

RUNNING A MULTI- OPERATOR EME STATION AS A SINGLE OPERATOR IN EME CONTESTS

EME CONFERENCE 2026 - TENERIFE

- JAY BAACK N1AV

HOW DID I GET HERE?

- EME- THE ULTIMATE “DX”
- DRAWN TO DIFFICULT
- LOVE THE THRILL OF COMPLETION OF DIFFICULT TASKS
- GET BORED OF “EASY” SO CONTINUALLY MAKING IT MORE DIFFICULT IS FUN
- TRYING TO ANSWER THE QUESTION; WHAT DOES IT TAKE TO BE COMPETITIVE?



STATION GOALS

- CONTEST GRADE STATION(S) = ABILITY TO MAKE 75% OF THE CONTACTS THE BAND WINNERS MAKE.
- FLEXIBLE ENOUGH TO UPGRADE TO TAKE ADVANTAGE OF LATEST TECHNOLOGY
- EASY TO OPERATE (WITH FOCUS)
- CONSISTENT AND EFFECTIVE LOGGING (REDUCE ERRORS)
- EASY TO REPAIR (N1AV'S 2 AM RULE)
- STANDARDIZATION WHEN POSSIBLE

WHAT IS THE LARGEST LIMITING FACTOR OF YOUR CONTEST STATION?

- YOU – YOUR ABILITY TO TOLERATE BOREDOM, DISCOMFORT & PROCESS INFORMATION!

CRITICAL ASPECTS OF RUNNING A MULTI-OP AS A SINGLE OP – MENTAL FOCUS

- MOVING FROM A MULTI-TASKING MINDSET TO A CONTINUOUS PARTIAL ATTENTION MINDSET

MULTI-TASKING MINDSET

- MULTITASKING= TRYING TO PERFORM 2 OR MORE TASKS AT THE SAME TIME
- TRYING TO THINK ABOUT MULTIPLE TASKS AT THE SAME TIME WITH EQUAL LEVELS OF FOCUS
- HIGHER RATE OF MISTAKES, AND "ATTENTION RESIDUE"

CONTINUOUS PARTIAL ATTENTION MINDSET

- COINED BY LINDA STONE, AN EXECUTIVE AT APPLE AND MICROSOFT
- CPA = HYPER FOCUS ON 1 TASK WHILE CONSTANTLY SCANNING FOR ANYTHING ELSE TO DEMAND FOCUS
- SENSE OF CRISIS – “YOU ARE THE ETHERNET SWITCH” SWITCH, 90% FOCUS, SWITCH 90% FOCUS, SWITCH
- HIGH STRESS, LOW EMOTION, LESS CREATIVE, MORE ROBOTIC, EXTREMELY FATIGUING



N3FJP

Amateur Radio Software®

LOGGING SOFTWARE

N3FJP ACLOG NETWORKED TO ALL STATIONS.

OVERVIEW OF THE CURRENT ANTENNA ARRAYS

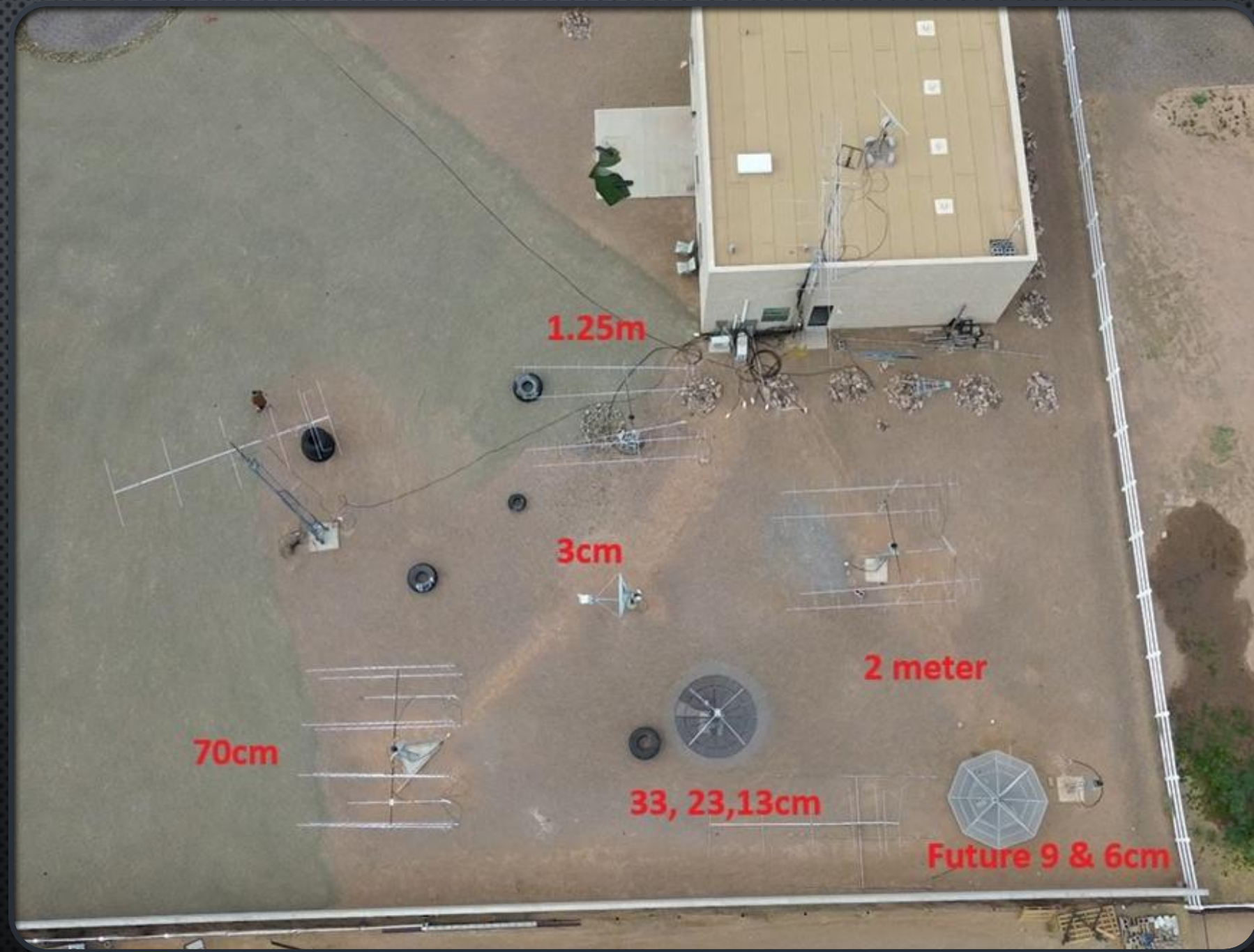


ANTENNA FARM

MORE LIKE ...

ALL ANTENNAS

- 20 METERS X 30 METERS
- EAST TO WEST CONFIG (BAD!)



HARDWARE

COMPUTER/MONITOR

- DEL MIDTOWER WORKSTATIONS x4
- 2 DEL LAPTOPS
- 2x 24" MONITORS
- 4x 50" TVs (4K)



OPERATING POSITION

IT IS A "WIRELESS" HOBBY RIGHT?



KEYBOARD AND MOUSE MANAGEMENT

- SYNERGY
- SLAVE / MASTER RELATIONSHIP
- IP (ETHERNET) BASED NOT BLUETOOTH
- HOT CORNERS (WALLS) TO DRAG TO NEW MACHINE
- FULL KEYBOARD/MOUSE CONTROL WITH CUT AND PASTE



Control other computers on your local network with a single mouse and keyboard

Use the keyboard and mouse of one computer to control nearby computers. Copy and paste between all of your computers with shared clipboard. Download for Windows, macOS, and Linux.





NO WIFI OR BLUETOOTH!

- ALL COMPUTER CONNECTIONS ARE ETHERNET WIRED
- WIRELESS LOCKS UP WHEN ON 13CM EME
- LOSE NETWORK, LOSE POINTS



1 DEGREE SPID
ROTORS AND
CONTROLLERS
(10G IS
WINTRACK)

N1AV'S CURRENT STATION BAND BREAK DOWN

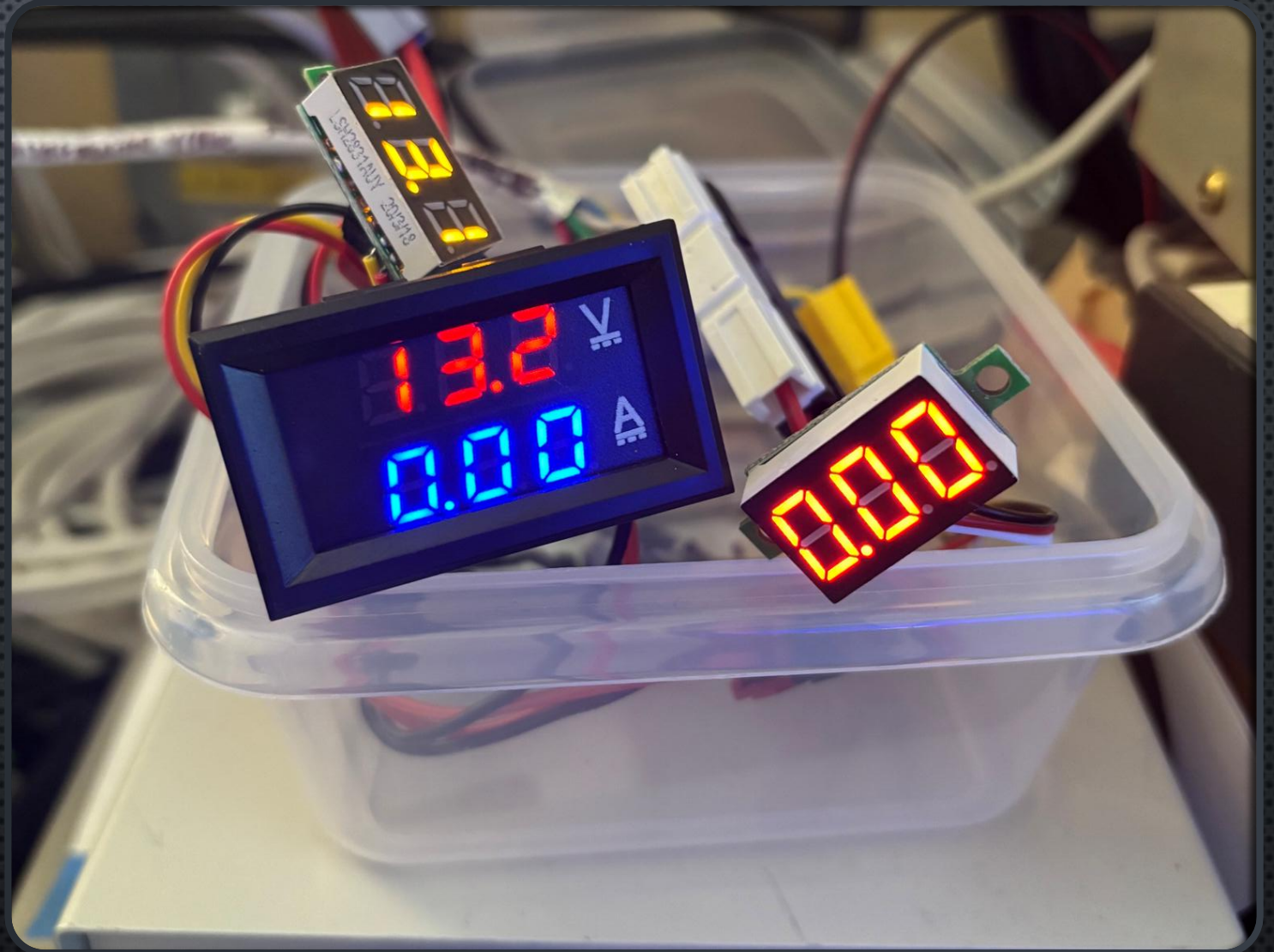
3 CM – 50W

- 1.8M OFFSET DISH
- SLEW DRIVE WINTRACK CONTROLLER
- FLEX 1500
 - SINGLE VFO NO MAP65
- DELL LAPTOP
- REMOTE POWER RELAY SWITCH IN SHACK
- POWER SUPPLIES, TRANSVERTER, PA, WAVEGUIDE LNA ALL OUT OF THE DISH



EXTREMELY CRUDE BUT FUNCTIONAL 3CM METERING

- TRANSVERTER VOLTAGE
- PA MONITOR VOLTAGE
- OVERALL AMP DRAW/VOLTAGE

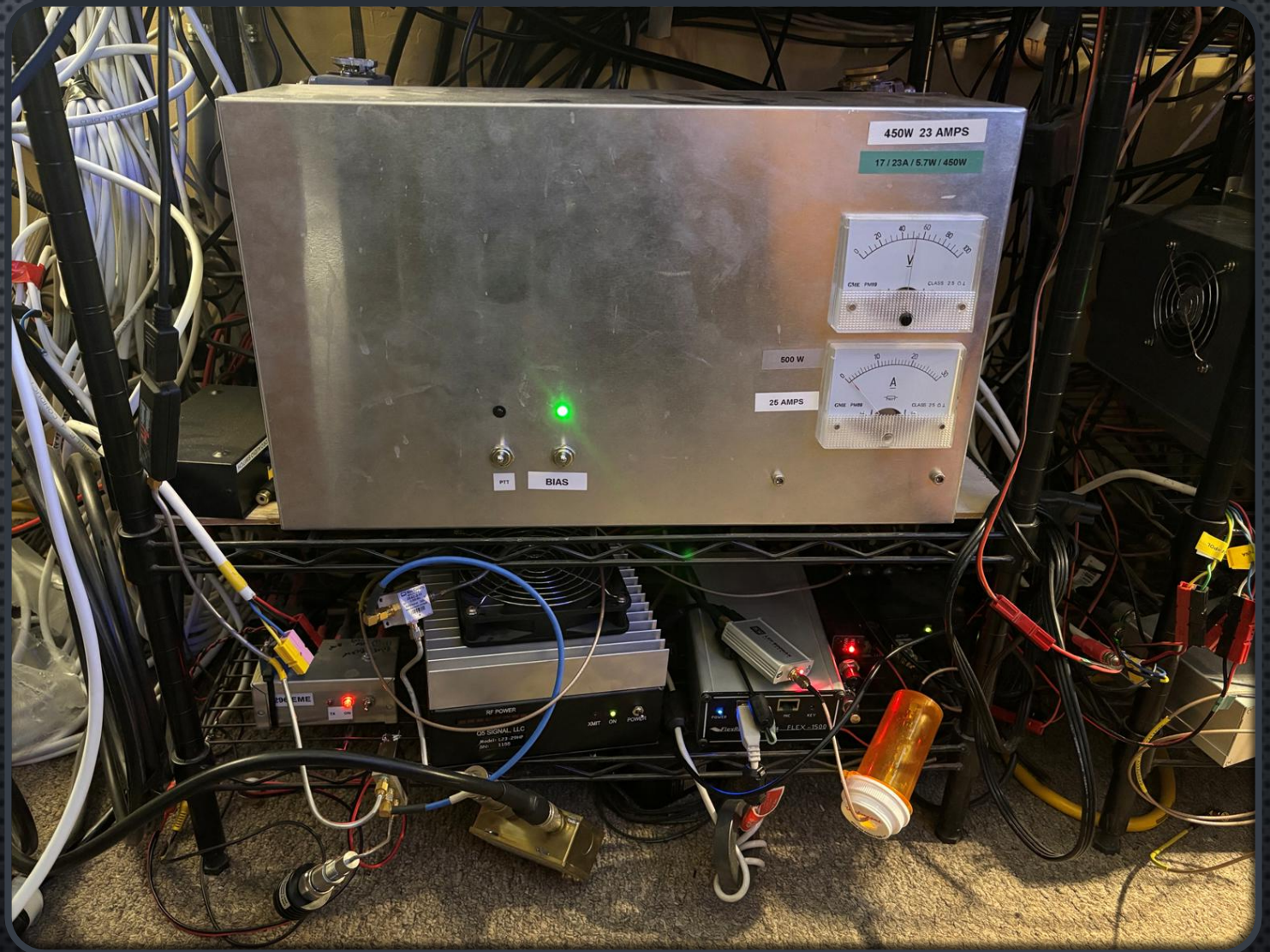


13 CM -220W

- 4.2M DISH (TVRO 3M EXTENDED TO 4.2M)
- FLEX 6400M
- RX 2304 AND 2320 WITH CFOM AT THE SAME TIME
- DELL LAPTOP, DEMI CUSTOM 2300-2304-2320 TRANSVERTER
- RFHAM DESIGN FEED, AG6EE LNA – BANDPASS FILTER
- 7/8THS HARDLINE TX, LMR 400 RX (88')

23 CM – 500W

- 4.2M DISH
- FLEX 1500
- SINGLE VFO NO MAP65
- DELL WORKSTATION
- Q5 TRANSVERTER
- 500W PQL PA, AGO LNA
- 7/8THS HARDLINE TX, LMR 400 RX (88')



33 CM -500W

- 4.2M DISH
- FLEX 1500
- SINGLE VFO NO MAP65
- DELL WORKSTATION
- Q5 TRANSVERTER
- 500W PA, AG6EE LNA, BANDPASS FILTER
- 7/8THS HARDLINE TX, LMR 400 RX (88')

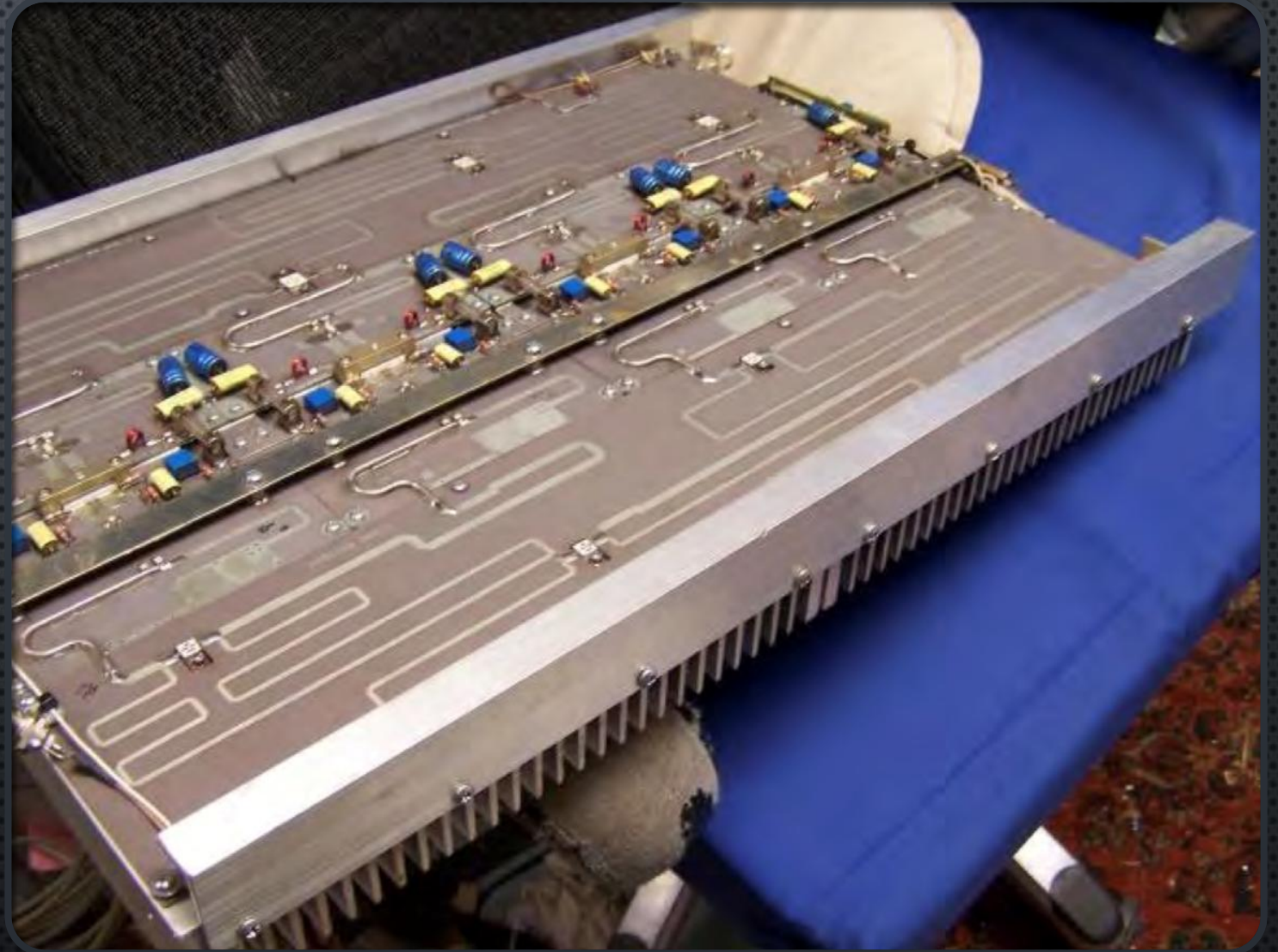
70 CM – 1000W

- 8x 23EL X POL (ANTENNA AMPLIFIERS)
- FLEX 1500
 - SINGLE VFO NO MAP65
 - SINGLE POL RX (CURRENTLY)
- DELL WORKSTATION
- Q5 TRANSVERTER
- 1KW LUNAR LINK, CAVITY LNA (CURRENTLY) BANDPASS FILTER
- 7/8THS HARDLINE TX, LMR 400 RX (102')



1.25 M -1000W

- 4x 15EL X POL M2
- FLEX 6400
 - SINGLE VFO NO MAP65
 - SINGLE POL RX (CURRENTLY)
- DELL WORKSTATION
- Q5 TRANSVERTER
- 1KW 6 DEVICE LARCAN RF PALLET,
ODO LNA (CURRENTLY) BANDPASS
FILTER
- 7/8THS HARDLINE TX, LMR 400 RX (30')



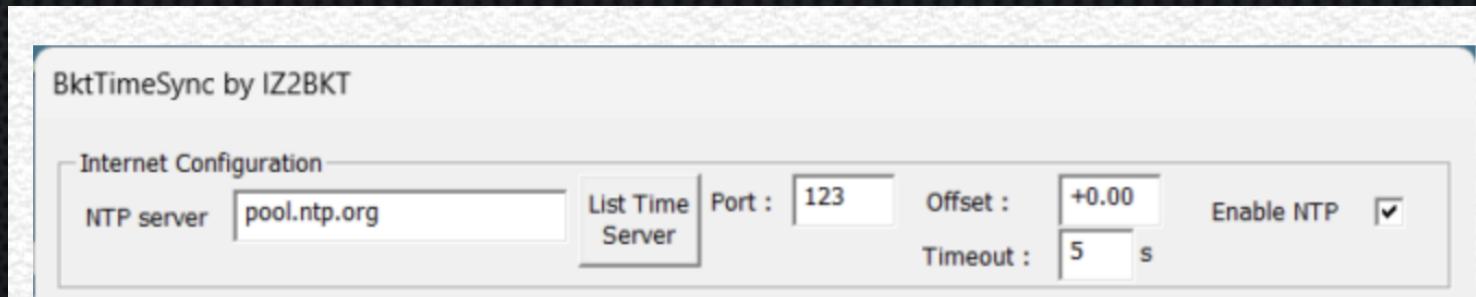
2 M -1500W

- 4x 10EL X POL M2
- FLEX 1500
 - SINGLE VFO NO MAP65
 - SINGLE POL RX (CURRENTLY)
- DELL WORKSTATION
- DEM TRANSVERTER
- 1.5Kw 2 PALLET PQL, AGO LNA (CURRENTLY) BANDPASS FILTER
- 1/2" HARDLINE TX, LMR 400 RX (50')



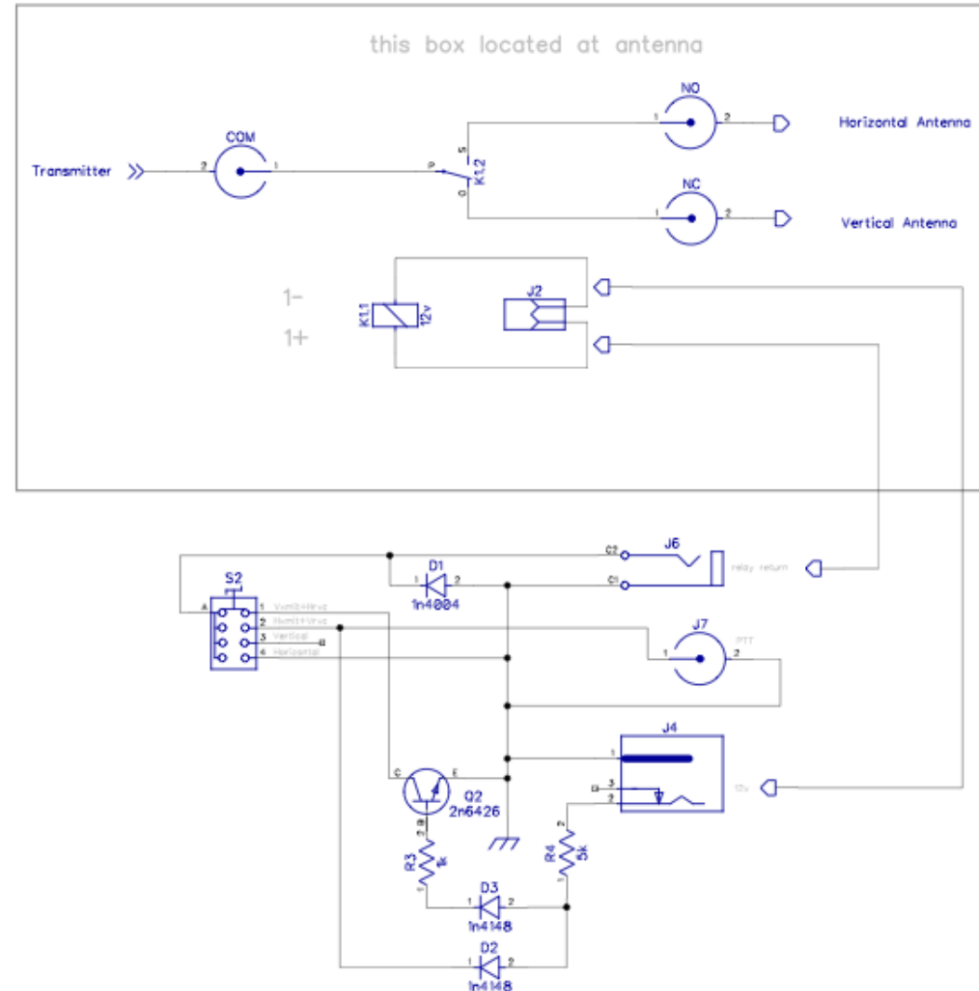
ALL LAPTOPS/DESKTOPS/TRANSVERTERS/RADIOS

- ALL LAPTOPS AND DESKTOPS ARE TIME SYNCED WITH BKTIMESYNC
- ALL TRANSVERTERS ARE 10 MHz LOCKED – LEO BODNAR AND DEMI DISTRIBUTION BOXES

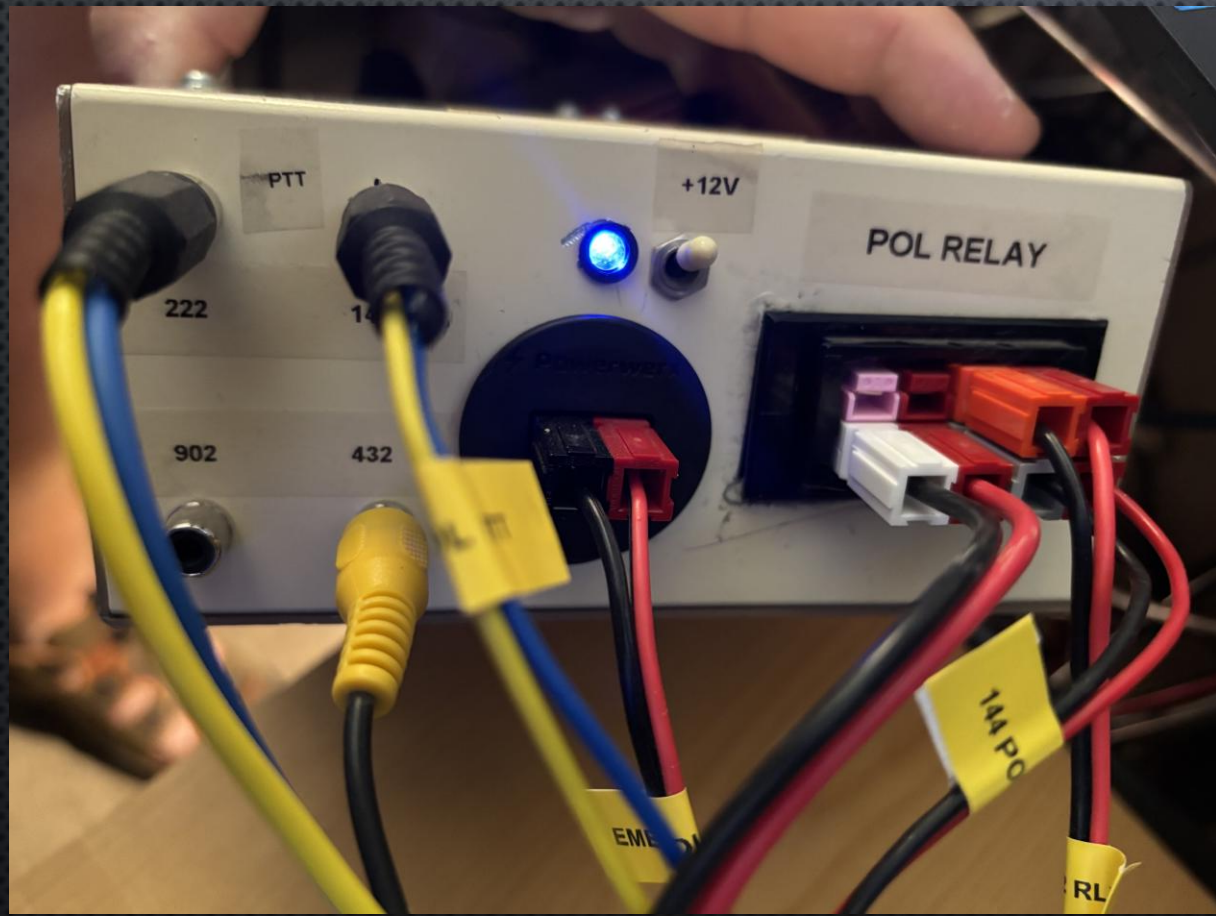


POLARITY MANAGEMENT (2M/1.25M/70CM)

- W6PQL DESIGNED CIRCUIT
- IT ALLOWS YOU TO SELECT THE FOLLOWING CONFIGURATIONS:
- V TX WITH V RX
- H TX WITH H RX
- V TX WITH H RX
- H TX WITH V RX



POLARITY MANAGEMENT



MODE MANAGEMENT (6M – 23CM WEEKENDS)

- COMMON MODES AND TRANSMIT TIMING?
- 2M =
- JT65 B / 48 SECONDS
- 70CM =
- Q65 60B / 51 SECONDS
- 1296 =
- Q65 30B / 25.5 SECONDS

BANDPASS FILTERS ON EVERYTHING

2/1.25/70cm/902/13cm/2304

WHERE?

ANTENNA- FILTER- LNA



ONLINE CHAT ROOMS “HB9Q”

- EACH BAND HAS ITS OWN INSTANCE / CONNECTION TO THE CHAT AT EACH STATION.
- SLACK + N5TM PING JOCKEY CLIENT (144)



ERGONOMICS AND FUNCTION

KEY ERGONOMIC CONSIDERATIONS

- **OPERATING POSITION:**

- **CHAIR:** INVEST IN A COMFORTABLE OFFICE CHAIR WITH GOOD LUMBAR SUPPORT TO PREVENT BACK STRAIN.
- **DESK HEIGHT:** POSITION THE DESK SO YOUR ELBOWS ARE AT A 90-TO-100-DEGREE ANGLE WHILE OPERATING, AVOIDING SHOULDER TENSION.
- **MONITOR PLACEMENT:** PLACE MONITORS AT OR SLIGHTLY BELOW EYE LEVEL TO REDUCE NECK STRAIN.

- **STATION LAYOUT:**

- **ACCESSIBILITY:** PLACE FREQUENTLY USED EQUIPMENT (MAIN RADIO, MICROPHONE, KEY) WITHIN EASY REACH, WHILE INFREQUENTLY USED GEAR (LINEAR AMPLIFIERS, POWER SUPPLIES) CAN BE FURTHER AWAY.
- **ORGANIZATION:** USE SHELVES, MONITOR RISERS, OR UNDER-DESK DRAWERS TO KEEP THE WORKSPACE TIDY.
- **LIGHTING:** ENSURE SUFFICIENT, GLARE-FREE LIGHTING FOR THE DESK SURFACE,

- **EQUIPMENT AND ENVIRONMENT:**

- **VENTILATION:** ALLOW FOR ADEQUATE AIRFLOW AROUND TRANSCEIVERS AND AMPLIFIERS TO PREVENT OVERHEATING.
- **CABLE MANAGEMENT:** AVOID A "RAT'S NEST" OF CABLES, WHICH IMPROVES SAFETY AND MAKES MAINTENANCE EASIER.

ERGONOMICS IN REALITY...

- TOTALLY ORGANIZED CABLING..
- TOTALLY...



FUTURE PLANNING (2026 CONTEST)

ADD BANDS (6M*, 9CM 6CM)

- INSTALL 12' PARACLIPSE PRIME FOCUS
- SLEW DRIVE WITH WIN TRACK CONTROLLER
- 9CM DEMI TRANSVERTER, AG6EE LNA (WITH FILTER), 100W PA (ALL DISH MOUNTED)
- 6CM DEMI TRANSVERTER, AG6EE LNA (WITH FILTER) 45W PA (ALL DISH MOUNTED)
- 144 MHZ INTERMEDIATE 90'ISH FEET OF CABLING BACK TO SHACK IF
- FLEX 6600 28 MHZ IF (FOR BOTH)

IF FREQUENCY SELECTION

- CURRENTLY MANY IF RADIOS ARE ALL ON 28 MHZ.
- NEED TO SEPARATE THESE OUT TO AVOID NOISE AND SIGNAL CONTAMINATION

DUAL POLARITY OR DIVERSITY RX (2 M/1.25 M/70 CM)

- FASTER QSO RATE DUE TO REMOVAL OF POLARITY CHOICES
- REDUCTION OF THE CHANCE OF HOT SWITCHING AN AMPLIFIER BY 50%
- LET THE SYSTEM REMOVE GUESSWORK FROM ME





FLEX-1500 Front Panel View



FLEX-1500 Rear Panel View



Figure 3 — The FLEX-6600M rear panel.

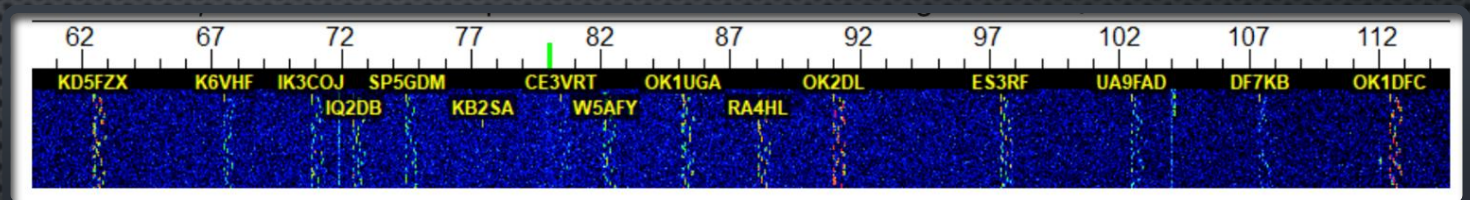
RADIO UPGRADE(S)

- MIGRATE FROM FLEX-1500 (12-BIT) TO FLEX 6XXX (16-BIT) PLATFORM FOR ALL STATIONS
- INCREASED DYNAMIC RANGE
- WIDER PANADAPTER BANDWIDTH
- ETHERNET VS USB 2.0 CONNECTION (INCREASED STABILITY)
- BETTER GUI
- EASIER CONTROL OF FREQUENCY AND AUDIO CONNECTIONS (CAT/DAX)
- MULTIPLE VFO/SLICES/RECEIVERS PER BAND
- MAP65 INTEGRATION



MAP65

- MASSIVE CHANGES TO MAP65 IN THE PAST 3 MONTHS. (N6NU)
- INTEGRATE MAP65 ON ALL BANDS
2M/1.25CM/70CM/33CM/23CM
/13CM/9CM/6CM/3CM (FLEX OR EXTERNAL SDR)
- MORE INFO = MORE POINTS



CHASE HARDER

- MORE EMAILS AND SKEDS WITH EU STATIONS WHO SHUT DOWN BEFORE I HAVE MOON.

AI INFLUENCE

- AI OPTIONS ARE LIMITLESS
- CONVENIENCE HACKS WITH CLAUDE CODE / CHAT GPT
- HOWEVER!
AI WILL NOT, NOT, NOT,
AUTOMATE/RUN MY STATION

> Improve the image quality of 1759609776673.png

• I'll help you improve the image quality. Let me first read the image to see what we're working with.

• **Read(1759609776673.png)**
└ Read image (372.7KB)

• I can see this is a screenshot of terminal output showing system diagnostics. The image appears to be of low resolution. To improve the image quality, I'll need to use Python with image processing libraries to let me create a script to upscale and enhance the image.

• **Bash(python3 -c "import PIL; print(PIL.__version__)")**
└ 11.3.0

• Great! Pillow is available. Let me create an image enhancement script.

• **Write(enhance_image.py)**
└ Wrote 61 lines to **enhance_image.py**
#!/usr/bin/env python3
"""
Image Enhancement Script
Improves image quality through upscaling and enhancement techniques
"""
from PIL import Image, ImageEnhance, ImageFilter
import sys
def enhance_image(input_path, output_path, scale_factor=2):
... +51 lines (ctrl+o to expand)

• **Bash(cd "/Users/lennyrachitsky/Downloads/Project 1" && python3 enhance_image.py)**
└ Loading image: 1759609776673.png
Original size: 952x1041
Upscaling to: 1904x2082
... +7 lines (ctrl+o to expand)

• Perfect! I've successfully enhanced the image. Here's what was done:

Improvements applied:

- **Upscaled 2x:** From 952x1041 to 1904x2082 pixels using high-quality LANCZOS resampling
- **Sharpness enhancement:** Applied sharpening filter to improve text clarity
- **Contrast boost:** Slightly enhanced contrast (10% increase)
- **Color enhancement:** Minor color saturation improvement (5% increase)

The enhanced image has been saved as **1759609776673_enhanced.png** in the same directory. The new image is:

- 4x larger in total pixels
- Sharper and clearer text
- Better overall visual quality

You can find the enhanced image at: /Users/lennyrachitsky/Downloads/Project 1/1759609776673_enhanced.png

RECAP

- WORK FAST AND EFFICIENT
- KEEP PUSHING TECHNOLOGY BOUNDARIES
- DON'T LISTEN TO INTERNET EXPERTS AS GOSPEL
- EXPERIMENT AND REMOVE SENTIMENTAL 'THINGS'
- KISS- MAKE SYSTEMS EASY TO REPAIR
- STANDARDIZE WHEN YOU CAN
- MAKE WHAT YOU HAVE WORK WHEN YOU CAN'T
- TRAIN YOUR BRAIN AND BODY TO DO HARD THINGS

International EME Contest

In recognition of achieving a winning score by working fellow amateurs around the world, using the moon as a passive reflector, on designated Amateur Radio frequencies above 50 MHz during the contest period.

This award is presented to

N1AV

Score: 11,923,200 (World Record)

Single Operator, All Mode, All Band

1st Place World

2025

Paul Arden KSUR

President, ARRL

Paul Boyer N1SFE

Contest Manager

EME



ARRL The national association for
AMATEUR RADIO™

