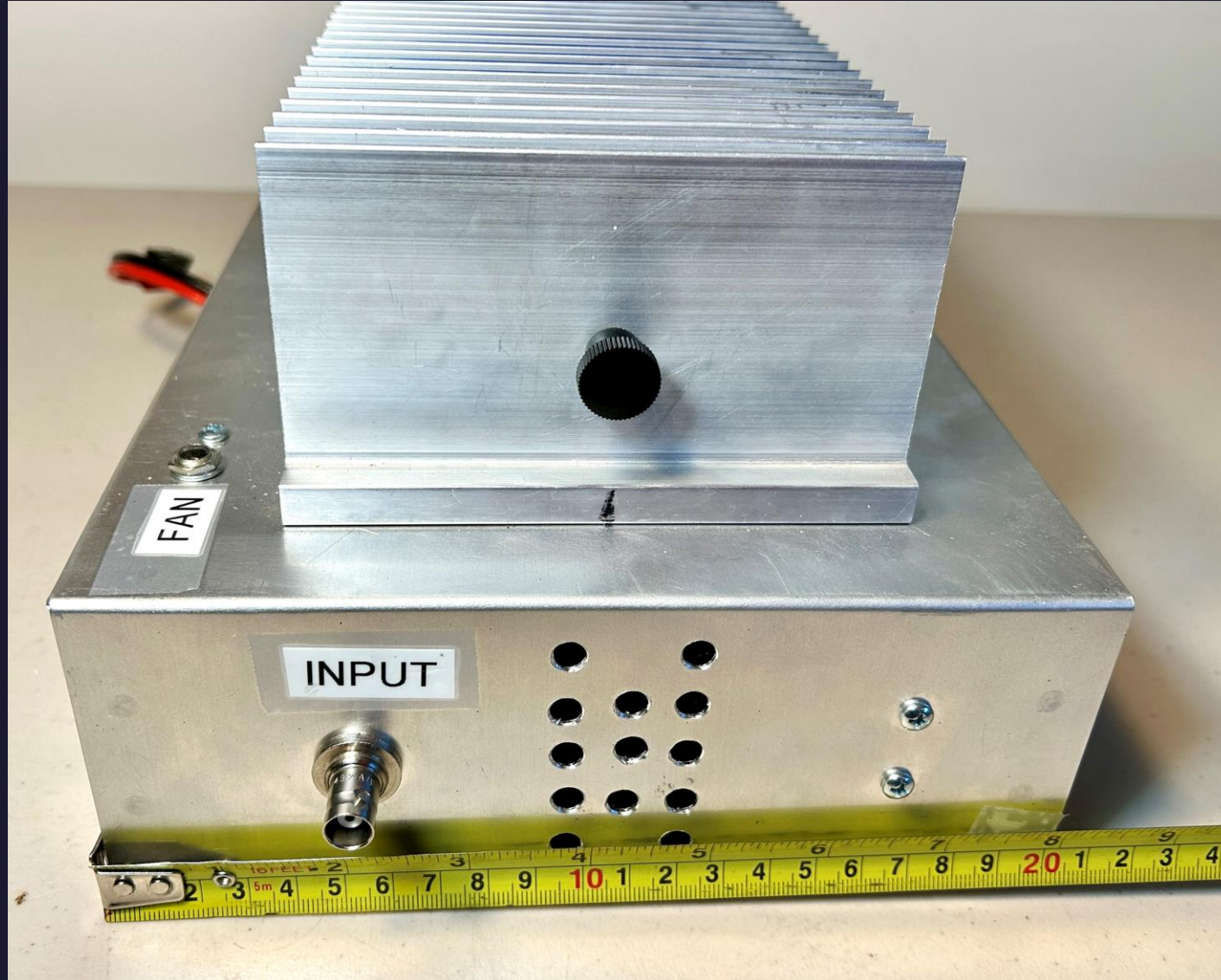
Front View



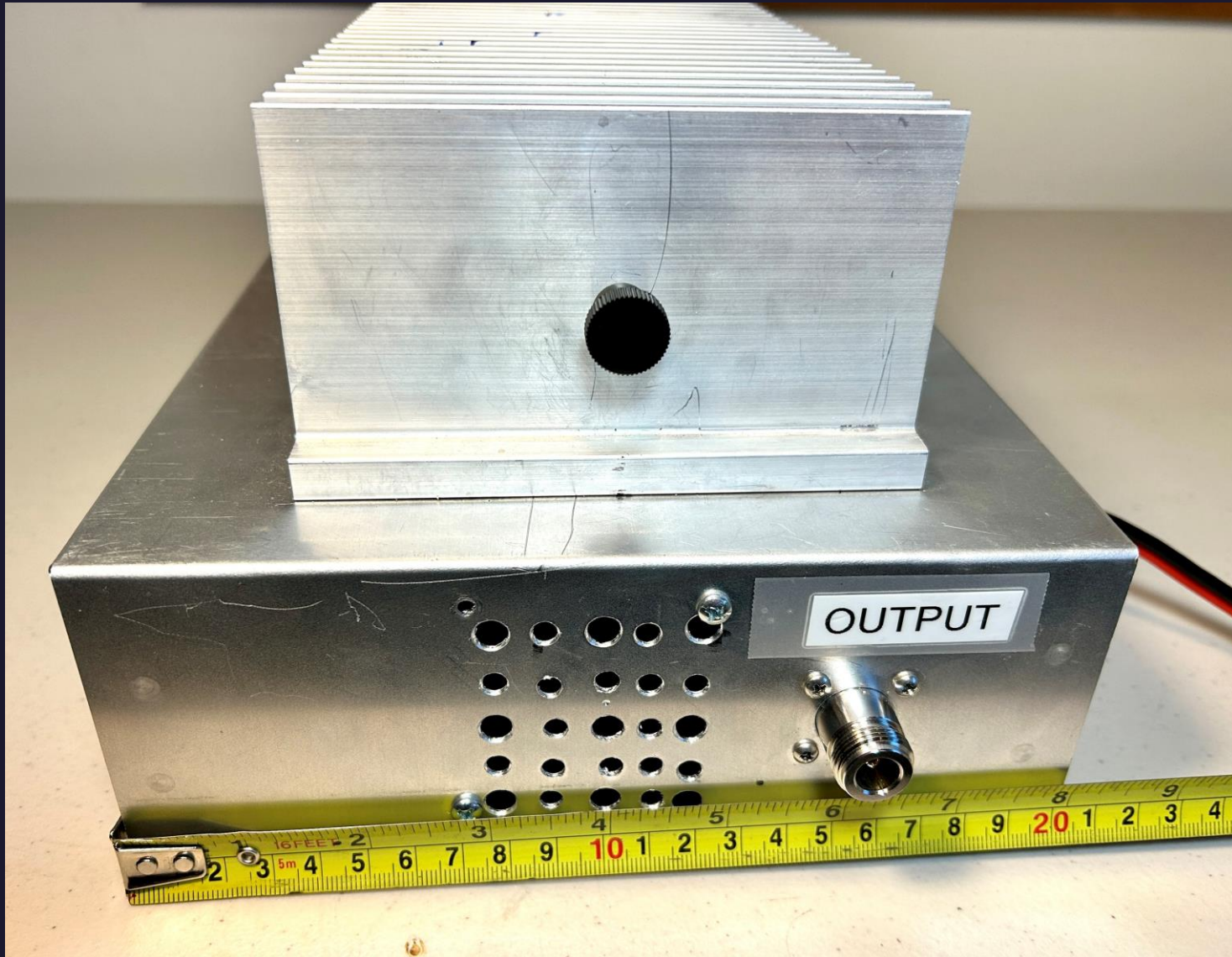
Back View



Input



Output



Recognizing folks who have made EME more accessible



W6PQL Jim Klitzing

QRO RF pallets, complete amps, LP filters, various modules, attenuators



K1JT Joe Taylor

WSJT-X Software, JT65 and Q65 Modes



W2HRO Paul Andrews

Folding portable dishes, patch feeds, moon tracking hardware



Thank you

Gene Shea, KB7Q

geneshea@gmail.com



Questions?

