This ULU

The *ULU.35 Ignition box* can be used, to launch a model rocket. It has a safe/arm system to make the ULU safe to use. Not every e-match will ignite using 5V, so that needs to be tested on forehand. In the case it will not ignite, the addition of a DC boost (step-up) converter to 12V and the corresponding 12V 2F capacitor, is necessary.

Used parts

The standard ULU specifications are applicable as specified in the datasheet *ULU.00 – Common specifications*. For this ULU, many non-standard parts are used.

The following standard parts are used:
1x casing 80 x 25 x 25mm;
1x mini (SRD-5VDC-SL-C) relay;
1x fly back diode (1N4148);
1x 3mm round LED;
1x resistor to dim the LED;
1x LED holder.

The following extra parts are used:
1x 3-pole 2.5mm data-connector;
2x 4mm insulated banana plug sockets;
2x (super) capacitor 2F 2.7V;
1x resistor 12Ω 5W;
1x 10mm (large) red LED;
1x resistor to dim the LED;
1x 2mm male signal plug;
1x 2.5mm male power plug;
1x 2.5mm 3-pole female socket;
1x 3-pole 2.5mm to 3.5mm jack plug adapter;
1x 3-pole 3.5mm jack plug 10m extension cable;
1x (preferable black) RCA socket;
1x RCA plug;
1x *Remove before flight* label.

When an aluminum case is used, it is important that the 4mm sockets are insulated and will not connect to the enclosure.

Construction

This ULU is a dense packaged ULU, with probably the largest number of non-standard components. The components are tightly together, so shrink fit tube is used form isolation when necessary.

A 2.5mm 3-pole female connector is used for input, to avoid using a regular data cable with unwanted effects. Long 10m or 20m 3-pole extension cables (3.5mm female to male) are easily available. To use these, an adaption cable needs to be made (See Figure 6). This extension cable is placed between the cable and the 3.5mm to 2.5mm adapter.

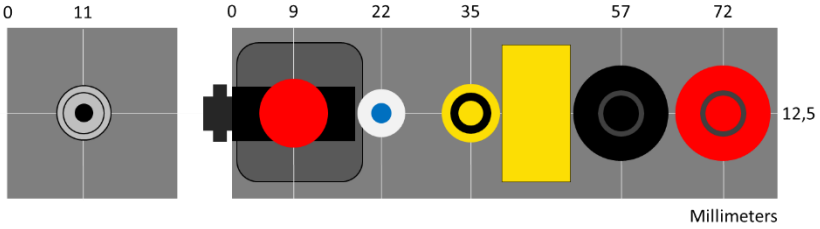


Figure 1 – Drill guide

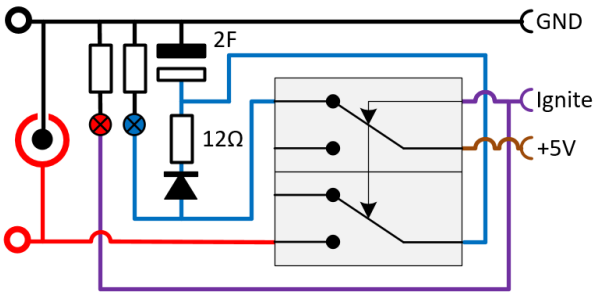
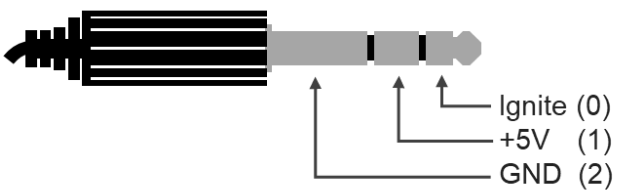
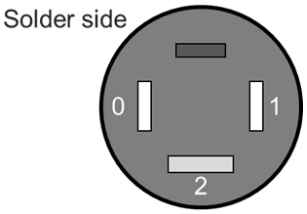


Figure 2 – Schematic





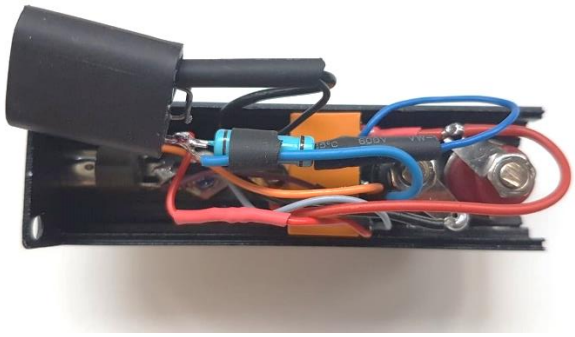


Figure 3 – ULU inside

Figure 4 – Finished ULU

Usage

Model rockets use electric matches to ignite the rocket motor, they are also called e-matches. The ignition of a model rocket motor is inherently dangerous, since the motor contains a burning propellant that can cause severe burns. The best way to protect against an unwanted start of the rocket motor is the use of a safe/arm system to short-circuit the e-match. An RCA-socket and RCA safe/arm plug are used to do so. When the plug is placed, the output is short-circuited. The *ULU.36 Launch enable* also uses an RSA socket, in this case to enable a connection. Both ULUs (35 and 36) work together to realize a simple but effective safe/arm system:

1. The safe/arm plug is disconnected from the *ULU.36 Launch enable*, therewith disabling the launch pulse be send to this ULU. Very important: there must be only one safe/arm plug in use!
2. The safe/arm plug is put into this ULU, the Ignition box, therewith shortcutting the E-match. Even when 5V is put on the ignition lines, it will not ignite.
3. After the ignition lines are connected to the igniter and the red LED is not burning (!), the rocket ignition is armed by removing the safe/arm plug.
4. Finally, the launch control is armed by placing the safe/arm plug back in the *ULU.36 Launch enable*.

The ignition box uses a supercapacitor to guarantee a proper current to ignite the E-match. This also avoids the current running along the long ignition line. A relay is used to differentiate between the default state: charging the capacitor and ignition: discharging this capacitor.

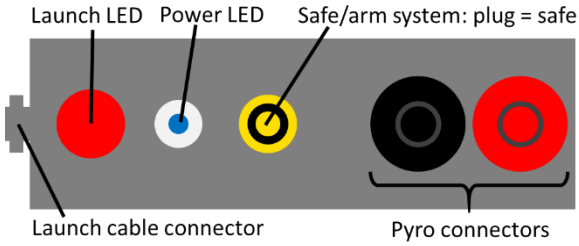


Figure 5 – Controls and connectors

Figure 6 – Ignition adapter cable

Figure 7 – Ignition box wired up