Improving your DX Chase:

Station optimization and automation

KI0KN
James Cizek

About me:

KI0KN

- First licensed in 1993
- Technical Chair: NCARC
- Director: RMHAM
- Treasurer: MHDXA
- 30+ years in IT @ CSU
- Favorite 2 areas of ham: DX'ing & SOTA

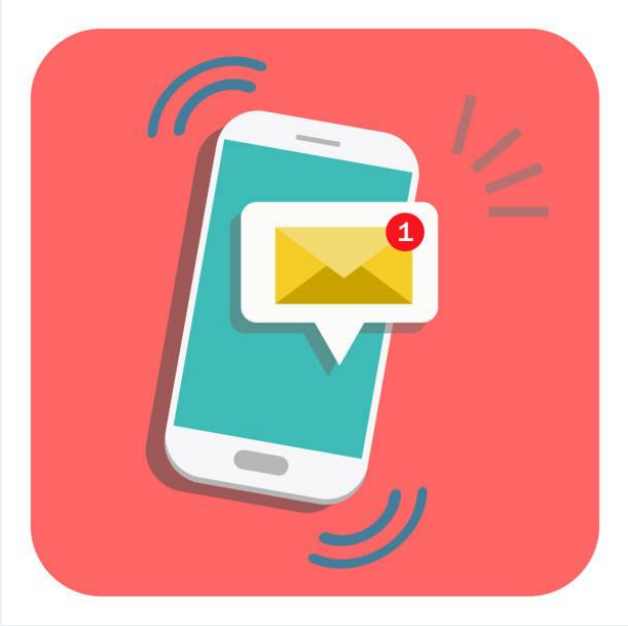
About my DX'ing:

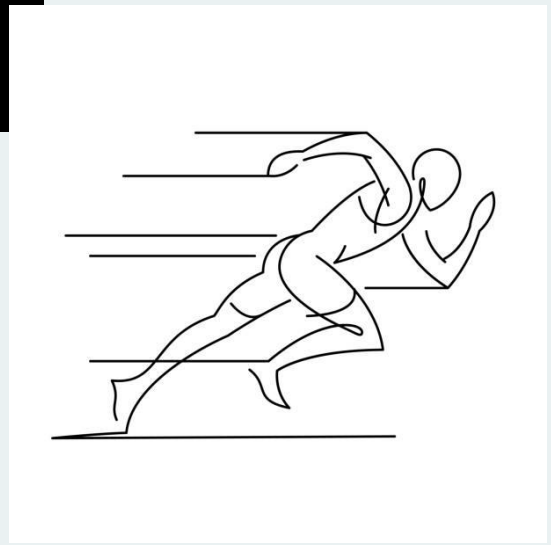
(As of Oct 2025)

KI0KN

Mixed	Phone	CW	DIGI	160M	80M	40M	30M	20M	17M	15M	12M	10M	6M	2M	Challenge
worked	291	206	193	241	73	109	155	119	213	151	190	117	156	2	1285
confirmed	286	200	186	225	69	105	147	114	202	132	182	108	152	2	1213
verified	286	200	186	224	67	103	146	112	201	132	182	107	150	2	1202

The (twisted?) art of DX’ing





Why do we have to be quick?

- Grayline
- QSB
- Never know when QSY/QRT
- Spot propagation
- DX “Checking prop” on a new band

Building an efficient station (Goals)

- Extremely low noise
  - Special attention given to Common Mode
- Flexible receiving options
  - Vertical / Horizontal
  - Incoming angle
  - Diversity receive
- Flexible transmitting options
- 3:00am “Idiot proof”!
  - Can’t transmit into out-of-band antenna
  - Can’t transmit into second radio
  - Can’t transmit into receive only antenna

Building an efficient station (Goals)

- Instant QSY between bands / band areas
- No tuning needed band edge – to band edge
- No amplifier warm up
- Station equipment “follows” you
  - Amp band switches
  - Antennas switch
  - Band pass filters switch
  - Rotors auto-selected
  - Input interface auto-switches (Mic, Key, Computer)

Station Optimization

Keeping everything resonant
(and ready to go at 50 ohms!!)

The “no-tune” station

For each band 6-160M:

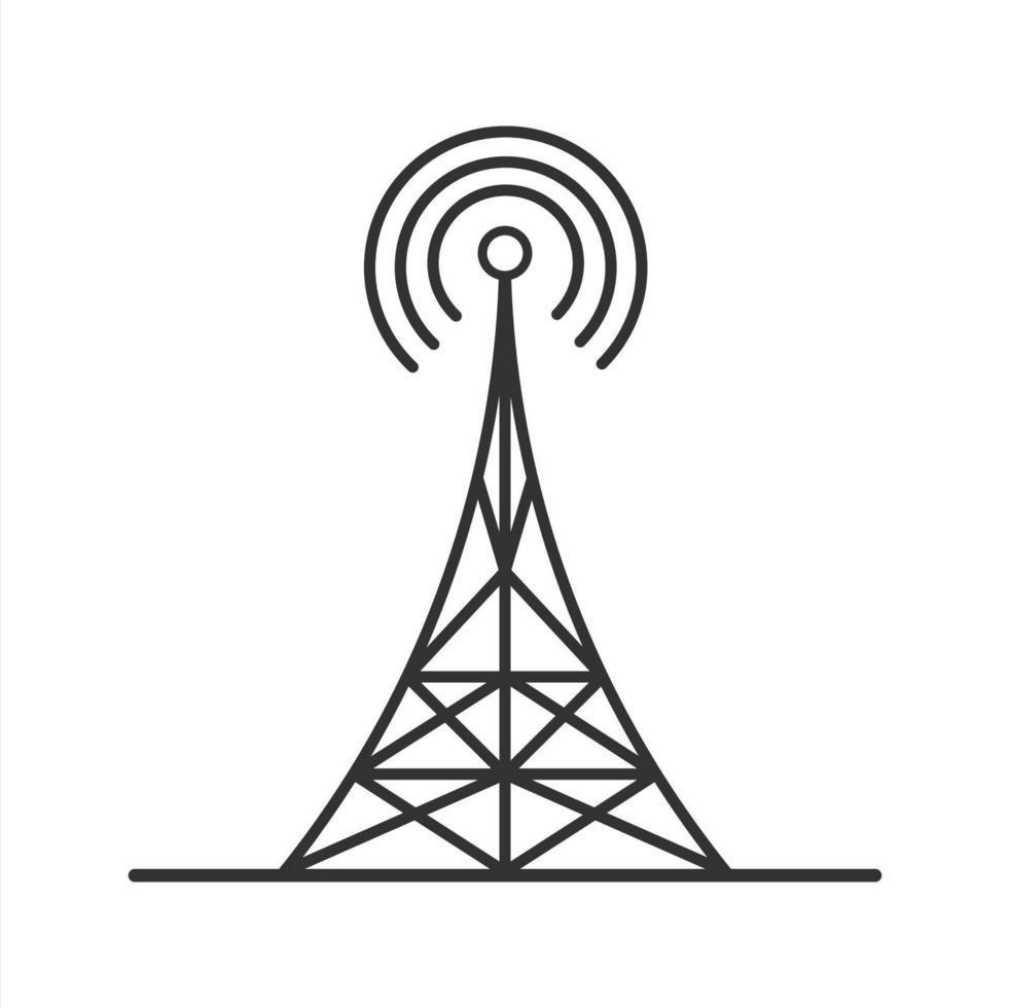
- Antenna must be natively resonant and wide banded enough to require no tuning edge-to-edge (less than 2:1 SWR)
- -Or-
- Antenna must be adjustable in some fashion (quickly) to move its resonance within the band.

6 Meters – 40 Meters

6 Meters – 40 Meters

6 Meters – 40 Meters

60 Meters and Below? New challenges….



Physical limits impose a greater challenge on building “full size” antennas (1/4 wave or larger) as the wavelength increases.

Ex: 160 Meter quarter wave = ~132 ft

Below 30 Meters? New challenges….

Short antennas

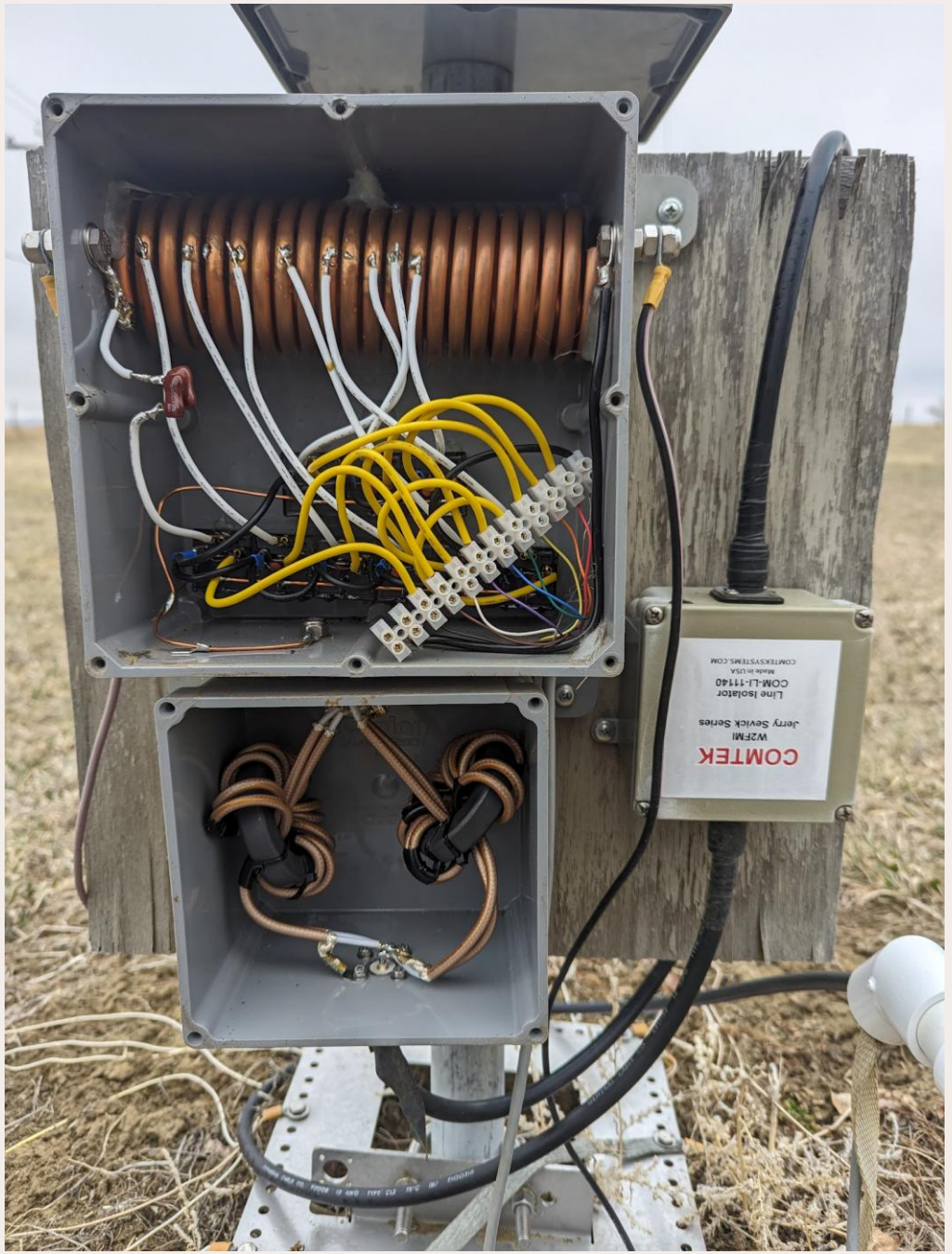
=

Limited bandwidth

How do you make short antennas wide-banded?

Adjustable resonance

Adjustable resonance



Sidetrack: Building for efficiency

Resonant frequency ≠ Best SWR

Sidetrack: Building for efficiency

KI0KN 160 Meter antenna:

Resonance: 1.845 Mhz @ 12.5 Ohm

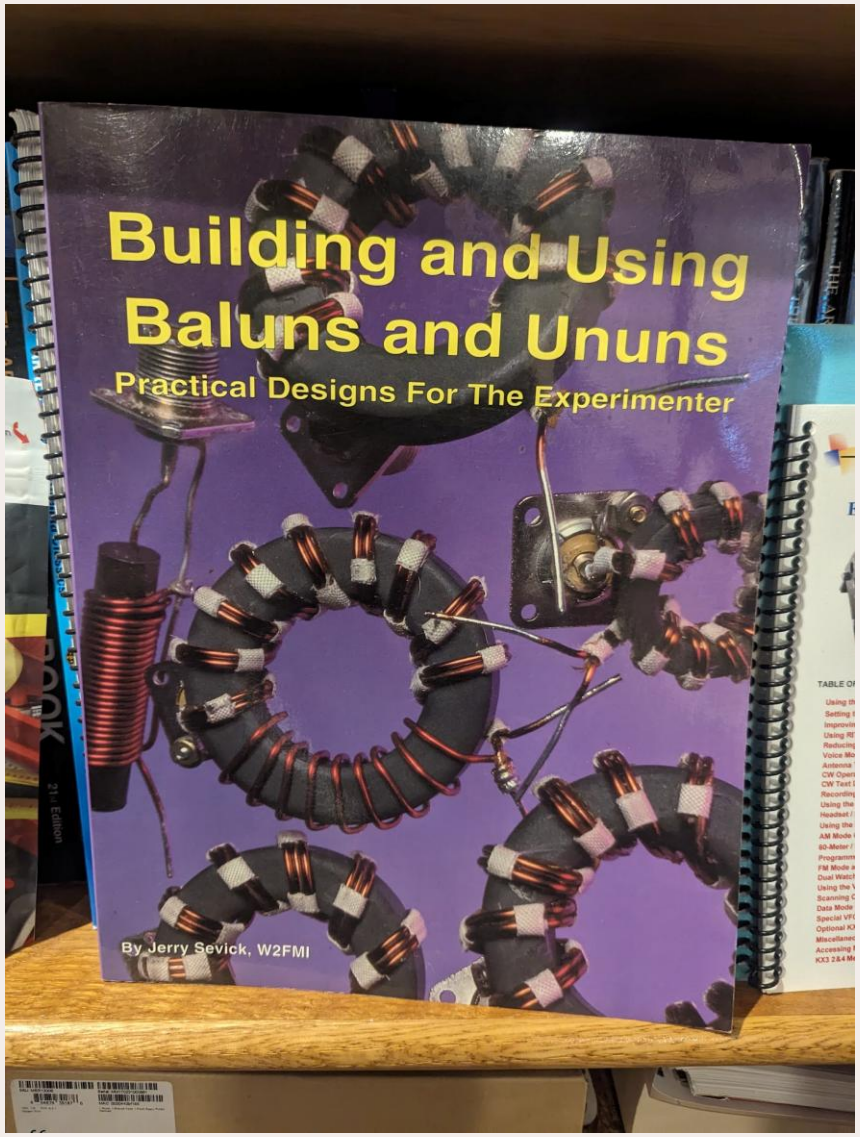
SWR (50 Ohm) @ 1.845 Mhz ~4:1

Sidetrack: Building for efficiency

1:4 “Current” UN-UN

*Located @ antenna, keeps feedline impedance at 50 ohms

Sidetrack: Building for efficiency



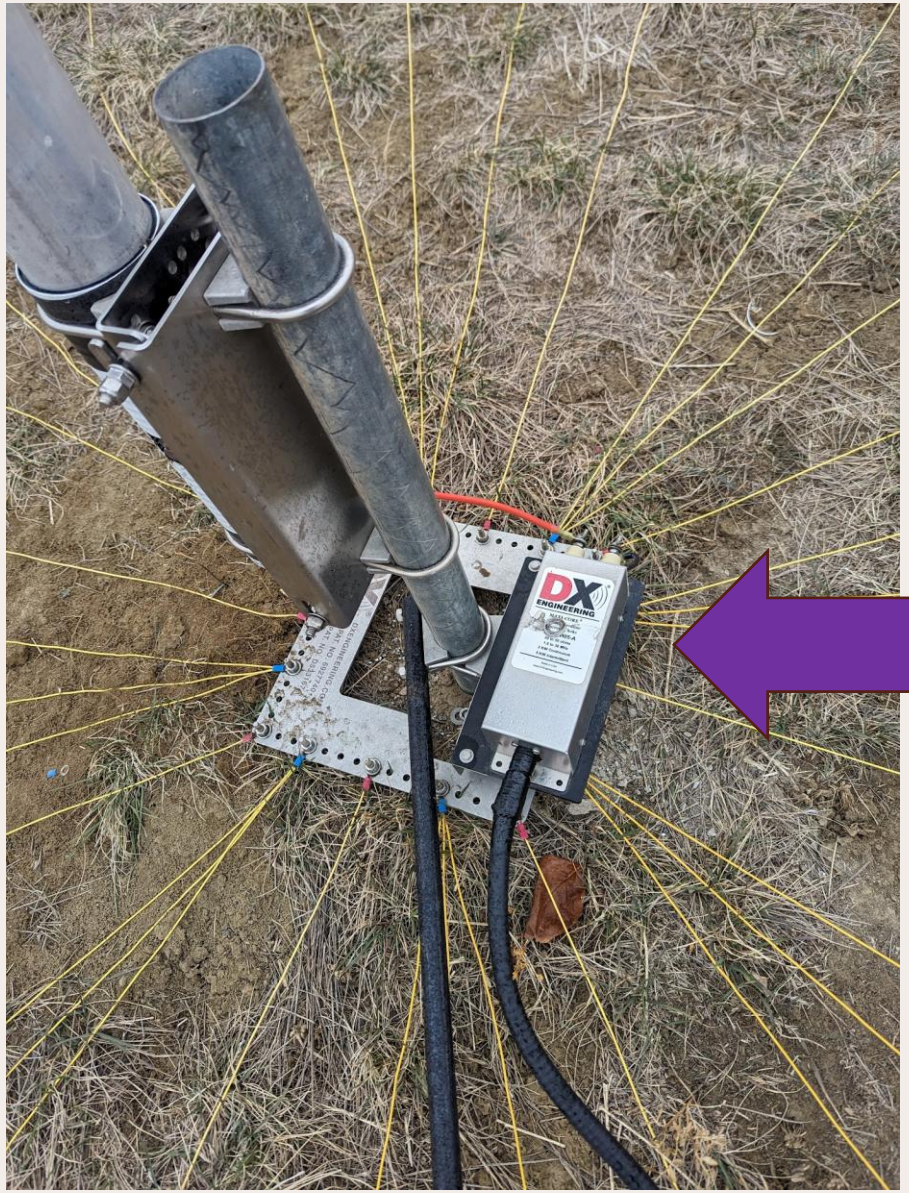
Station Optimization

Common mode. Keep the RF where it belongs!

Keeping common-mode currents at bay

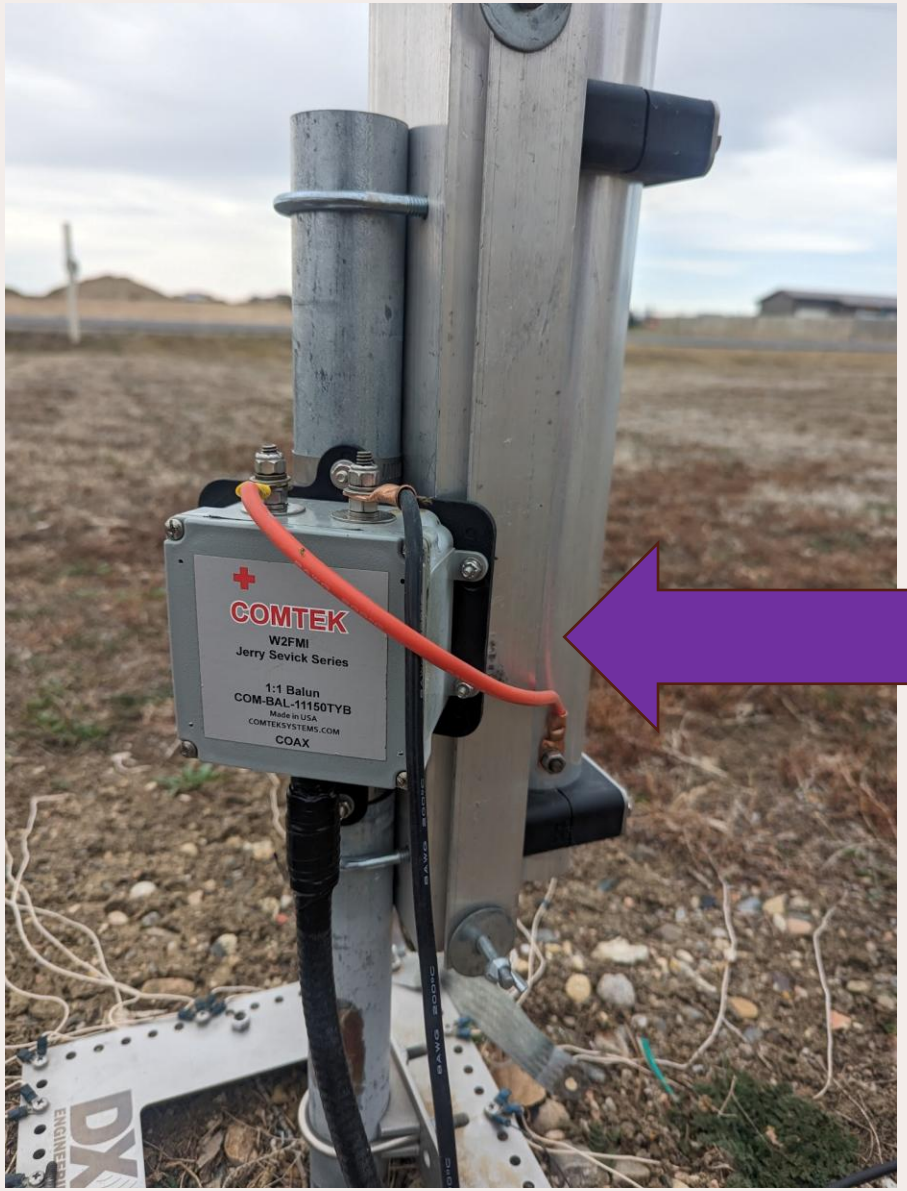
1:1 Choke
(Common Mode)

Keeping common-mode currents at bay



1:1 Choke
(Common Mode)

Keeping common-mode currents at bay



1:1 Choke
(Common Mode)

Keeping common-mode currents at bay

1:1 Choke
(Common Mode)

Keeping common-mode currents at bay

Feedlines run Underground!

Keeping common-mode currents at bay

Station Optimization

NOISE!!!!

Keeping noise minimized

LDF4-50A Heliax Feedlines

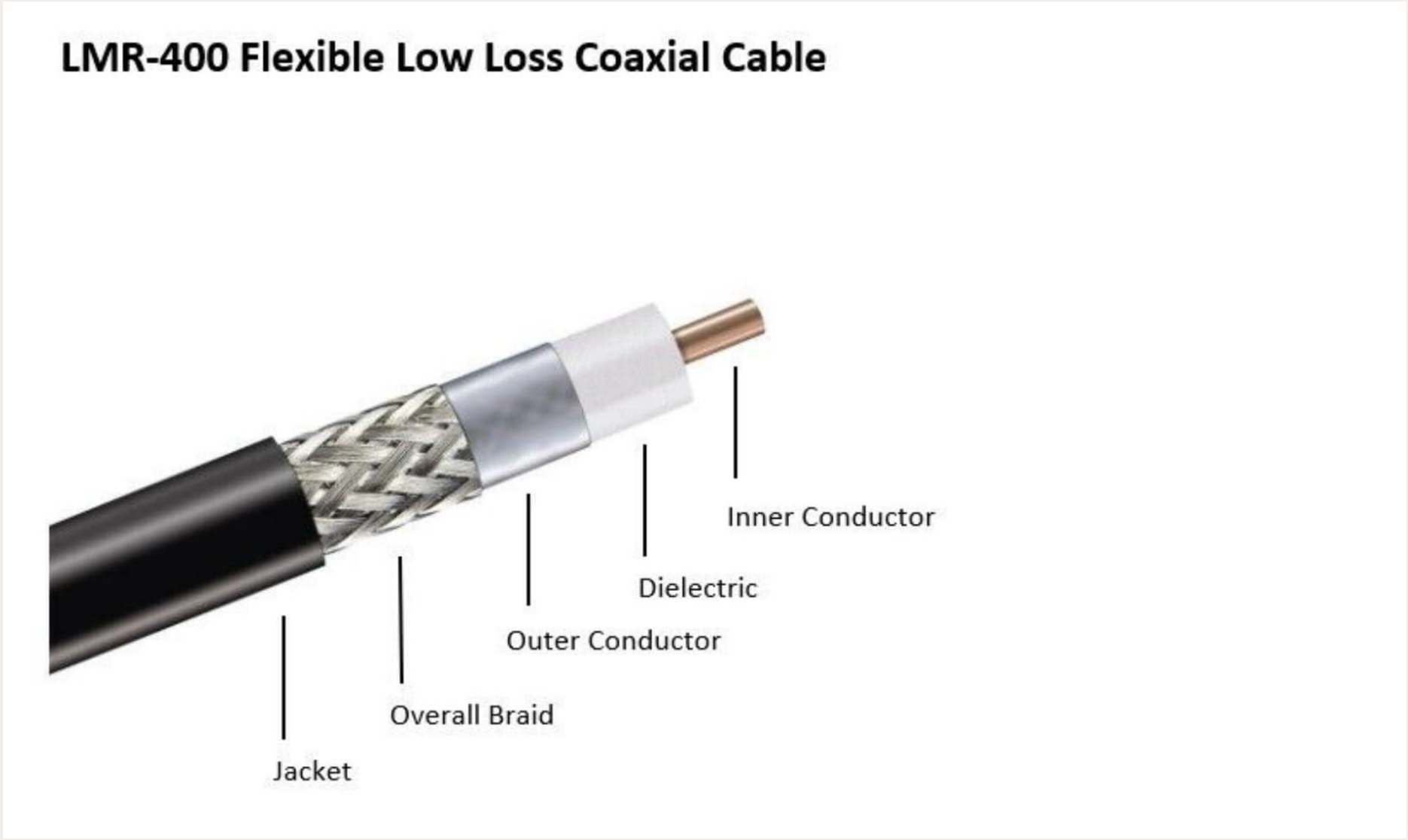
Keeping noise minimized

LDF Heliax Feedlines

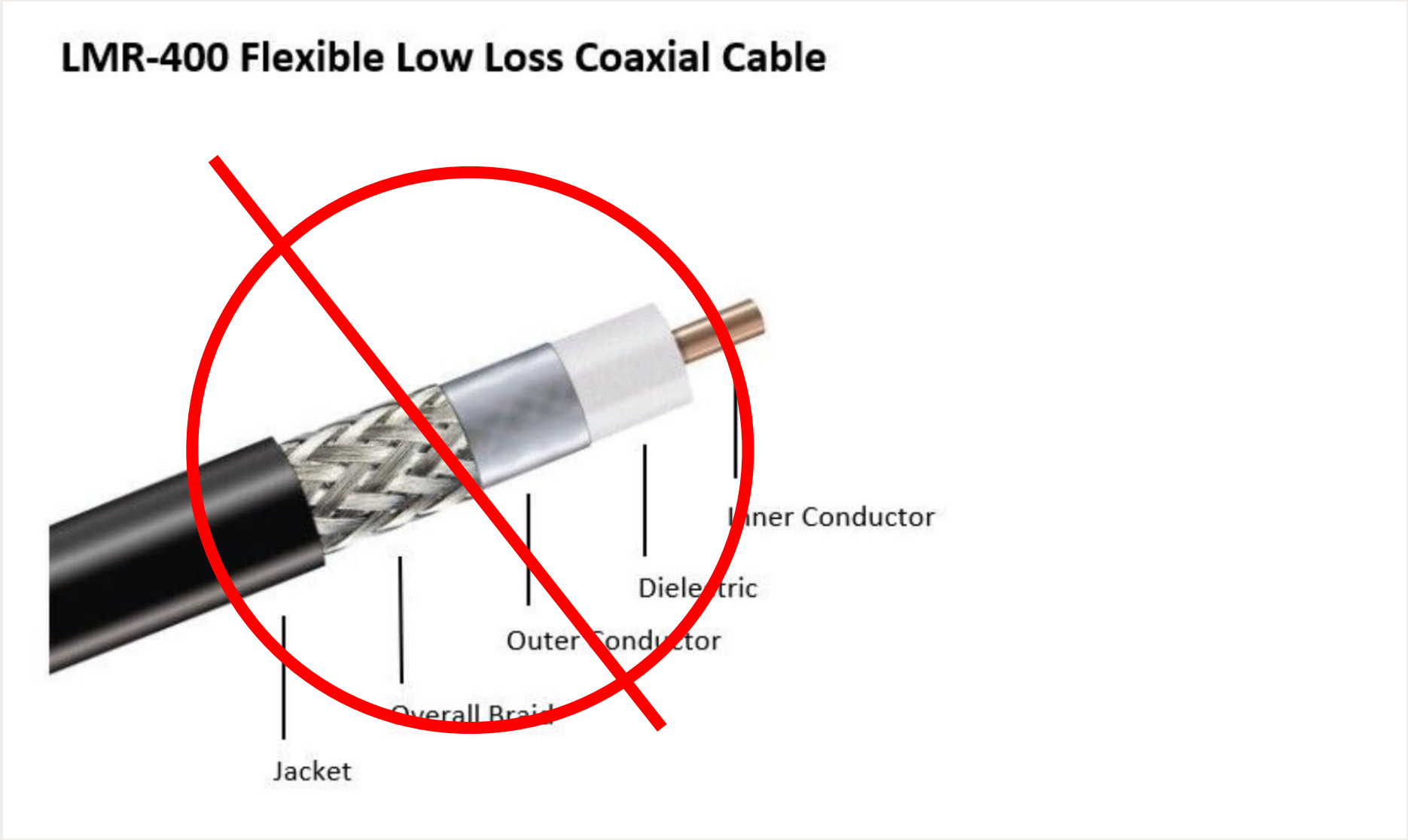
100% shield coverage

<100% shield coverage

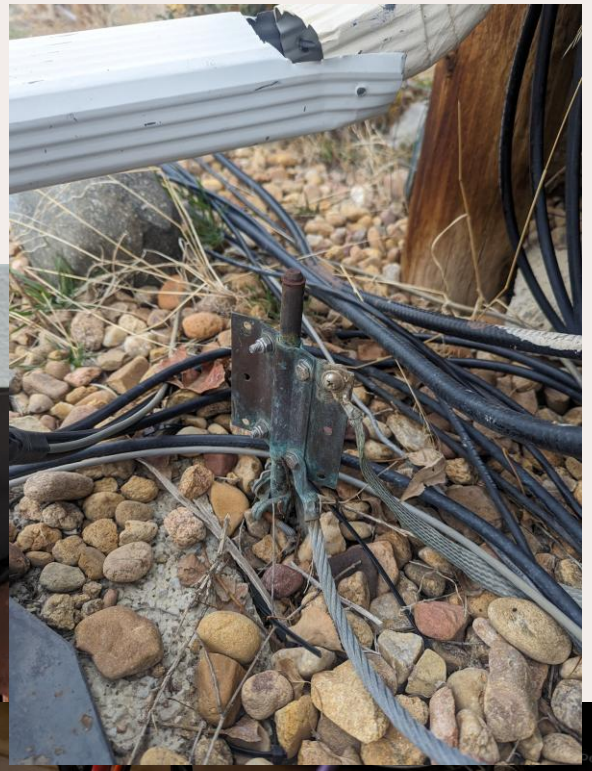
Keeping noise minimized

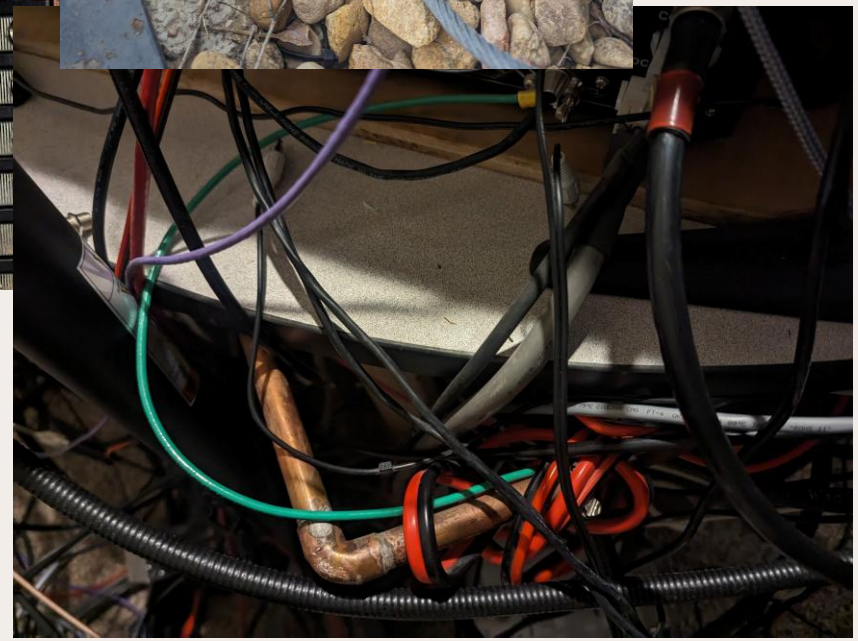


Keeping noise minimized



Keeping noise minimized





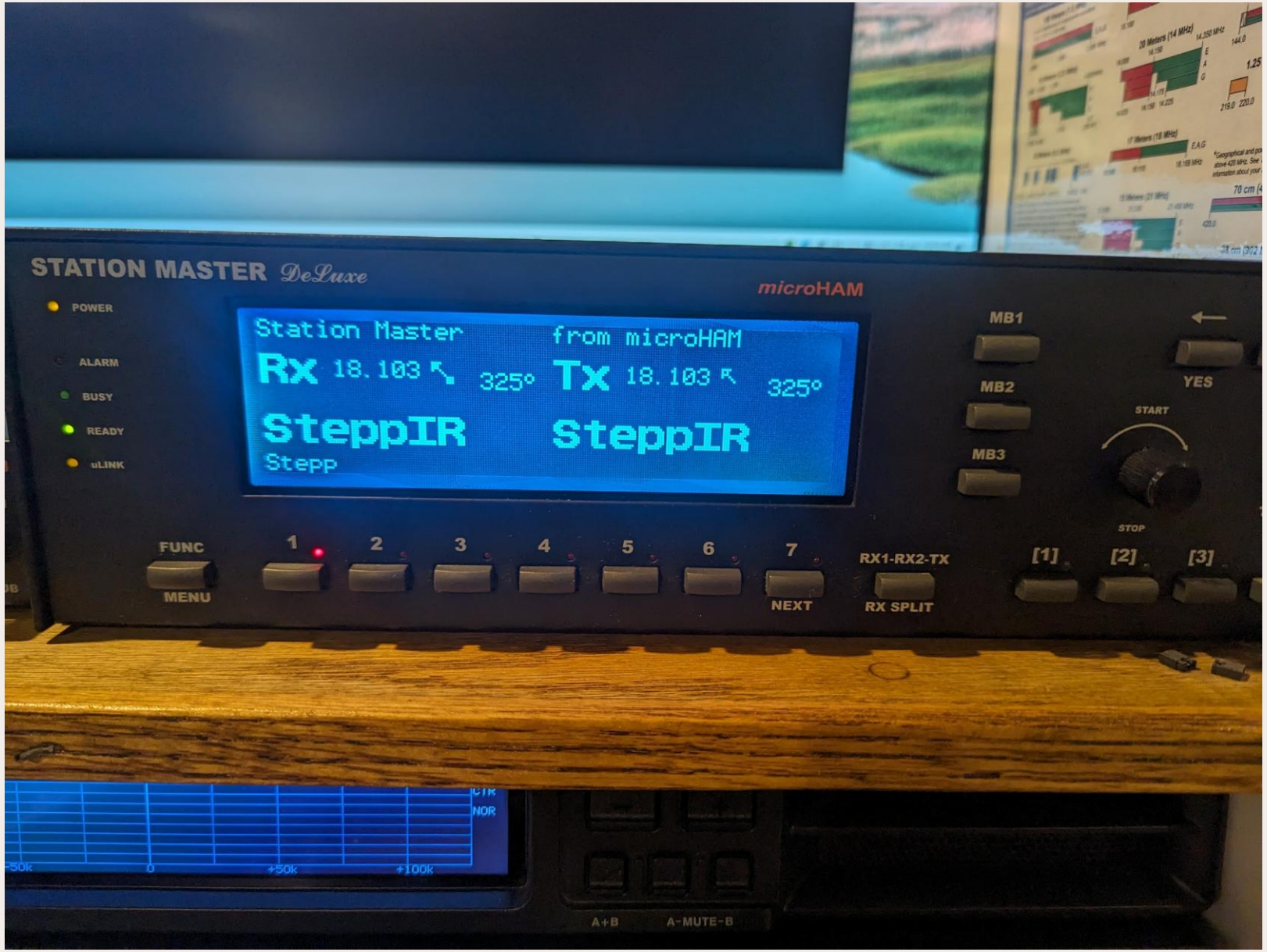
Keeping noise minimized

Station Optimization

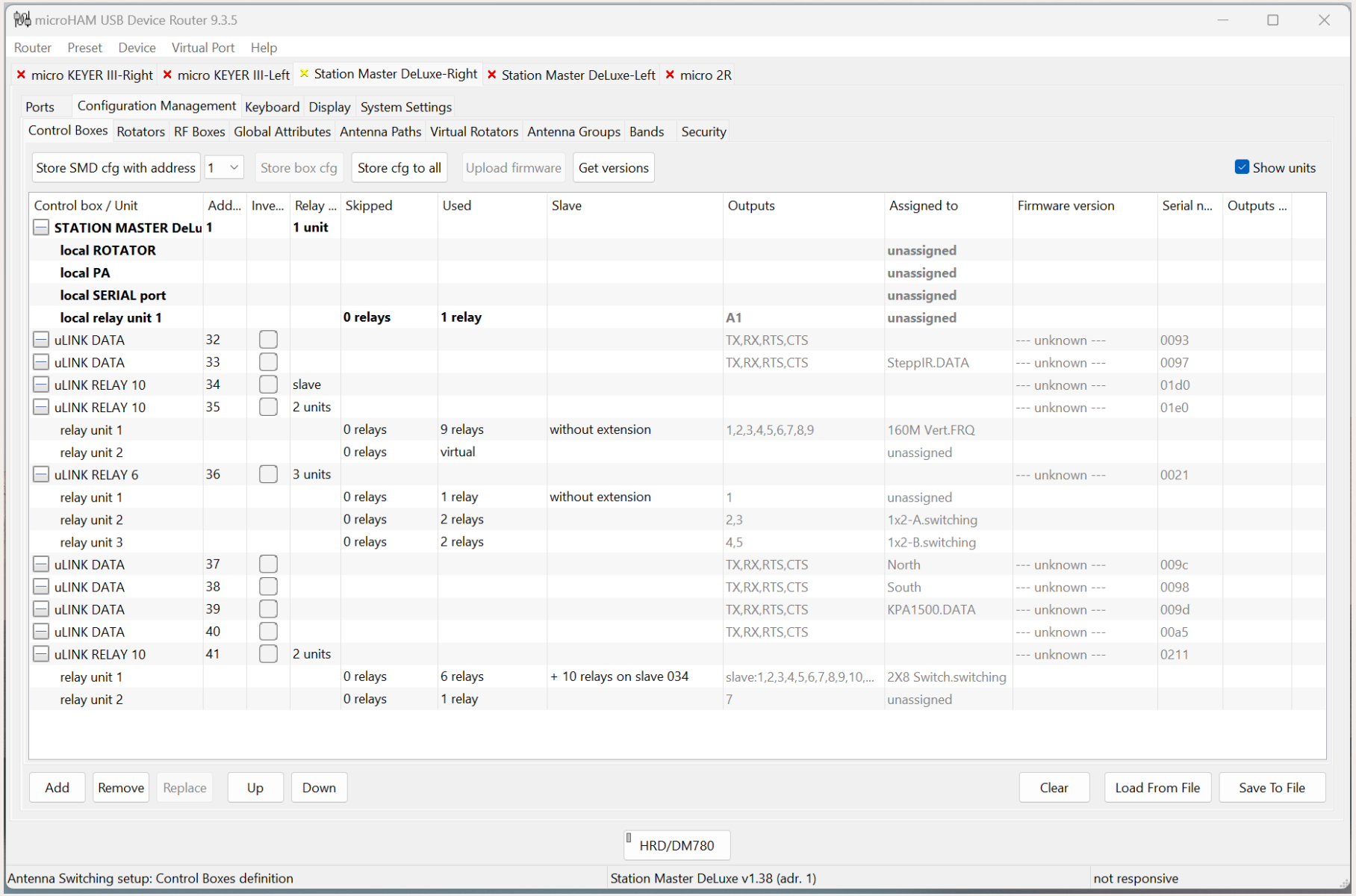
Automation: Putting it all together

Automation: The hamshack

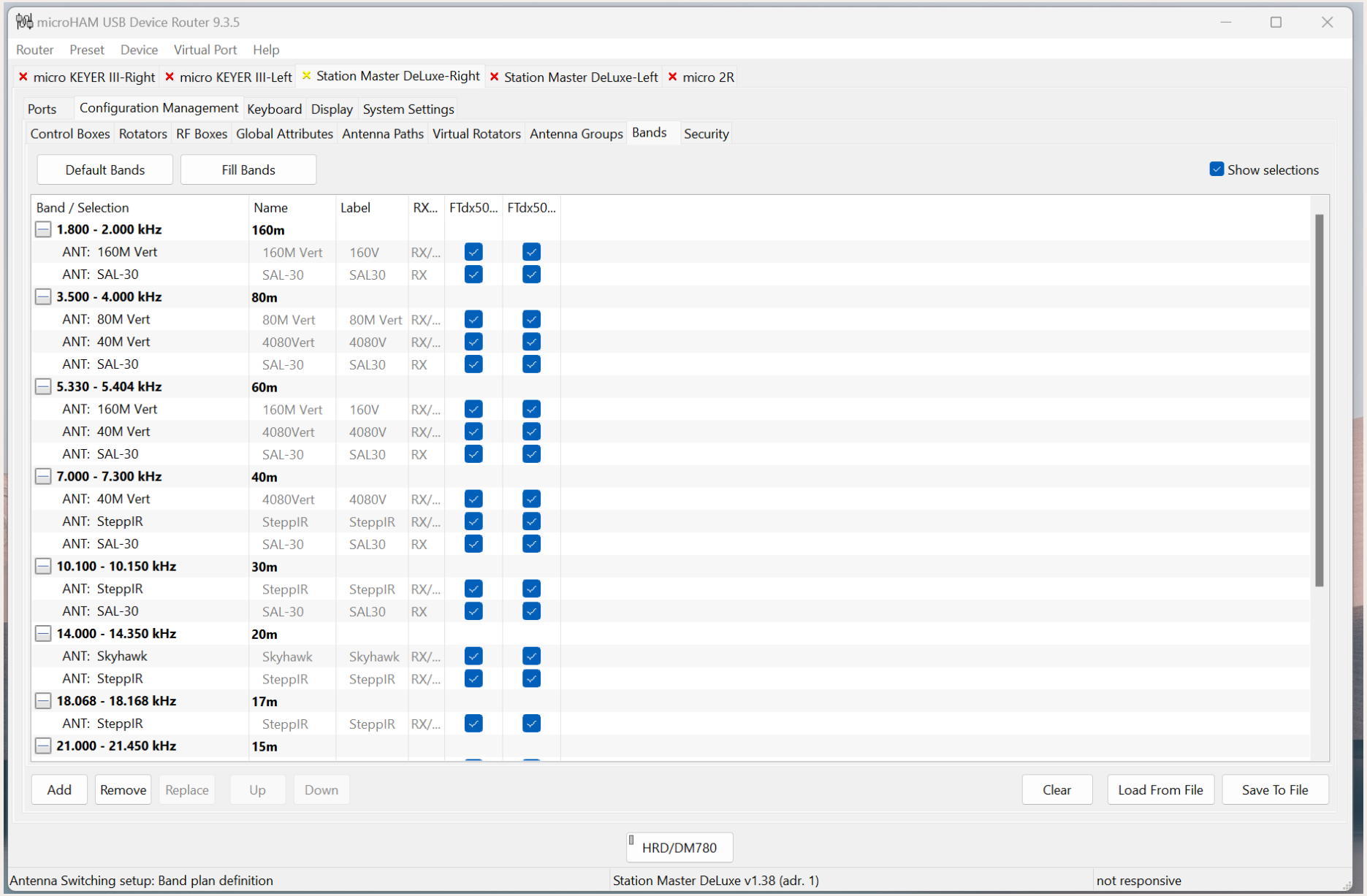
Automation


STATION MASTER DeLuxe
microHAM
POWER
ALARM
BUSY
READY
uLINK
Station Master from microHAM
Rx 18.103 325°
Tx 18.103 325°
SteppIR SteppIR
Stepp
MB1
MB2
MB3
YES
START
STOP
FUNC
MENU
1
2
3
4
5
6
7
NEXT
RX1-RX2-TX
RX SPLIT
[1]
[2]
[3]
A+B
A-MUTE-B

Automation


microHAM USB Device Router 9.3.5
Router Preset Device Virtual Port Help
micro KEYER III-Right
micro KEYER III-Left
Station Master DeLuxe-Right
Station Master DeLuxe-Left
micro 2R
Ports
Configuration Management
Keyboard
Display
System Settings
Control Boxes
Rotators
RF Boxes
Global Attributes
Antenna Paths
Virtual Rotators
Antenna Groups
Bands
Security
Store SMD cfg with address
1
Store box cfg
Store cfg to all
Upload firmware
Get versions
Show units
Control box / Unit
Add...
Inve...
Relay ...
Skipped
Used
Slave
Outputs
Assigned to
Firmware version
Serial n...
Outputs ...
STATION MASTER DeLu 1 1 unit
local ROTATOR unassigned
local PA unassigned
local SERIAL port unassigned
local relay unit 1 0 relays 1 relay A1 unassigned
uLINK DATA 32 TX,RX,RTS,CTS --- unknown --- 0093
uLINK DATA 33 TX,RX,RTS,CTS SteppIR.DATA --- unknown --- 0097
uLINK RELAY 10 34 slave --- unknown --- 01d0
uLINK RELAY 10 35 2 units --- unknown --- 01e0
relay unit 1 0 relays 9 relays without extension 1,2,3,4,5,6,7,8,9 160M Vert.FRQ
relay unit 2 0 relays virtual unassigned
uLINK RELAY 6 36 3 units --- unknown --- 0021
relay unit 1 0 relays 1 relay without extension 1 unassigned
relay unit 2 0 relays 2 relays 2,3 1x2-A.switching
relay unit 3 0 relays 2 relays 4,5 1x2-B.switching
uLINK DATA 37 TX,RX,RTS,CTS North --- unknown --- 009c
uLINK DATA 38 TX,RX,RTS,CTS South --- unknown --- 0098
uLINK DATA 39 TX,RX,RTS,CTS KPA1500.DATA --- unknown --- 009d
uLINK DATA 40 TX,RX,RTS,CTS --- unknown --- 00a5
uLINK RELAY 10 41 2 units --- unknown --- 0211
relay unit 1 0 relays 6 relays + 10 relays on slave 034 slave:1,2,3,4,5,6,7,8,9,10,... 2X8 Switch.switching
relay unit 2 0 relays 1 relay 7 unassigned
Add
Remove
Replace
Up
Down
Clear
Load From File
Save To File
HRD/DM780
Antenna Switching setup: Control Boxes definition
Station Master DeLuxe v1.38 (adr. 1)
not responsive

Automation


microHAM USB Device Router 9.3.5
Router Preset Device Virtual Port Help
micro KEYER III-Right
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Station Master DeLuxe-Right
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micro 2R
Ports
Configuration Management
Keyboard
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System Settings
Control Boxes
Rotators
RF Boxes
Global Attributes
Antenna Paths
Virtual Rotators
Antenna Groups
Bands
Security
Default Bands
Fill Bands
Show selections
Band / Selection
Name
Label
RX...
FTdx50...
FTdx50...
1.800 - 2.000 kHz
160m
ANT: 160M Vert
160M Vert
160V
RX/...
ANT: SAL-30
SAL-30
SAL30
RX
3.500 - 4.000 kHz
80m
ANT: 80M Vert
80M Vert
80M Vert
RX/...
ANT: 40M Vert
4080Vert
4080V
RX/...
ANT: SAL-30
SAL-30
SAL30
RX
5.330 - 5.404 kHz
60m
ANT: 160M Vert
160M Vert
160V
RX/...
ANT: 40M Vert
4080Vert
4080V
RX/...
ANT: SAL-30
SAL-30
SAL30
RX
7.000 - 7.300 kHz
40m
ANT: 40M Vert
4080Vert
4080V
RX/...
ANT: SteppIR
SteppIR
SteppIR
RX/...
ANT: SAL-30
SAL-30
SAL30
RX
10.100 - 10.150 kHz
30m
ANT: SteppIR
SteppIR
SteppIR
RX/...
ANT: SAL-30
SAL-30
SAL30
RX
14.000 - 14.350 kHz
20m
ANT: Skyhawk
Skyhawk
Skyhawk
RX/...
ANT: SteppIR
SteppIR
SteppIR
RX/...
18.068 - 18.168 kHz
17m
ANT: SteppIR
SteppIR
SteppIR
RX/...
21.000 - 21.450 kHz
15m
Add
Remove
Replace
Up
Down
Clear
Load From File
Save To File
HRD/DM780
Antenna Switching setup: Band plan definition
Station Master DeLuxe v1.38 (adr. 1)
not responsive

Automation

Keyer / audio card handles audio/key inputs / outputs

Automation


micro KEYER III
KI0KN
Loveland, CO
STATION MASTER DeLuxe
Station Master
from microHAM
Rx 1.836
Tx 1.836
SAL-30
160M Vert
SteppIR
Pattern = Normal
20.2 dB
13.6 dBi
28.000 MHz
OptimizIR 2 Controller
YAESU
FTDX101D
1.836.600
1.836.000

Automation


micro KEYER III
KI0KN
Loveland, CO
STATION MASTER DeLuxe
Station Master from microHAM
Rx 14.136 227° Tx 14.136 227°
SteppIR SteppIR
Skyha Stepp Dummy NOANT
micro KEYER III
WPM: 28 POT: 28
Loveland, CO
STATION MASTER DeLuxe
Station Master from microHAM
Rx 28.085 0° Tx 28.085 0°
Skyhawk Skyhawk
Skyha Stepp Dummy NOANT
RigSelect PRO
14.136.600
14.090.000
28.085.060
28.050.000
ELECRAFT K4 TRANSCEIVER
ELECRAFT K4 TRANSCEIVER

Automation


LP-700
Digital Station Monitor
Power / SWR Meter
Waveform Monitor
Spectrum Display
KI0KN
Mode
CH 2
Rng Auto
AL Off
Peak Hld
Setup
ELECRAFT KPA1500 AMPLIFIER
YAESU
VL-1000

Automation


RigSelect PRO
Radio 1
WinKeyer Enabled
Normal Audio
RIG 1
RIG 2
(Menu/Ent)
(Up/Dn)
RIG 3
RIG 4
(WK Cmd)
CW
PTT
PWR
CW SPEED
ON/OFF
POWER
XMTR
TUNE
XMIT
TUNE LP
TEST
ATU TUNE
VOX
ATU
QSK
ANT
RX ANT
REM ANT
SUB ANT
MON
FILTER
NORM
PHONES
USB
RF/SQL
MIC 15 CMP
PWR 81 DLY
BW 3.30 HI
SHFT 0.45 LO
M.RF 0 M.SQL
S.RF 0 S.SQL
12.1V 2.5A
14.136.600
A
DATA
TX
SPLIT OFF
B
DATA
MSG: 1
RIT XIT
+0.00
FL2
FL2
DR+
S1 3 5 7 9 +20 +40 +60
AGC-S NB PRE1 ANT1
ANT1
AGC-S NB PRE1
14.039
14.089.9
-100
-120

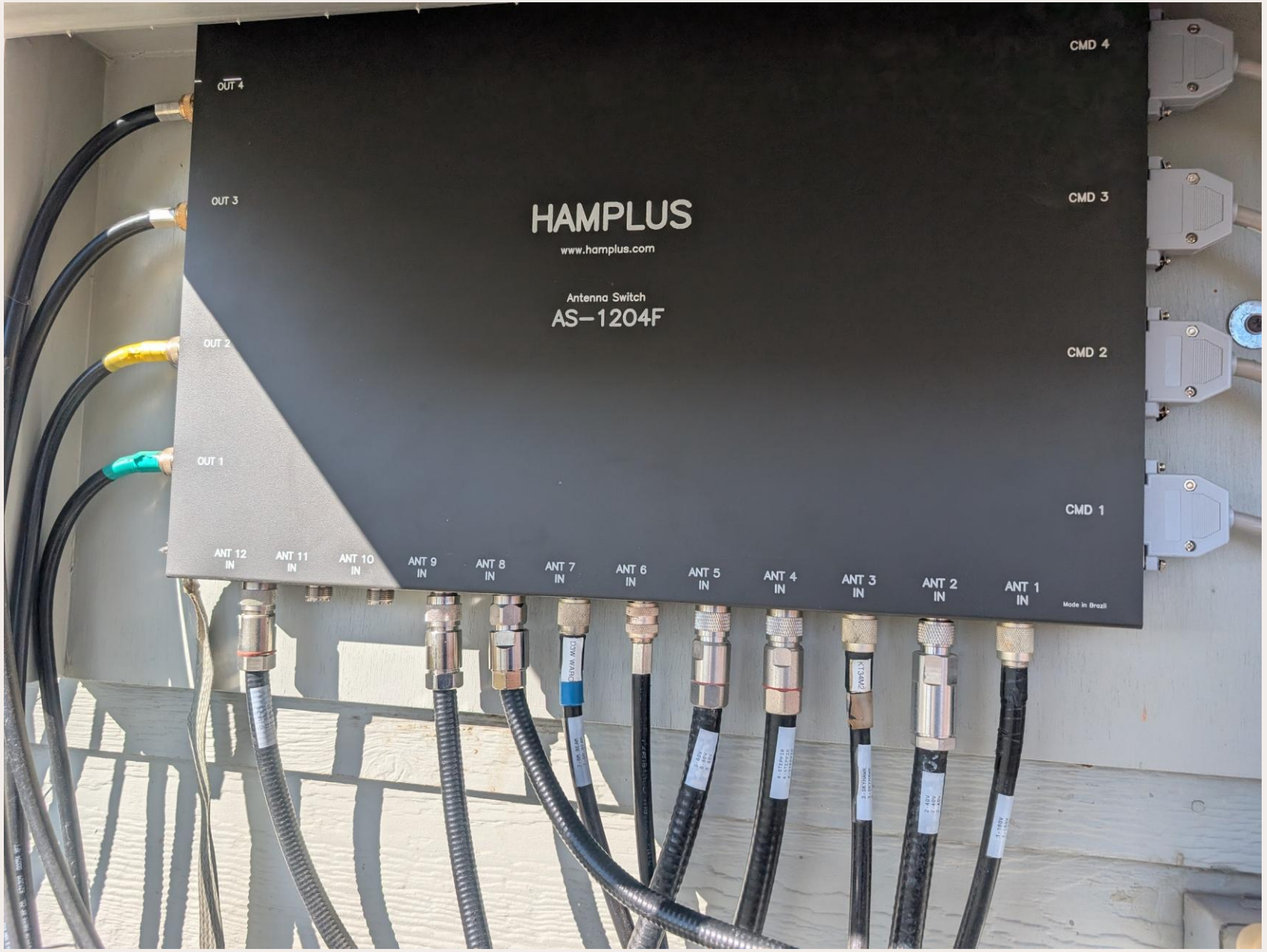
Automation


ARCO
microHAM
+02:32
325°
CCW CW
SteppIR
Motor PSU OFF.
SelfTest running...
SelfTest done.
BACK
NORTH 0°
Europe 30°
0°
0°
0°
0°
STOP
POWER
MOTOR
FAULT
POWER
Smart Antenna Rotator Controller
ARCO
microHAM

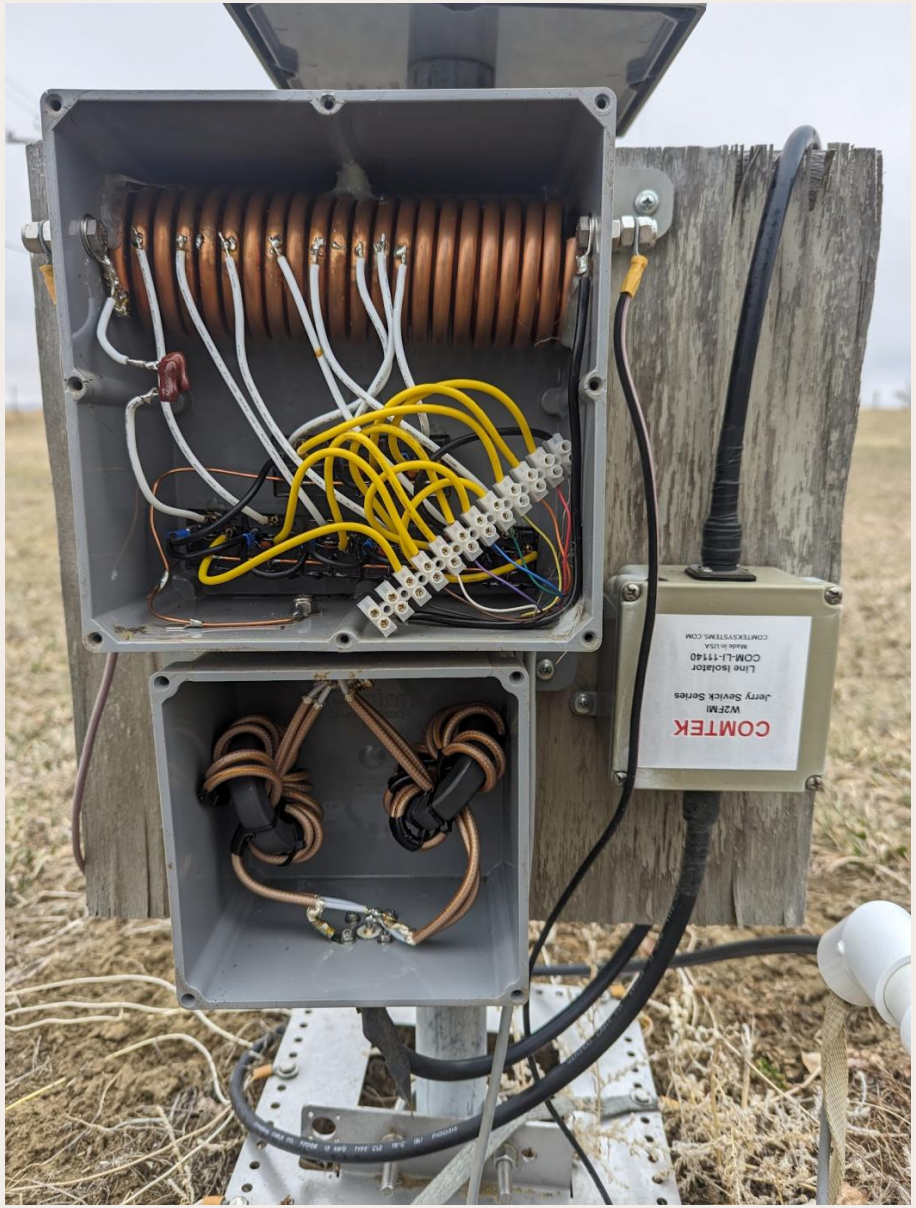
Automation


uLINK DATA microHAM
032
uLINK RELAY10 microHAM
034
035
uLINK DATA microHAM
033
uLINK RELAY10 microHAM
041
uLINK DATA microHAM
040
uLINK DATA microHAM
037
uLINK RELAY8 microHAM
036
uLINK DATA microHAM
039
uLINK DATA microHAM
038
uLINK HUB microHAM
SET

Automation

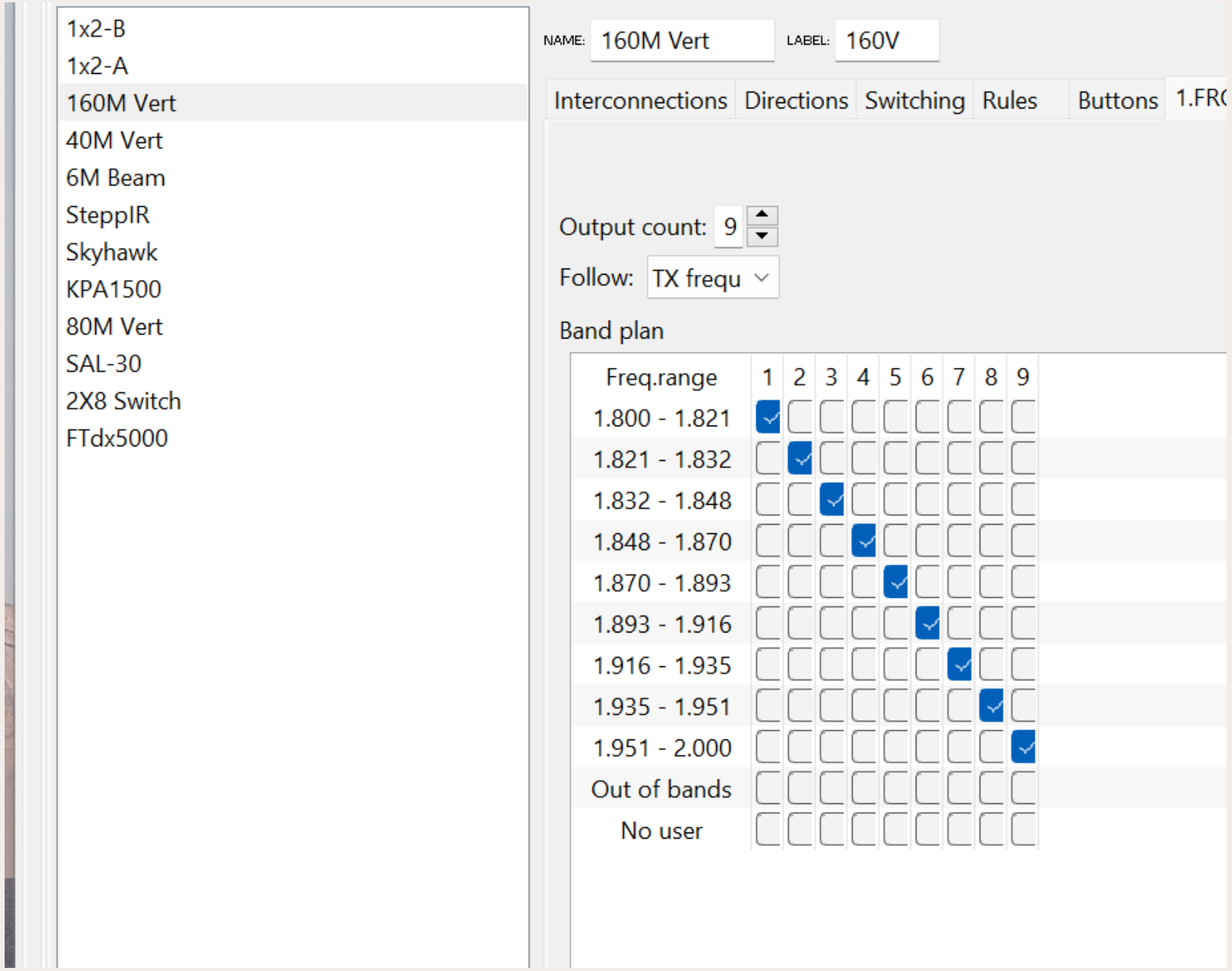

HAMPLUS
www.hamplus.com
Antenna Switch
AS–1204F
OUT 4
OUT 3
OUT 2
OUT 1
CMD 4
CMD 3
CMD 2
CMD 1
ANT 12 IN
ANT 11 IN
ANT 10 IN
ANT 9 IN
ANT 8 IN
ANT 7 IN
ANT 6 IN
ANT 5 IN
ANT 4 IN
ANT 3 IN
ANT 2 IN
ANT 1 IN
Made in Brazil

Automation

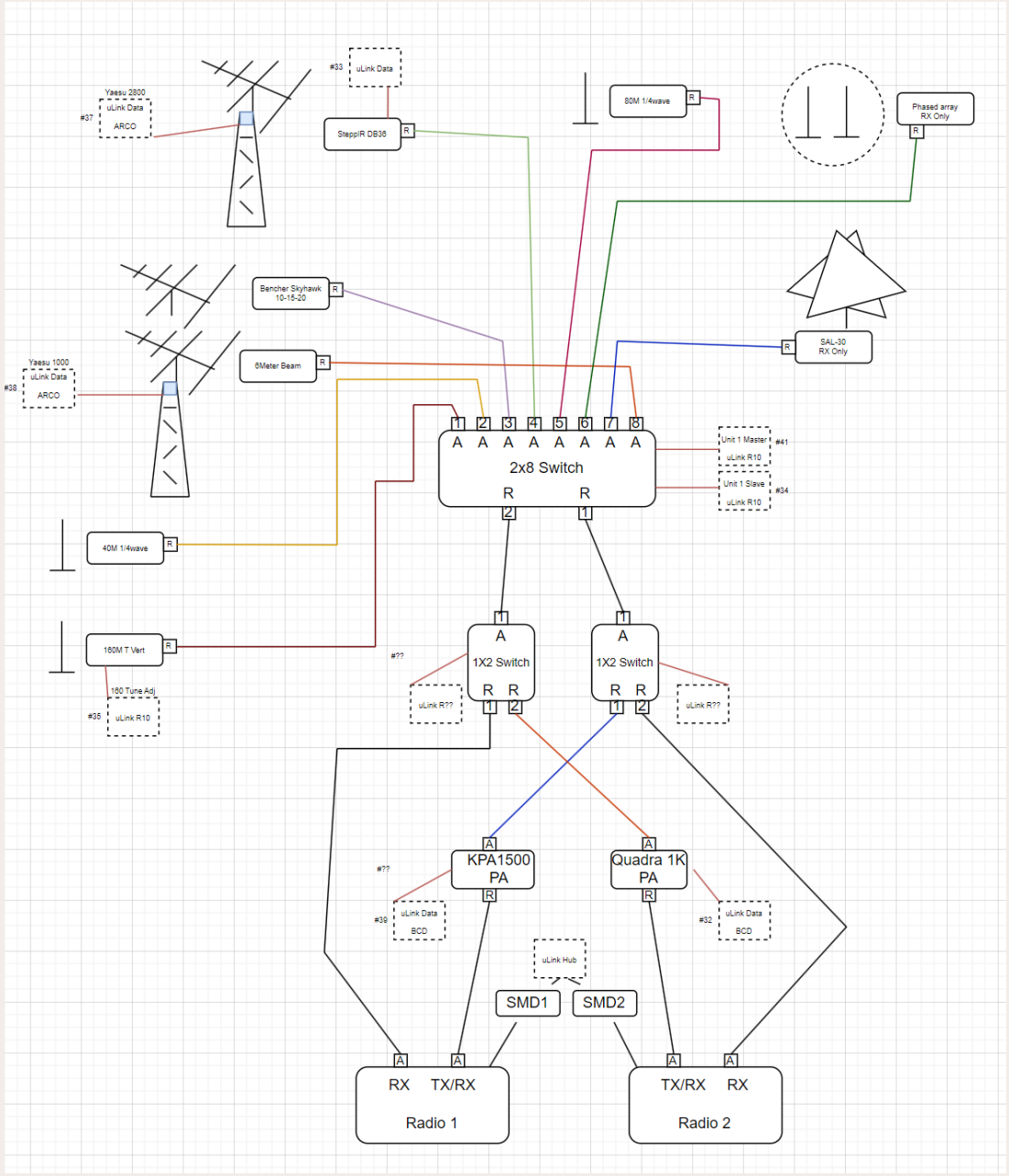

COMTEK
Jerry Sevick Series
W2FMI
Line Isolator
COM-LI-11140
Made in USA
COMTEKSYSTEMS.COM


uLINK DATA microHAM
032
uLINK RELAY10 microHAM
034
uLINK RELAY10 microHAM
035
uLINK DATA microHAM
033
uLINK RELAY10 microHAM
041
uLINK DATA microHAM
040
uLINK DATA microHAM
037
uLINK RELAY8 microHAM
036
uLINK DATA microHAM
039
uLINK DATA microHAM
038
SET

Automation


1x2-B
1x2-A
160M Vert
40M Vert
6M Beam
SteppIR
Skyhawk
KPA1500
80M Vert
SAL-30
2X8 Switch
FTdx5000
NAME: 160M Vert
LABEL: 160V
Interconnections
Directions
Switching
Rules
Buttons
1.FR(
Output count: 9
Follow: TX frequ
Band plan
Freq.range 1 2 3 4 5 6 7 8 9
1.800 - 1.821
1.821 - 1.832
1.832 - 1.848
1.848 - 1.870
1.870 - 1.893
1.893 - 1.916
1.916 - 1.935
1.935 - 1.951
1.951 - 2.000
Out of bands
No user

Automation


Yaesu 2800
uLink Data
#37
ARCO
#33
uLink Data
SteppIR DB36
80M 1/4wave
Phased array
RX Only
Bencher Skyhawk
10-15-20
6Meter Beam
SAL-30
RX Only
Yaesu 1000
uLink Data
#38
ARCO
2x8 Switch
Unit 1 Master
uLink R10
#41
Unit 1 Slave
uLink R10
#34
40M 1/4wave
160M T Vert
160 Tune Adj
#35
uLink R10
1X2 Switch
#??
uLink R??
1X2 Switch
uLink R??
KPA1500
PA
#??
uLink Data
BCD
#39
Quadra 1K
PA
uLink Data
BCD
#32
uLink Hub
SMD1
SMD2
RX
TX/RX
Radio 1
TX/RX
RX
Radio 2

Automation

The only “Manual” part of the station ☺

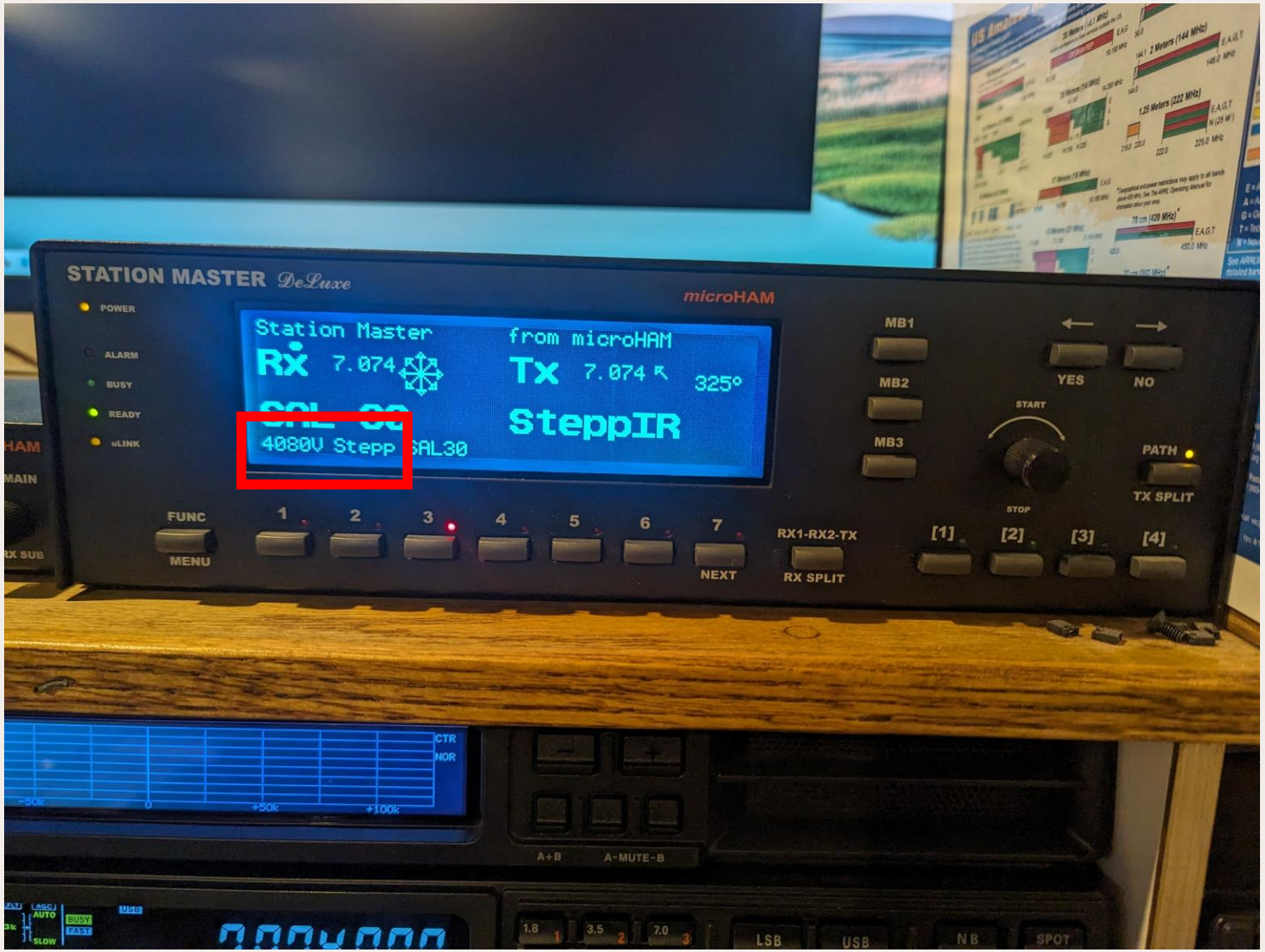
Station Optimization

Automation: Have multiple options available quickly

Automation

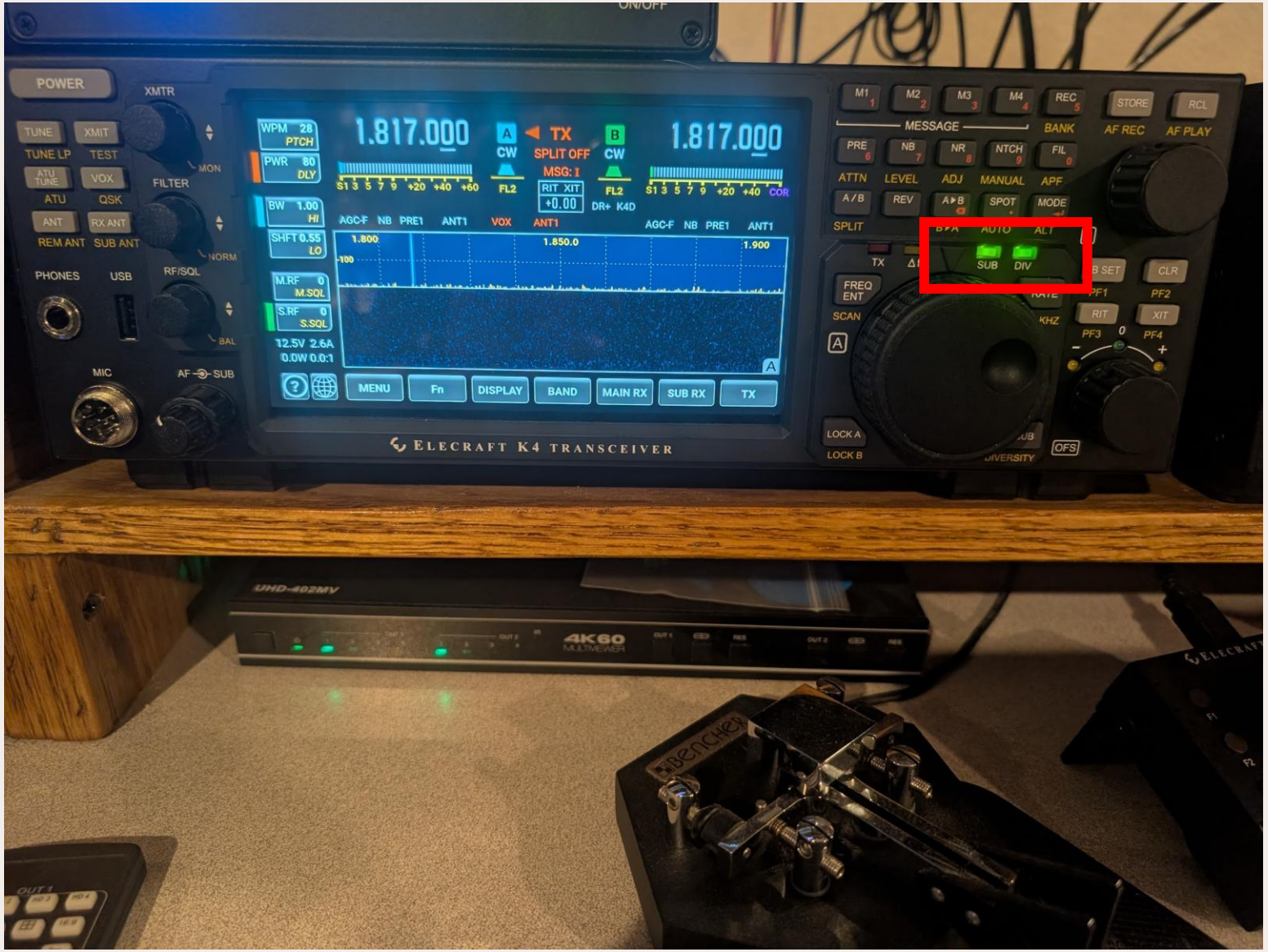
Multiple RX and TX antennas available

Automation



Multiple polarizations available (Horizontal / Vertical)

Automation



Multiple polarizations available (Horizontal / Vertical) - Diversity

Automation

Check Long Path &
Skew Path quickly!!

Automation

- Especially useful for FT8
  - Decode on both at same time, with same or different antennas

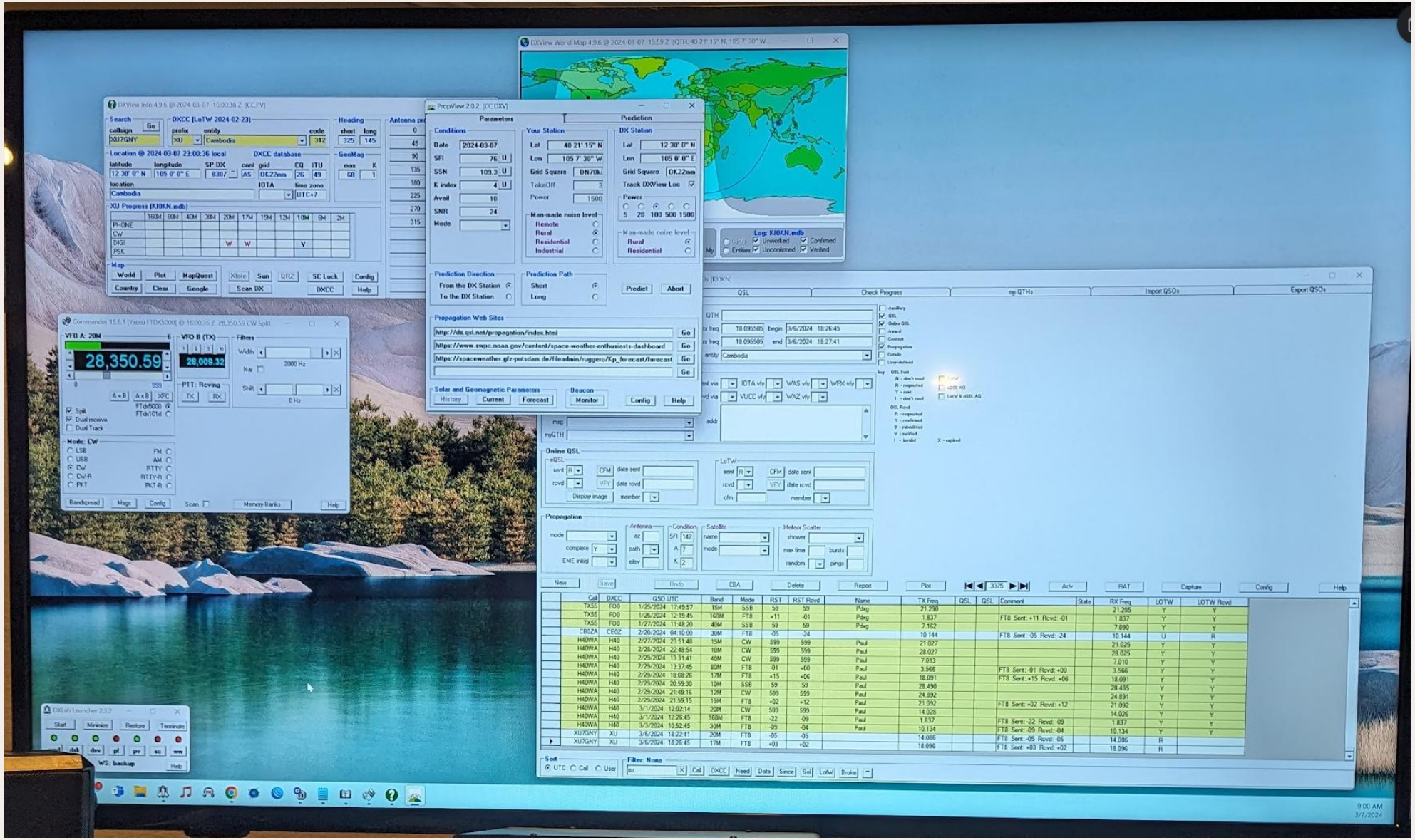
- Listen on 2 (or more) radios at the same time
  - Ground RX port on RX Radios while radio 1 transmitting

Yes! You can run 2 copies of WSJT-X with full automation and logging at same time!

Station Optimization

Automation: Quickly make changes

Automation



Automation

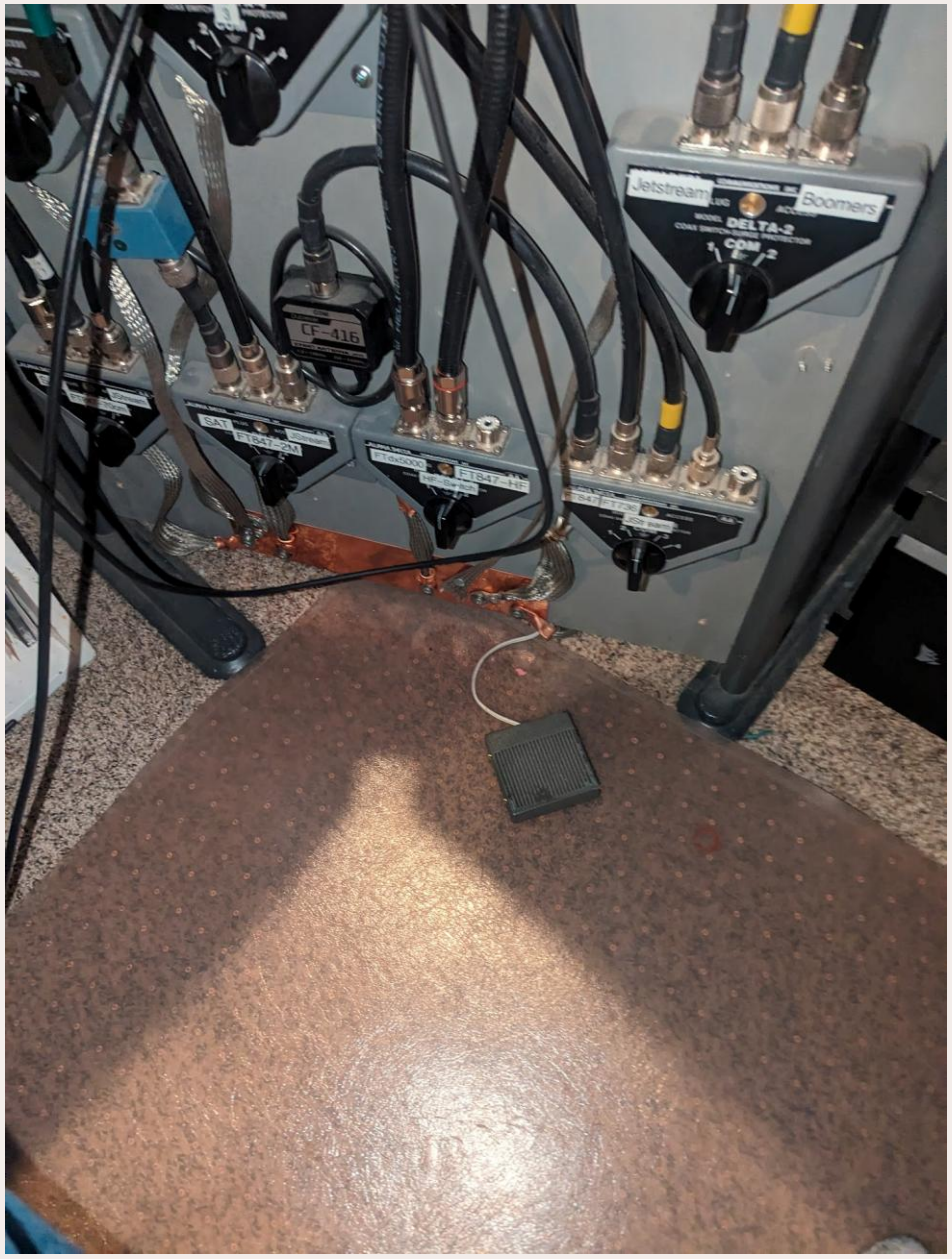

microHAM
u2R
PHONES
MIC
MIN
MAX
LATCH
MIX
LATCH MIX
RX
R1 BOTH R2
AUTO
R1
R2
RX
FOCUS
TX
R1 / R2
AUTO
R1
R2
TX
CW SPEED
MIN
MAX
CW
R1
R2
PTT
RADIO 1
MIN
MAX
FSK
RADIO 2
MIN
MAX
YAESU
HF/50MHz LINEAR AMPLIFIER
VL-1000
POWER
OPERATE
DIM
LOW
INPUT
ATT
ANT
DISPLAY
1
2
SELECT
TUNER — TUNE
F SET
CONTRAST

Automation


RigSelect PRO
Radio 1
WinKeyer Enabled
Normal Audio
RIG 1
RIG 2
(Menu/Ent)
(Up/Dn)
RIG 3
RIG 4
(WK Cmd)
CW
PTT
PWR
CW SPEED
ON/OFF
POWER
XMTR
TUNE
XMIT
TUNE LP
TEST
ATU TUNE
VOX
ATU
QSK
ANT
RX ANT
REM ANT
SUB ANT
MON
FILTER
NORM
PHONES
USB
RF/SQL
MIC 15 CMP
PWR 81 DLY
BW 3.30 HI
SHFT 0.45 LO
M.RF 0 M.SQL
S.RF 0 S.SQL
12.1V 2.5A
14.136.600
A
TX
B
DATA
SPLIT OFF
DATA
MSG: I
RIT XIT
+0.00
FL2
FL2
DR+
S1 3 5 7 9 +20 +40 +60
AGC-S NB PRE1 ANT1
ANT1
AGC-S NB PRE1
14.039
14.089.9
-100
-120

Automation

Automation



Automation


ARCO
microHAM
RETURN
GO
H40 - TEMOTU
CURRENT
325°
ENTRY
H40
NEW
261°
SP
7
8
9
4
5
6
LOC
1
2
3
0
WAZ
ITU
DXCC
STOP
POWER
MOTOR
FAULT
POWER
Smart Antenna Rotator Controller

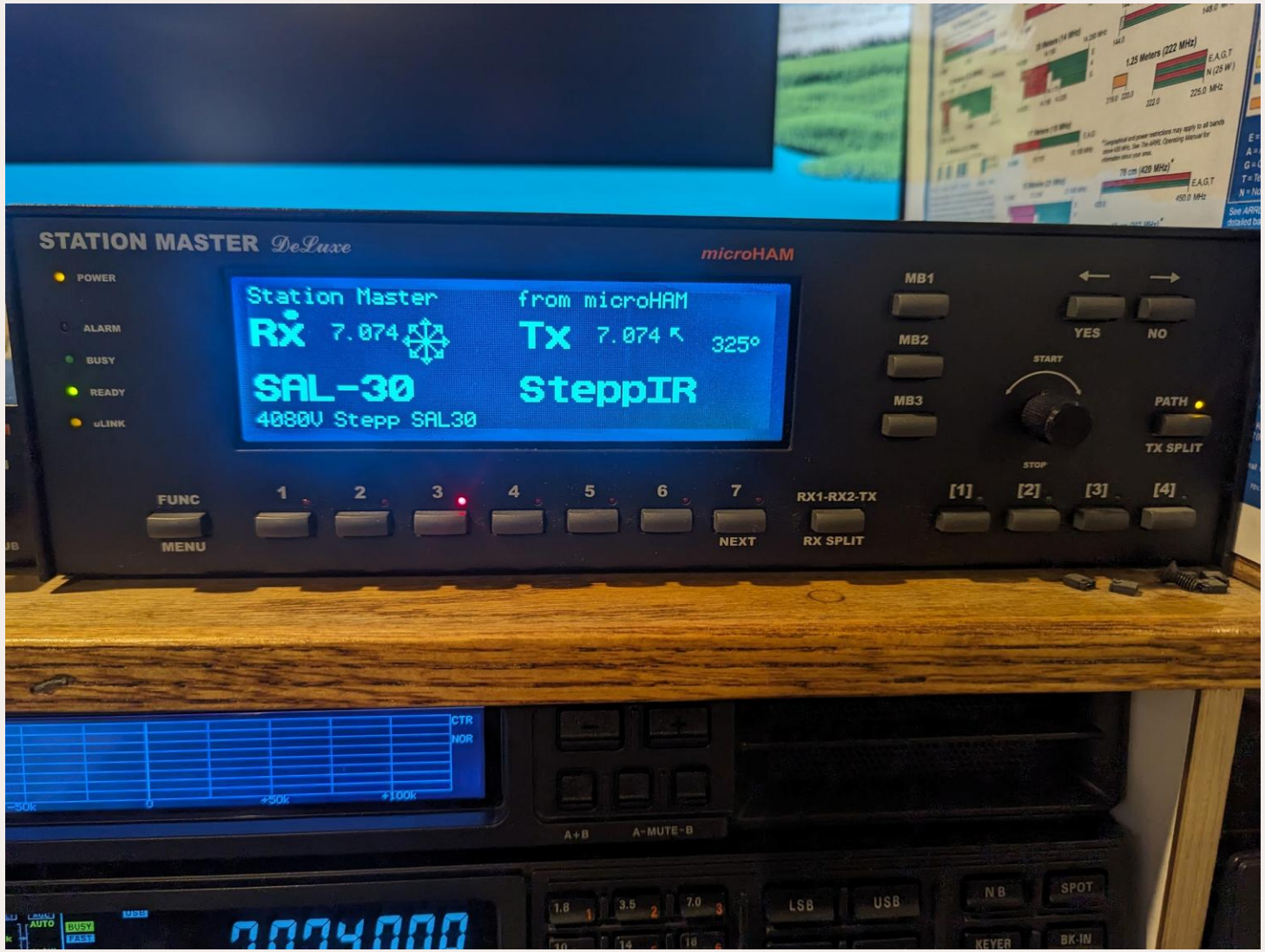
Automation

Putting it all together

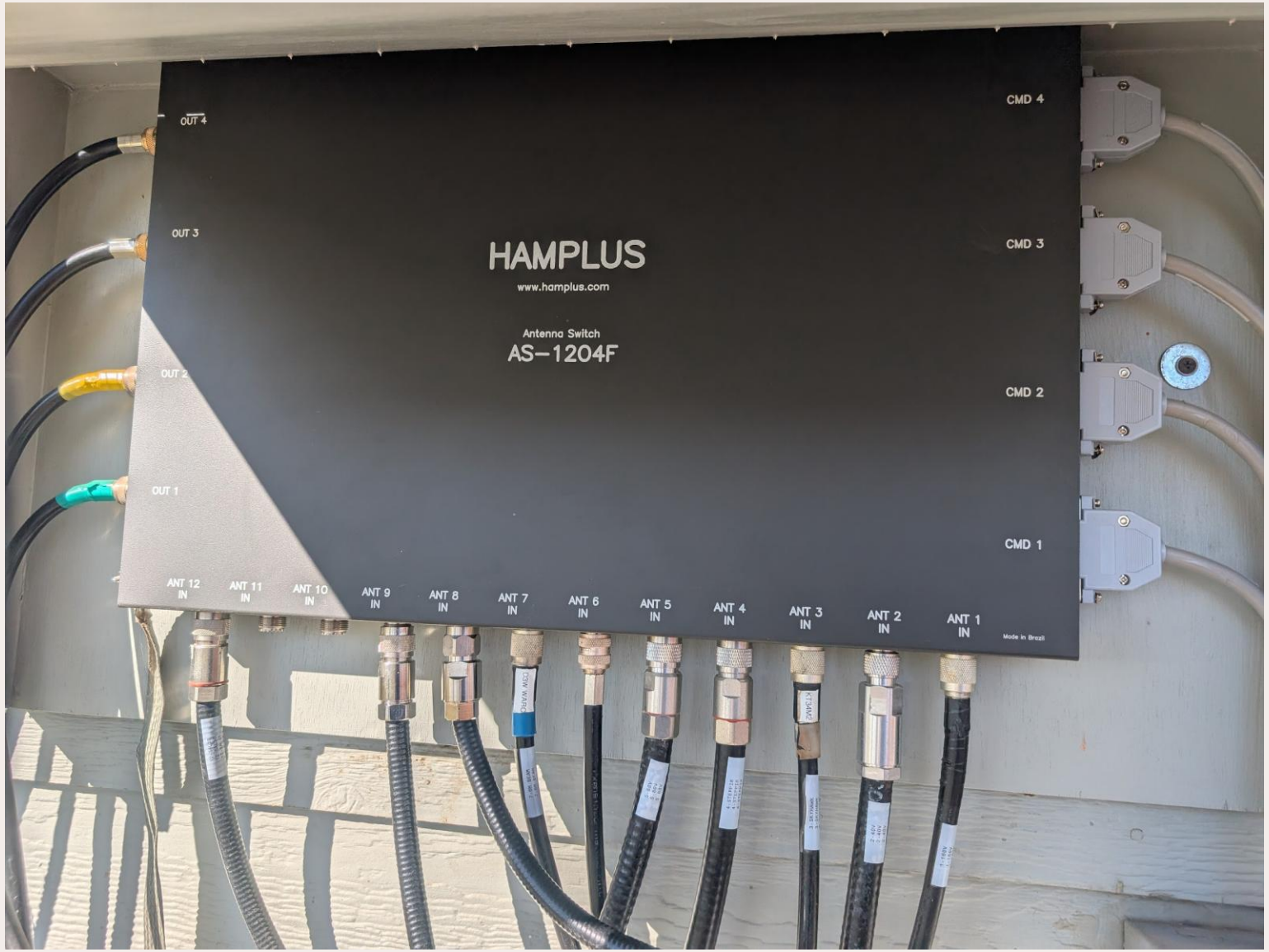
Automation


NOR
+50k
+100k
A+B
A-MUTE-B
7.074.000
1.8
3.5
7.0
10
14
18
21
24.5
28/29
GEN
50
ENT
LSB
USB
CW
AM/FM
RTTY
PKT
NB
SPOT
KEYER
BK-IN
DOWN
UP
7072500
DNR 06
DNR 06
RX CLAR FAST
CLEAR
TX CLAR LOCK
CLAR/GRP
BAND/MCH
A/B
RX
CLAR
VFO-B
TX
VRF/μ-T
SHIFT
CONT/APF
NOTCH
WIDTH
RESET
VFO-A
DNF
DNR
VRF
SHIFT
CONT/APF
NOTCH
WIDTH
RESET
VFO-B
DNF
DNR
FAST
LOCK
A>B
A<B
V/M
M>A
A>M
MENU

Automation


STATION MASTER DeLuxe
microHAM
POWER
ALARM
BUSY
READY
uLINK
Station Master
from microHAM
Rx 7.074
Tx 7.074
325°
SAL-30
SteppIR
4080V Stepp SAL30
MB1
MB2
MB3
YES
NO
START
STOP
PATH
TX SPLIT
FUNC
MENU
1
2
3
4
5
6
7
NEXT
RX1-RX2-TX
RX SPLIT
[1]
[2]
[3]
[4]
CTR
NOR
A+B
A-MUTE-B
LSB
USB
NB
SPOT
KEYER
BK-IN

Automation


OUT 4
OUT 3
OUT 2
OUT 1
HAMPLUS
www.hamplus.com
Antenna Switch
AS–1204F
CMD 4
CMD 3
CMD 2
CMD 1
ANT 12 IN
ANT 11 IN
ANT 10 IN
ANT 9 IN
ANT 8 IN
ANT 7 IN
ANT 6 IN
ANT 5 IN
ANT 4 IN
ANT 3 IN
ANT 2 IN
ANT 1 IN
Made in Brazil

Automation


ARCO
microHAM
+03:24
325°
CCW CW
SteppIR
Motor PSU OFF
SelfTest running...
SelfTest done.
BACK
NORTH 0°
Europe 30°
0°
0°
0°
0°
STOP
POWER
MOTOR
FAULT
POWER
Smart Antenna Rotator Controller

Automation


STATUS
MENU
EDIT
7 MHz 0A 21C
PWR 0W
50 100 150 200 250 300 400 500 700 900 1100 1300 1500 1700
POWER (W)
FAULT
OVR
OPER
STBY
ANT 1
ANT 2
ATU
IN
BYP
1.0 1.5 2 3
SWR
RESET
INFO
MODE
PF1
ANTENNA
PF2
ATU TUNE
ATU MODE
BAND
1.8 3.5 7 14 21 28
AUX 5 10 18 24 50
ELECRAFT KPA1500 AMPLIFIER
RADIO 1
RADIO 2
PTT
MIN
MAX
ON

Automation

Automation


micro KEYER III
24-bit AUDIO
CW SPEED
TX
KI0KN
Loveland, CO
microHAM
RX MAIN
STATION MASTER DeLuxe
Station Master from microHAM
Rx 7.12
SMD 1
occupies 41
Vert
4080V Stepp SAL30
MB1
MB2
MB3
YES
NO
START
STOP
PATH
TX SPLIT
FUNC
MENU
NEXT
RX SPLIT
RX1-RX2-TX
YAESU

Automation

Automation


3YØJ
Cape Fie
Bouvet Island
NORTHERN CALIFORNIA DX FOUNDATION, INC.
International DX Association
DX ENGINEERING
www.DXEngineering.com • 1-800-777-0703
GDXF
German DX Foundation


FT5ZM
AMSTERDAM ISLAND 2014
INTERNATIONAL DXPEDITION

Automation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Cape Fie
Bouvet Island
NORTHERN CALIFORNIA DX FOUNDATION, INC.
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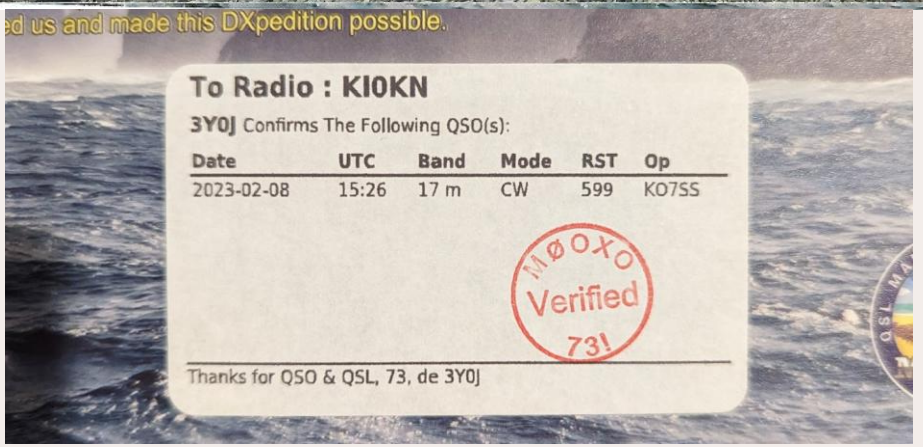
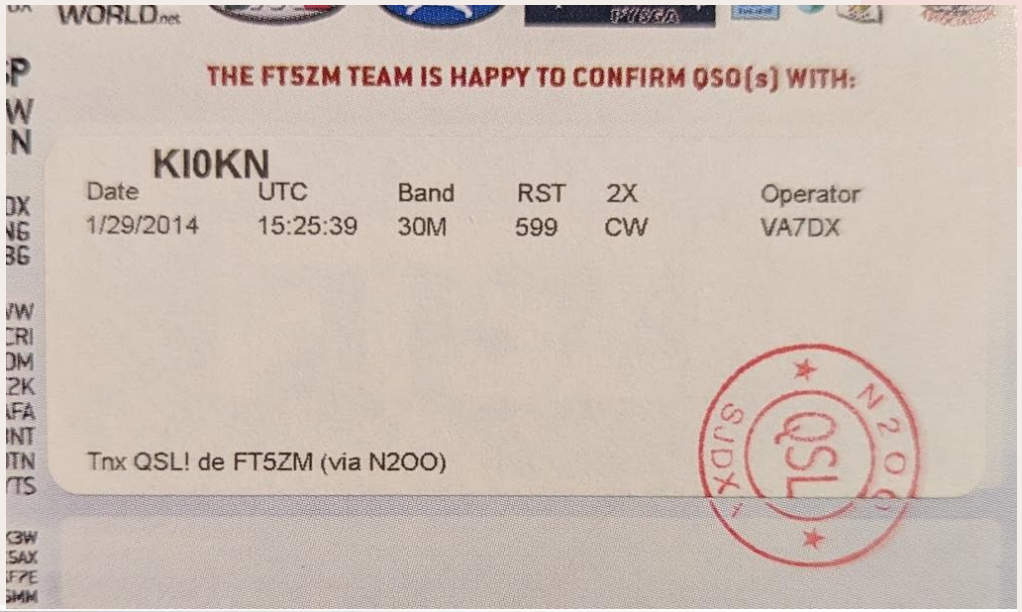
GDXF
German DX Foundation


ed us and made this DXpedition possible.
To Radio : KI0KN
3Y0J Confirms The Following QSO(s):
Date UTC Band Mode RST Op
2023-02-08 15:26 17 m CW 599 KO7SS
MØOXO
Verified
73!
Thanks for QSO & QSL, 73, de 3Y0J


THE FT5ZM TEAM IS HAPPY TO CONFIRM QSO(s) WITH:
KI0KN
Date UTC Band RST 2X Operator
1/29/2014 15:25:39 30M 599 CW VA7DX
Tnx QSL! de FT5ZM (via N2OO)
TNX QSL
N2OO


FT5ZM
AMSTERDAM ISLAND 2014
INTERNATIONAL DXPEDITION

Thank you

James Cizek

KI0KN

ki0kn@arrl.net