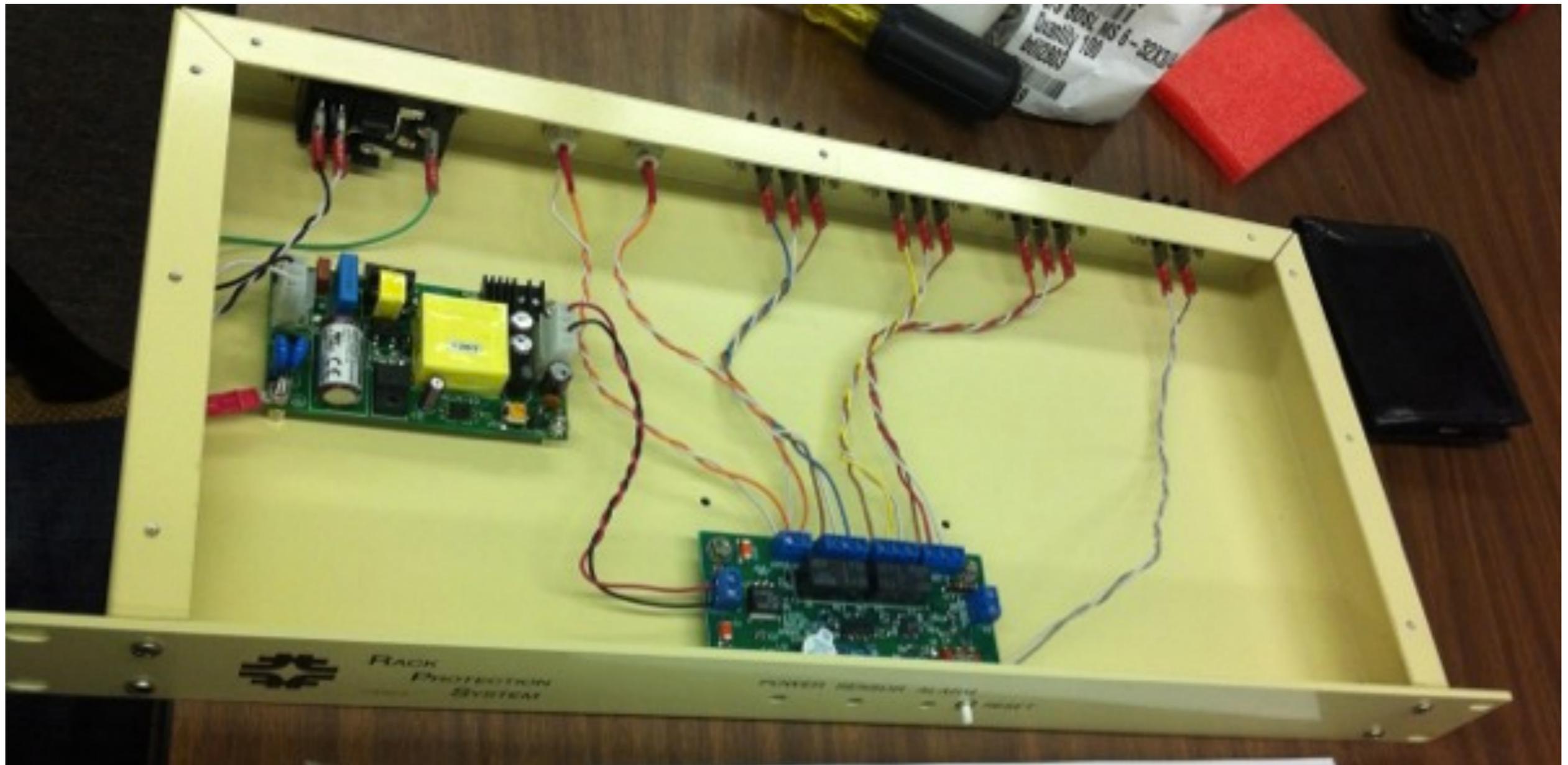

How to Build the Rack Protection System (RPS) Chassis

Bryce Littlejohn
University of Cincinnati



What is the RPS Chassis for?

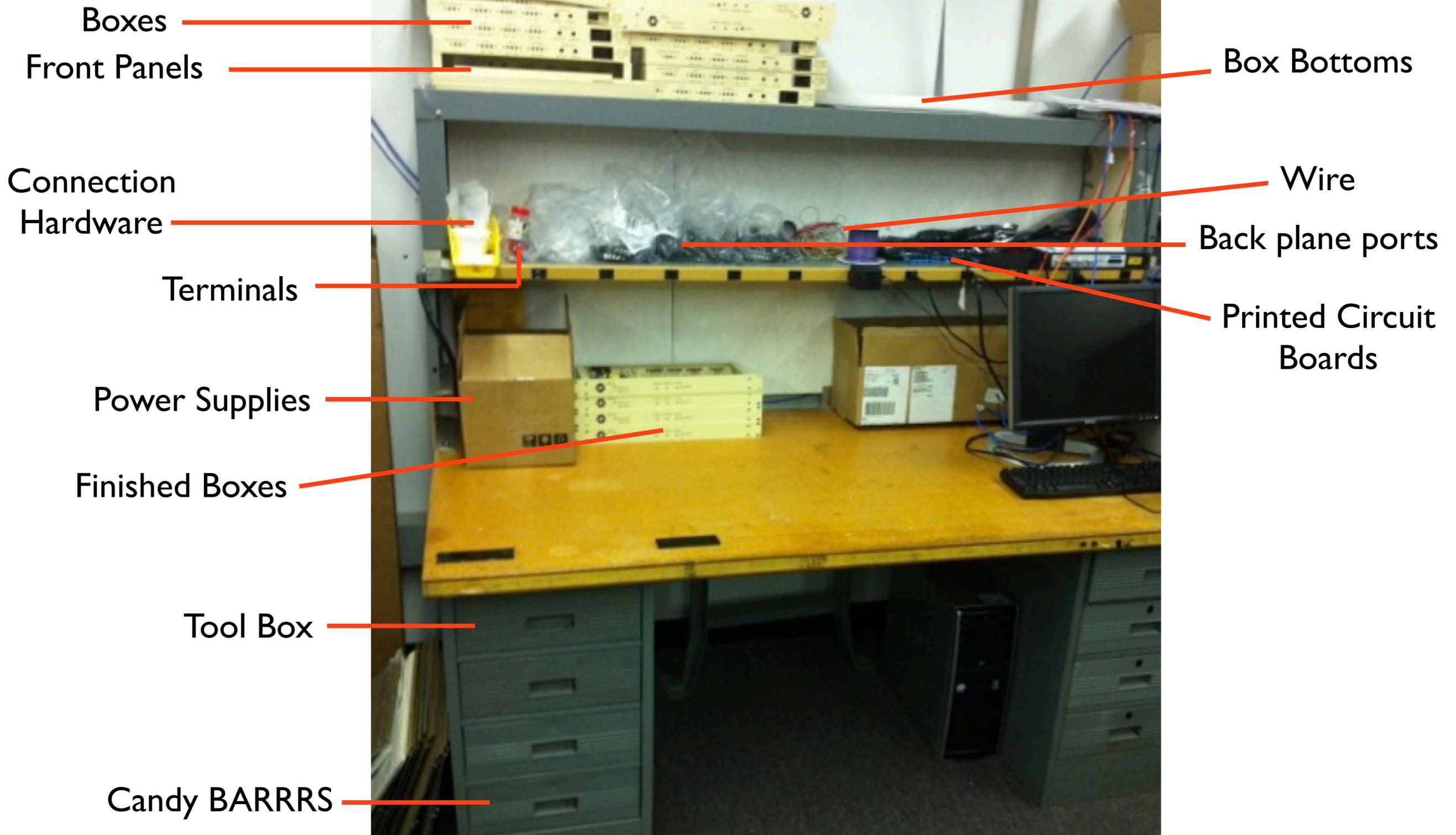


- The RPS sends an interlock signal to the AC Switch Box if and only if:
 - It is connected to the smoke detector
 - The smoke detector is not detecting smoke
- If either of these conditions is not met:
 - The RPS system will cause a shutdown of AC Switch Box power distribution to the rack components
 - The RPS chassis will emit an audible alarm
- Automated fire safety!

RPS Station



- Here is a tour of where you will build it:



Construction Steps



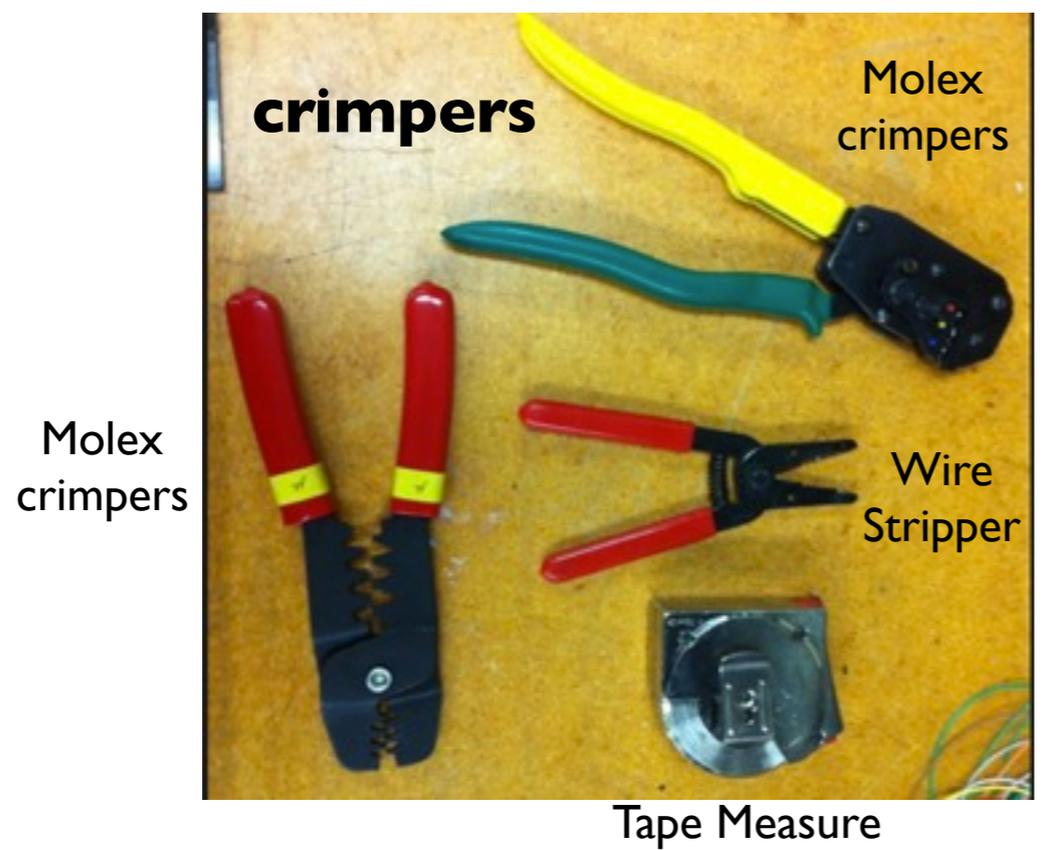
- Here are the general building steps:
 1. Build the wires
 2. Connect and wire backplane components
 3. Connect boards and front panel
 4. Wire boards

Pretty simple, right?

Rest of the talk will outline each of these steps

1: Build Wires

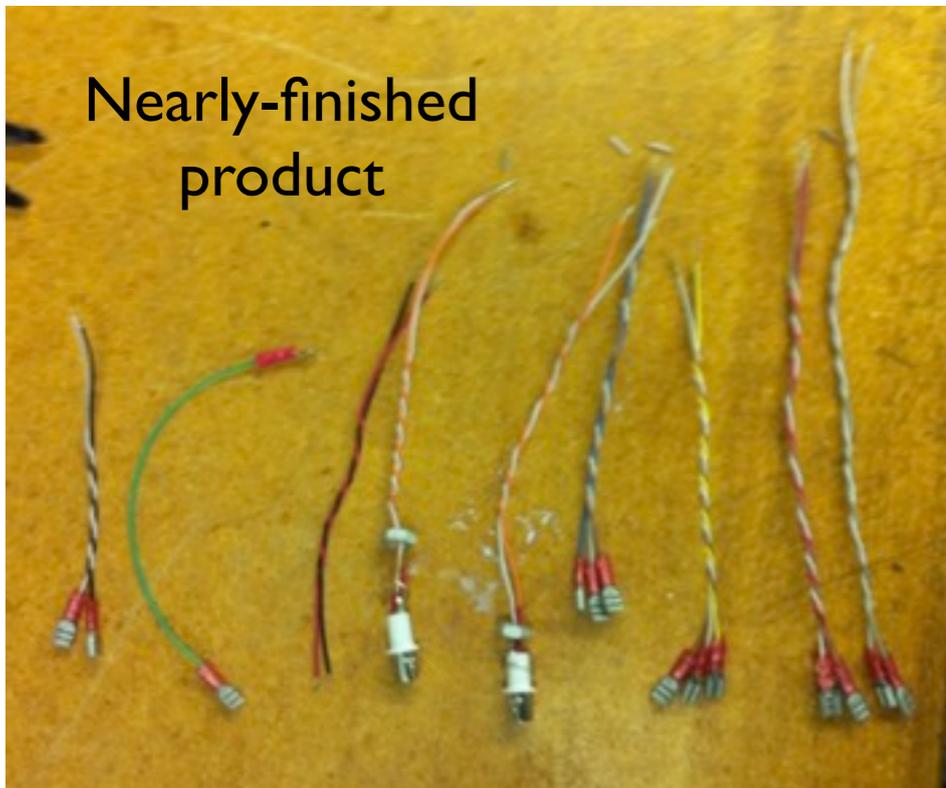
- **Tools:**



- **Materials:**

Wire gauge is labelled on wire!!!
Wire Larger gauge = thinner!

Easiest to keep organized in groups



Wire Building Tips



- Wires: Make sure to use correct wire gauge (AWG)!!!
- Stripping:
 - Do not damage conductors; a good method is to go one size bigger with the stripper to try and take off the insulation
 - If you clip or damage some conductor, cut the wire end off and try again!
- Crimping:
 - Crimp such that a tiny bit of the wire conductor is visible out the end of the terminal
 - Make sure to strip enough such that there is no insulation in the crimping area, but don't strip so much such that the wire conductor is visible beyond the terminal insulation.
 - Molex crimper: a little bit harder to use; ask Bryce for a tutorial :)



1: Build Wires

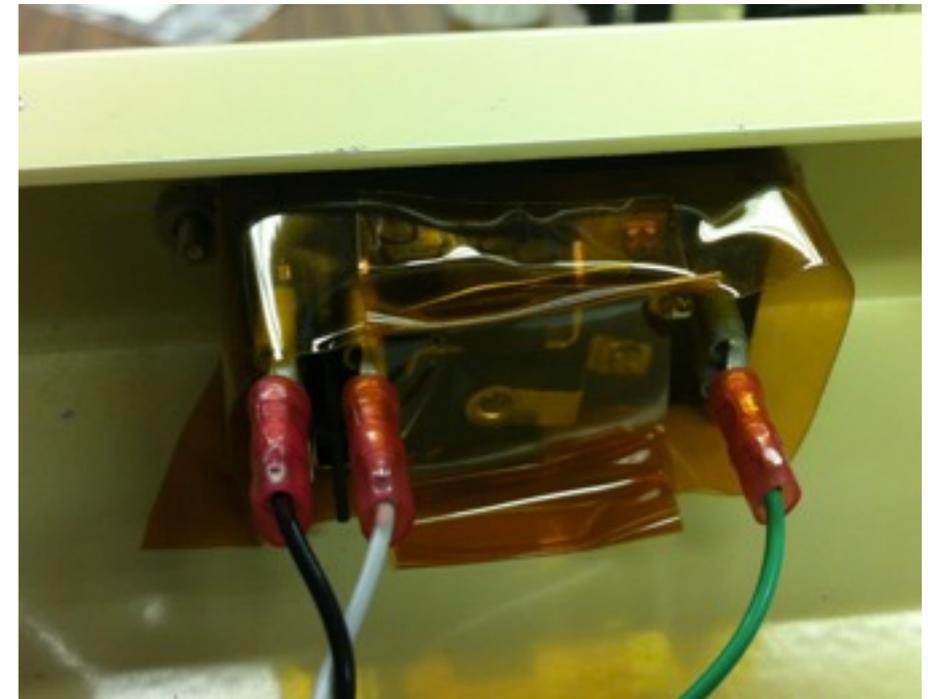
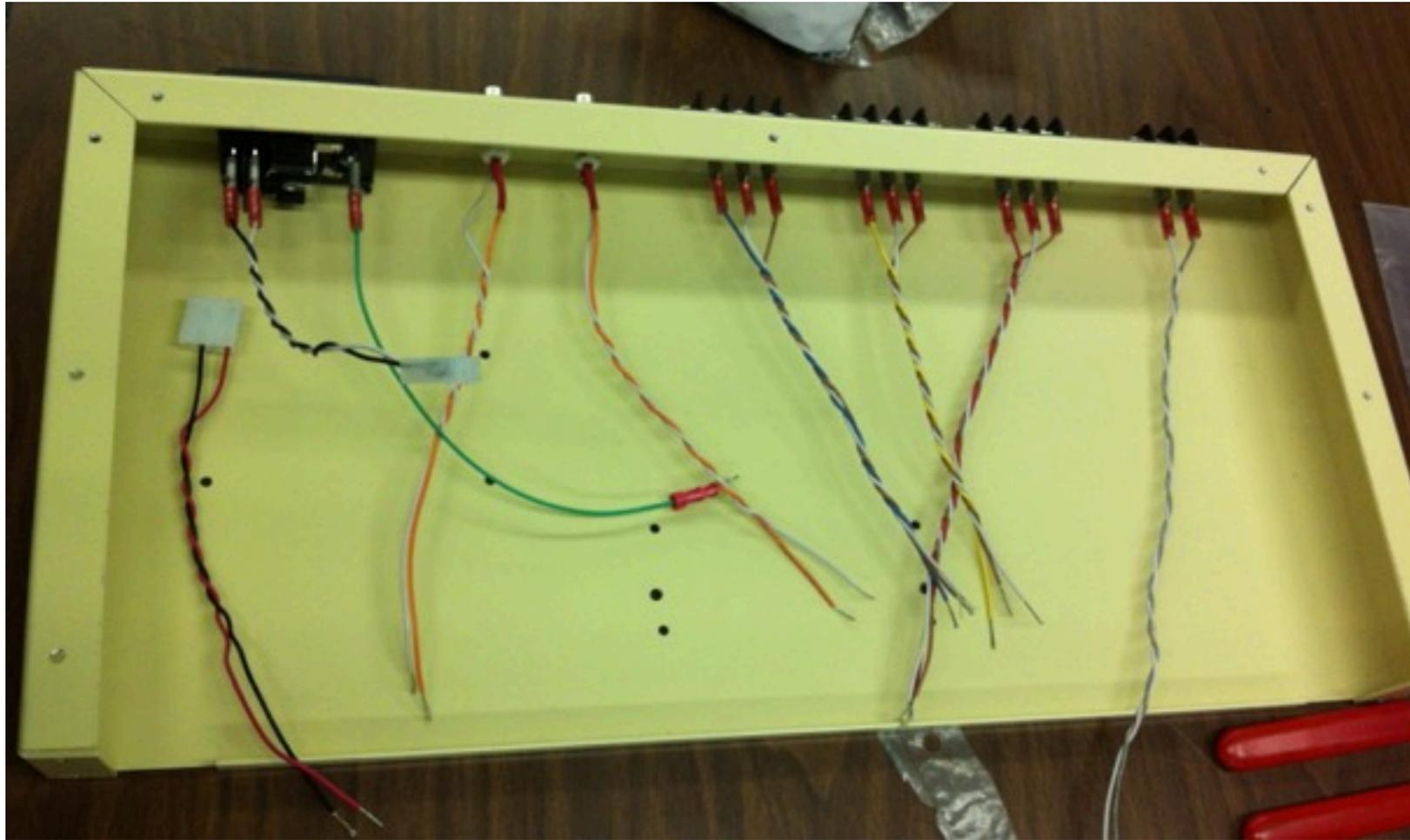
- Build these wires!

Cable #	Description	Hardware	End 1	Color/Ga	Length	End 2	Hardware	Notes
RPS101	AC Input	0.183" x 30mil Quick Connect		White/22	4.5"		Molex	Twist wires together
RPS102	AC Input	0.183" x 30mil Quick Connect		Black/22	4.5"		Molex	
RPS103	AC Input	0.183" x 30mil Quick Connect		Green/22	6.5"		#4 Ring Terminal	
RPS104	DC Out	Molex		Red/22	6.5"		Stripped 3/16"	Twist wires together
RPS105	DC Out	Molex		Black/22	6.5"		Stripped 3/16"	
RPS106	Interlock	Stripped 3/16"		White/22	7"		Stripped 3/16"	Twist wires together
RPS107	Interlock +	Stripped 3/16"		Orange/22	7"		Stripped 3/16"	
RPS108	Interlock	Stripped 3/16"		White/22	7"		Stripped 3/16"	Twist wires together
RPS109	Interlock +	Stripped 3/16"		Orange/22	7"		Stripped 3/16"	
RPS110	UPS EPO C	Stripped 3/16"		White/22	6.5"		0.183" x 30mil Quick Connect	Braid wires together
RPS111	UPS EPO NC	Stripped 3/16"		Brown/22	6.5"		0.183" x 30mil Quick Connect	
RPS112	UPS EPO NO	Stripped 3/16"		Blue/22	6.5"		0.183" x 30mil Quick Connect	
RPS113	AUX 2 C	Stripped 3/16"		White/22	6.5"		0.183" x 30mil Quick Connect	Braid wires together
RPS114	AUX 2 NC	Stripped 3/16"		Yellow/22	6.5"		0.183" x 30mil Quick Connect	
RPS115	AUX 2 NO	Stripped 3/16"		Brown/22	6.5"		0.183" x 30mil Quick Connect	
RPS116	AUX 1 C	Stripped 3/16"		White/22	8"		0.183" x 30mil Quick Connect	Braid wires together
RPS117	AUX 1 NC	Stripped 3/16"		Red/22	8"		0.183" x 30mil Quick Connect	
RPS118	AUX 1 NO	Stripped 3/16"		Brown/22	8"		0.183" x 30mil Quick Connect	
RPS119	Smoke Detector -	Stripped 3/16"		White/22	10"		0.183" x 30mil Quick Connect	Twist wires together
RPS120	Smoke Detector +	Stripped 3/16"		Violet/22	10"		0.183" x 30mil Quick Connect	

2: Connect backplane components, wires



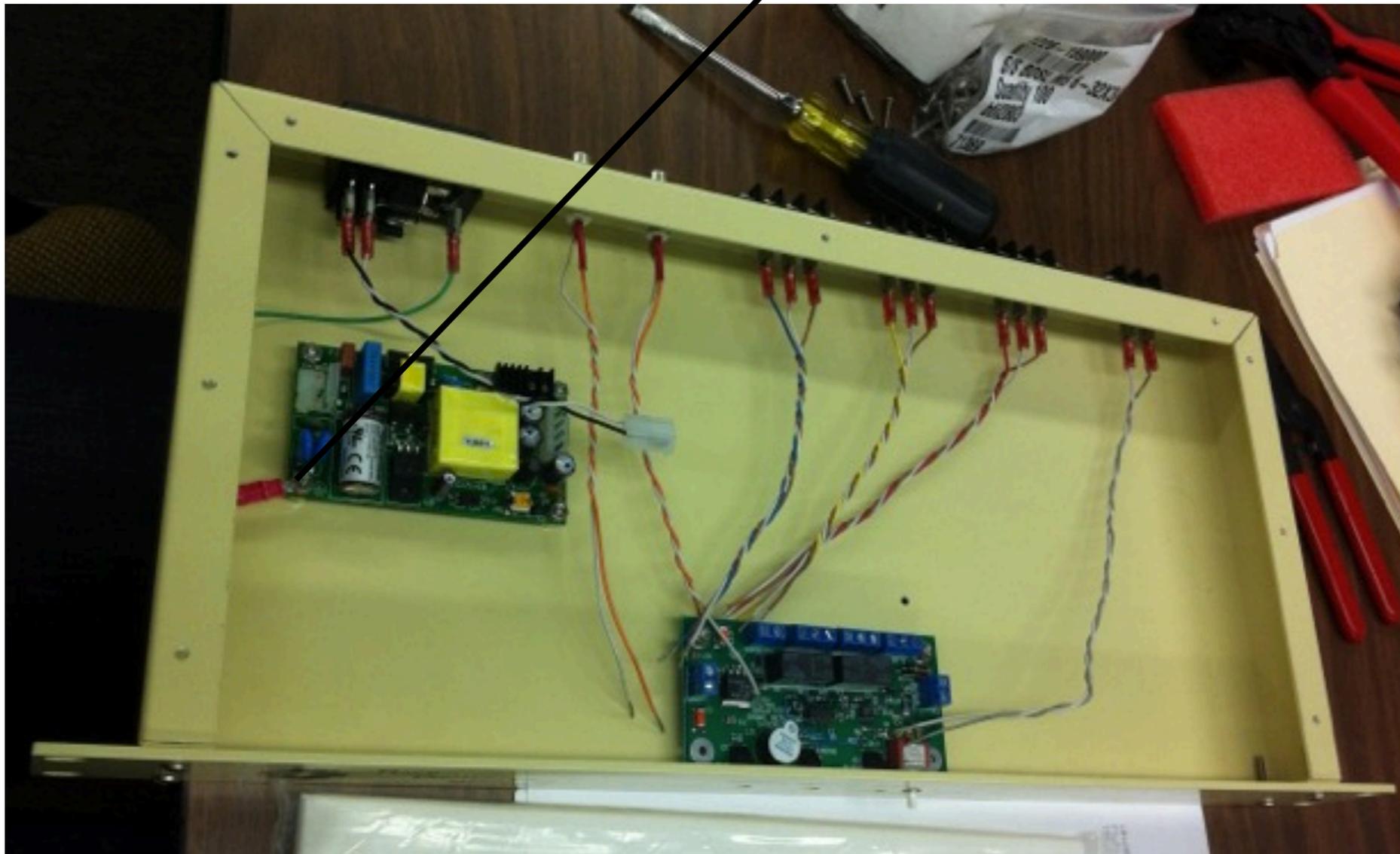
- See example boxes for exact connections, or connection diagram in extra slides
- See BOM in extra slides for which screws go where
- Wrap power switch in Capton tape



3: Connect boards and front panel



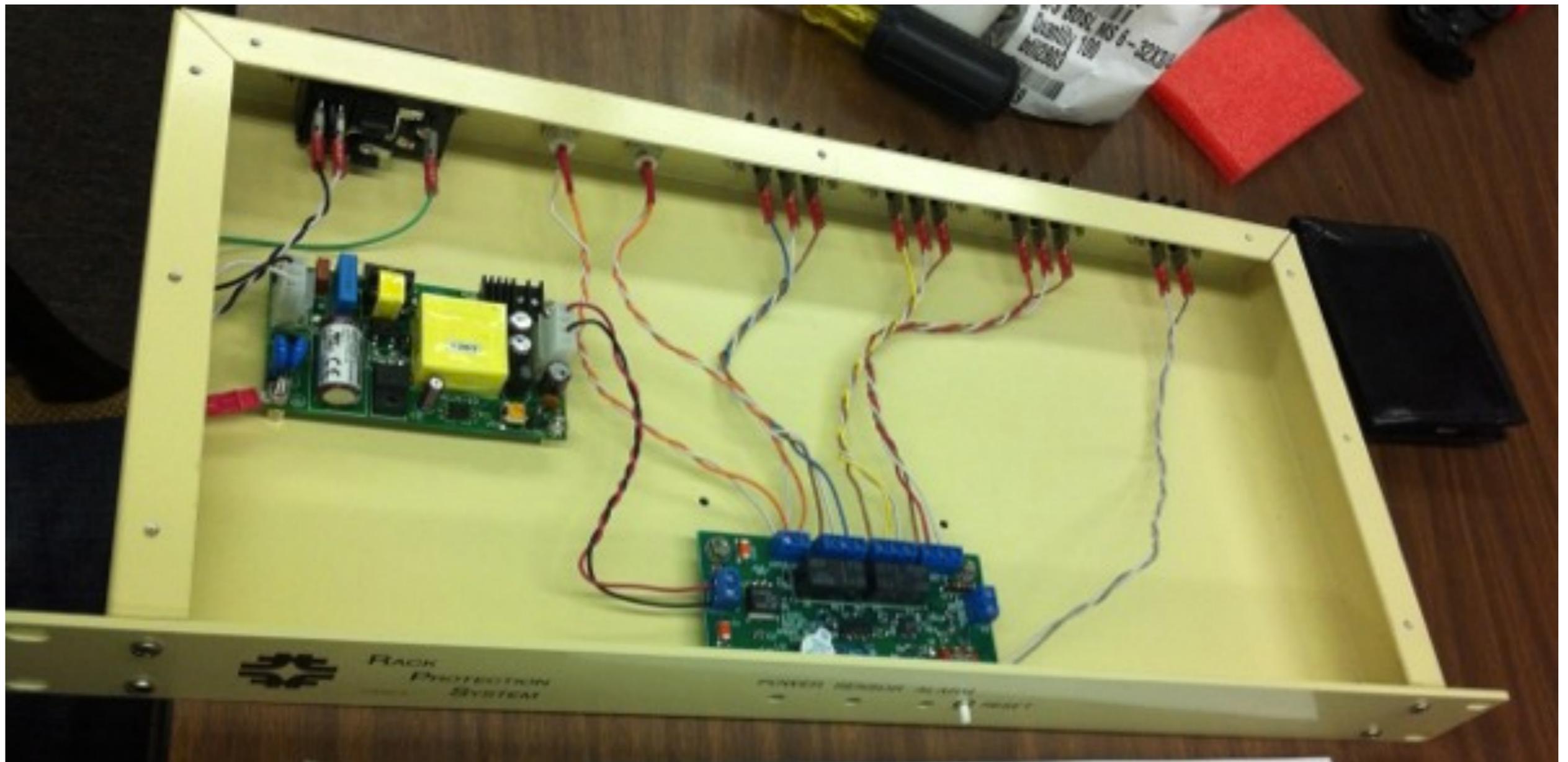
- Connect boards with 4-40 screws
 - Don't forget 1/4" spacers!
 - Connect ground wire to ground post. Add star washers under two screws for good ground connection
- Attach front panel



4: Wire boards



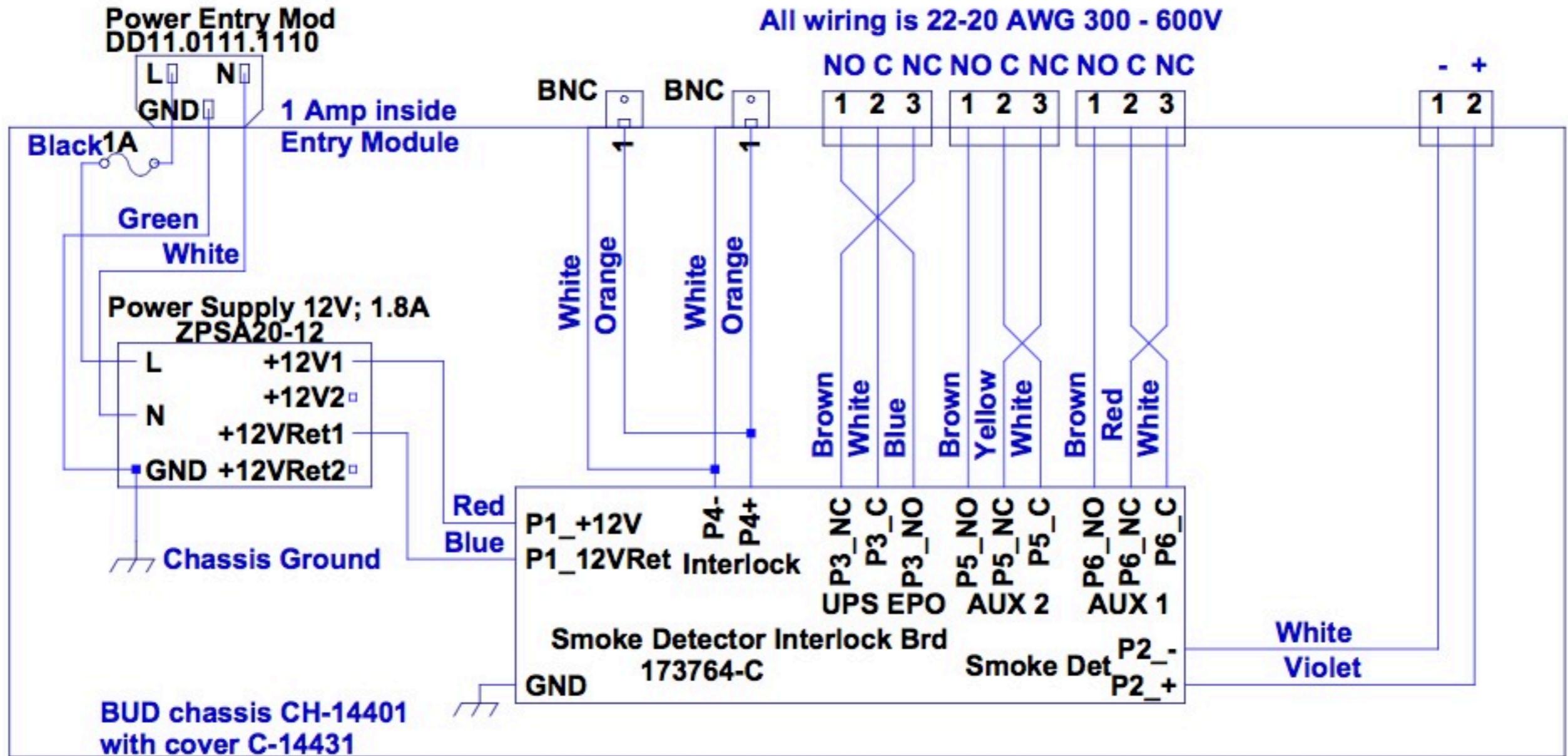
- Follow example boxes, or wiring map in extra pages
- Use ferrules on wire ends to connect into boards
- Connect moles connectors



Done!



Wiring connections



Bill of Materials



Chassis

Item #	Comment	Description	Part Number	Quantity	Unit \$	Total \$
1	12V 1.8A	12V power supply, TDK-Lambda	ZPA20-12	1	\$ 20.00	\$ 20.00
2	Power Entry Module	IEC Appliance Inlet C14 with Line Switch 2-pole, Fuseholder 1	DD11.0111.1110	1	\$ 8.15	\$ 8.15
3	BNC	Isolated BNC, TE Connectivity	5227726-2	2	\$ 2.39	\$ 4.78
4	Barrier Strip	3 position barrier connector strip, Molex	38721-6703	3	\$ 3.83	\$ 11.49
5	Barrier Strip	2 position barrier connector strip, Molex	38721-6702	1	\$ 1.83	\$ 1.83
6	3 pin connector	3 pin connector with pins, Molex	0009503031	1	\$ 0.18	\$ 0.18
7	4 pin connector	4 pin connector with pins, Molex	0009503041	1	\$ 0.24	\$ 0.24
8	Quick connector	0.187" x 0.030" female quick connect	5-160479-2	14	\$ 0.55	\$ 7.70
9	AC Line cord	CORD NEMA5-15P C-15SJT 7'6" 16/3	338010-01	1	\$ 4.98	\$ 4.98
10	Sensor Cable	Red Plentum Cable, 18-1TP 10'	B887600	1	\$ 12.50	\$ 12.50
11	Chassis Cover	17" x 8" chassis cover, BUD	C-14431	1	\$ 20.00	\$ 20.00
12	Grounding lug connection	#4 ring tongue 24-20 AWG		1		\$ -
13	Entry Module Mounting	4-40 x 3/8 flathead screw		2		\$ -
14	Power Supply Mounting	4-40 x 1/2 panhead screw		4		\$ -
15	Main PCB mounting	4-40 x 3/4 panhead screw		4		\$ -
16	Main PCB mounting	1/4" pillar standoff		8		\$ -
17	Main PCB/Power Supply mtg	4-40 locking nut		10		\$ -
18	Rack Mounting screws	10-32 x 3/8 Panhead		4		\$ -
19						
20	Barrier Strip Mounting	6-32 x 3/4 panhead screw		8		\$ -
21	Barrier Strip Mounting	6-32 locking nut		8		\$ -
22	Patch Cable	RG-58 Interlock Cable w/BNC ends		1		\$ -
23	Chassis Front Panel	1U 19" rack panel Fermilab design	173764	1	\$ 25.27	\$ 25.27
24	Chassis and Rear Panel	Chassis and Rear Panel	173764	1	\$ 36.45	\$ 36.45
					\$	153.57