

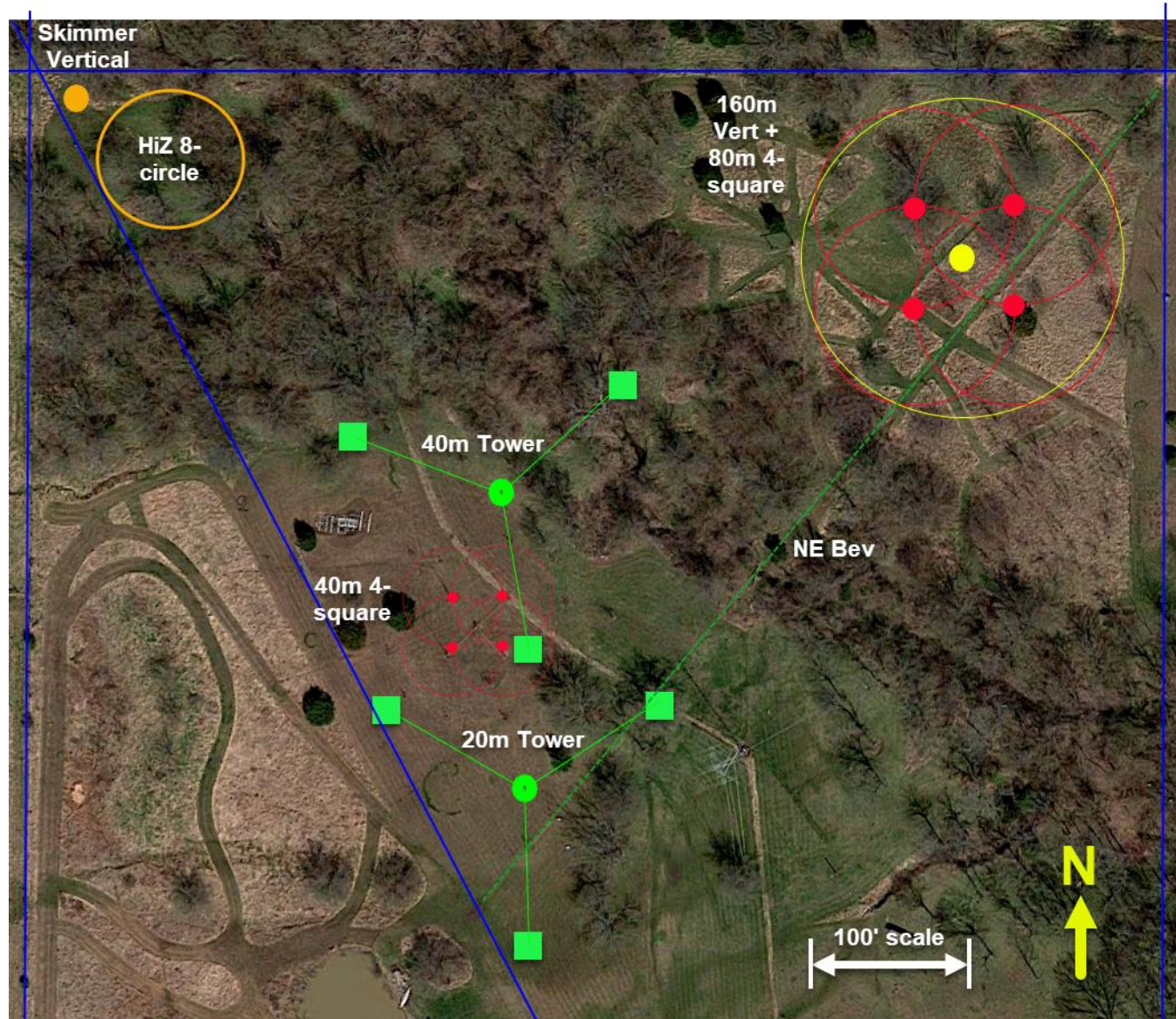
Fire Control

ACØC – MAR 2019 - KCDXC



Integration Scope

SITE



4 Towers

- 160m: 160/80-4sq
- 40m: 40/30/17/10
- 20m: 80d/20/15/6
- House: 12/2/440

21 Antennas

- 18 RX/TX
- 3 RX-only

Shack Gear

- 9 Rigs
- 4 amps
- DX, Contesting, RC

Agenda

▶ **Shack Topology**

- ▶ Control - Inside
- ▶ Control - Outside

Shack



Hybrids

Hollow
State

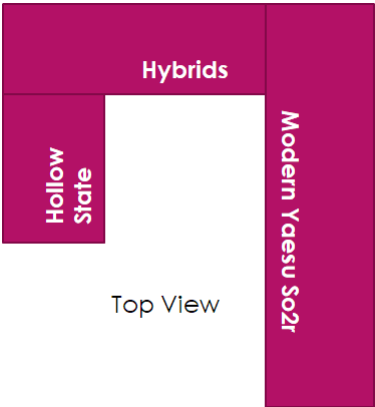
Modern Yaesu So2r

Top View

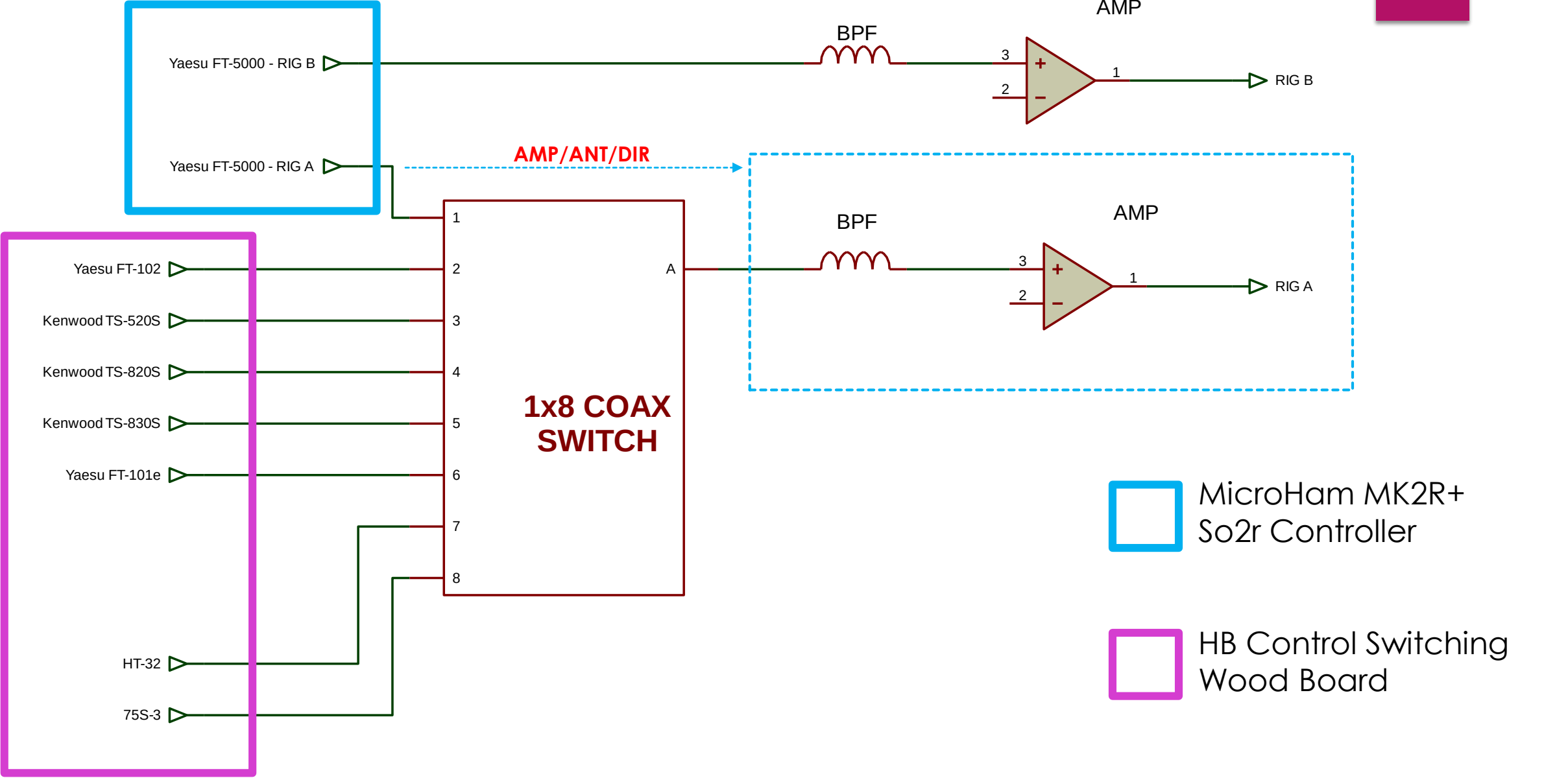
Shack – Modern Gear



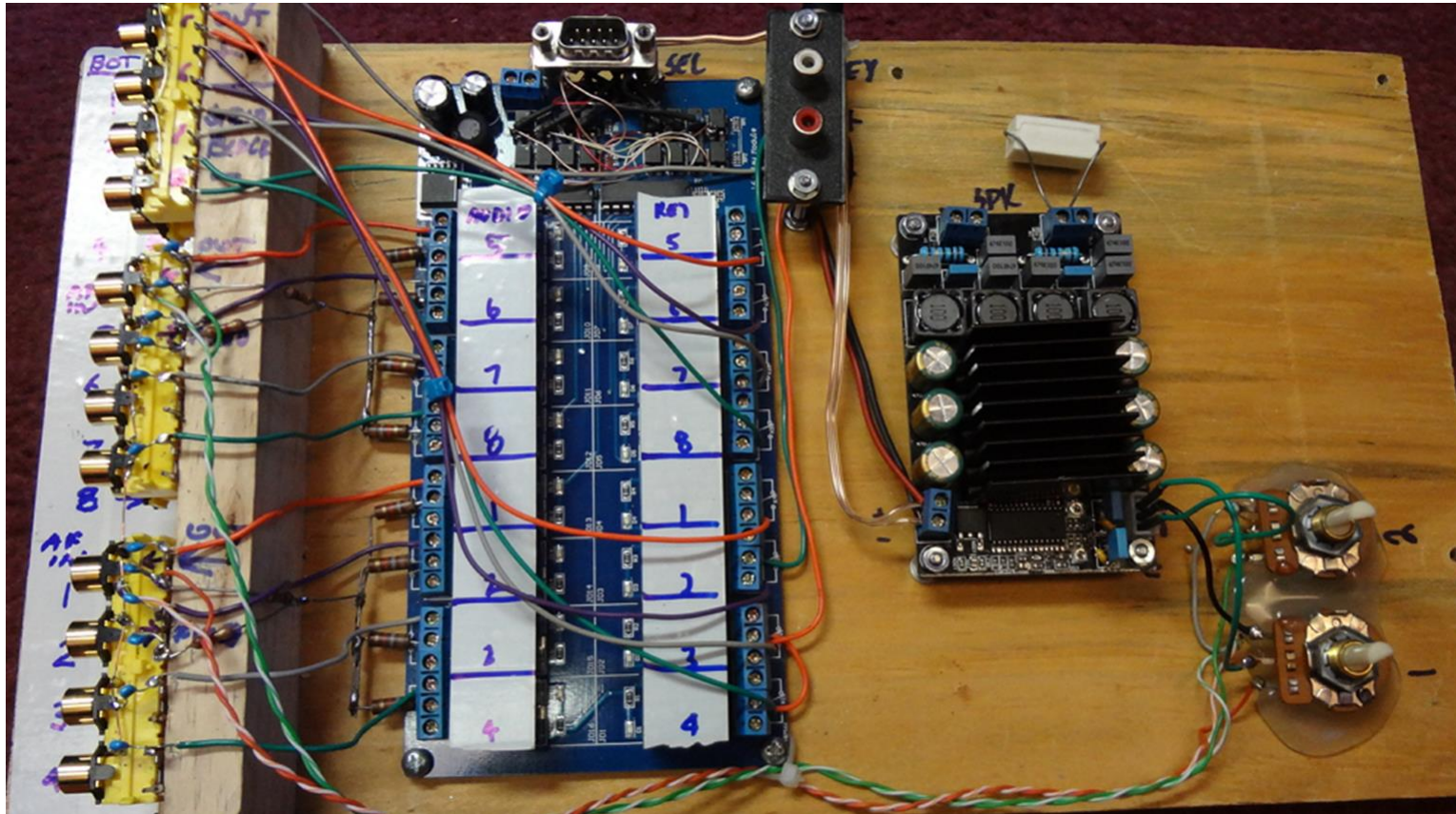
Shack – Hybrid & Vintage Gear



Simplified Shack Topology



Vintage Gear - Rig Selection & Control



Switches:

- Speaker
- Coax
- Keyer

Modern Gear – So2r Controller MicroHam MK2R+



Key Features:

- Internal sound card for AFSK RTTY + digital
- Internal Winkeyer chip for CW
- 2-rig handling of mic and DVK
- 2-rig handling of speaker
- 2-rig handling of PTT, footswitch, inhibit
- Configuration in software

Agenda

- ▶ Shack Topology
- ▶ **Control - Inside**
- ▶ Control - Outside

Modern Gear – Control Topology

Rig-A
FT-5000

MK2R
So2r

Rig-B
FT-5000

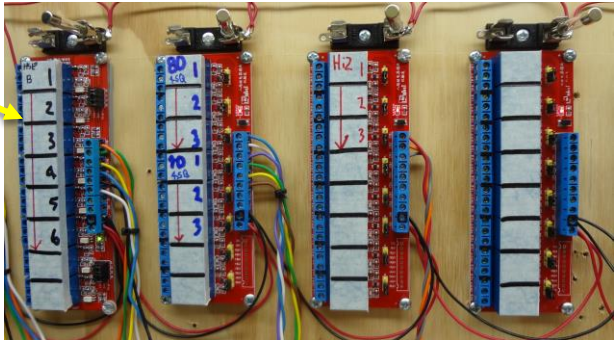
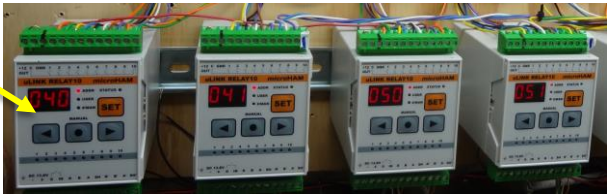
SMD-A
ANT

SMD-B
ANT

SMD Switching Modules

Isolation Relays

Control Lines To Tower





- One SMD per rig
- Manual antenna selection, control
- Automatically resets antennas to last config



Antenna & Tower Control - SMD



Key Features:

- Manual antenna selection, control
- Drives 20 internal relays – dedicated to single rig
- Interfaces with SMD modules – **shared to all rigs**
- Follows rig frequency, automatically sets antennas to last config
- Setup via software

MicroHam SMD Console



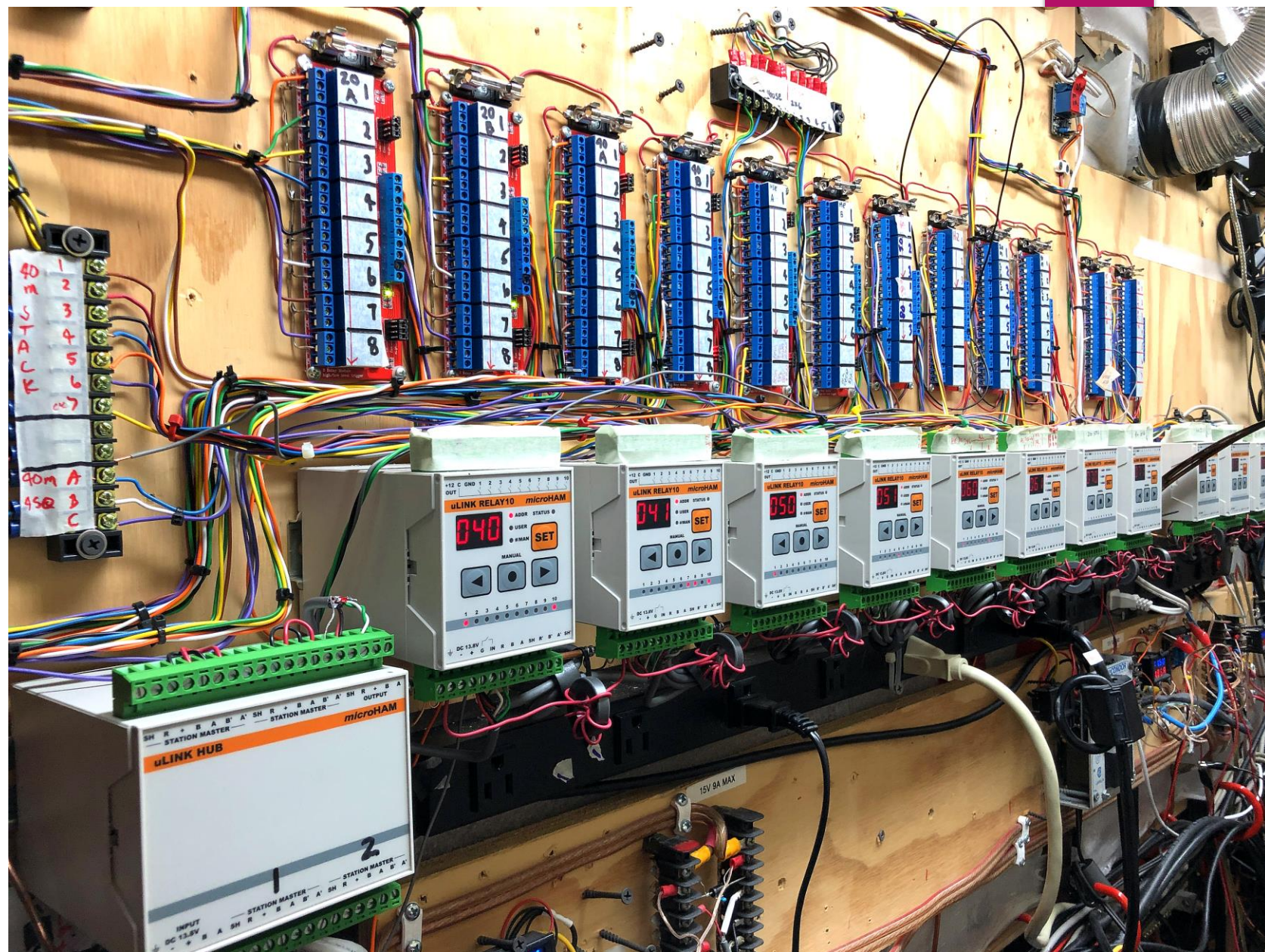
- Yellow – ANT selection
- Green – Stack & 4SQ
- Orange – Memorized config

- Yellow – Stack: Top 2 selected
- Green – Shows direction of beams

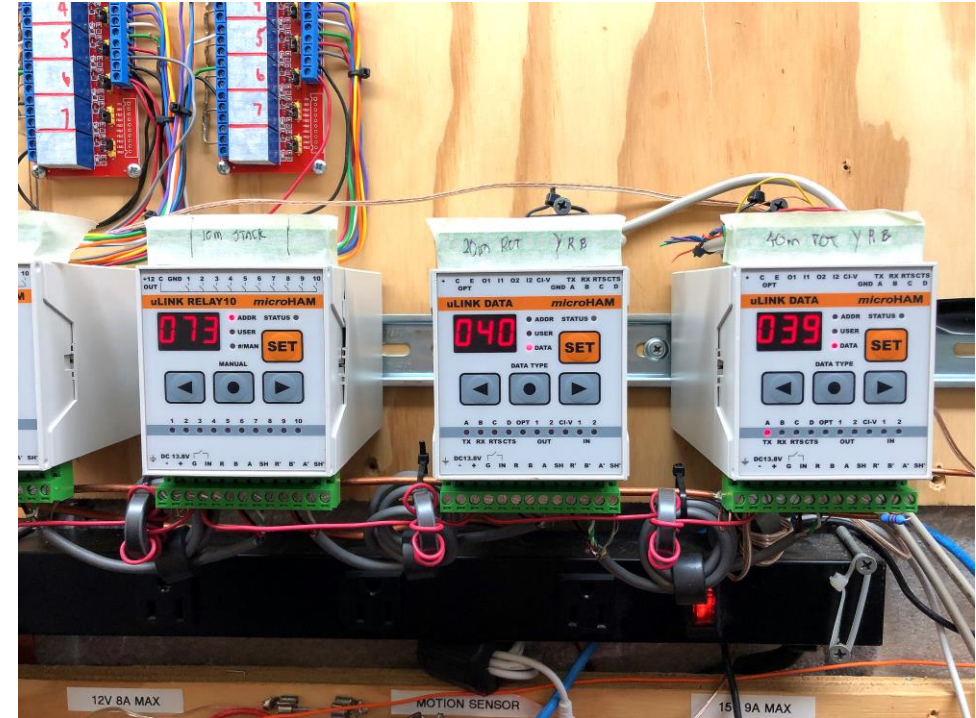
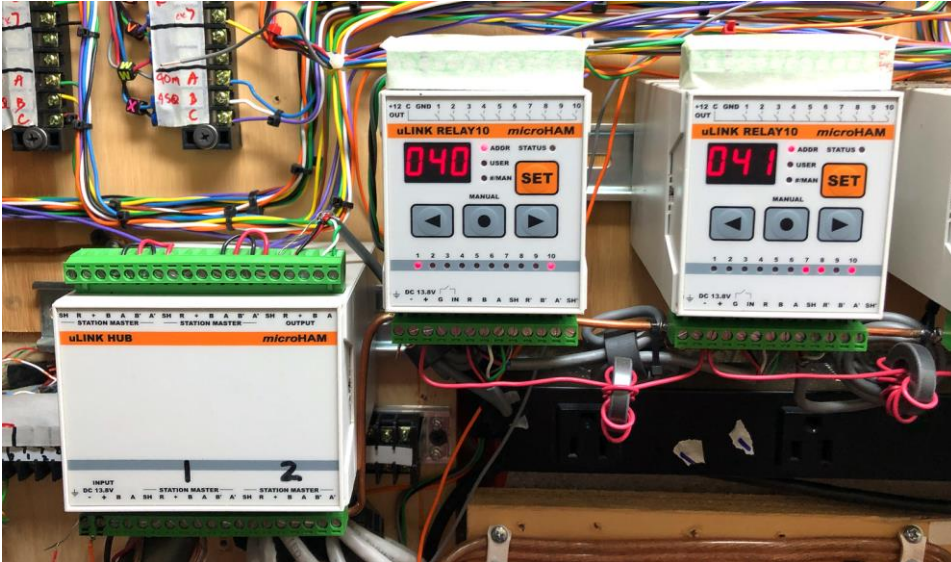


SMD Back End - Switch Panel

- SMD modules
- Isolation relays
- Cable breakout
- Power supply



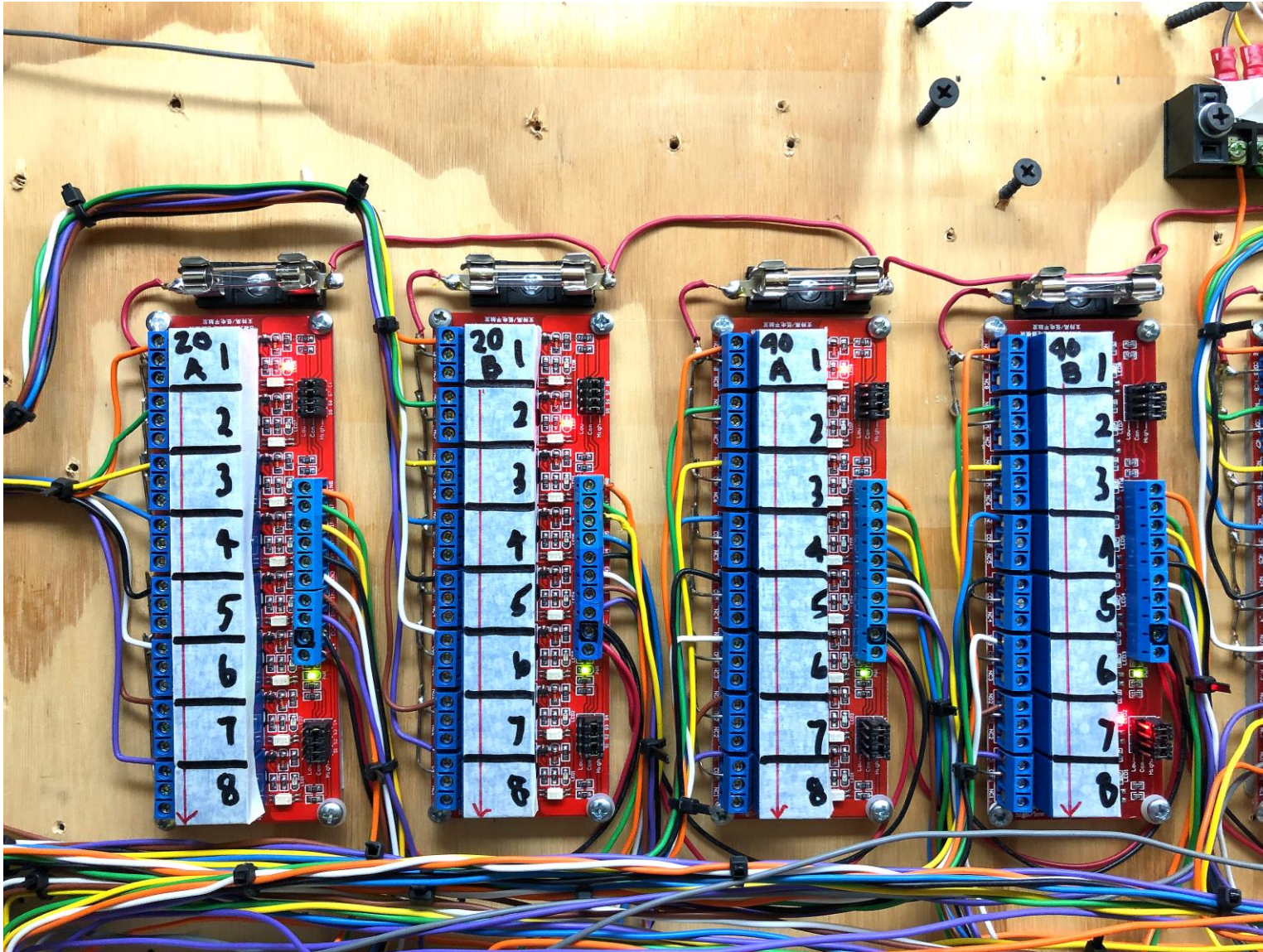
SMD - Control Modules



Features:

- Relay module – drives 10 relays – controls antennas, switches, etc
- Serial module – connects to rotor – read & set direction
- Interfaces with SMD via serial bus
- Modules are shared to all SMD
- Setup via software

Isolation Relays



Generic Arduino-type Module

- 8 SPDT relays
- Opto-isolated drive
- Active high or low
- LED indicator per relay

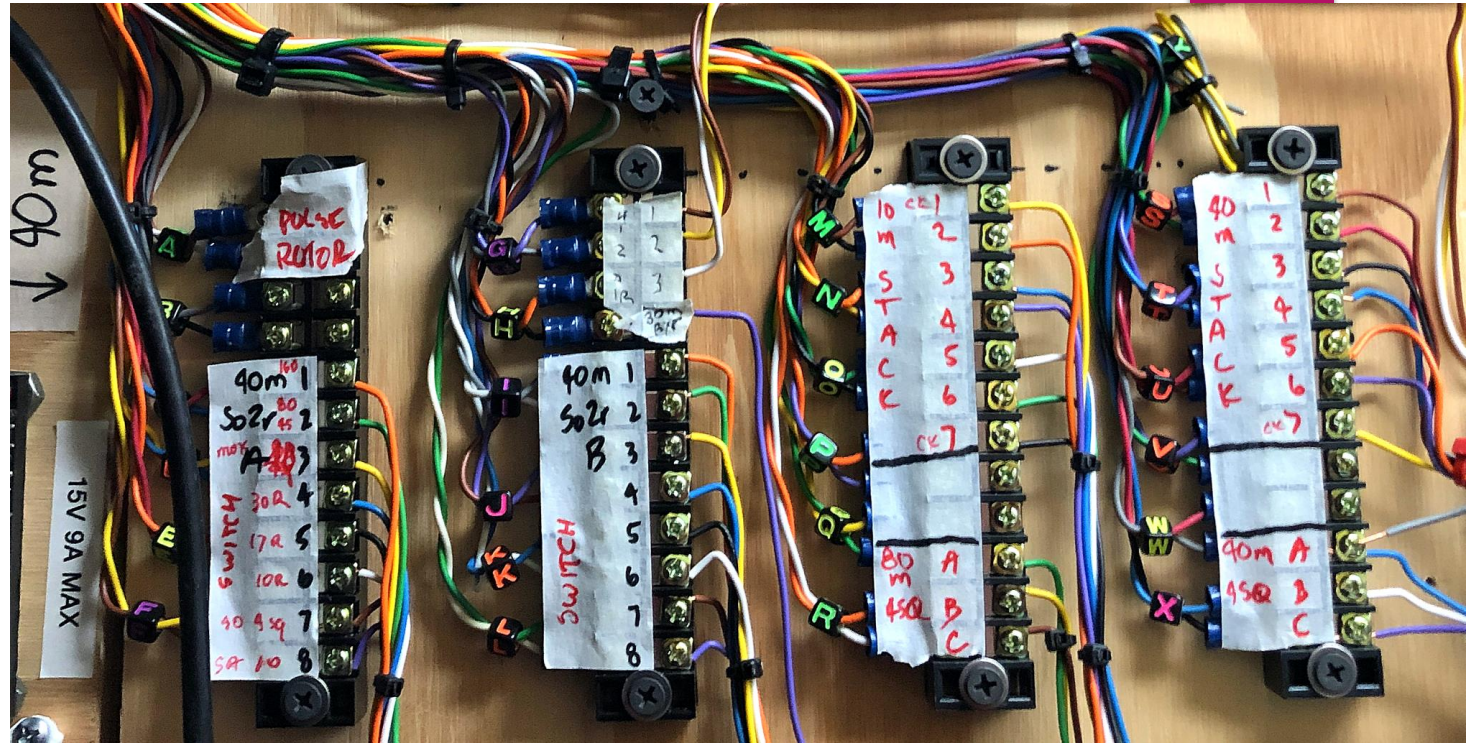
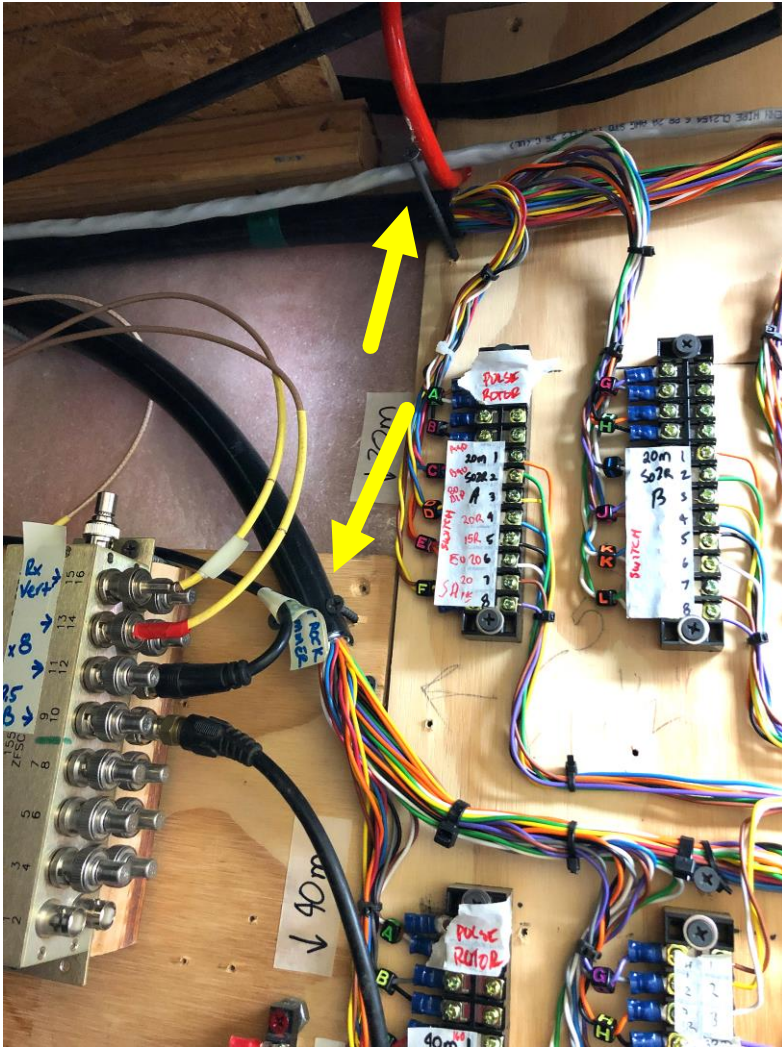
Benefits:

- Separate PS feed
- ~1KV isolation
- Combination logic

Relay & Module Assignments

RELAY ASSIGNMENTS											
1	2	3	4	5	6	7	8	9	10	11	12
1 So2r DXE 20m A	1 So2r DXE 20m B	1 So2r DXE 40m A	1 So2r DXE 40m B	1 So2r AS HSE A	1 So2r AS HSE B	1 40m 4SQ A	1 HIZ A	1 20m STACK	1 40m STACK	1 15m STACK	1 10m STACK
2 So2r DXE 20m A	2 So2r DXE 20m B	2 So2r DXE 40m A	2 So2r DXE 40m B	2 So2r AS HSE A	2 So2r AS HSE B	2 40m 4SQ B	2 HIZ B	2 20m STACK	2 40m STACK	2 15m STACK	2 10m STACK
3 So2r DXE 20m A	3 So2r DXE 20m B	3 So2r DXE 40m A	3 So2r DXE 40m B	3 So2r AS HSE A	3 So2r AS HSE B	3 40m 4SQ C	3 HIZ C	3 20m STACK	3 40m STACK	3 15m STACK	3 10m STACK
4 So2r DXE 20m A	4 So2r DXE 20m B	4 So2r DXE 40m A	4 So2r DXE 40m B	4 So2r AS HSE A	4 So2r AS HSE B	4 80m 4SQ A	4	4 20m STACK	4 40m STACK	4 15m STACK	4 10m STACK
5 So2r DXE 20m A	5 So2r DXE 20m B	5 So2r DXE 40m A	5 So2r DXE 40m B	5 So2r AS HSE A	5 So2r AS HSE B	5 80m 4SQ B	5	5 20m STACK	5 40m STACK	5 15m STACK	5 10m STACK
6 So2r DXE 20m A	6 So2r DXE 20m B	6 So2r DXE 40m A	6 So2r DXE 40m B	6 So2r AS HSE A	6 So2r AS HSE B	6 80m 4SQ C	6	6 20m STACK	6 40m STACK	6 15m STACK	6 10m STACK
7 So2r DXE 20m A	7 So2r DXE 20m B	7 So2r DXE 40m A	7 So2r DXE 40m B	7	7	7	7	7 20m STACK	7 40m STACK	7 15m STACK	7 10m STACK
8 So2r DXE 20m A	8 So2r DXE 20m B	8 So2r DXE 40m A	8 So2r DXE 40m B	8	8	8	8	8	8	8	8
uHAM MODULES											
ADDR 40	41	50	51	60	61	70	71	72	73	82	84
1 So2r DXE 20m A1	1 So2r DXE 20m B3	1 So2r DXE 40m A1	1 So2r DXE 40m B3	1 So2r AS HSE A1	1 So2r AS HSE B5	1 20m STACK	1 40m STACK	1 15m STACK	1 10m STACK	20m ROTOR CTL	40m ROTOR CTL
2 So2r DXE 20m A2	2 So2r DXE 20m B4	2 So2r DXE 40m A2	2 So2r DXE 40m B4	2 So2r AS HSE A2	2 So2r AS HSE B6	2 20m STACK	2 40m STACK	2 15m STACK	2 10m STACK		
3 So2r DXE 20m A3	3 So2r DXE 20m B5	3 So2r DXE 40m A3	3 So2r DXE 40m B5	3 So2r AS HSE A3	3 HIZ A	3 20m STACK	3 40m STACK	3 15m STACK	3 10m STACK		
4 So2r DXE 20m A4	4 So2r DXE 20m B6	4 So2r DXE 40m A4	4 So2r DXE 40m B6	4 So2r AS HSE A4	4 HIZ B	4 20m STACK	4 40m STACK	4 15m STACK	4 10m STACK		
5 So2r DXE 20m A5	5 So2r DXE 20m B7	5 So2r DXE 40m A5	5 So2r DXE 40m B7	5 So2r AS HSE A5	5 HIZ C	5 20m STACK	5 40m STACK	5 15m STACK	5 10m STACK		
6 So2r DXE 20m A6	6 So2r DXE 20m B8	6 So2r DXE 40m A6	6 So2r DXE 40m B8	6 So2r AS HSE A6	6 40m 4SQ SEQ	6 20m STACK	6 40m STACK	6 15m STACK	6 10m STACK		
7 So2r DXE 20m A7	7 40m 4SQ A	7 So2r DXE 40m A7	7 80m 4SQ A	7 So2r AS HSE B1	7 80m 4SQ SEQ	7 20m STACK	7 40m STACK	7 15m STACK	7 10m STACK		
8 So2r DXE 20m A8	8 40m 4SQ B	8 So2r DXE 40m A8	8 80m 4SQ B	8 So2r AS HSE B2	8 BPF HP1 BYPASS	8	8 40m SEQ LC NET	8	8		
9 So2r DXE 20m B1	9 40m 4SQ C	9 So2r DXE 40m B1	9 80m 4SQ C	9 So2r AS HSE B3	9 BPF HF1 80m	9	9 30m SEQ open bypass	9	9		
0 So2r DXE 20m B2	0 40m 4SQ	0 So2r DXE 40m B2	0 80m 4SQ	0 So2r AS HSE B4	0 BPF HF1 40m	0	0	0	0		

Tower Control Breakout



- Tower cable run breakout
- 48 lines per tower
- Layout matches tower junction box

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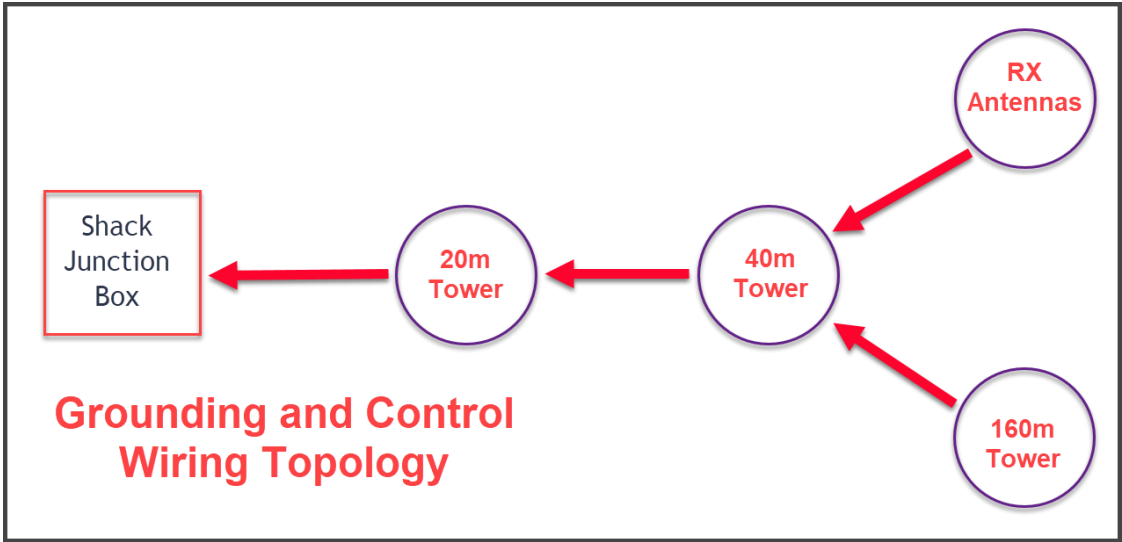
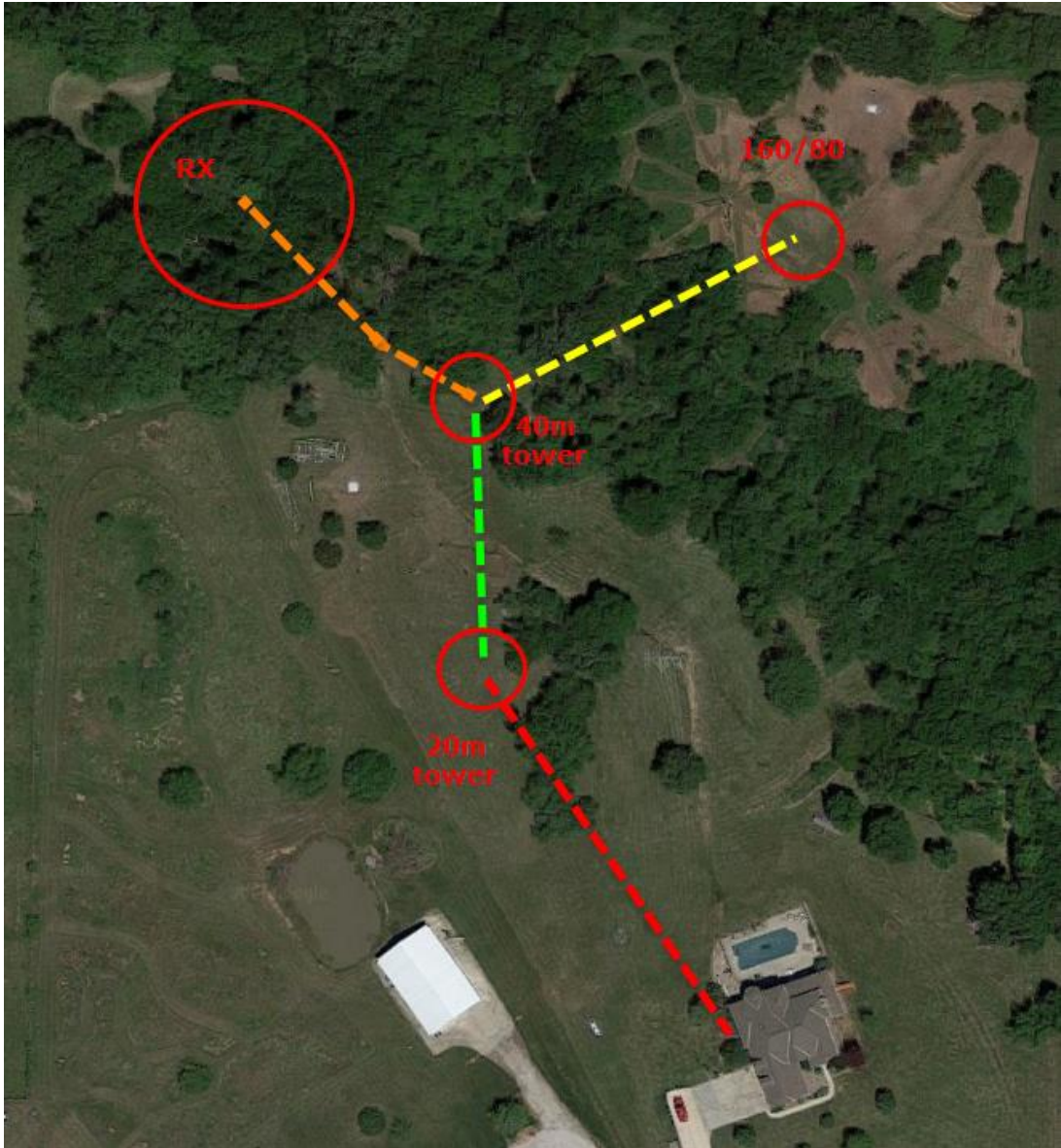
20m TOWER JUNCTION BOX															
	Color-50	Color-24	Use		Color-50	Color-24	Use		Color-50	Color-24	Use		Color-50	Color-24	Use
A	Brown	Brown	Rotor Pulse - blue	G	Purple	Red		M	Brown	Brown	15mSTK CTL 1 - Yellow	S	Red	Red	20mSTK CTL 1 - Yellow
	White	White	Rotor Pulse - orange gnd		Gray	Green			Black	White	15mSTK CTL 2 - White		Green	Green	20mSTK CTL 2 - White
B	Gray	Blue		H	Orange	Orange		N	Orange	Orange	15mSTK CTL 3 - Orange	T	Purple	Red	20mSTK CTL 3 - Orange
	Black	Black			Black	Black			Yellow	Red	15mSTK CTL 4 - Red		Blue	Blue	20mSTK CTL 4 - Red
C	Red	Red	So2r A - 20m 2x8: Line 1	I	Gray	Gray	So2r B - 20m 2x8: Line 1	O	Green	Green	15mSTK CTL 5 - Green	U	Red	Red	20mSTK CTL 5 - Green
	Blue	Blue	So2r A - 20m 2x8: Line 2		White	White	So2r B - 20m 2x8: Line 2		Black	White	15mSTK CTL 6 - Blue		Brown	Brown	20mSTK CTL 6 - Blue
D	Yellow	Red	So2r A - 20m2x8: Line 3	J	Purple	Red	So2r B - 20m2x8: Line 3	P	Orange	Orange	15mSTK CTL 7 - Purple	V	Purple	Gray	20mSTK CTL 7 - Purple
	Blue	Gray	So2r A - 20m 2x8: Line 4		Brown	Brown	So2r B - 20m 2x8: Line 4		Purple	Black			Green	White	
E	Red	Red	So2r A - 20m 2x8: Line 5	K	Blue	Blue	So2r B - 20m 2x8: Line 5	Q	Yellow	Blue		W	Red	Red	
	Orange	Orange	So2r A - 20m 2x8: Line 6		White	White	So2r B - 20m 2x8: Line 6		Green	White			Gray	Gray	
F	Yellow	Orange	So2r A - 20m 2x8: Line 7	L	Green	Green	So2r B - 20m 2x8: Line 7	R	Orange	Orange		X	Blue	Blue	
	Brown	White	So2r A - 20m 2x8: Line 8		White	White	So2r B - 20m 2x8: Line 8		White	White			Black	Black	
												Y			

40m TOWER JUNCTION BOX															
	Color-50	Onward	Use		Color-50	Onward	Use		Color-50	Onward	Use		Color-50	Onward	Use
A	Brown		Rotor Pulse - blue	G	Purple	OR/WH	RX/HiZ Dir A	M	Brown		10m Stack A	S	Red		40m Stack A
	White		Rotor Pulse - orange gnd		Gray	GRN/WH	RX/HiZ Dir B		Black		10m Stack B		Green		40m Stack B
B	Gray			H	Orange	BRN/WH	RX/HiZ Dir C	N	Orange		10m Stack C	T	Purple		40m Stack C
	Black				Black	RED	30m Open Bypass		Yellow		10m Stack D		Blue		40m Stack D
C	Red		So2r A - 40m 2x8: Line 1	I	Gray		So2r B - 40m 2x8: Line 1	O	Green		10m Stack E	U	Red		40m Stack E
	Blue		So2r A - 40m 2x8: Line 2		White		So2r B - 40m 2x8: Line 2		Black		10m Stack F		Brown		40m Stack F
D	Yellow		So2r A - 40m2x8: Line 3	J	Purple		So2r B - 40m2x8: Line 3	P	Orange		10m Stack G	V	Purple		40m Stack G
	Blue		So2r A - 40m 2x8: Line 4		Brown		So2r B - 40m 2x8: Line 4		Purple	BLUE/WH	160/Match A		Green		
E	Red		So2r A - 40m 2x8: Line 5	K	Blue		So2r B - 40m 2x8: Line 5	Q	Yellow	GREY/WH	160/Match B	W	Red		
	Orange		So2r A - 40m 2x8: Line 6		White		So2r B - 40m 2x8: Line 6		Green	OR/WH	160/80m 4sq Control - A		Gray		40m 4sq Control - A
F	Yellow		So2r A - 40m 2x8: Line 7	L	Green		So2r B - 40m 2x8: Line 7	R	Orange	GRN/WH	160/80m 4sq Control - B	X	Blue		40m 4sq Control - B
	Brown		So2r A - 40m 2x8: Line 8		White		So2r B - 40m 2x8: Line 8		White	BRN/WH	160/80m 4sq Control - C		Black		40m 4sq Control - C

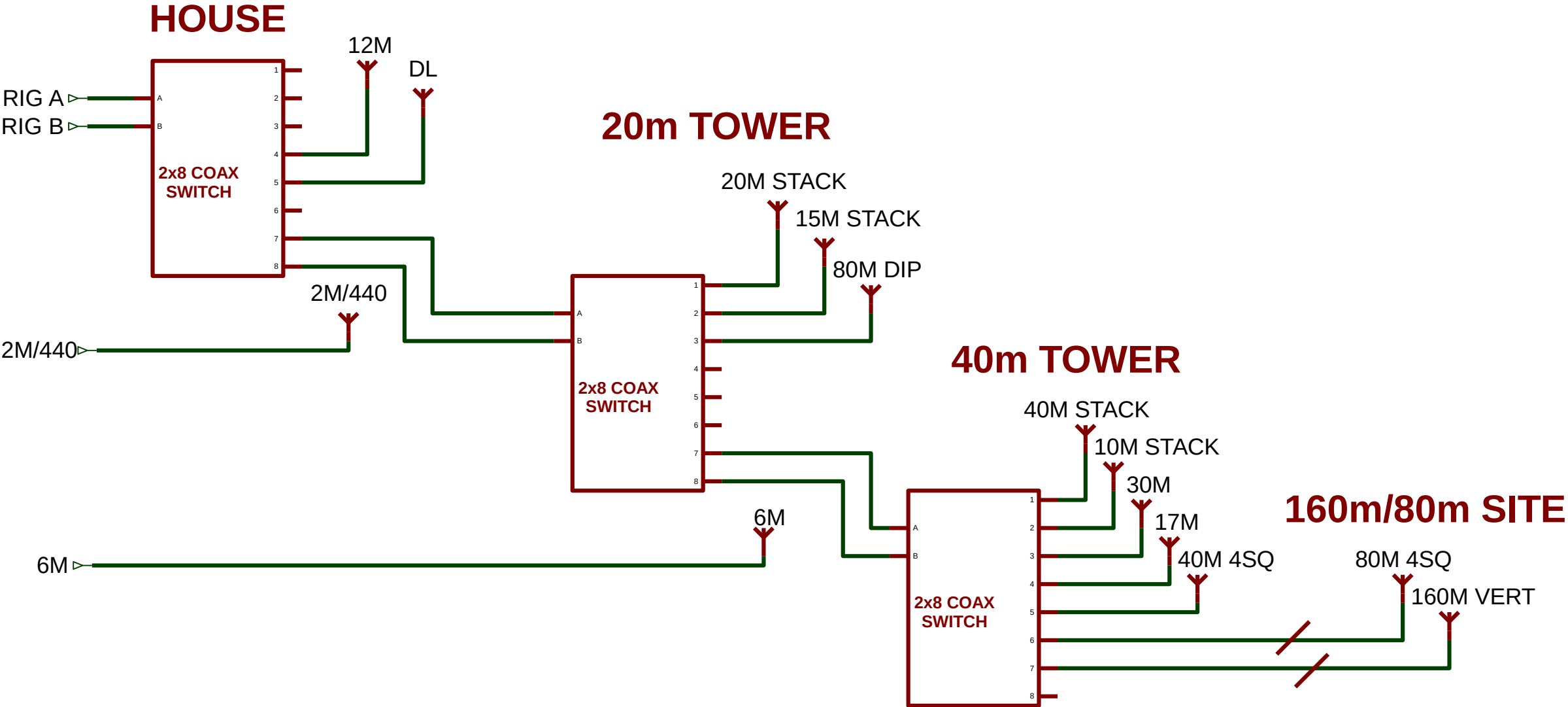
Agenda

- ▶ Shack Topology
- ▶ Control - Inside
- ▶ **Control - Outside**

Tower Control Topology



Basic Feedline Routing



Feedlines Used



LMR400
Jumpers

3/8 Heliax
Stack match,
House tower runs

3/8 CATV
75R RX
ANT runs

5/8 CATV
75R 40m 4SQ
phase lines

1/2 Heliax
40m & 30m beams,
40m 4SQ, 160m Vert

7/8 Solid Wall
Tower->80m 4SQ

7/8 Heliax
Shack-Tower runs,
Most up-tower runs

Connectors Used



7/16 DIN

All 7/8 hardline
Shack-tower-tower
Up tower 7/8 HL runs



N

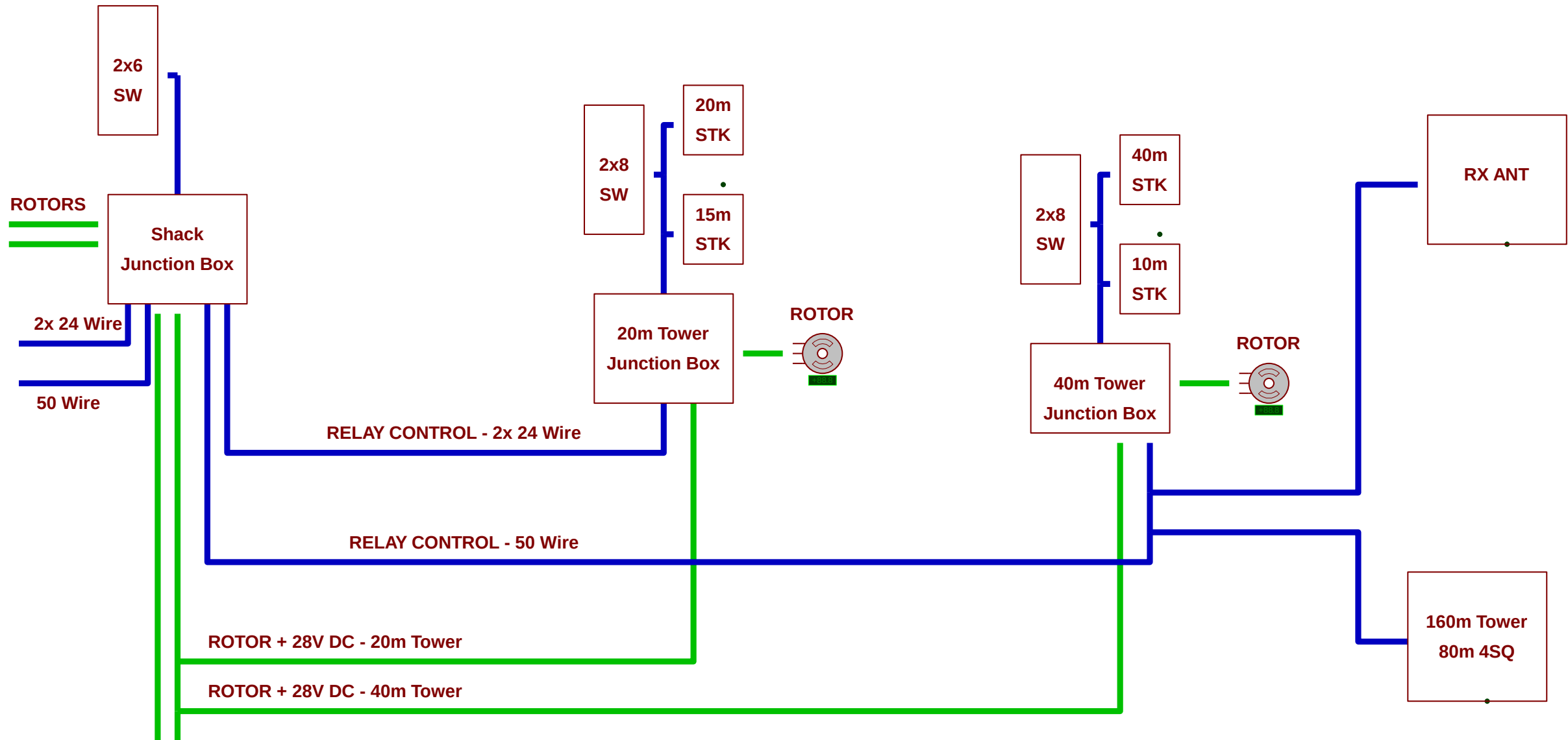
Most 1/2" hardline
40m 4SQ, tower to 160m run,
40m/30m/6m yagi
up tower runs



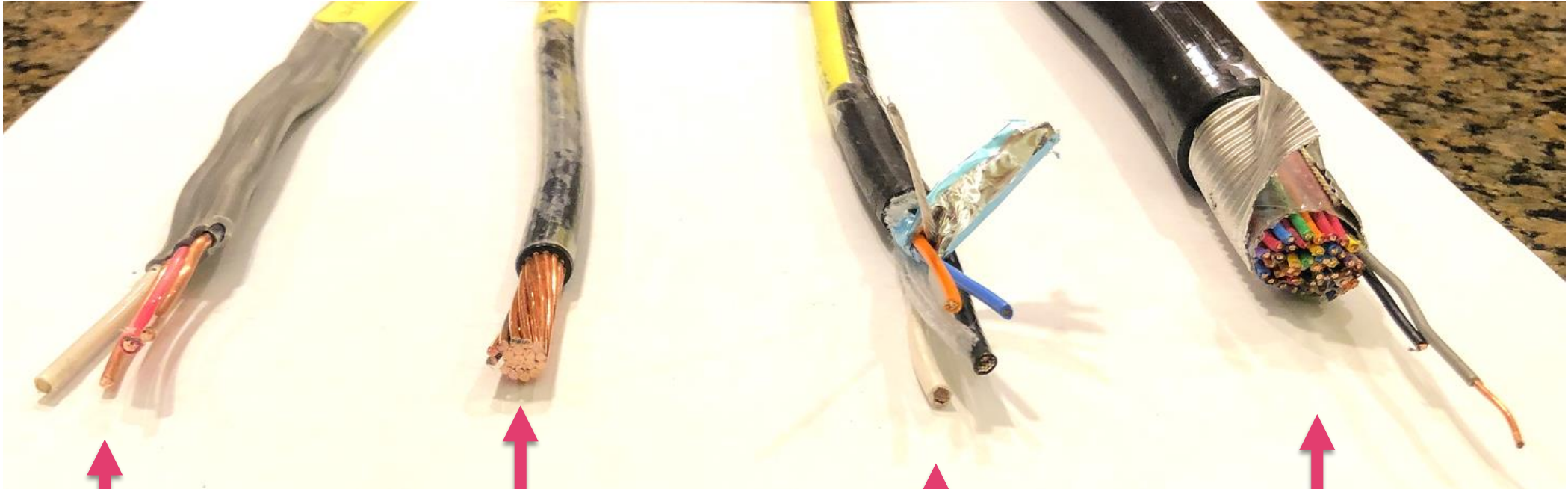
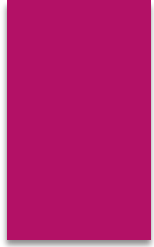
UHF

Jumpers to SW & SURGE
Tower top to yagi jumper,
Termination jumpers at tower
(7/16 DIN → UHF)

Basic Control Routing



Control Cables Used



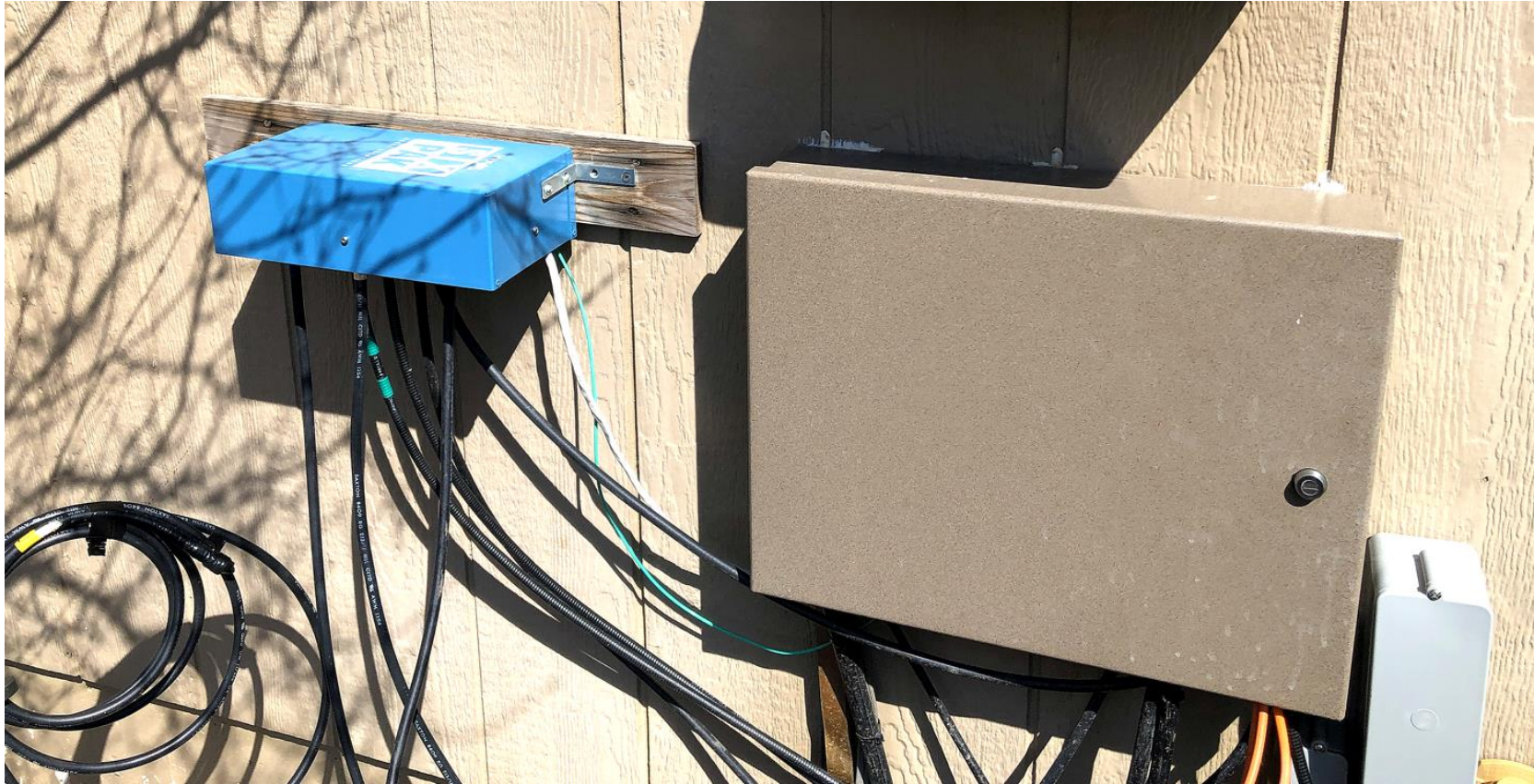
12/3 UG
Shack→Tower rotor
+28V & GND

#3 Stranded
Ground rod
to tower

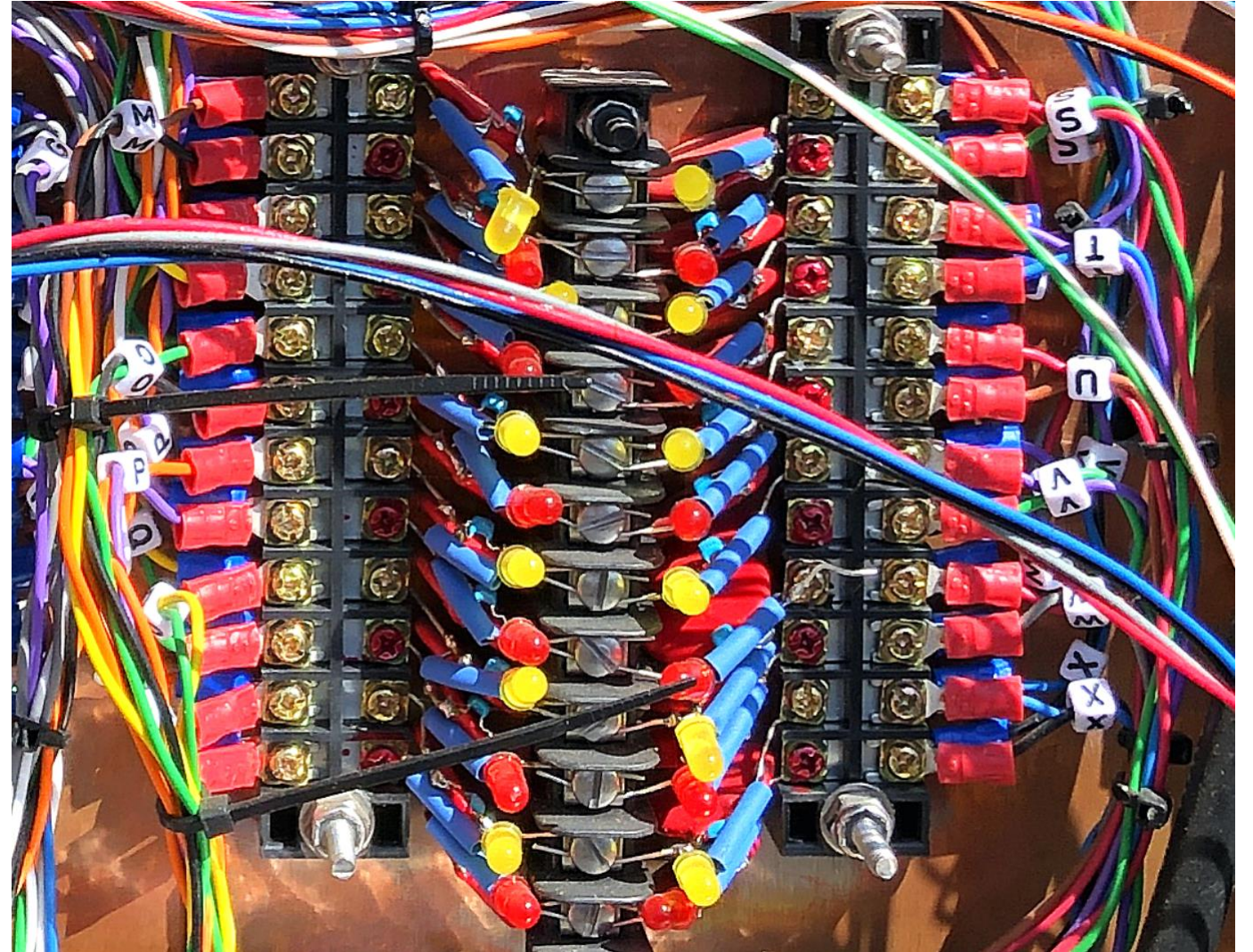
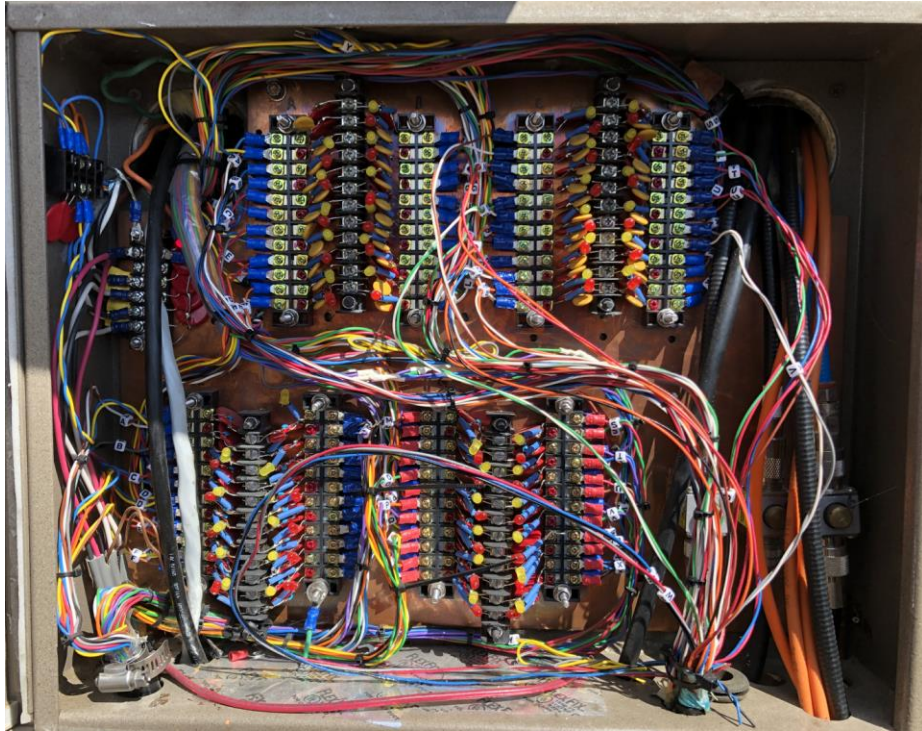
12/2+18/3
Up-tower rotor

50c #20
Shack→Tower
Control runs

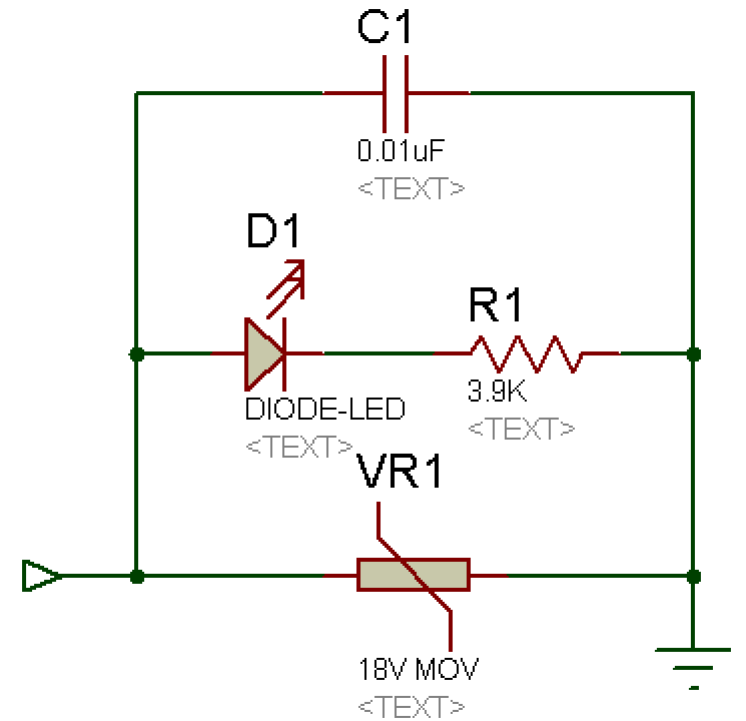
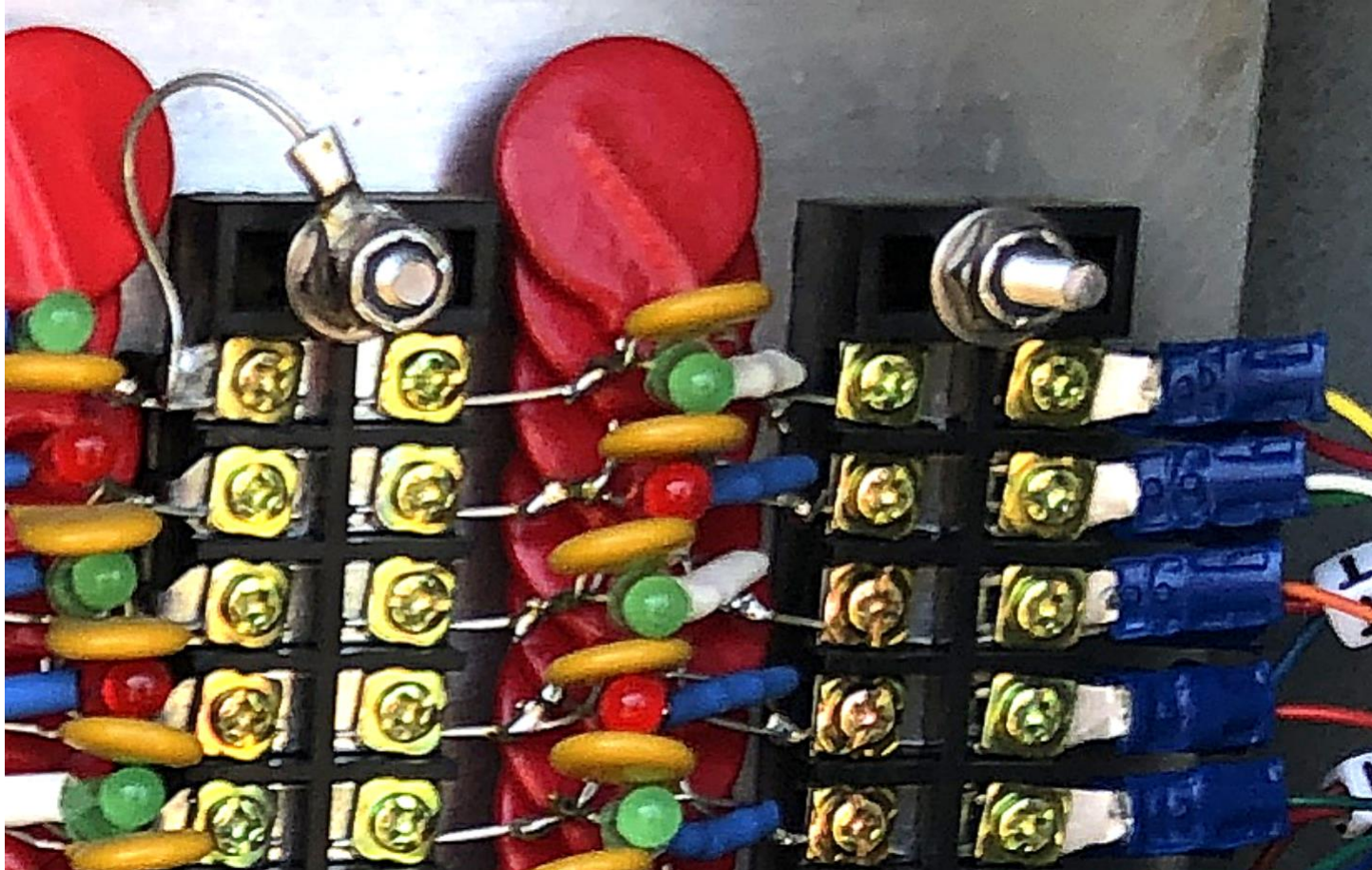
Shack Junction Box & Coax SW



Shack Junction Box – Control Lines



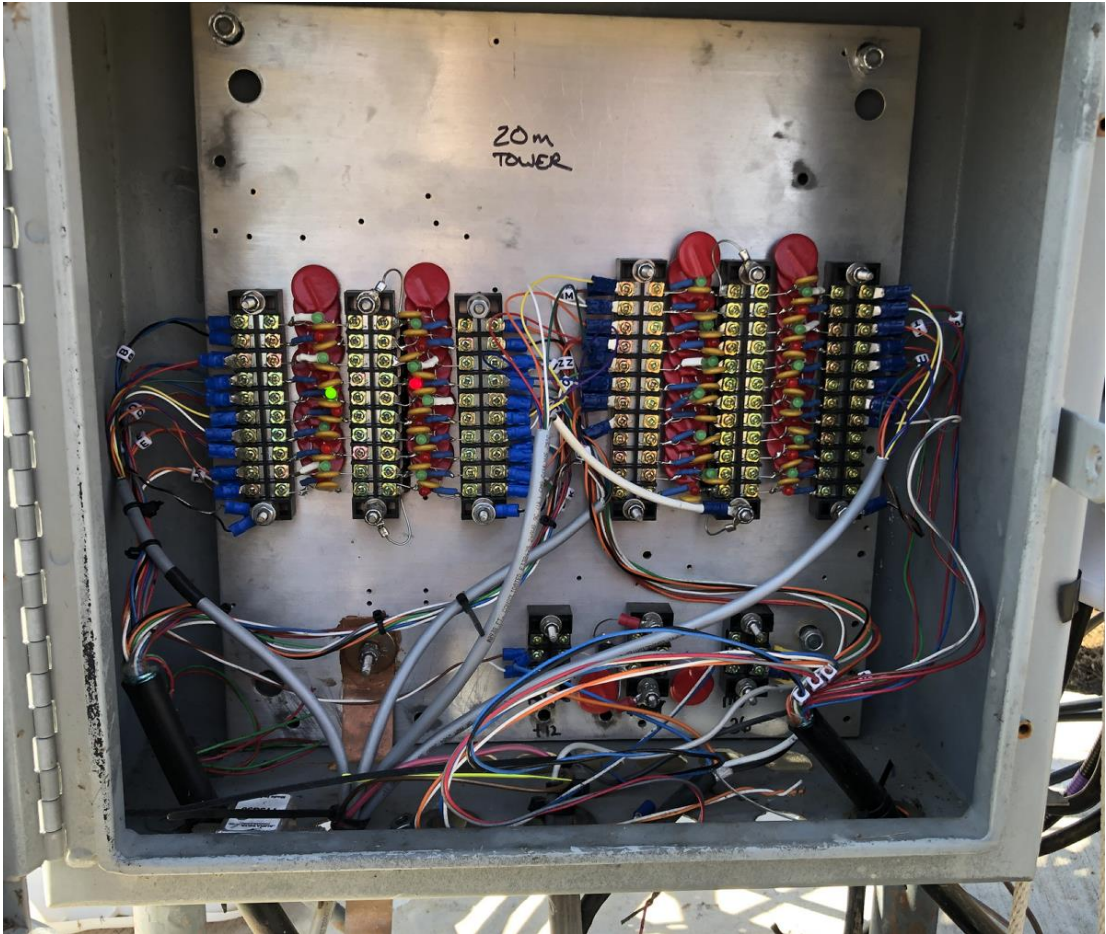
Control Line - Surge & LED Detail



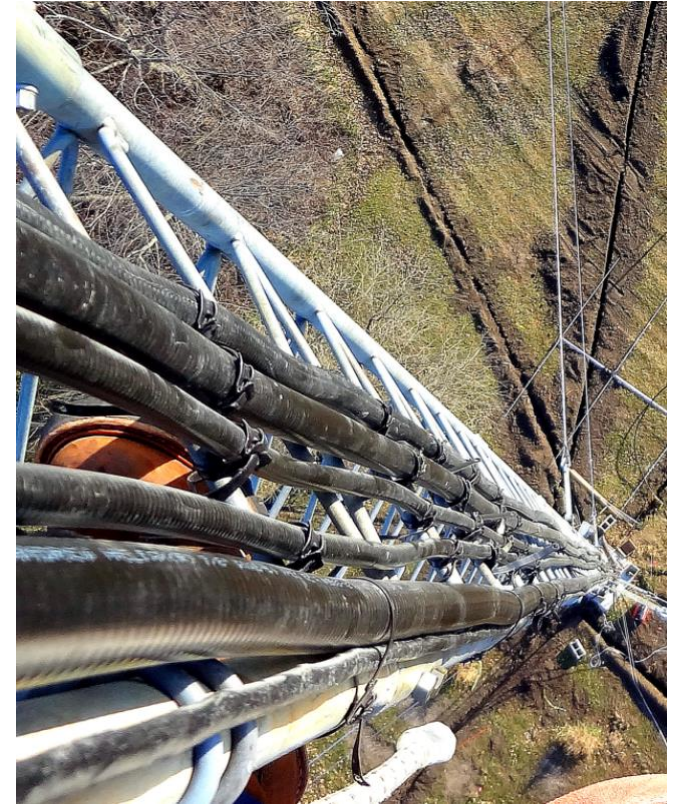
20m Tower Junction Box & Coax SW



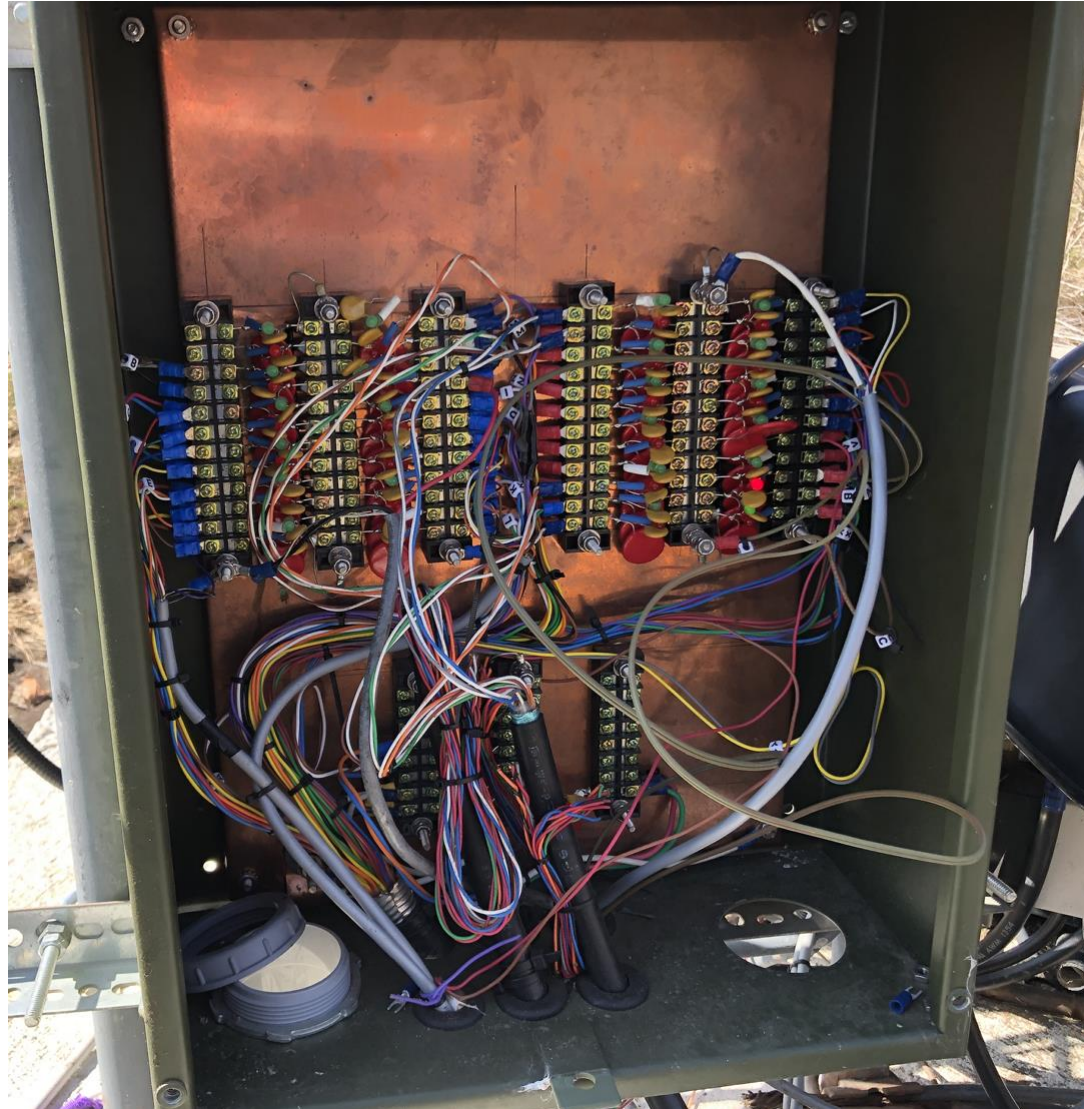
20m Tower Junction Box & Coax SW



40m Tower Junction Box & Coax SW



40m Tower Junction Box & Coax SW



1 60m Tower Base + 80m 4-SQ Controller



RX Antenna Site



- HiZ 8-Circle array
- Skimmer all-band vert



More Info:
acøc.com

