8 Pad Launch Controller
by Steve Robb

About six months ago I started thinking about the possibility of building a new launch controller that the club could use at it's monthly launches. This was partly as a result of a discussion that occurred on the MASA mailing list related to ways to improve the regular launches(optimum number of pads, pad rotations, etc) and also as a result of having access to a large number of surplus components that could be used in the design and construction of a new system. Having a background in electronics I've always been interested in some of the different designs that I've seen in books and on the web so I thought that I would try and take the many ideas that I had come across and try and combine them into a new design.

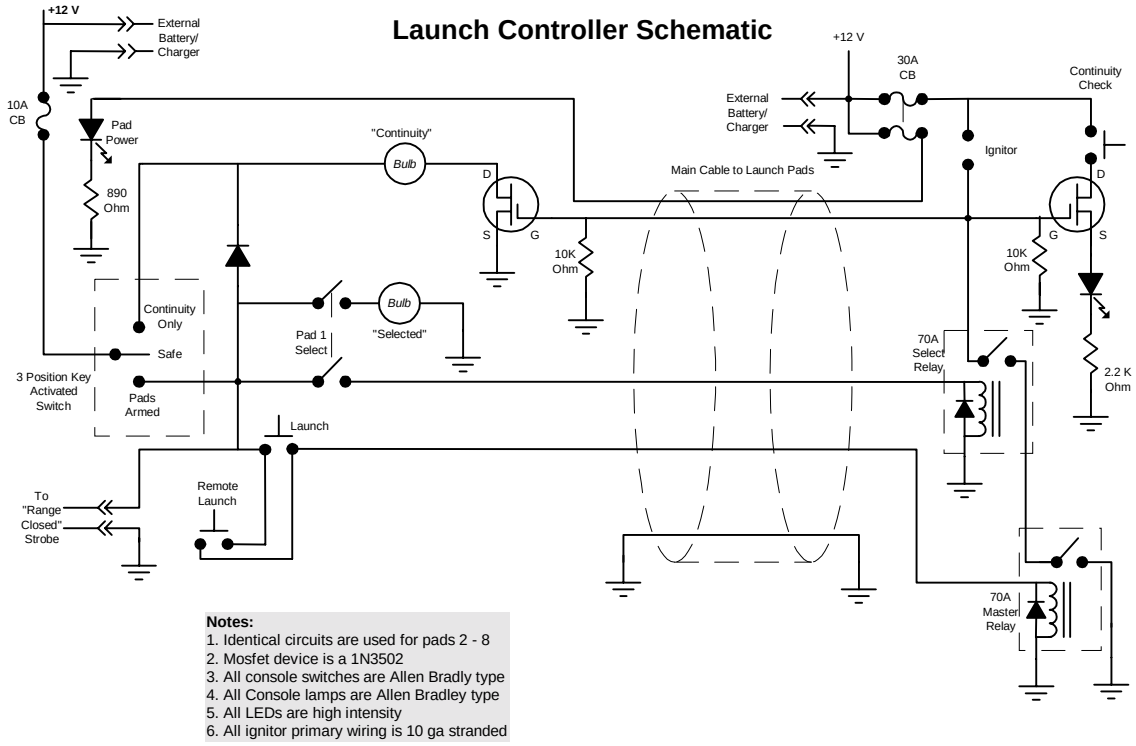
The basic design centered around the following ideas –

- Control 8 pads
- Ability to check igniter continuity at the pad as well as at the console
- Maximize safe operation
- Robust construction
- Self contained – no external batteries
- Flexible and expandable
- Have maximum power available at the launcher clips

The overall design went through a number of design changes as I tried one option after another and in the end, the simplest one won out. I had tried to utilize all electronic (no relay) circuitry but creating the high power circuits was too much of a challenge and so I reverted back to a mechanical relay design.

In general, the controller uses a 3 position key switch to select either a "Continuity only", "Safe", or "Pads Armed" circuit. The continuity circuits use MOSFETs to drive the indicator lights (either type 1816 12v bulbs or high intensity LEDs) which limits the current flow through the igniter to a maximum of 3 mA. The pad select switches on the console will energize any combination of pad side relays that are in series with the a master launch relay that controls either pads 1 – 4 or pads 5 – 8. A path to ground for the battery through the igniter is only possible when the master launch button is pressed which picks both master relays.

Here's the controller schematic in it's final form –



The pad side boxes contain two12v, 7Ah gel cell batteries wired in parallel and all internal wiring is 10 ga stranded copper wire. The connections to the pads are 14 ga stranded wiring with typical copper clips soldered to the ends. A 30A circuit breaker protects the pad boxes in the event of an overload condition.

The console is a custom designed, stainless steel cabinet that contains two 12v, 7Ah batteries wired in parallel as well as the continuity circuitry. A remote launch button can be plugged into a ¼" audio type jack on the side so that someone can launch their own rocket without having to reach over by the LCO and press the master switch.

The connection between the console and the pad boxes is 125' of 25 conductor cable. This provides enough individual conductors to provide 8 select signals, 8 continuity signals, 2 launch signals (one for pads 1 – 4, one for pads 5 – 8), 2 ground signals to eliminate grounding issues between the pad side boxes and the console, and 2 pad side power signals to indicate if the circuit breakers at the pads have tripped (quite possible in the event of a short at the clips).

If I was to do it over again, I would eliminate the 12V bulbs that are used for continuity and when the select switches are activated as they are just not bright enough under daylight conditions. On the other hand, the high intensity LEDs that I used (typically 13000mcd) are definitely bright enough even in direct sunlight and could have been used instead of the 12v bulbs.

Overall, it was a fun project to design and build and I'm looking forward to getting lots of use out of it at he upcoming launches.

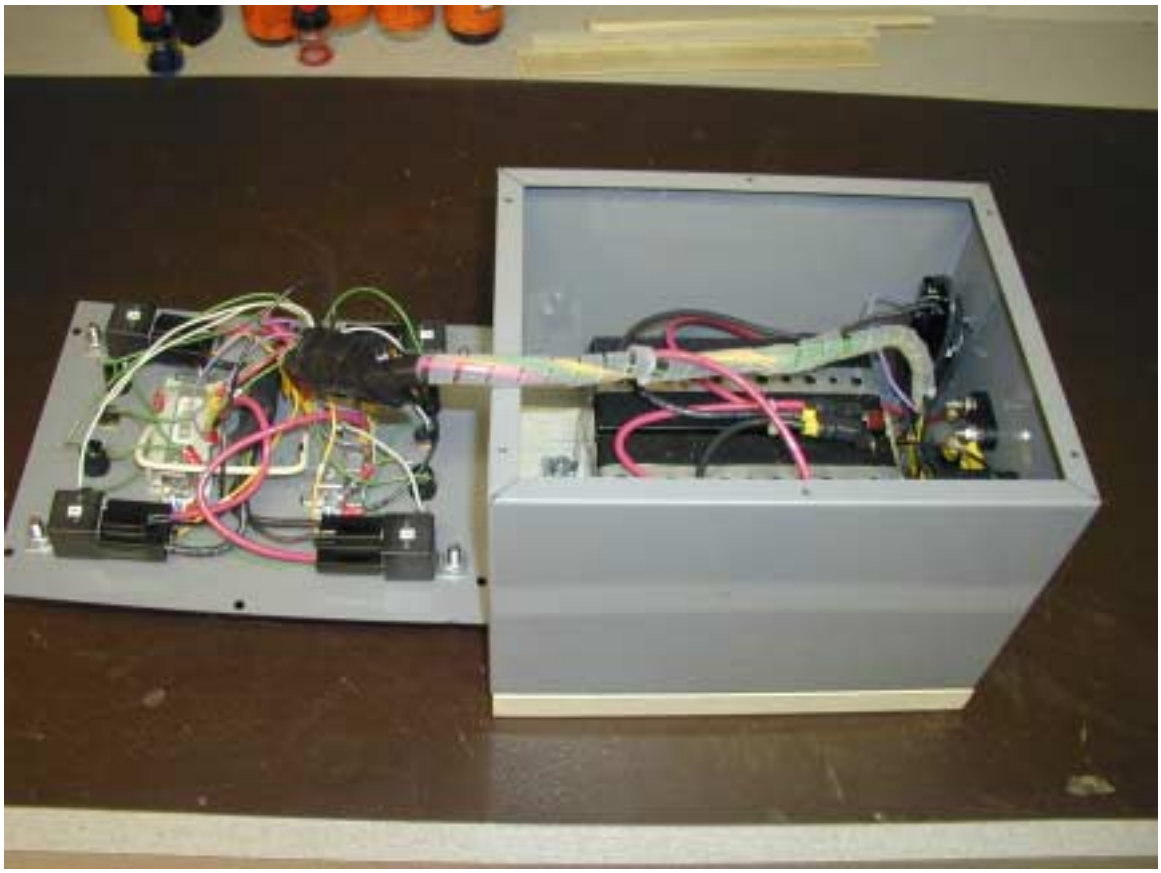
Photos

Inside view of console

Inside view of console showing batteries

Front view of console

Pad side box



Internal view of pad side box