Dual Parachute Deployment Altimeter with an ATtiny 84 microcontroller

Mini Altimeter ParDuo (or Mini Alti Duo) Kit operating instructions

Rocket Type

Micro-max	Model Rocket	Mid power	High power
No	yes	yes	yes

Goal

The goal of this document is to explain how to use the dual altimeter kit that you just bought. The document assumes that you have already installed altimeters in a rocket payload bay or have some electronics experience.

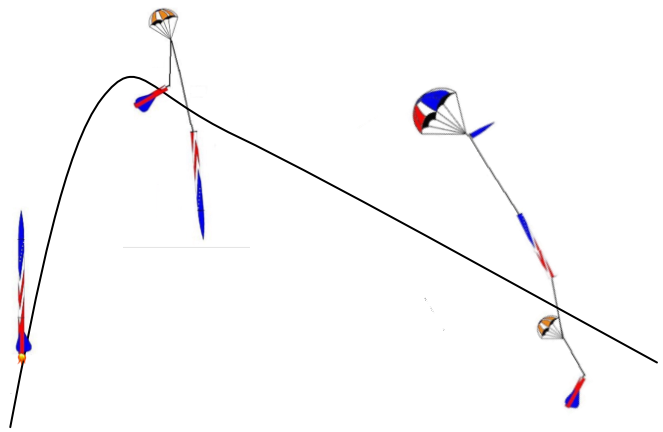
Before your start

Remember that you can modify the program and behaviour of your altimeter (flashing the altimeter).

The country where you live might not even allow the use of such device. You have to assume total legal responsibility for any damages or claims including personal injury that results from the use of this device. Modelraketten.NL shall not be responsible for the above. If you disagree with that, please do not use it.

What is dual deployment?

The Mini ParDuo kit is a dual deployment altimeter.
The idea is, that when you start reaching high altitudes, the rocket will land very far from the launch pad because it takes time to get back on the ground and the wind will take your rocket on its path.
One solution is to use a dual deployment altimeter that will use a very small parachute called the drogue, that you deploy at apogee. Ejecting the drogue prevents the rocket from doing a ballistic flight, makes it more visible and slows the model down. Then just before the model lands, the ParDuo deploys another parachute, called the main.



Choosing the power supply
The kit has been designed to use a 9Volt battery or a lipo battery with a voltage between 7 and 12 volts. If you are using a 9 Volts rechargeable battery make sure that you use a good one.
Using a poor quality battery may result in an ejection failure which could cause a ballistic crash! Always use new or fully loaded batteries for each flight.
Remember that when you power on the altimeter it is doing continuity test and beeping, which is discharging the battery.
Recommendation: use a lipo battery. You can get 9Volts lipos, but be careful: you will need a special charger.

This is the rechargeable battery we used and tested. It can do more than 10 flights without recharging. They are about 10 dollars each, but they are worth it. Better than buying and building a new model rocket...

They are also a lot lighter than normal rechargeable batteries, less than 27g

Standard rechargeable battery

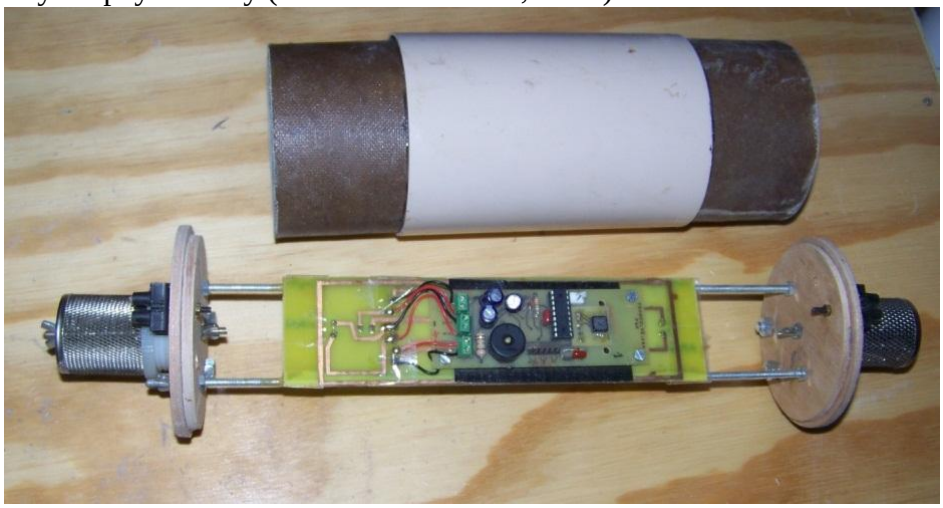
Lipo rechargeable battery

Installing the altimeter in the electronic bay

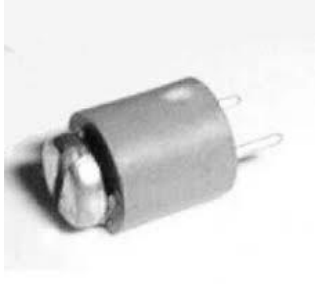
You need to install the altimeter using 4 screws (or two tie wraps) inside the electronic bay. i.e. You can use 3mm Allen screws, because it has a smaller head.

Make sure that the electronic parts are protected from ejection smokes, which are very corrosive and could damage the altimeter board very quickly.

However remember that you have a pressure sensor which needs to measure (outside) pressure changes to work out altitude changes… so you need to drill pressure exchange holes in your payload bay (min.2x small holes, 1mm).

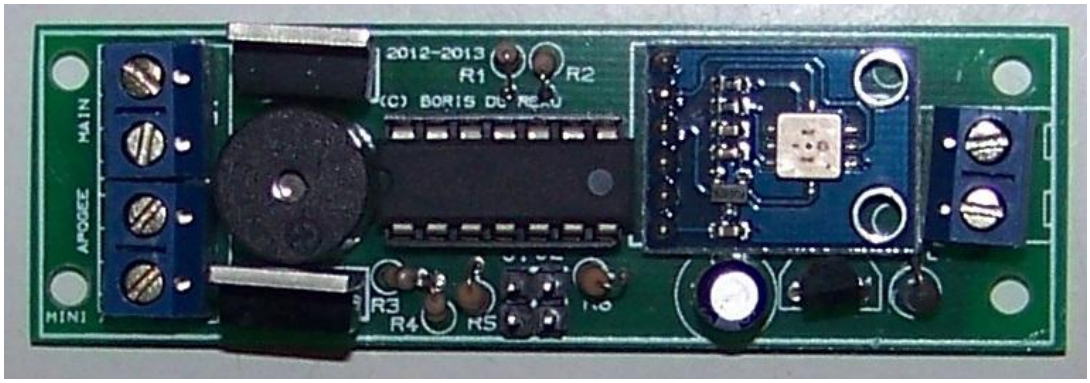


You will also need a switch to turn the altimeter on, when the rocket is installed on the launch pad. You can use a screw switch to turn the altimeter on or some sort of switch that will not turn itself off, due to acceleration forces (horizontal installation of the switch!). The hole for the (screw) switch in your body tube can also be used for exchanging pressures. If you have the switch below or above your electronics compartment, be sure your electronics compartment (with the ParDuo Altimeter) has its own pressure exchanging holes.



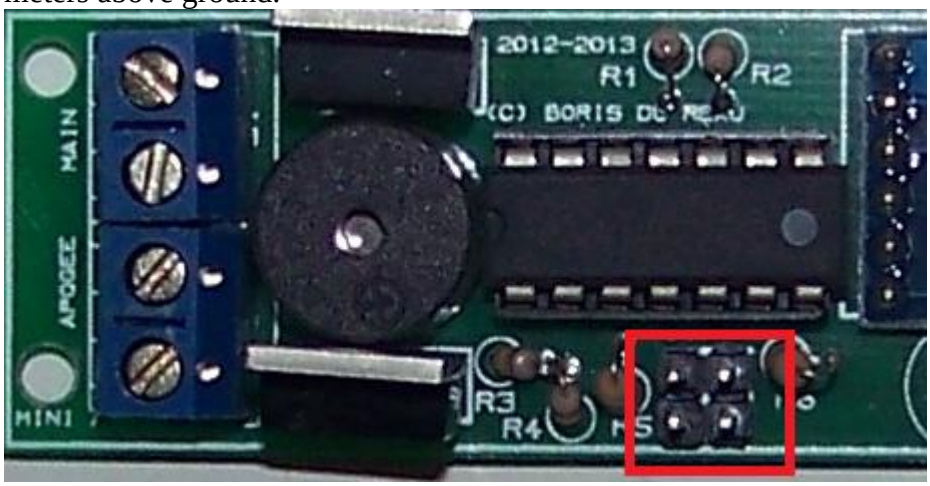
Connect the left two terminal blocs to the ejection charges, that will push out your drogue and main parachute.

- Connect the **APOGEE** terminal bloc to the drogue parachute charge.
- Connect the **MAIN** terminal bloc to the main parachute charge (i.e.: the big parachute).
- Connect the single right terminal bloc to the power supply (9Volt).



Presetting the deployment altitude for the main

The main deployment altitude can be preset using a couple of jumpers. With version 1.0 to 1.3 of the program you can choose from 4 different altitudes. They are 50, 100, 150 or 200 meters above ground.



Here is a table with all possible options:

50m	
100m	
150m	
200m	

Powering on the altimeter

When you have everything installed in your rocket you can turn it on.
It will then initiate, beep the version and then continuously beep.
Beeps are for the continuity test (i.e.: to make sure that your electric matches/igniters are ok).
Basically:

- If you get a long beep, that means that the circuit is open for one of the charges (bad ejection igniter).
- If you get 2 long beeps, it means that both ejection igniters are either not connected or bad.
- If you get 2 short beeps, it means both igniters are fine.
- The altimeter will continuously beep until lift off is detected. Lift off being reference altitude + 20 meters.

After the altimeter has fired both igniters, it will beep the apogee altitude and the main deployment altitude.
Beep resolution is 10 meters so it will round up the results.

- 1 long beep = 100m
- 1 short beep = 10 m

Note that the altimeter will keep on beeping the altitude of the apogee and main until it is switch of.
It does not save the altitude when powered off.

Testing the altimeter on the ground

We suggest that you build a very basic pressure chamber. It will cost you a couple of euro's and you will make sure that your altimeter is working before you fly your rocket.

You can do so by using a cardboard postal cylinder as the pressure chamber.
Secure one end and use the other end to make the necessary connections.
Use a straw through the (plastic) lid, to suck the air out with your mouth. Seal all gaps with glue or silicone rubber. Make electric connections on either side of the lid. On one side attach your altimeter, on the other side attach your igniters, or better a led or Christmas tree light bulb.

Before launching your rocket:

Double check your entire setup and electronics and make sure all components have been correctly positioned and strapped into place. One mistake and the altimeter will not work properly and the components could be damaged.
Be aware that a 40gramme battery, at 15G's, weighs more than half a kilogram!
Do not let anyone interrupt you, from youMini Altimeter ParDuo doing your necessary checks, before launching!

Altimeter characteristics

The altimeter is quite robust it has a protection diode which prevents polarity mistakes. It also uses a Kalman filter to prevent premature ejections.

Altimeter model	Mini ParDuo
Picture	
Size in mm	77x23mm
Weight	16 grammes à 18 grammes
Number of pyro output	2
Micro controller	ATtiny84
USB interface connector	no
power supply	4.5V to 9V
Max Output Current	17A or 49A
Pressure sensor	BMP085
Memory	no
Pressure range	300-1100hPa
Altitude range	-500 to 9000m
Kit	no
Main parachute altitude selection	50m, 100m, 150m and 200m
Current software version	1.3 (stable)
Front end version	none
Software update	Yes if you have an AVR programmer + the adaptor
Unit	metrics (but can be programmatically changed to imperial)