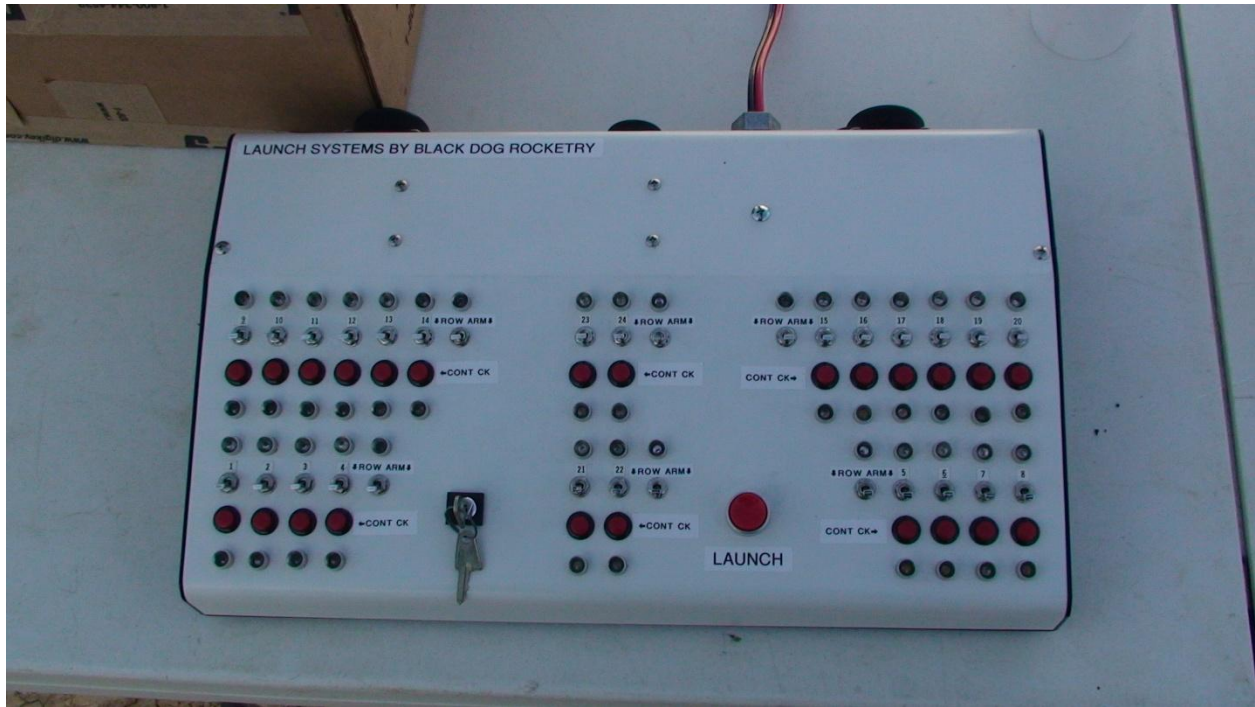


TCC Launch System

Version	Author	Notes	Date
0.01	James D.	Initial version	11/29/09
0.02	James D	Updates from Launch Cleaning	01/30/10
0.03	James D.	Updates for 2013	01/25/13

TCC Launch System

The Tripoli Central California Rocketry club launch system was designed and built by Ron McGough of Black Dog Rocketry.



Mission Control

The Mission control has 3 plug connectors in the rear and requires a 12-V battery for power.

Theory of Operation

The Mission control launch system provides 20 individual closed-loop circuits, all capable of being independently checked for continuity, armed, and fired. The system operates via a network of relay boxes each with individual power supplies (12V Battery) for full battery power discharge at the alligator clips. Each circuit also provides for a low-voltage continuity check which is isolated from the rest of the launch circuitry. Each Relay also has a circuit breaker which will fault in the event of an overload or short circuit to prevent poor or home-made igniters from being used or otherwise melting down the system.

Setup Strategy

The best strategy is to connect all of the mission control lines and have the model(#1-4, #5-8) and high-power (#9-14, #15-20) relays all setup in parallel with the away cells (#21-22/#23-24). Relays can be used on either model, high-power, or away cells as needed.

Model Rocket Relays #1-4, #5-8, Away Cell #21-22

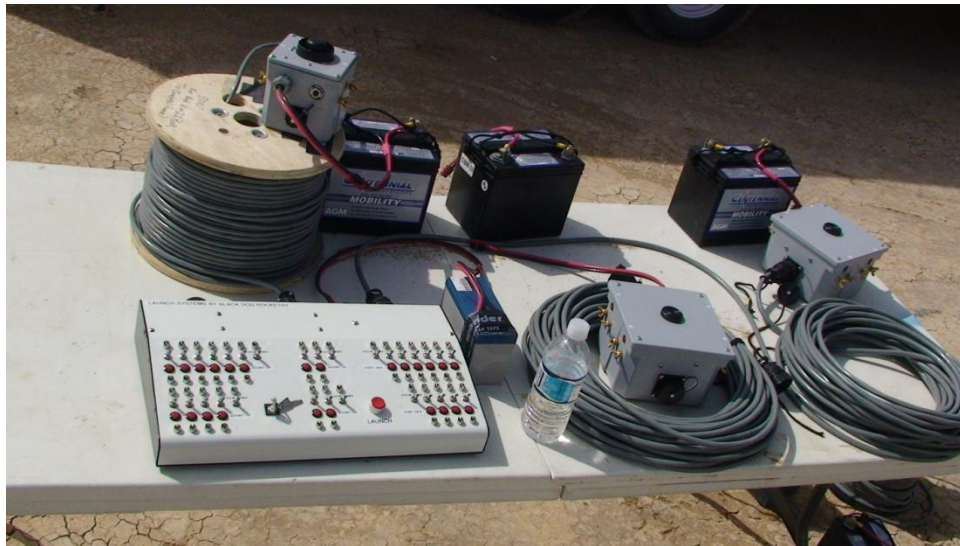
The Mission control plug connector on the left is large, and connects to Model Rocket Relay 1-4 with a 100' cable . The Mission control plug connector in the middle is smaller than the left or right and connects to the small relay box 21-22 to the away cell using one of the 500' cables. The Mission control plug on the right connects to Model Rocket Relay 5-8.



500' Away Cell #21-22, #23-24

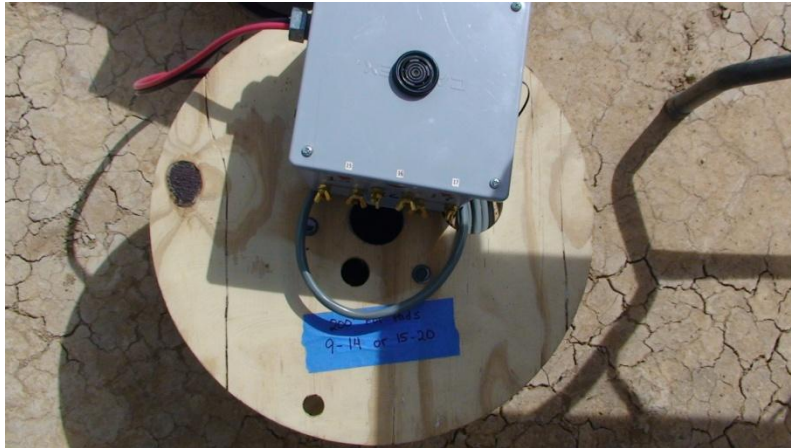
The Mission control plug connector in the middle is smaller than the left or right and connects to the small relay box 21-22 to the away cell using one of the 500' cables. You need Relay #21-22 to do any away cell activities, it has two cable connectors on the relay box. This relay connects directly to the

mission control center plug with the 500' cable on the spool. Relay #23-24 connects to the 21-22 relay using a 500' cable.



300' High Power Relays #9-14, #15-20

The High Power pads connect to the 100' model rocket relays on either side for up to 12 high power pads. Relay boxes 9-14, and 15-20 have 6 terminal blocks each and one plug connector which is attached to Model rocket relays #1-4 and #5-8 with two 200' cable runs. Two batteries are used (one per relay).



500' or 1000' Away Cell 23-24

Relay #23-24 connects to the 21-22 relay using a 500' cable. Unfurl the 500' cable to make 1000' for #23-24 relay.



4-Port Repeaters

The 4 port repeaters have terminal posts which connect directly to the alligator leads of whatever they are attached to. The repeaters are battery powered and fire all 4 of the terminals when the input terminal is active or fired.

4-Port Repeaters (10-M Cluster/Drag Capability)

The 4 port repeaters attach directly to Relay #23-24 to make two banks of 4 pads for a total of 8 pads which all fire off of 23/24 (4 Left/4-Right). When Relay #21-22, #23-24, and the 2 4-Terminal Repeaters are located at 500', 5 M-Class rockets may be fired by arming and firing 21-22,23-24 at the same time.

4-Port Repeaters (8-N Cluster/Drag Capability)

Alternatively, Relay #21-22 can be left at 500' pads, and the 500' cable for Relay #23-24 can be unrolled to 1000' away from the mission control. The 2 4-Port repeaters can be connected directly to #23-24 allowing 2 banks of 4 to be fired at the same time from 1000' away when #23-24 are armed and fired.

Cables



Top-left: soldering SBS-50 terminals to 10GA, Top-Right: Completed SBS-50 Quad lead and heat shrink
Bottom-left: 12 Igniter leads with SBS-50 connector, Bottom-Right: Dual 6' Umbilical cord (Model Pads)



Top-Left: 4-Motor cluster Igniter leads (4'), Top-Right: 6' Deans Ultra-Wire Leads

Bottom-Left: 6' Deans Ultra-Wire Leads with Nomex, Bottom-Right: 12 9' Cables, 2 Umbilical Leads, 2 Ultra-Leads, 2 Relay Leads

Notes

- All battery connectors are Anderson Powerpole PP45 type 45A connectors.
- All Terminal lead cables are Malibu outdoor wiring in 12ga (Away cells) and 14ga. This wire is flexible at all temperatures, is rugged (it's meant to be buried) and is relatively cheap (100' spool of 12ga is \$70 in 2009).
- 12ga wire is rated at 20amps, system is rated at 30. The wire can handle the load of 30-amps for a short duration and heat up the wire but it won't matter since a short will fire the circuit breaker.
- The circuit breaker is a push-button type (manual reset).

- If you're blowing a 30-amp breaker, you're using too heavy a nichrome wire and you should learn how to make an igniter.
- Copper Alligator Clips are manufactured by Mueller Electric Co., their part #BU-60S. Digi_Key's part # is 314-1034-ND. In 2009, the price is \$0.75 each, the price break is at 100 units at \$70.78. In 2013 the design has changed to Nickel plated do to the price of copper and now the price is 100 units for \$35.00
- Connectors from the relays to the new Disposable Lead format are made with Anderson SBS-50 type connectors. Anderson 6331G2 (Red). The handle is Anderson SB50-HDL-RED. You need two per lead, one is throw-away (at least the housings can be saved and the pins replaced).
- Ring terminal connector is Gardner Bender Part #15-107: #12-1/4" Stud, 12-10, Ring Terminals
- Relay leads have an SBS-50 on one end, and two Ring connectors on the other end
- Igniter leads have an SBS-50 on one end, and two Mueller Alligator clips on the other end.
- Use 62/36/2 silver bearing rosin core solder (or better)