North Texas NTMS Microwave Society

Restoration of GR-1216A IF amp for sun noise measurements

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May 18, 2024

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The GR-1216A

- Used with external oscillator and mixer, this was part of a very flexible system to detect UHF and VHF signals
- An AM signal would be mixed to 30 MHz and then detected and amplified by the GR-1216A
- can be used to measure Voltage, current, power and attenuation.
- can be used as a RF voltmeter with a 100dB dynamic range and 5uV sensitivity
- Bandwidth is 700 kHz (to 3dB points) and the build in step attenuator is 70 dB
- it was a sort of measurement receiver or selective voltmeter from the days before (affortable) spectrum analyzers

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The GR-1216A

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DNT Detector

for High-Frequency Measurements
25 to 5000 Mc

★ High Sensitivity — detects 5μv or less over most of range

★ Excellent Stability and Shielding

★ Large, Calibrated Output Meter — db as well as linear voltage scale

★ Built-in Precision 70-db Attenuator. Accuracy is ±(0.3 db + 1% of indicated attenuation)

★ Accurately Measures Relative R-F Voltage Levels Over 80-db Range

★ AVC Provided for Null Detection

★ Modulation Envelope Brought out to Binding Posts

★ Two Seperate Internal Power Supplies — one for operating the I-F Amplifier, another for driving the local Oscillator minimizing number of units necessary.

★ Compact and Light Weight — Detector with all interconnecting cables and accessories is less than 17 pounds.

Complete Detector Assemblies

Fundamental Frequency Operation

Type DNT-1	35 to 530 Mc	$626
Type DNT-2	25 to 280 Mc	$606
Type DNT-3	220 to 950 Mc	$659
Type DNT-4	870 to 2030 Mc	$879

Higher frequency operation to 5000 Mc using oscillator harmonics. Any of these assemblies may be converted to any other by using the appropriate local oscillator for that range.

The Type DNT Detector is especially designed to meet the need for a sensitive, thoroughly-shielded, general-purpose vhf-uhf Detector.

The signal to be detected and a local-oscillator frequency are mixed in the Type 874-MR Mixer Rectifier to produce a 30-Mc difference frequency which is detected by the Type 1216-A Unit I-F Amplifier. The crystal-diode Mixer Rectifier is accurately linear over a voltage range of about 80 db, and hence the relative level of the signal to be detected is easily measured by means of the calibrated step attenuator and calibrated output meter in the I-F Amplifier. This type of detector has high sensitivity, good linearity, excellent discrimination against harmonics, and eliminates frequency-modulation errors present in many measurements when the signal source is amplitude modulated.

The four-stage Amplifier provides 100-db gain. Less than 5μv from a 50-ohm source gives 1% meter deflection over residual noise at frequencies between 50 and 950 Mc — less than 80 μv produces full-scale deflection. The 0.7 Mc bandwidth is sufficiently wide to detect pulsed signals and is broad enough to eliminate detuning due to slight changes in frequency.

Accurate high-frequency measurements of *voltage*, *current*, *power* and *attenuation* are possible with this system. The precision step-attenuator permits accurate insertion loss and attenuation measurements of filters, attenuators, coaxial cables and coupling networks.

The small physical size and compactness of the several units make this versatile high-frequency detector easily portable.

GR-1260A set up

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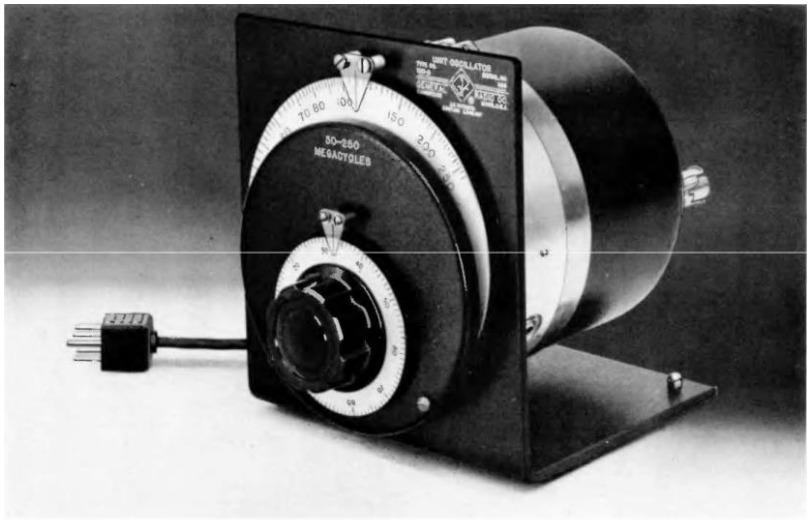
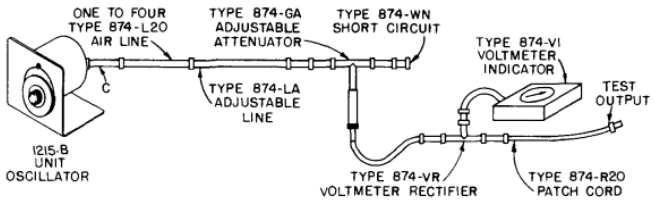
Configurations



View of Type 1215-B Unit Oscillator

Figure 5. Functional Diagram of the Unit Oscillator and Accessories Arranged to Work as a Standard-Signal Generator.



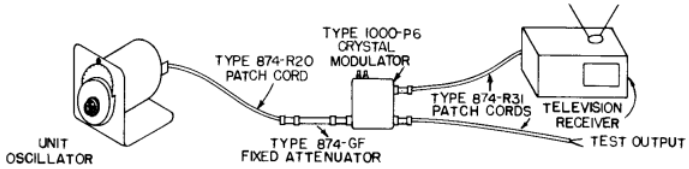


Figure 6. Functional Diagram of the Unit Oscillator with Video Modulator to Form a Television Signal Generator

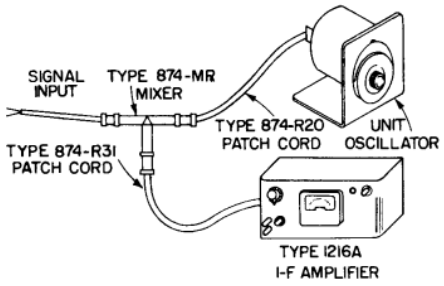


Figure 7. Functional Diagram of the Unit Oscillator and Mixer Rectifier Used as a Frequency Converter to Feed the Type 1216-A I-F Amplifier

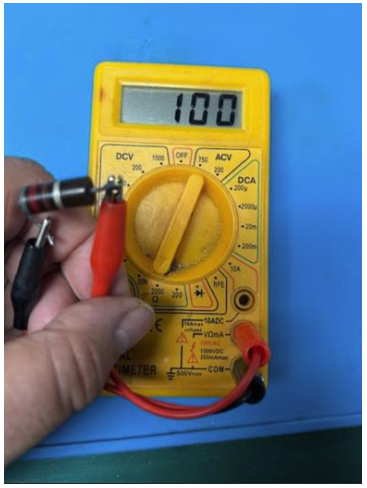
Initial inspection

- Obtain manual https://www.ietlabs.com/genrad_history/historic_manuals
- Do not plug into mains or turn power on
- Remove cage (friction fit) which will expose top and bottom decks
- Desolder power resistors and remove wires from power supply “can” electrolytics
- Expect the electrolytics to be expired and look for signs of leakage
- Measure power resistors for resistance value
- Start on a list of components to order

Power resistors bad

680 ohms?

820 ohms?



Restoration work

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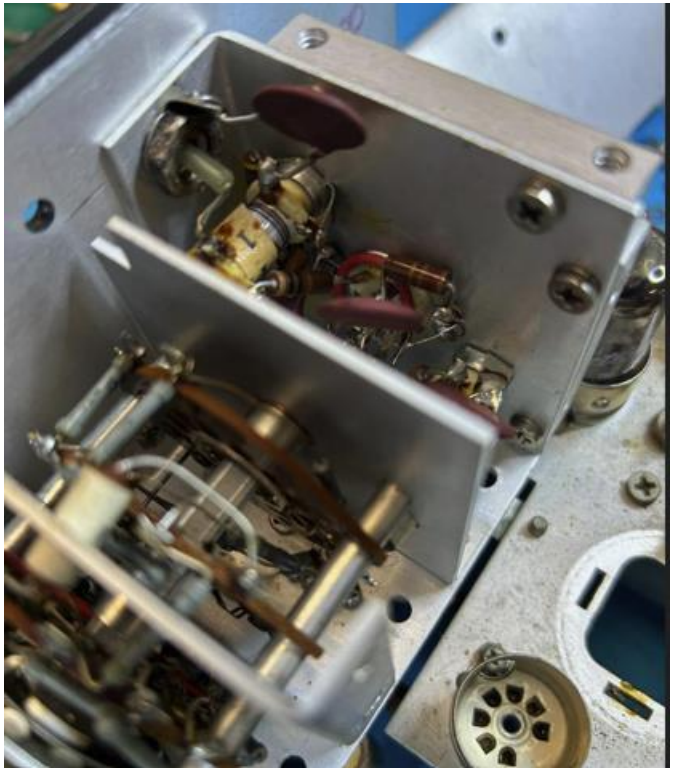
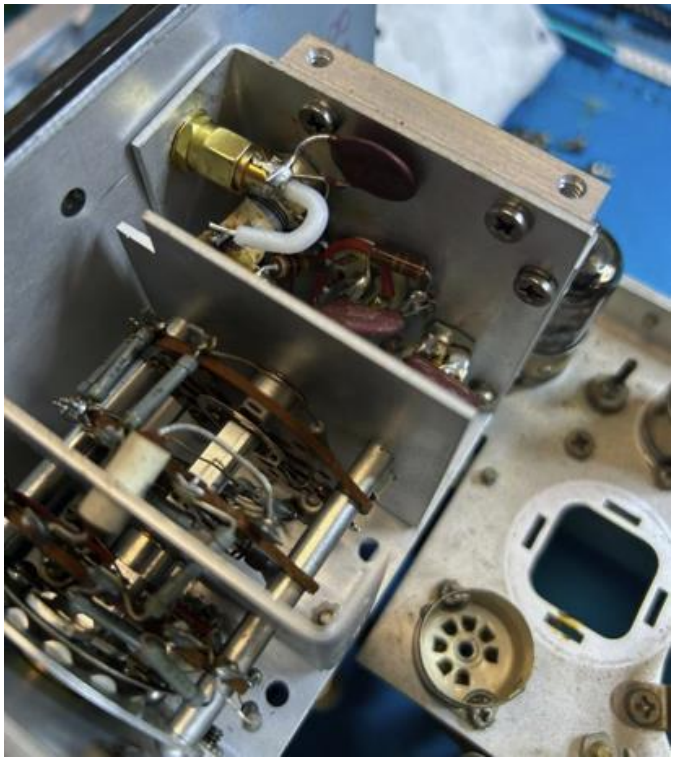
- Remove the “can” electrolytic capacitors
- Remove other axial lead electrolytic capacitors
- Remove tubes
- Carefully apply AC power and measure rectifier outputs (optional)
- There are two HV transformer secondaries (two power supplies) plus filament secondary.
- The external power supply should measure ~340v and the internal should measure ~160v

Restoration work

- Replace Rf output connector – requires opening shielded box.





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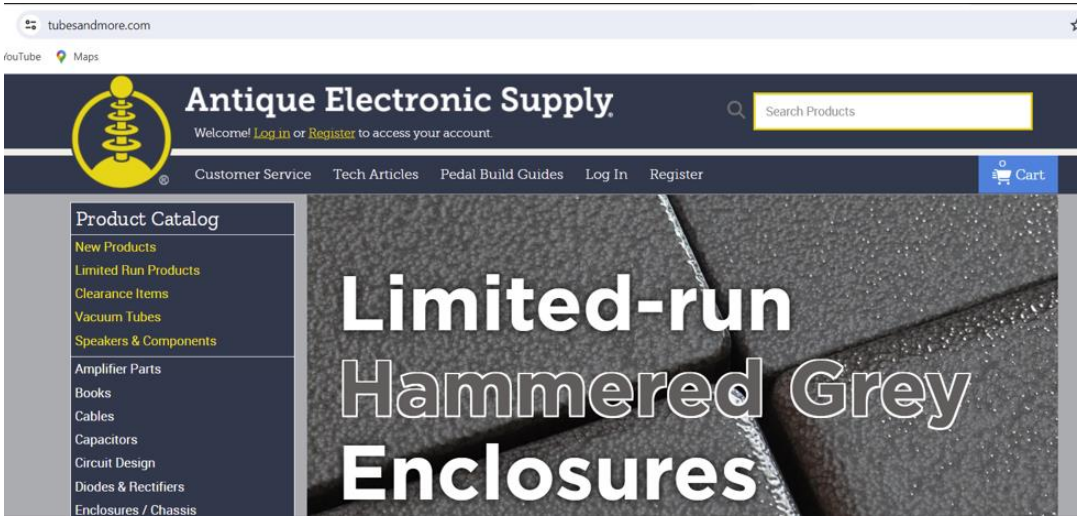
Restoration work

- Order the parts – I found all parts here: Antique Electronic Supply



Restoration work

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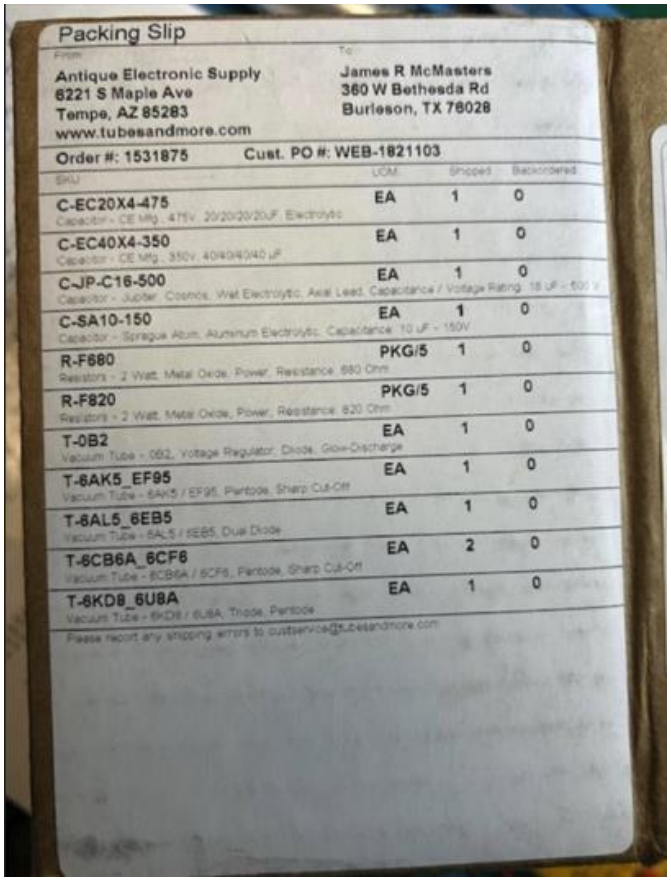

Packing Slip

From:
Antique Electronic Supply
6221 S Maple Ave
Tempe, AZ 85283
www.tubesandmore.com

To:
James R McMasters
360 W Bethesda Rd
Burleson, TX 76028

Order #: 1531875 Cust. PO #: WEB-1821103

SKU		UOM	Shipped	Backordered
C-EC20X4-475	Capacitor - CE Mfg., 475v, 20/20/20/20uF, Electrolytic	EA	1	0
C-EC40X4-350	Capacitor - CE Mfg., 350v, 40/40/40/40 uF	EA	1	0
C-JP-C16-500	Capacitor - Jupiter, Cosmos, Wet Electrolytic, Axial Lead, Capacitance / Voltage Rating: 16 uF - 500 V	EA	1	0
C-SA10-150	Capacitor - Sprague Atom, Aluminum Electrolytic, Capacitance: 10 uF - 150V	EA	1	0
R-F680	Resistors - 2 Watt, Metal Oxide, Power, Resistance: 680 Ohm	PKG/5	1	0
R-F820	Resistors - 2 Watt, Metal Oxide, Power, Resistance: 820 Ohm	PKG/5	1	0
T-0B2	Vacuum Tube - 0B2, Voltage Regulator, Diode, Glow-Discharge	EA	1	0
T-6AK5_EF95	Vacuum Tube - 6AK5 / EF95, Pentode, Sharp Cut-Off	EA	1	0
T-6AL5_6EB5	Vacuum Tube - 6AL5 / 6EB5, Dual Diode	EA	1	0
T-6CB6A_6CF6	Vacuum Tube - 6CB6A / 6CF6, Pentode, Sharp Cut-Off	EA	2	0
T-6KD8_6U8A	Vacuum Tube - 6KD8 / 6U8A, Triode, Pentode	EA	1	0

Please report any shipping errors to custservice@tubesandmore.com

Reinstall new parts

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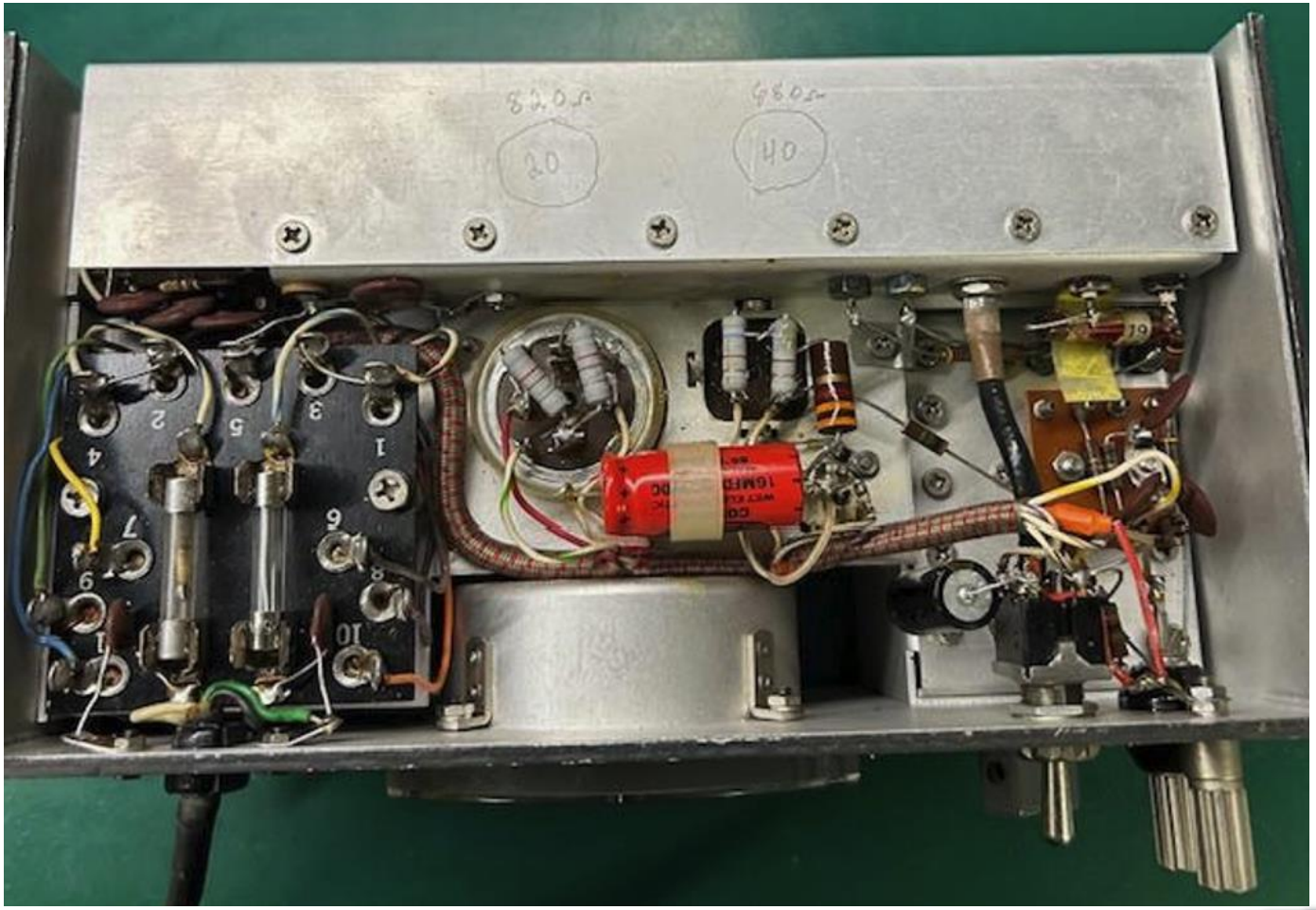
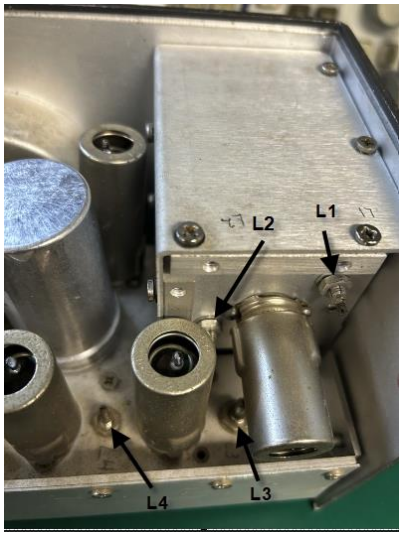


Install tubes and fire it up

Retuning

Loosen tuning coil lock nuts with tube shields removed.



Apply 28.1 MHz signal externally attenuated to produce mid-scale meter reading with front panel 30 dB attenuation dialed in.

Retuning

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- Starting with L1, tune the L1 coil for maximum deflection on front panel meter. Add more attenuation (external or by way of front panel attenuator pad) as needed to maintain mid scale deflection.
- Peak L2 through L6 coils for max deflection in same fashion as L1.
- The last coil – L6, which tunes the second detector stage, should not necessarily be adjusted for peak response. After gaining peaks on all stages L1 through L6, adjust the 28.1 MHz input for full scale meter deflection. Then add 10 dB additional attenuation. If the meter does not indicate 10 dB drop (should read 0 dB) then slightly detune L6 and repeat procedure. This will provide the maximum linearity possible.
- Tighten L1 – L6 tuning coil lock nuts.

Retuning

- Set full scale

- Add 10 dB attenuation, observe zero dB

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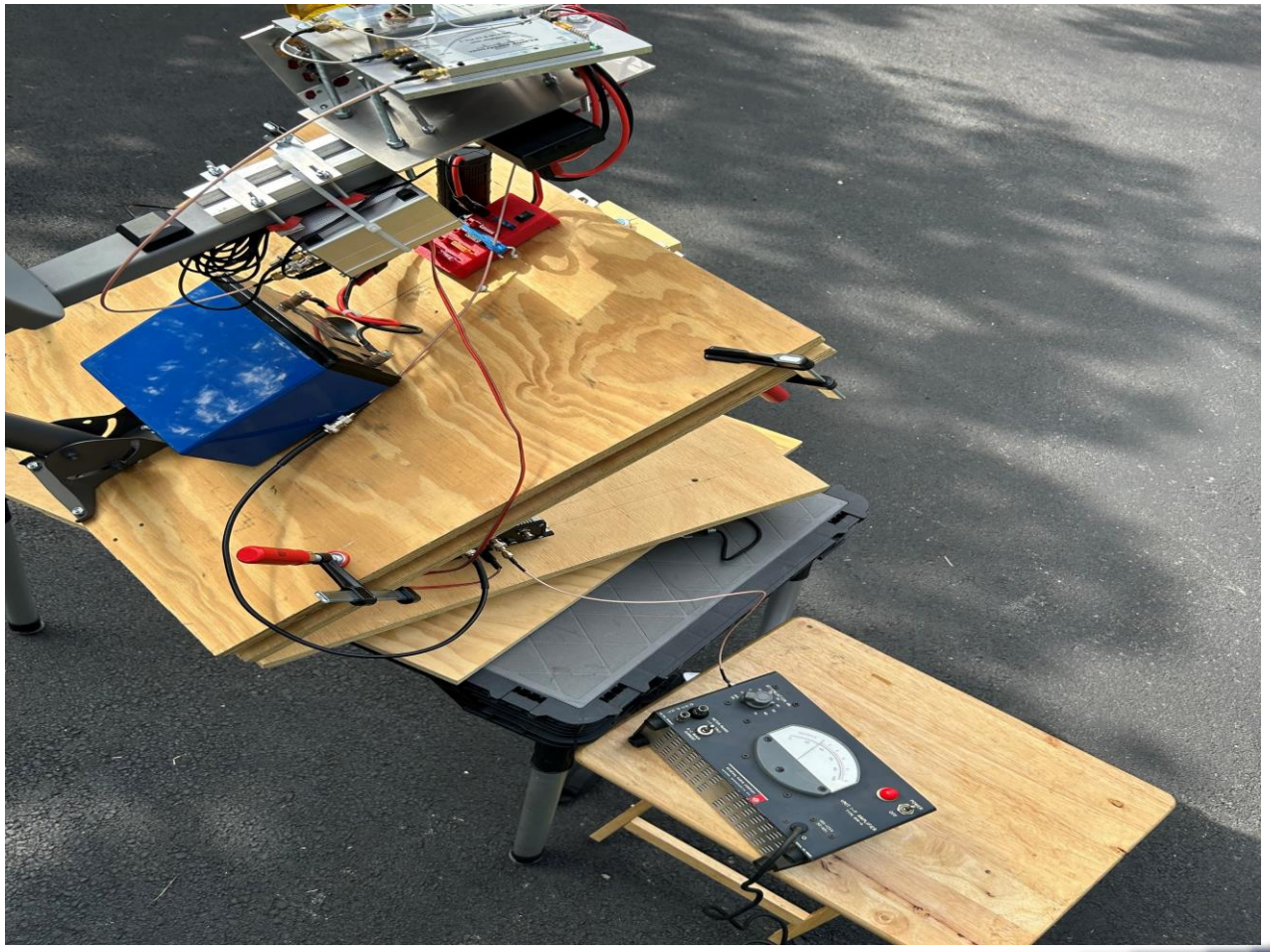
Center peak/bandwidth

Frequency	Power
28.100 MHz	0 dBm
28.610 MHz	-3 dBm
27.930 MHz	-3 dBm
00.680 MHz	bandwidth

Sun noise measurements



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Sun noise measurements

- For additional information please see Al Ward's W5LUA presentation Feb 2024

https://www.ntms.org/files/Feb2024/Sun_Noise%20Measurements_FEB_2024.pdf

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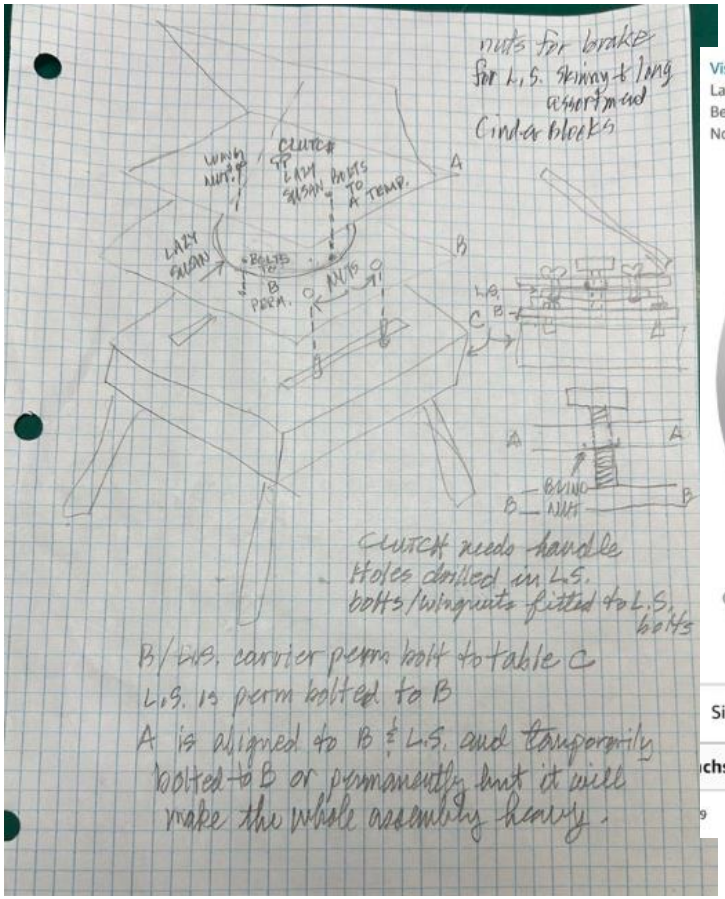
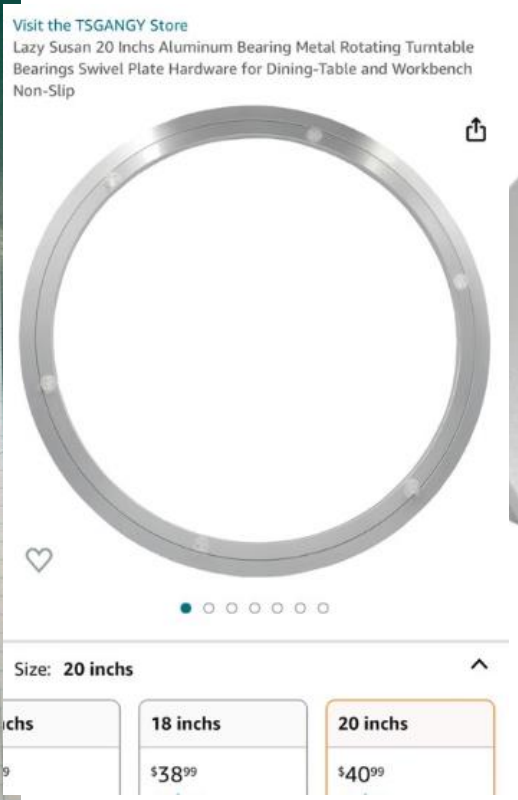
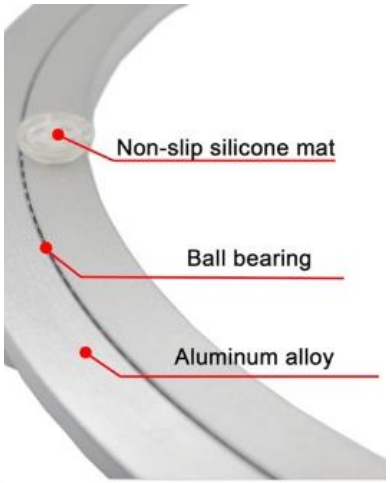
Sketch of sandwich design & lazy susan







Sandwich design

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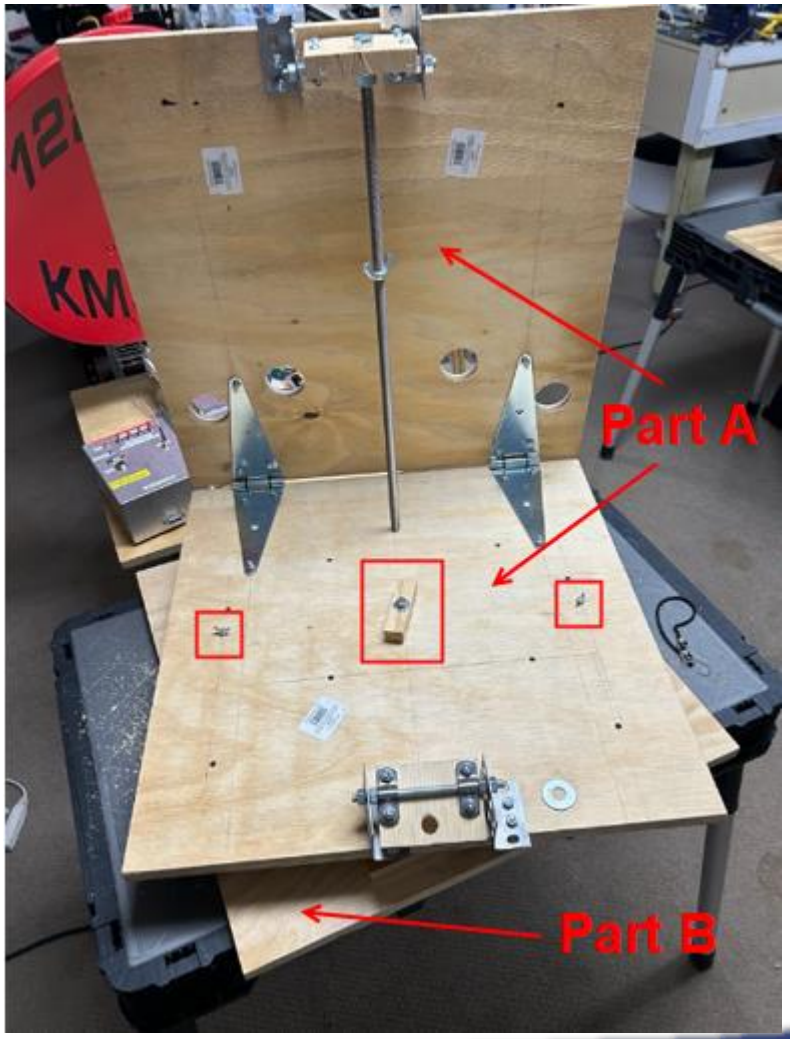
Hinged plates (part A) swivel (AZ) on lazy susan bolted together with 2 wing nuts

Clutch bolt in middle adds friction to AZ movement

Part B is fixed to table with bolts and holds lazy susan on elevated blocks



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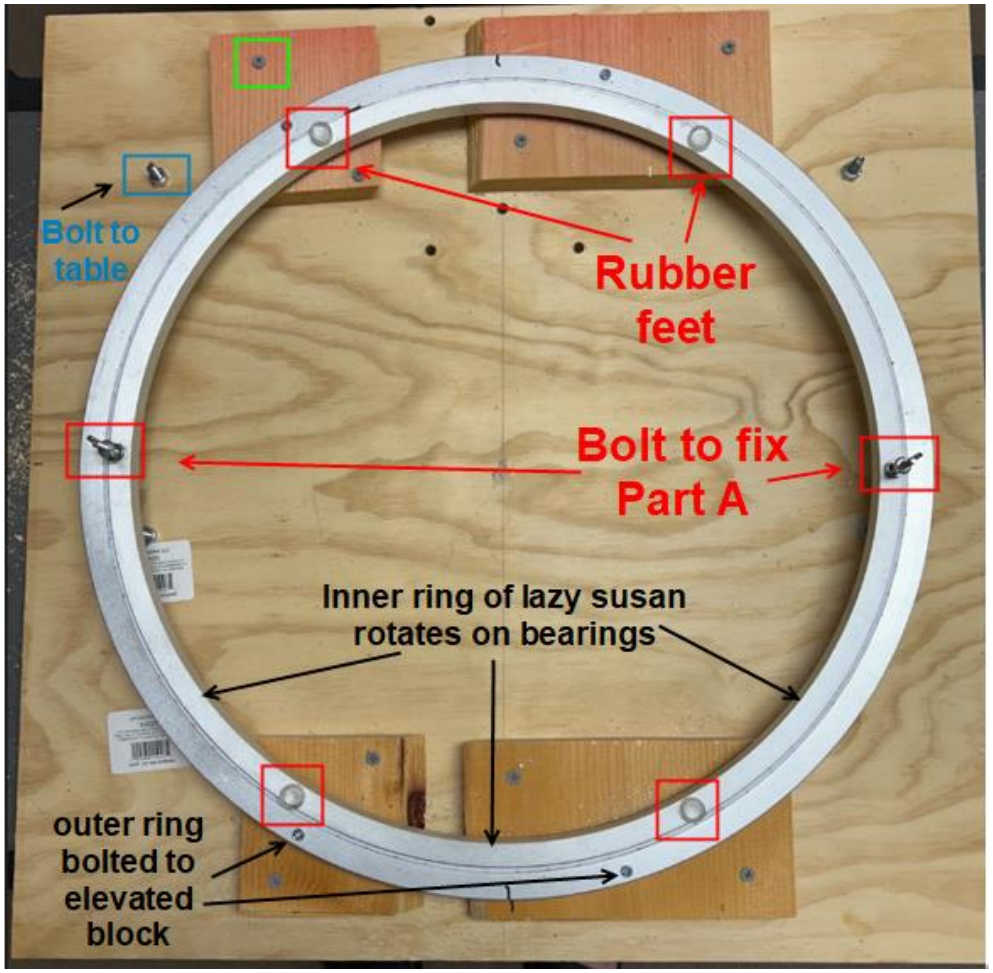
Sandwich design



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Questions?