

Simple, Multiple-Pad Launch Controller

Plans, Etc By John Hruby

I have been a rocketeer for many years with the typical hiatus during early adulthood. Several years ago I came back to the hobby and launch mostly mid and high power stuff, but many times I am asked to conduct launches for local Cub Scout groups as well as my own children.

I wanted a multiple pad controller like our Tripoli club had, but did not need the capacity they had. A smaller version would work well with the Cub Scout launches and would be simple enough for our family launches.

My requirements:

1. A launch controller that could handle 4-6 pads
2. Use high amperage relays to dump current to the igniters
3. Use easy-to-obtain serial cable of various lengths(10, 25, 50,100 ft)
4. Capable of lighting A - J motors
5. Compact
6. Reliable

The Internet being what it is, I set out on a quest for plans detailing a simple Multiple-Pad Launch Controller that even I could wire without screwing up. I consider myself quite technology savvy, but when I have to figure out a wiring diagram and then actually start soldering things together – something's bound to end up in smoke.

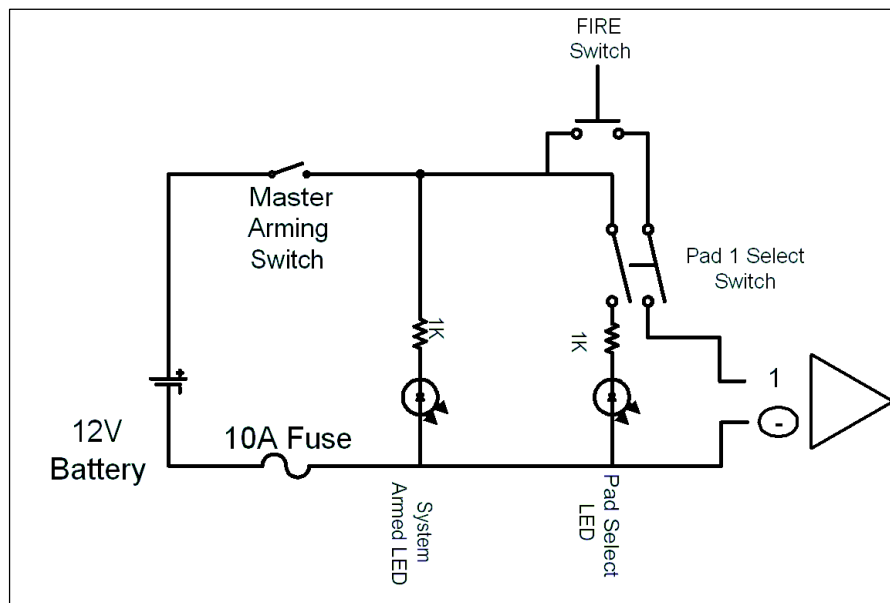
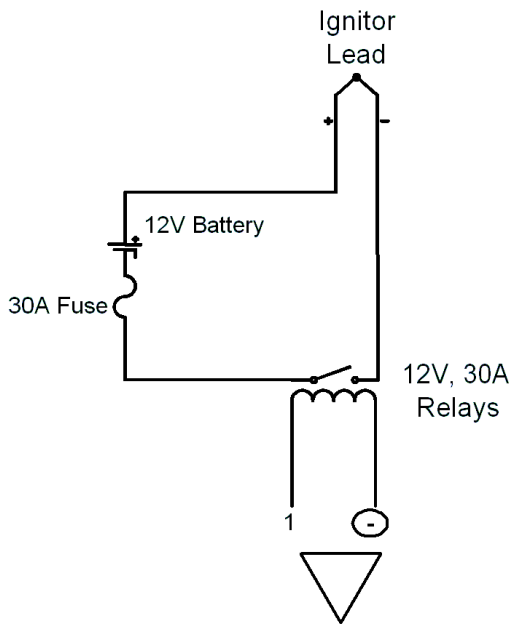
I found a system that was close to what I wanted, but it had one major drawback. The operator had to initially select a pad and then throw multiple switches to launch more than one rocket. I wanted something that was one switch per pad and hit fire. I later found this to be the hurdle – stay tuned.

Initially, I prototyped the controller mentioned in the previous paragraph. It had all sorts of continuity circuits, buzzers, etc, and every time I wired it, something went up in smoke – oops. See, I told ya. I set this prototype to the side for many months and did other things.

My rocket group, Tripoli Oklahoma, had to refurbish one of our relay boxes and it gave me a good look at the innards of that box. One day, on a whim, with all of my previously purchased components, I started putting things together with test leads. A test lead is just a wire with alligator clips at either end. I kept it simple.

After attaching a 12 volt hobby battery, I clicked on the “master arming” switch. The red LED came on and viola, no smoke. I next threw the “pad select” switch. Again, no smoke, and a pretty LED let me know the pad was selected. Finally, I hit the “fire” switch. The LED I had wired blinked every time I pressed the fire button – and no smoke. I finally made the circuit work!!!

Bolstered by my controller’s success, I started drawing the diagram for it and started to figure out where and how multiple pads would fit in. Below is the diagram for a single pad circuit. Simple and easy.



I then figured out how multiple pads would fit in. Here is the diagram for multiple pads.

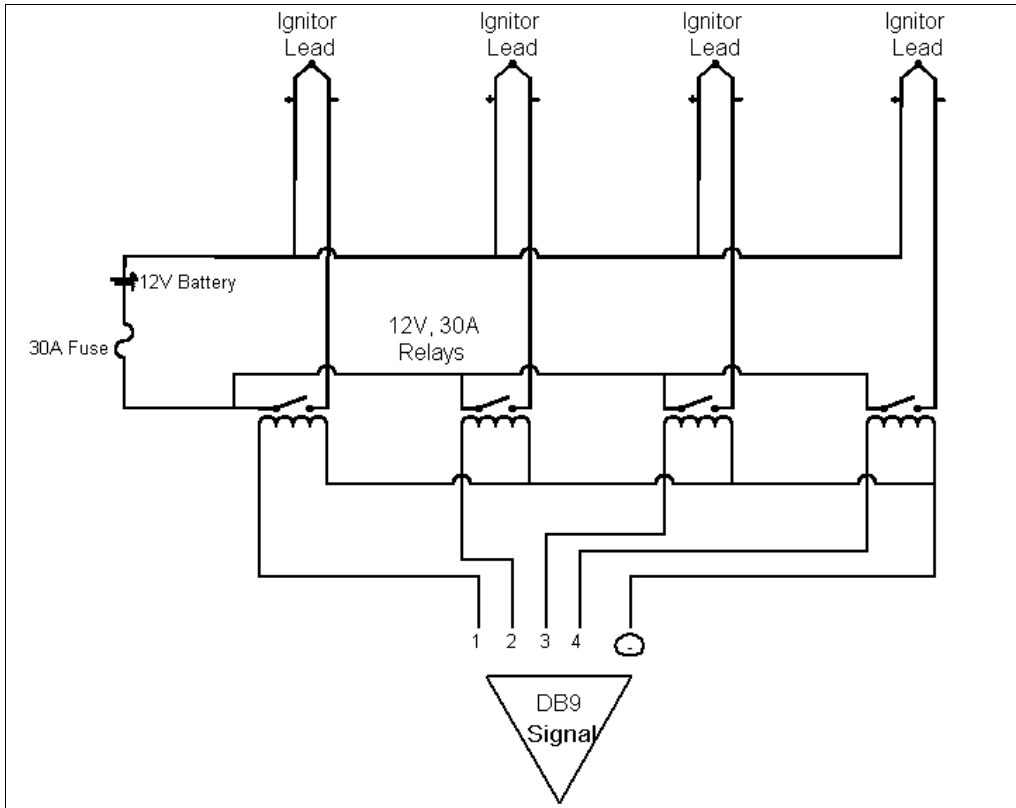


Figure 1 - Relay Box

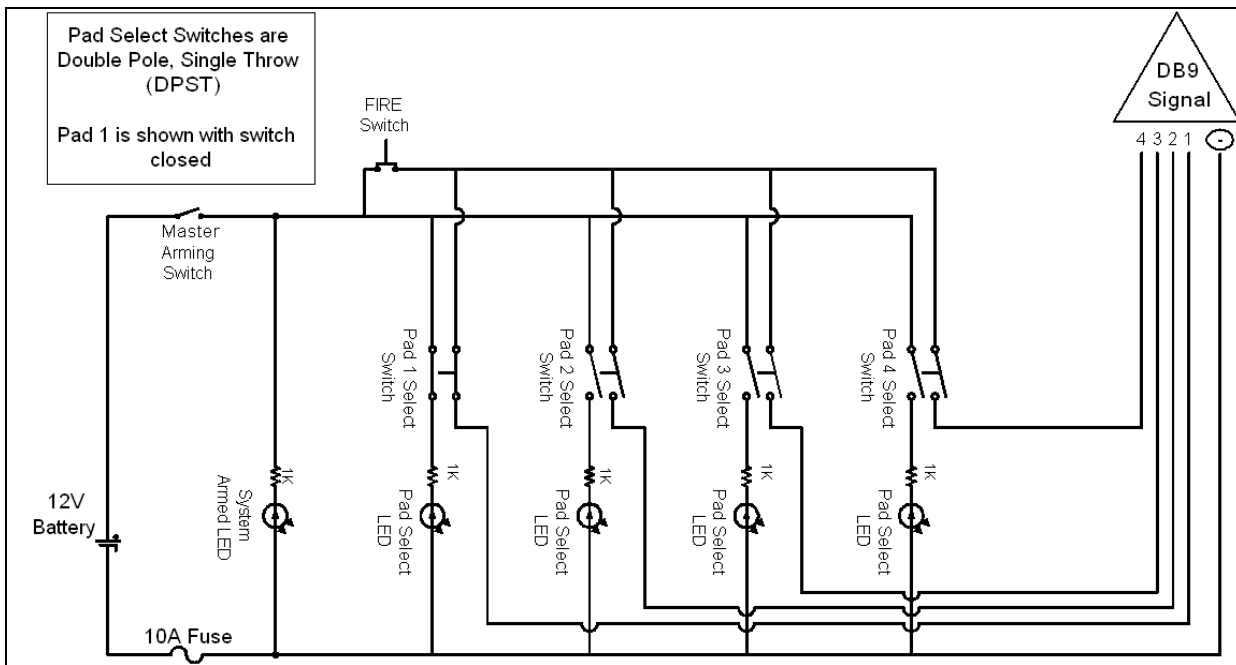


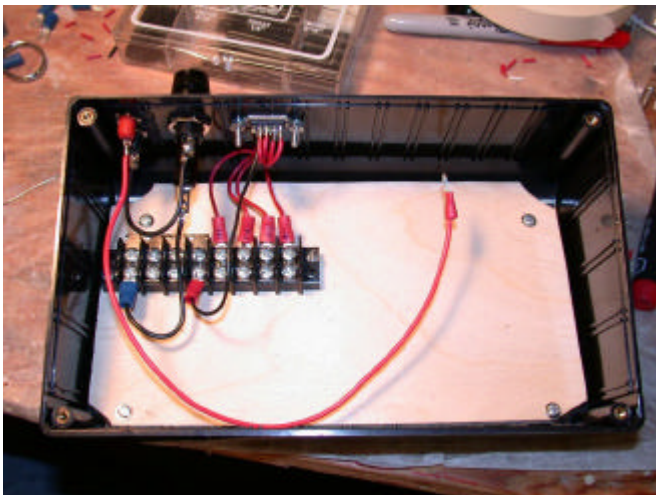
Figure 2 - Controller Box

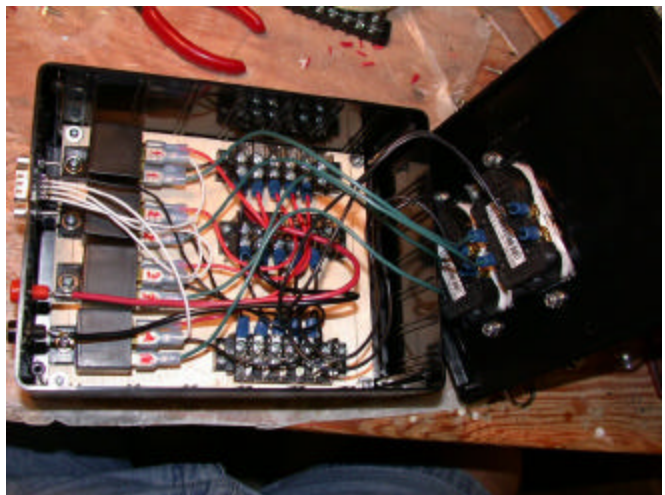
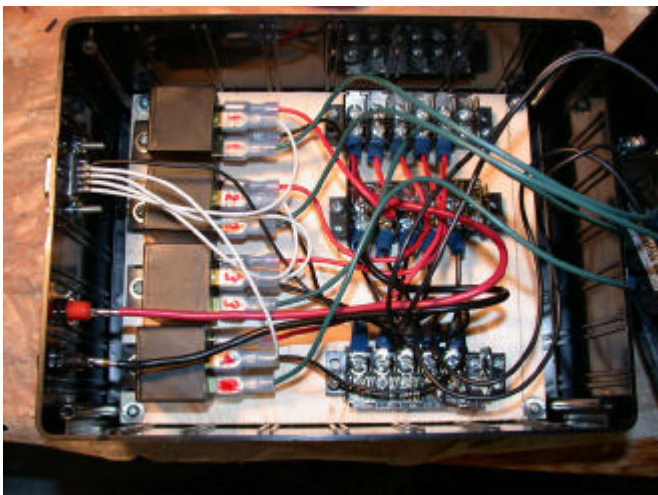
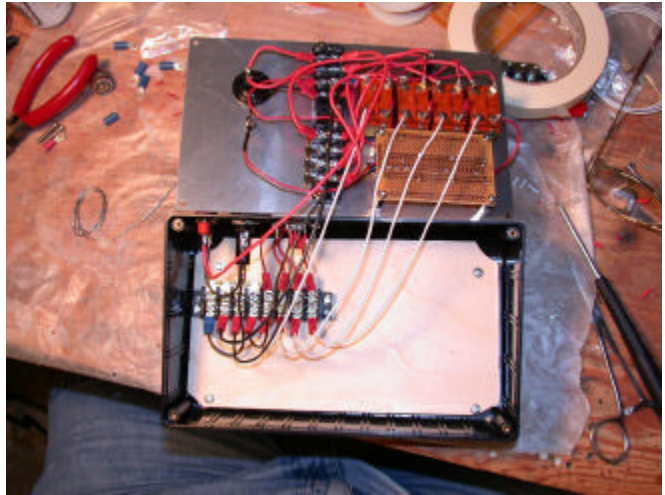
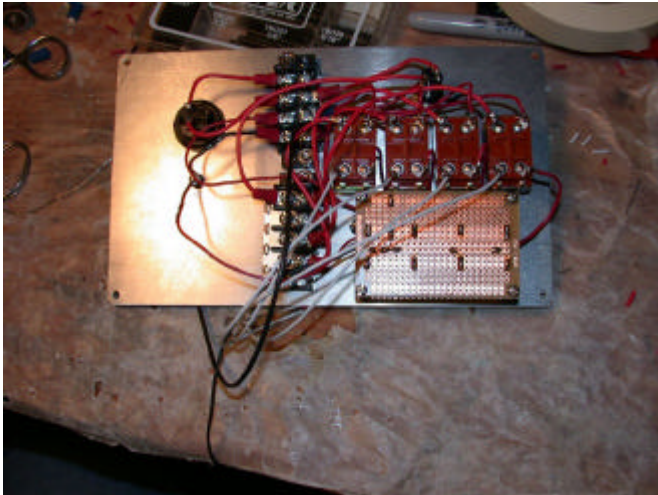
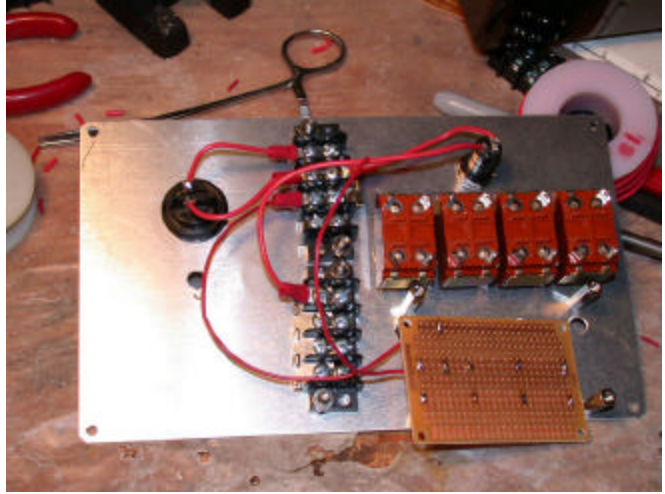
The key component to make the multiple pad controller function as I wanted was a specific switch to select the individual pad circuits. It has to be a Double-Pole, Single-Throw(DPST). With a single throw of the switch, part of

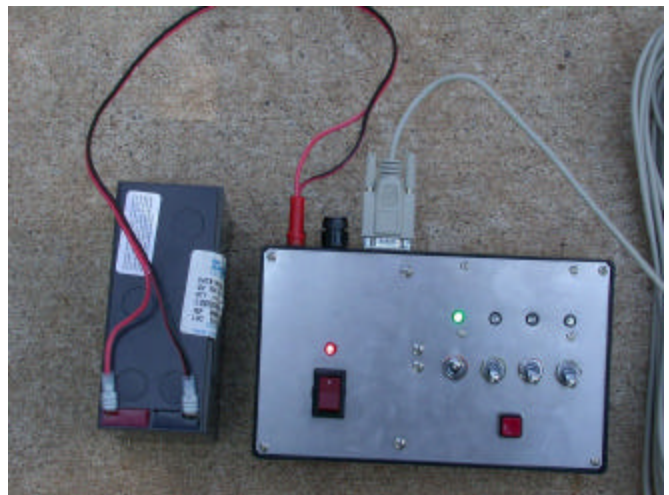
the circuit lights an LED, indicating that that pad is selected **without** sending a signal down the control cable. The other pole, is energized when the "Fire" button is pressed and sends a signal(current) down the serial cable to the appropriate relay – thus energizing the right igniter. If you use a SPST switch the LED will only light when the "Fire" button is pressed – not too useful to see which pads are selected.

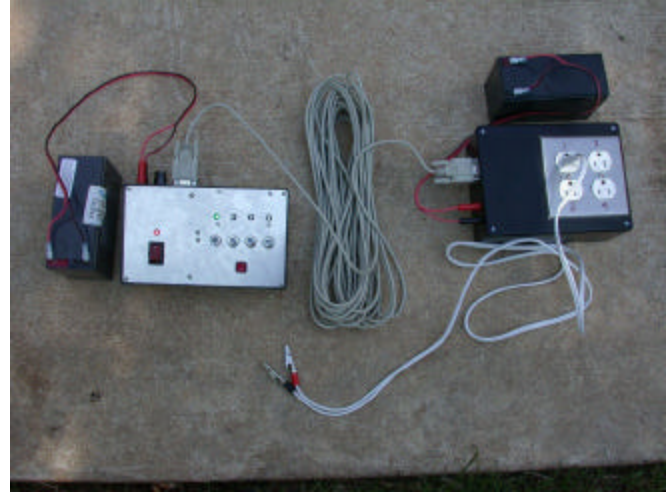
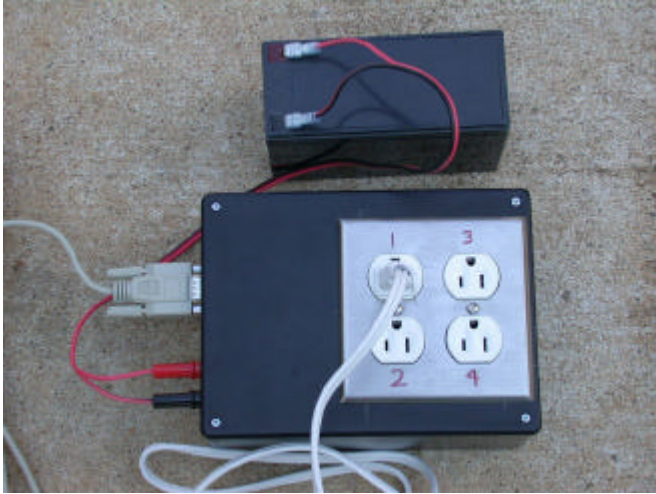
I used a DB9 serial cable for signaling the remote relay box and its circuits. DB9 is lightweight, easy to solder, comes in many lengths, and can support up to a 8 pads without continuity(8 pads + 1 ground). A DB25 cable would be another good choice, and could support additional features like continuity along with 8+ pads.

Below are construction photos.









Things I'd like to do . . . Things I might do.

- Using one wire(positive and use existing ground) of my cable, I might wire a piezo buzzer into the relay box that would sound if the master arming switch is selected "On," and would warn someone that the system is armed while they are at the pads.
- Another addition could be a circuit(piezo or light) to warn users if a relay was "welded" closed and the igniter is "hot" without the Fire switch being pressed.
- I may substitute a key switch instead of the rocker switch for added security from inadvertent arming. The key switch I had was too big to fit my box and I could not find the two others I have . . . somewhere.

All of the components in the project were purchased from either Radio Shack or Digi-Key. Digi-Key is a LARGE electrical part supplier and will have just about anything you may need. All Electronics is another good parts house.

The most difficult part of the build was finding a box big enough to house the wiring without breaking the bank. I bought the largest plastic box I could find in the Digi-Key catalog. Other, larger boxes were available, but they were all metal(nice) and expensive - \$35 and up.

Although, I could have wired the boxes more efficiently and saved space, I tried to keep things neat and reduce stress on components when opening and closing the cases. This is why I used terminal strips wherever I could.

Parts List

Qty	Description	Supplier	Part #	Cost	Total Cost
1	Project Box. 8x7x3, Relay Box	Radio Shack	270-1809	6.99	6.99
1	Hammond Enclosure(Controller)	Digi-Key	HM244-ND	12.82	12.82
1	50 ft DB9 Serial Cable	CablesToGo	09453	28.99	28.99
4	Relay, 12vdc, 30 amp	Radio Shack	275-226	6.29	25.16
1	Fuse Holder 10amp	Radio Shack	270-367	2.29	2.29
1	Fuse Holders 30amp, Auto Style	Radio Shack	270-1234	2.59	2.59
4	Toggle Switches - Pad Select	Digi-Key	360-1191-ND	8.37	33.48
1	Rocker Switch - Master Arm	Radio Shack	275-690	2.59	2.59
1	Momentary On Sw, Fire Switch	Radio Shack	275-1566	2.69	2.69
1	SuperBrite LEDs, Red	Digi-Key	67-1611-ND	0.46	0.46
4	SuperBrite LEDs, Green	Digi-Key	67-1755-ND	2.73	10.92
5	LED Holders	Radio Shack	276-079	0.26	1.29
5	1K Ohm Resistors	Radio Shack	271-1118	0.20	0.99
1	DB9, Female, Solder Cup	Radio Shack	276-1538	1.59	1.59
1	DB9, Male, Solder Cup	Radio Shack	276-1537	1.59	1.59
2	Banana Plugs	Radio Shack	274-721	2.59	5.18
2	Banana Jacks	Radio Shack	274-725	2.59	5.18
2	110v Std Wall Outlets	Electrical Supply Store		0.97	1.94
1	Double Gang Face Plate	Electrical Supply Store		5.00	5.00
4	Alligator Clips	Radio Shack	270-347	0.82	3.28
4	Extension Cords	Big Blue		2.00	8.00
5	Terminal Strips and Jumpers	Radio Shack	274-659	2.49	12.45
4	Terminal Block Jumpers	Radio Shack	274-650	1.99	7.96
1	PC Board for Resistors, small 2x3	Radio Shack	276-150	1.79	1.79
1	Misc Wire, connectors, etc			30.00	30.00
					215.22

This is more expensive than I had first anticipated. The DPST switches added quite a bit to the cost, but this is an attractive, functional system that meets or exceeds my requirements – it looks snazzy too.

Note: The green “superbright” LEDs are blindingly bright. Even in direct sunlight, they almost hurt to look at. The red LED is easily seen in direct sunlight as well – you just won’t get blinded by staring at it like the green ones.

www.radioshack.com

www.digikey.com

www.allelectronics.com

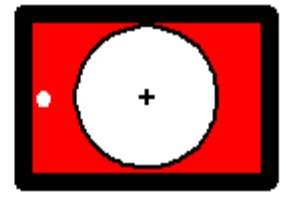
www.cablestogo.com

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Below is a rendering of the controller face. The outlines are component sizes so I could visualize how things would fit together.

Multi-Pad Launch Controller

Armed 

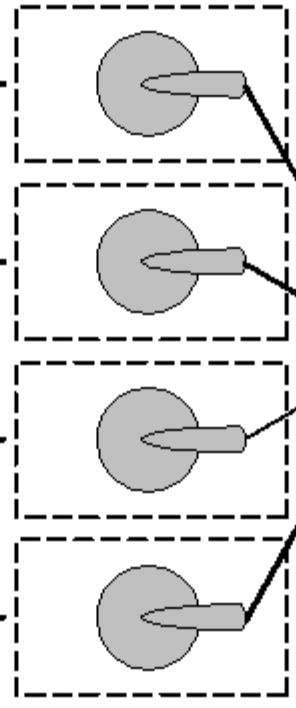


Master Arming
Switch

Pad

- 1 
- 2 
- 3 
- 4 

Pad
Select



FIRE!