

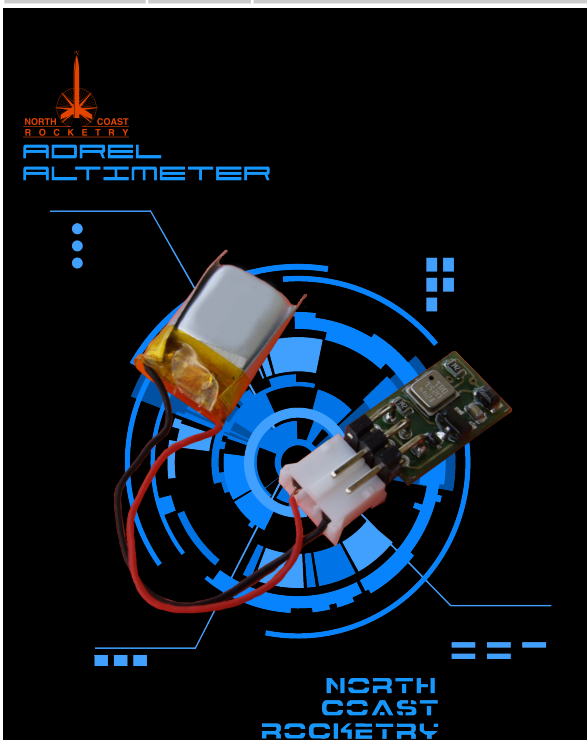


# Adrel MaxAlt™

Model Rocket Altimeter  
Designed by Leszek Swed

## Required Altimeter Parts

Contains	Part #	Description
<input type="checkbox"/>	810A	Adrel Altimeter MaxAlt
<input type="checkbox"/>	811	Adrel Battery
<input type="checkbox"/>	812A	Adrel Data Port & Charger



## Important Note!

- This version (#810A) is not compatible with the older versions on the Adrel BMP (#810) that run on Windows 7.
- To use this version, you need the Adrel Data Port and Charger (#810A).
- **Do not mix the older altimeter with new data port, or the new altimeter with the old data port!**

- This kit is recommended for adults (18 and older) only.
- North Coast Rocketry certifies that it has exercised reasonable care in the design and manufacture of its products. However, as we cannot control the use of our products once sold, we cannot assume any responsibility or liability for product usage.
- North Coast rocketry shall not be held responsible for personal injury or property damage resulting from the use of our product. The buyer assumes all risks and liabilities arising from the use of our product and uses our product on these conditions.
- North Coast Rocketry makes no warranty regarding our products, except for defects in materials or workmanship for a period of one year after purchase.
- If any of these terms are unacceptable, please return the item to the point of purchase.

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NCR 9810 (2/19)

## About the Adrel MaxAlt:

For years, the Federation Aeronautique Internationale (FAI) has used Adrel altimeters for world championships. These units are examples of incredible engineering, both in hardware and software. Because I have personally planted more of these units in more countries across the world than anyone else, I jumped at the opportunity to become the exclusive worldwide distributor (and cut my losses!).

The Adrel MaxAlt altimeter™ is National Association of Rocketry (NAR) and FAI certified for competition flights and record attempts. It is designed and manufactured by Adrel Electronics in Krakow, Poland.

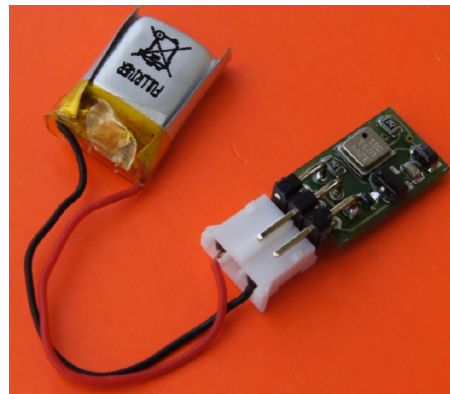
## Before You Start:

Thank you for purchasing this North Coast Rocketry® product. We hope you have an enjoyable time constructing and using this tool. Please read all of these instructions to become familiar with them before starting construction.

You will need the following for use with the Adrel MaxAlt:

- Windows 10 computer
- USB Type AB cable
- Adrel Battery
- Adrel Battery Charger/Data Port (#810A only)

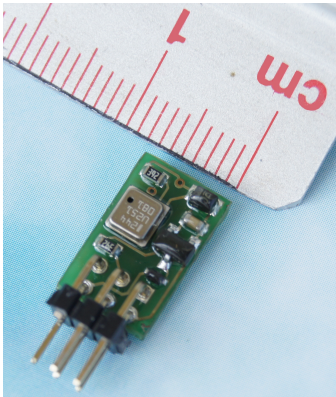
If items are missing or damaged, or if for any reason you are dissatisfied with this product, please let us know at [www.NorthCoastRocketry.com](http://www.NorthCoastRocketry.com). We will gladly replace any item found to be defective. Our goal is for you to be satisfied with your purchase, and to have fun!



## Altimeter Overview

The Federation Aeronautique Internationale (FAI) governs all aerosport competition sports worldwide. The FAI recommends that the measurement of altitude in the categories S1 (Altitude) and S5 (Scale Altitude) be measured electronically with the use of altimeters (rather than optical trackers, as was the previous method). The Adrel ALT-BMP altimeter was developed in accordance with the FAI specifications.

In addition to measuring the maximum flight altitude to the required precision, the ALT-BMP altimeter stores altitude measurement results for the entire flight, allowing for a complete review of the flight. The altimeter's small size (8mm x 19mm x 5mm/0.31" x 0.76" x 0.19") and weight (0.6g/ 0.021 oz.) allow for its inclusion in all types of contest rockets. It is currently the smallest, lightest altimeter system on the market.



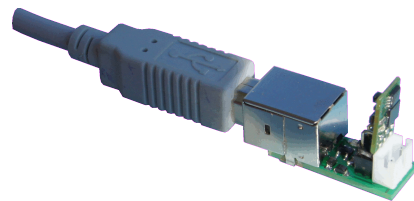
The altimeter height measurement is based on the change of pressure as a function of altitude. The altimeter pressure sensor, calibrated at the factory, measures absolute pressure.

The Adrel data conversion program reads the pressure data from altimeter pressure sensor and converts it to altitude. The conversion is based on an NAR and FAI approved formula, which takes into account the current pressure, pressure changes, temperature, vertical temperature gradient, change of the density of the atmosphere, depending on altitude. Measurements are stored in nonvolatile memory, so they are saved when device is disconnected from power. Altitudes measurements can be sampled from 20 measurements per second to 1 measurement every 2 seconds (which can be useful for airplane applications where sampling speed is not as critical).

The data chart shows the entire flight of a rocket. The graph can be expanded to better examine the data. For contests, the altimeter is able to store the competitor's competition number. In addition, each altimeter has a recorded permanent unique serial number. For archiving the results of competitions, the measurements can be saved to disk and retrieved any time.

## USB Adapter/Charger

The Adrel ALT-BMP uses a special adapter that works as both the data port for the altimeter to the computer, and as a charger for the battery. The charger used to connect the altimeter to a computer using a standard USB cable with tip type B. The Adapter has a built-in control system for the single-cell Li-Po battery recharger.



## Charging the Battery

Using data port/charging adapter, you can recharge the Adrel lithium-polymer batteries. Charging is indicated by red LED. When the LED is off, charging is finished. Connect the USB cable to any power source, such as a computer, mobile phone charger, or battery pack.

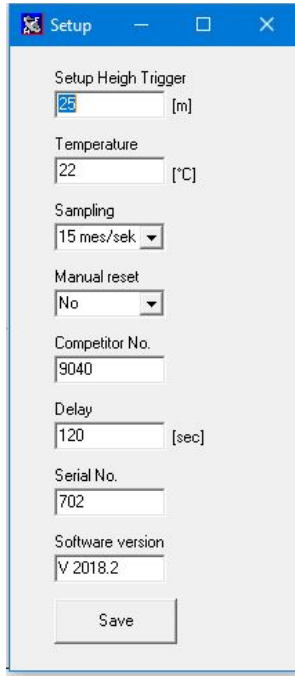


## Altimeter Setup

### Altimeter Setup

After you have installed the Adrel drivers (see following) you will need to initialize the altimeter. Connect the altimeter to the computer using a USB cable and run the Altimetr\_FTDI.exe program. Press "Settings", and the "Setup" window appears.

Input in the following order:



**Altitude Measurement Trigger Height** (20-30 meters)

**Sample rate** (per second)

**Altimeter Reset Method** (Manual – Yes/No)

When you press "Save", entered settings will be saved to the altimeter. Exit without saving the occurs after the closing of the window (click on X).

These settings are remembered by the altimeter, even after power is switched off. A single programming session is all that is required.

**Setup Height Trigger:** The optimum Setup Height Trigger height is about 20- 30 meters. The altimeter records measurements from the last three seconds before detection of measurement start level. If you set the start level too low (0 meters), the measurements could start on the pad, and you will get no altitude data, or incomplete data (if the memory fills up before the flight is complete). If the wind is near the high limit (20 mph), you may want to set the start at 50m to eliminate to possibility of gusts prematurely triggering the altimeter prior to launch.

**Sampling Frequency:** FAI rules state the measurement must be performed at least 10 times per second, but we have found it is best to set the rate at 15 samples per second. This ensures fast measurement with accuracy. Setting a higher frequency of measurements reduces the measurement resolution (to 1 meter).

**Manual Reset:** Set Manual Reset to "No" for contest use. That means the altimeter can not be reset without the use of a computer

**Calibration of Temperature:** During the conversion of the pressure to height, the air temperature is taken into account. The altimeter has a built-in temperature sensor. The temperature sensor used in the altimeter is factory calibrated.

**Competitor Number:** For contests, you may enter a competitor number.

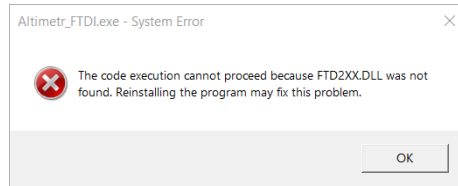
**Reset:** Before each flight, you must reset the altimeter. This can be done through the computer program by pressing the button "Reset". After an additional confirmation, the altimeter reset message appears. You can now disconnect the altimeter from the computer and connect the battery. Proper reset is signaled by a single, short-blinking LED. No reset is signaled by 3 blinks of the diode. Altimeter can also be reset manually by shorting the pins. To make this possible, you must first set the "Manual Reset" to 'Yes'. If it is set to 'No', then reset is only possible through the program.

# North Coast Rocketry

## Windows Driver Installation

In order to use the Adrel ALT-USB on your PC, the drivers must be installed. Go to the NCR website and download the Windows 10 Adrel software. When launching the program, you may see a message that warns you that the program is unrecognized. Ignore the warning, and click "Run anyway". It will run, and does not appear after the first time you run it.

If you get this error message:



First, try running the Adrel install program as the Administrator. If that fails, do a search of the Windows folder looking for the DLL file. You will likely find the file in a folder called "driver file repository" Copy the .dll file, then go to the Adrel executable folder and paste a copy of the .dll file into the folder. Rerun the Adrel program, and it should work.

## Battery Installation

Please pay attention when connecting the battery; refer to the photo below. When connecting, the battery connector pins should be parallel to altimeter's contacts. Clear resistance should be felt when connecting the battery to the altimeter.



## Preparation for Flight

After connecting the reset state is signaled by the LED blinking in single flashes. Before inserting the altimeter into the payload section, you should make sure that the LED is blinking single flashes. If you can see the altimeter after insertion into the payload section, make sure it is blinking single flashes. If it is not blinking single flashes, it will not record a peak altitude on your flight.

Installation of the altimeter into the model is very important. The altimeter payload section can not be air tight. Unlike most US altimeters, though, large holes are not needed. One to two pinholes (0.3-0.4mm/0.012-0.016") are all that are needed for the Adrel BMP to read altitudes. Larger holes may trigger false readings or let the wind trigger the altimeter on the pad.

The altimeter has a three minute delay window from power up to putting the nose cone on the payload section (or other actions that could change the pressure the altimeter reads) to install the altimeter. Three minutes is the default time – you can change it in the setup menu under "Delay".

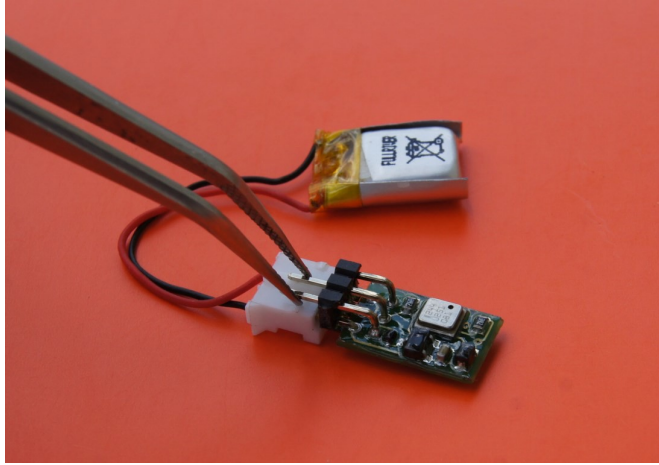
After the three minute window, the altimeter starts looking to sense liftoff. If you see a single steady flash, you are ready for launch. If you trip the altimeter and it thinks it senses launch, the flash sequence changes to double flashes. If you see double flashes, it's time pull the altimeter out, re-zero it, and connect the battery again.

For best results, the altimeter should be isolated from ejection charges or other effects that create pressure changes. If exposed to the ejection charge, the gasses could corrode the sensitive components of the altimeter.

## Altitude Measurement

After connecting the power, the LED will blink once or three times quickly. This indicates the state of the altimeter. Single flashes indicate that the altimeter is reset and ready for flight. Three quick flashes means the altimeter has been triggered, and has captured data for download.

The altimeter can be reset without a computer (if you have allowed this in the altimeter setup (see following section) by setting the Manual reset flag to "Yes"). You should wait until the LED blinks 3 times (if altimeter is not reset) and then short for a moment two free contacts of the connector (see below). The LED will blink with single flashes, indicating the altimeter has been reset, and is ready for flight.



When you reset the altimeter with the manual method, you do not erase the previous data on the altimeter. When the altimeter detects launch and begins measurement (indicated by two blinks) the previous data is deleted.

The altimeter is considered "enabled" after three minute delay period and begins sensing for pressure changes indicating launch. Measured changes are not stored in nonvolatile memory, only in the altimeter's instantaneous memory. Once the designated launch altitude (as indicated in the setup menu) is detected, the last 32 and current measurements are saved. The site altitude measured before the launch is regarded as a reference, or zero altitude. Measurement start is indicated by double blink of the LED. The pressure measurements are saved in memory. After a minimum of 2 seconds after launch detection, the altimeter software looks to see if the model is descending. If it detects a peak altitude of less than 7m, and the model does not descend further, 32 more measurements will be taken, and data collection is completed. Successful capture of the data is indicated by three blinks of LED (when the altimeter has not been reset). Then, disconnect the battery and connect the altimeter to the computer to read the flight data. If the end of the measurements was not detected automatically, you can short the contacts for a while (like the return to zero). The measurement is completed.

Here is how to attach the Adrel to a nose cone, without an altimeter compartment.



# North Coast Rocketry

## Reading the Altitude

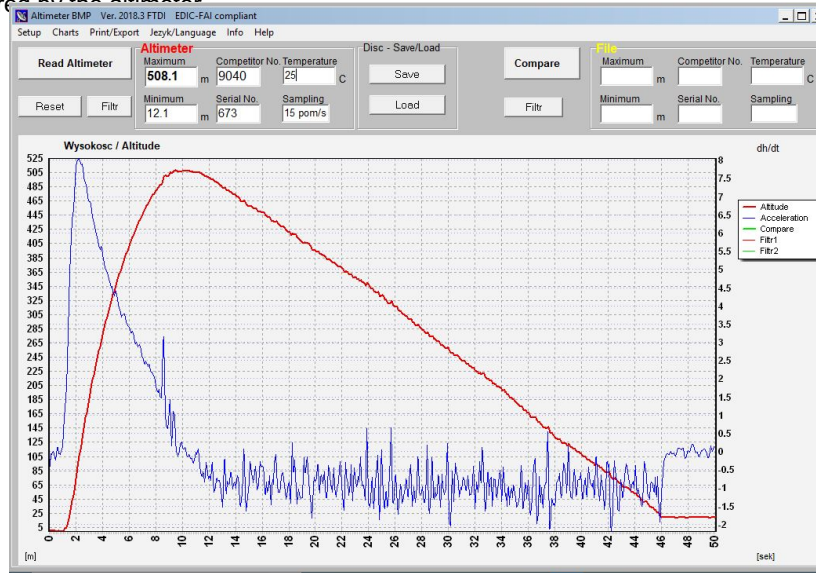
After the flight, check if the altitude has been measured, which is indicated by a three blinks of LED. If, after the flight the LED blinks twice, it means that level of the landing has not been detected, but the altitude measurements were made. In either case, disconnect the battery. The measurements were recorded in the memory on the altimeter.

Connect the altimeter to the computer with the data port. When connected to a computer, the altimeter's LED should blink once, then in groups of five flashes. After pressing the "Read altimeter" measurements will be read and displayed on the screen.

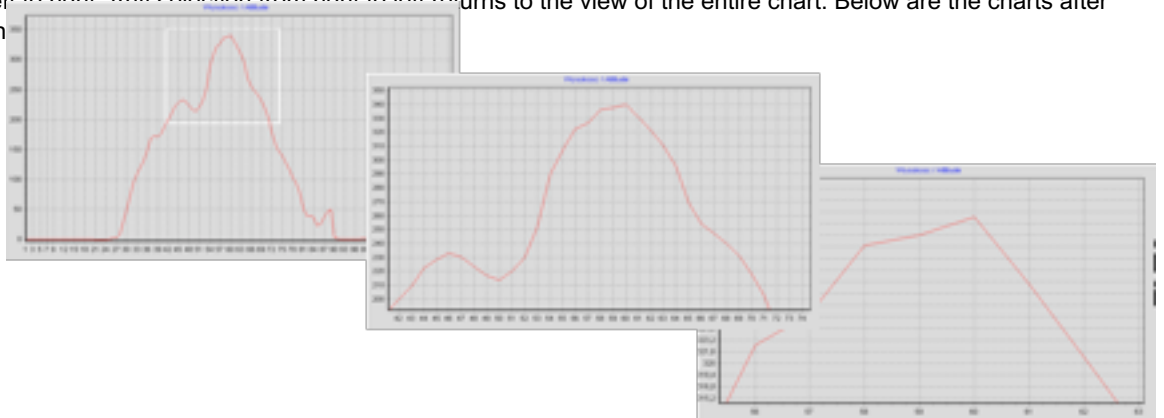
On the right side maximum and minimum altitude will be displayed. In the "contestant" window the number of competitor and the serial number will be displayed.

It is recommended that filter (Filtr") be used before saving data to eliminate noise spikes in the data and to obtain final results.

Read data can be saved on your computer HDD by pressing "Save" in the panel "Disk - Save/Load". Such recorded data can be played back at any time. Altimeter does not need to be connected. The program can read the current temperature measured by the altimeter.

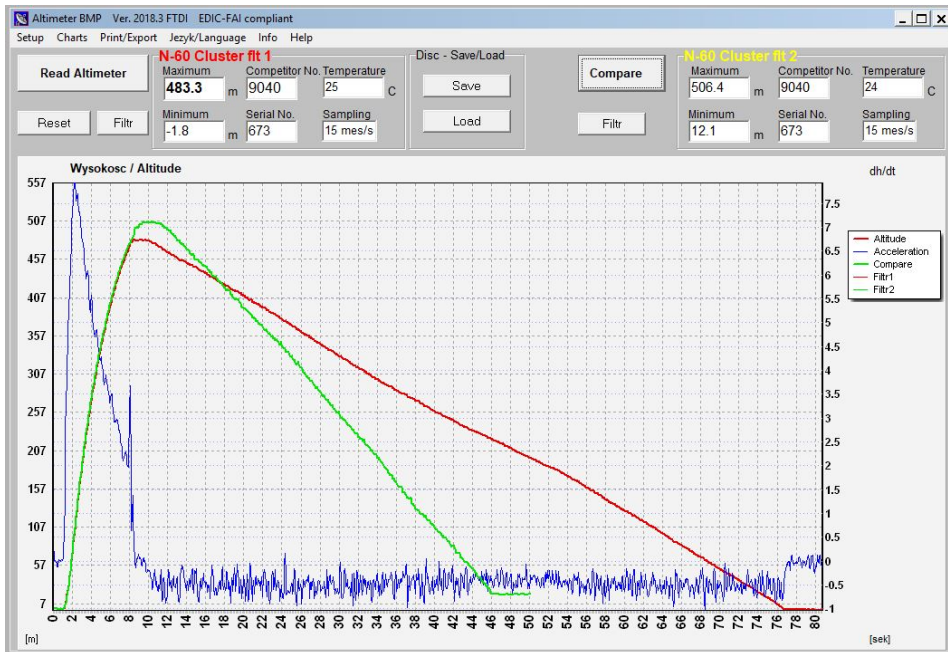


The graph can be zoomed in. Use your mouse to select the area of interest. During zooming, it is important to drag from left to right. Any selection from right to left returns to the view of the entire chart. Below are the charts after zooming in.



## Reading the Altitude Measurement (Continued)

Flight graphs can be compared with each other. To do this, read data from altimeter or disk, and then click "Compare". This brings up a file selection window. Please select a file with data to compare and click 'Open'. An additional chart appears on the screen. Speed chart and comparisons can be switched off in the menu tab "Charts".



### Temperature Correction:

Altimeter calculated height assumes the temperature that was measured by the altimeter. However, in many cases, the temperature may differ significantly from the actual value (due to holding the altimeter, or allowing sunlight to heat it up). The measured temperature may then vary up to several degrees. The difference in calculating the amount of approximately 0.3% per degree C. For example, height of 355.5 meters at 24 C, after correction for 20 C temperature is 350.7 (the difference of 4.8 meters).

Temperature correction is possible in the software. For NAR contest flights, use the standard 15C. For FAI or your own personal use, you can correct to the actual air temperature.. After entering the new value in the "Temperature" field and pressing "Enter", measurements will be re-converted and displayed. It is recommended that the flight cards have a place for recording the ambient temperature.

### Filtering:

The altimeter may be subject to a number of transient effects (direct airflow, ejection charge overpressure, wind gusts, etc.) which can show up in the final measurements and distort the results. Use the Filter command to remove these erroneous measurements. The measurements are filtered by discarding the transient "peaks". The result is a smooth graph.

Data from the altimeter or the disk can be filtered in using Filter button on the left side of the screen. Generally, it is a good idea to save the raw data to disk, then open that data file and apply the filter to get the final result, and save that file as "Filtered". Filter parameters can be set settings tab in the Filter.

*Special thanks to Bernard Cawley for beta testing the new version and proof-reading the instructions,*

## Adrel ALT-BMP Technical Parameters

Method of altitude measurement:	measurement of pressure changes
Measuring Range	-500.... 9000 m
Resolution	0.2 m
Accuracy:	0,5 % (accuracy of measuring the difference of altitude)
Supply Voltage:	3,6V to 6V
Current consumption:	6,5 mA
Sampling:	1 ÷ 2 sec / measurement 10 measurements / sec 15 measurements / sec 20 measurements / sec
Max measurement time:	2-4 h (for 1 ÷ 2 sec / measurement) 13 min (for 10 measurements / sec ) 9 min (for 15 measurements / sec ) 5 min (for 20 measurements / sec ) (total of 8050 measurements)
Measurement triggering:	Set in the range of 0 – 200 m
Measurement end:	Start level + 7m . Then 32 additional measurements are taken
Dimensions:	7,9 x 19,3 x 4,9 mm (with connector)
Weight:	0,6 g ( without battery)
Recommended battery:	LiPo 20mAh – weight 0,8g LiPo 50mAh – weight 2g
Battery life	for LiPo 20mAh – 3 hours for LiPo 50mAh – 8 hours
Serial number:	Unique entered permanently
Number of contestant:	Input form computer
Connection with computer:	USB