

**ADREL**

Elektronics and Industrial  
Automation  
NIP: PL 679-100-89-74

ul. Zablocie 39  
30-701 Krakow, Poland  
tel. +48501 607-607  
fax: +4812 398-37-87  
e-mail: adrel@adrel.com.pl  
www.adrel.com.pl

# ALTIMETER ALT-USB



**ADREL**  
CRACOW POLAND

[WWW.ADREL.COM.PL](http://WWW.ADREL.COM.PL)

## Parameters

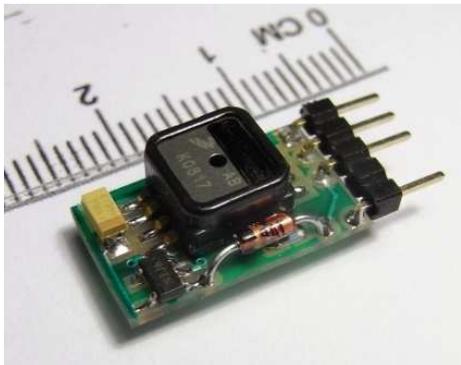
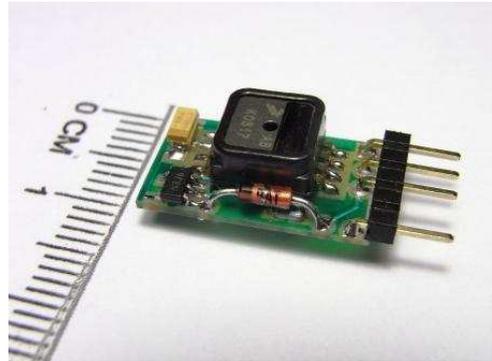
Method of altitude measurement:	measurement of pressure changes
Measuring Range	0- 5500 m
Resolution	0.2 m (for measurements < 25 meas. / sec ) 1 m (for measurements 25 i 50 meas. / sec)
Accuracy:	1 % (accuracy of measuring the difference of altitude)
Supply Voltage:	3,3V to 6V
Current consumption:	5,9 mA
Sampling:	1 ÷ 5 sec / measurement 10 measurements / sec 15 measurements / sec 25 measurements / sec 50 measurements / sec
Max measurement time:	1 - 5h (for 1 ÷ 5 sec / measurement) 400 sec (for 10 measurements / sec ) 260 sec (for 15 measurements / sec ) 160 sec (for 25 measurements / sec ) 80 sec (for 50 measurements / sec ) (total of 4000 measurements)
Measurement triggering:	Set in the range of 2 – 200 m
Measurement end:	Start level + 7m . Then 32 additional measurements are taken
Dimensions:	9,5 x 24 x 7 mm (with connector)
Weight:	1,2 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

## 1. Introduction

In accordance with the FAI recommendations, the measurement of altitude in the categories S1 and S5 is to be measured electronically with the use of altimeters. According to these guidelines altimeter has been developed, which in addition to measuring the maximum altitude, stores measurement results for the entire flight. Its parameters were adjusted to the recommendations of the FAI. Altimeter's size (9.5 x 24 x 7) and weight (1.2 g) allow for its inclusion in all types of space models. Altimeter may also prove useful when setting F1B model category (eg, choice of propeller).

## 2. Overview of altimeter

In the described altimeter height measurement is made on the basis of pressure changes depending on altitude. Measuring sensor is an electronic system, which measures the absolute pressure. This sensor is factory calibrated. In the program, which reads data from altimeter, follows the conversion of pressure to altitude based on the formula, which takes into account the current pressure, pressure changes, temperature, vertical temperature gradient, change of the density of the atmosphere, depending on altitude..



Model Altimeter AL-01 is used for measuring the height of the model and the analysis of the flight. Measurements are stored in nonvolatile memory so they are saved when device is disconnected from power. Frequency of measurement is set in the range of 50 measurements per second to 1 measurement every 5 seconds

The readout of the altimeter's measurements and parameters is possible when cable is connected to the USB connector on your computer. The chart shows the entire flight of a rocket. The graph can be zoomed. For the purposes of competitions altimeter is able to store the starting numbers of competitors. 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.



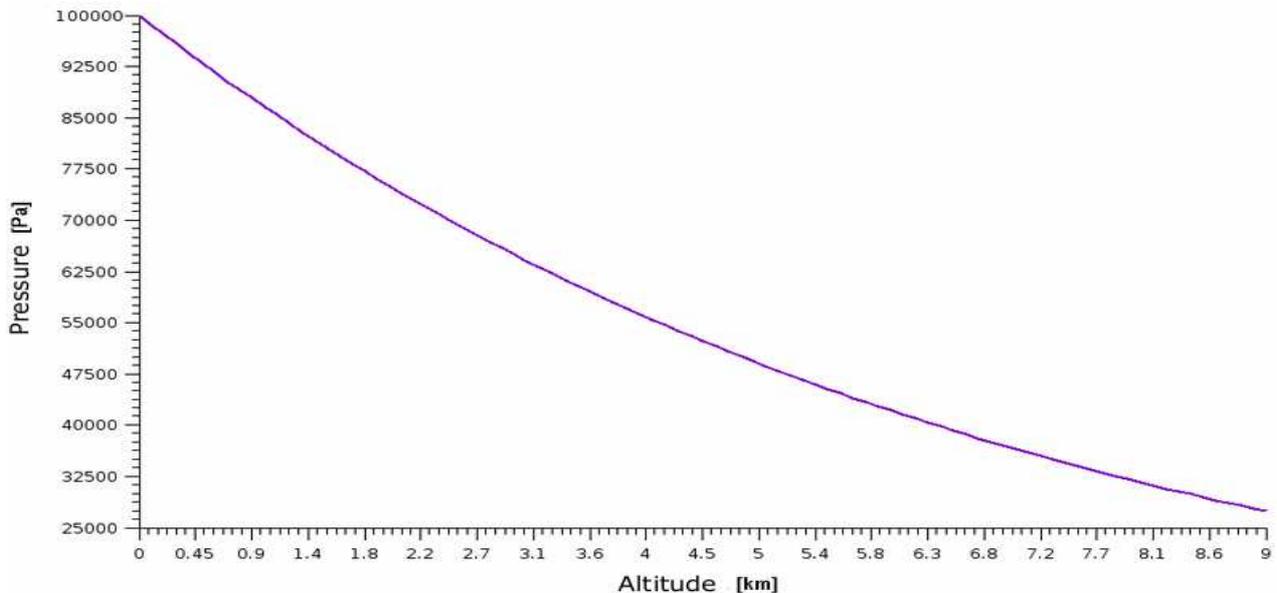
Adapter - Charger used to connect the altimeter to a computer using a standard USB cable with the tip of a type B.



Adapter has a built-in complete control system of battery recharge (single-cell Li-Pol).

## 3. Some theory

With the increase in altitude at which it measurement shall be taken the amount column of the atmosphere decreases, as well as the pressure measured. Pressure changes with altitude within the first 2000m above the sea are fast - with an increase of altitude about 8m atmospheric pressure decreases about 1 hPa (see further - bar degree). As a result, measurements made at the same point and at the same time at different heights, give different pressure values. In addition the changes in pressure at the same point will be affected by the changes in air temperature.

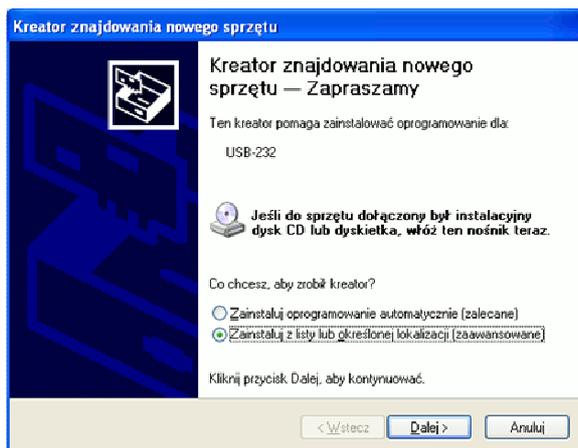
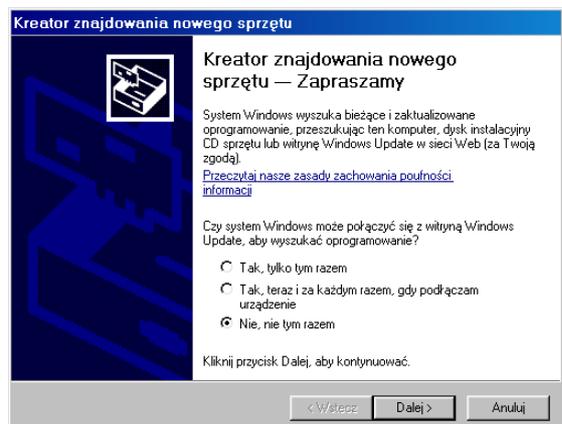


#### 4. Drivers installing

Please install on the PC the USB drivers. The drivers can be downloaded from [www.adrel.com.pl/download](http://www.adrel.com.pl/download) - file Altimetr\_Program.zip and unzip them to any folder.

For versions lower than programs 07.2010, you must copy the files from the folder .../Sterowniki\_Builder/ to folder .../windows/system32. They are files: "tee35.bpl" and "vcl35.bpl". For versions of 7.2010 and above there is no need to copy these files.

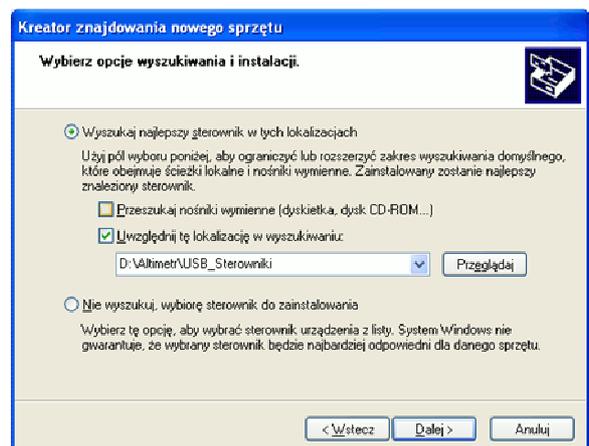
Then connect the altimeter to the computer via adapter or cable with a 5-pin tip (described above). For the connection additional hubs can not be used. Altimeter must be connected via a USB cable AB type with plugs directly into the computer. Windows automatically detects the connected device. On the screen Found New Hardware Wizard will appear. Select "Not this time" and press "Next".

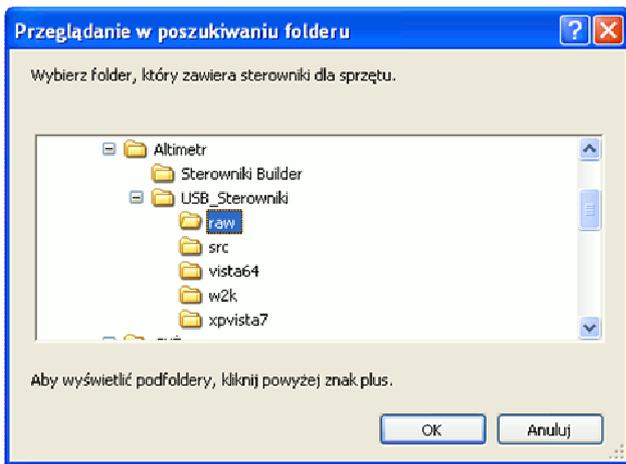


Now, select "Include this location in search" and press "Browse".

Find the folder where you previously unpacked the downloaded drivers. Select the directory of the driver, depending on the system:

Then select "Install from a list or specific location" and press "Next".

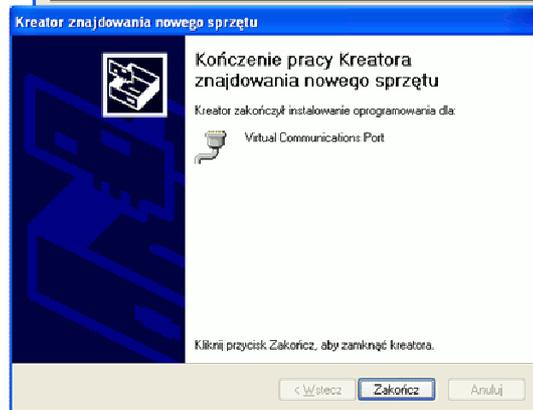
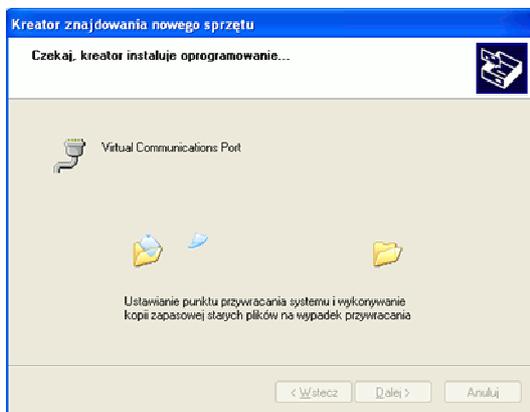
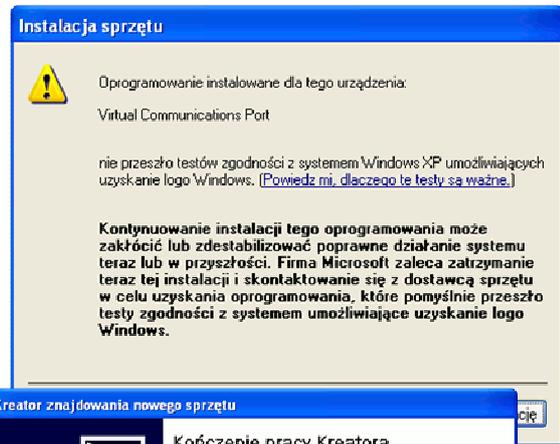




- /raw - Windows XP and 2000
- /w2k - only Windows 2000
- /xpvista7 - Windows XP/Vista/7 x 32
- /vista64 - Windows Vista x 64

And press 'OK'

This brings up a warning message. Ignore it, or press "Continue Anyway".



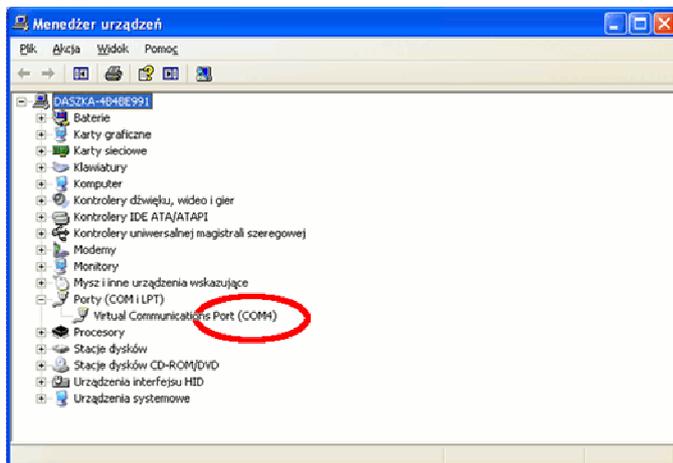
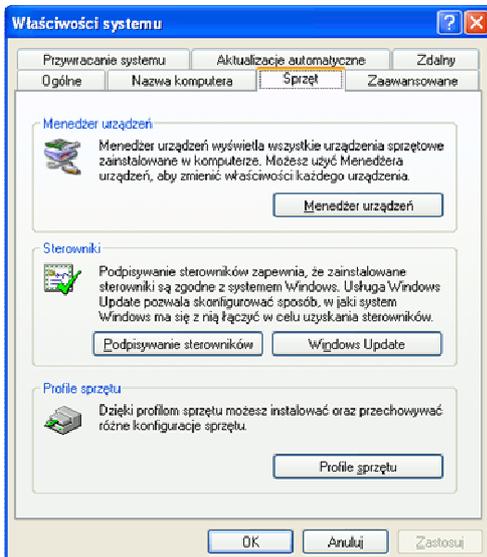
The driver will be installed. At the end choose "Finish".

Then we need to check the COM port number at which the driver has been installed. Then, we choose in turn:

Start -> Control Panel -> System or

Start -> Control Panel -> Performance and Maintenance -> System

This brings up a window "System Properties". Now select the "Hardware" and press "Device Manager". Click mark '+' At the label "Ports (COM & LPT)". You should receive a description of the "Virtual Communications Port (COM ...)". This is the port number that we need to set in the handler of the altimeter.



## **Vista x 64**

Vista x64 does not accept unauthorized kernel-mode drivers. To use AVR-CDC on 64bit machine, you have to turn the "Driver Signature Enforcement" off by pressing the F8 function key during system boot up.

"Driver Signature Enforcement Overrider" signs the driver as a Tested river and activates a test mode so you can load it without a real Signature. You can find a more detailed description on the download page of the override <http://www.ngohq.com/home.php?page=dseo>

## **USAGE**

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To install the driver:

1. Download the "Driver Signature Enforcement Overrider".  
<http://www.ngohq.com/home.php?page=dseo>
2. Start the DSEO (no installation is needed).
3. Choose "Sign a System File", click the "next" button and sign lowcdc.inf.
4. Choose "Sign a System File" again, click the "next" button and sign lowcdc.sys.
5. Choose "Enable Testmode" and click the "next" button.
6. Restart your computer.

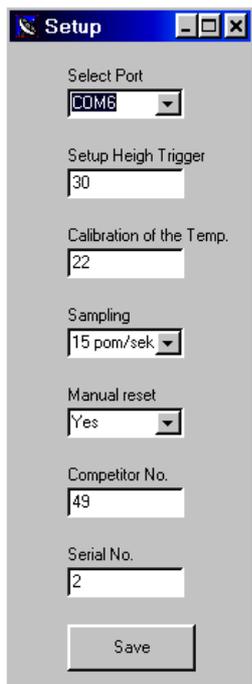
## **5. The maintenance program of the altimeter**

Before first use of the altimeter set its parameters. To do this, connect the altimeter to the computer using a USB cable (as described above) and call the handler Altimetr.exe.

Then press the "Settings". "Setup" window appears.

You need to set the communication port number, which we checked with the driver installation. If after you select the port you will receive an error message, then make sure you have selected the correct port and that the cord is inserted into your computer and you have installed the USB driver.

Then, in the following order, input:



- Measuring altitude start
- Current temperature
- Select the frequency of measurements
- Set the way the reset altimeter (described below)
- Number of the competitor

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. Just a single programming is enough.

### 1. Setting " Measurement Start Height "

Measurements start after reaching a height set in the parameter "Start Height Trigger" The optimum height is about 20 - 30 meters. Altimeter records measurements from the last three seconds before detection of measurement start level. If you set the start level too low (below 7 meters), the measurements could be started already at the starting position (fluctuations in atmospheric pressure are sufficient to start the measurement.) Then the height measurement is performed until the memory is full (the level of the landing is not checked - normally set to 7 meters). If a competitor delays the start, the whole flight may not be registered.

## 2. Sampling Frequency

Acc. FAI rules, the measurement must be performed at least 10 times per second. Altimeter ALT-USB has the ability to set the measurement frequency. It is best to set 15 measurements per second. This ensures fast measurement with accuracy. Setting a higher frequency of measurements reduces the measurement resolution (to 1 meter)

## 3. Setting "manual reset"

Altimeter can be reset in two ways: by using software or by altimeter's contact closure. During the event, set the lock of manual reset (parameter "manual reset "set to" No "). A competitor himself can not reset the altimeter.

## 4. Calibration of temperature.

During the conversion of the amount of pressure to height the air temperature is taken into account. Altimeter has a built-in temperature sensor. In altimeter's settings this sensor can be calibrated. Before the calibration altimeter be should put in place ensuring the ambient temperature for about 5 minutes (not connected to power). Then connect to your computer and enter the current temperature settings (field Setup -> "Calibration of the Temp.").

## 5. Number of competitors

In the "Competitor No." enter the number.

Before measuring, you must reset the altimeter. This can be done through the program, pressing the button "Reset". After an additional confirmation, the message of altimeter reset appears. You can now disconnect it 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 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. Locking this reset is required during the competitions

## **6. Assembly of altimeter in the model**

It is very important how to install the altimeter in the model. In particular, this applies to measurements on competitions. The chamber, in which the altimeter is assembled, can not be tight. There must be holes, allowing the pressure around the altimeter to equalize atmospheric pressure.

### **Where should we locate the altimeter?**

If you plan to put altimeteru the rocket to be taken into account that the altimeter is a device which measures changes in pressure. Therefore, should not be placed in the immediate vicinity altimeteru engine. Altimeter must be separated from direct gas engine. Ignition, which ejects the tape brake can significantly distort the measurement results as well as destroy the same altimeter (gases are very corrosive.) Therefore, you should always use the separating pistons. Must be maintained order: engine, brake piston with tape or other separator, container from the altimeter.

### **Ventilation holes**

For rockets S1 do not have ventilation holes (if the rocket is not hermetic)

For rockets S1 to be done two or three holes with a diameter of 0,3 mm – 0,4mm – (if the rocket is hermetic)

For rockets S5 to be done two or three holes with a diameter of 0,4 mm – 0,5mm

In models of gliders, airplanes, just altimeter is placed inside the hull model. In models that do not have a closed hull, perform a separate container where you put altimeter.

## Connecting the battery

Please pay attention when connecting the battery, the battery connector pins should be parallel to altimeter's contacts. Inserting the plug under angle does not provide adequate contact and the battery can be detached from the altimeter. When connecting clear perceptible resistance should be felt.

After connecting the battery serial number is displayed, then the reset state is signaled by - the LED should blink single flashes. Three flashes indicate that the altimeter is not cleared and that it can be reset manually. Four flashes mean that the altimeter is not cleared and that it can not be reset manually. It is possible to reset only by the computer.

Before inserting into the enclosure, you should make sure that the LED is blinking single flashes (altimeter alarm reset). Be careful with any assembly work, so as not to produce negative pressure in the chamber of the altimeter. Particular attention should be paid when removing the head of rockets. We can create a vacuum in the chamber of the altimeter and thus start the measurement. The altimeter rejects measurements of pressure changes that last less than 2 seconds. However, before re-assembly of the model, you need to make sure that the altimeter is reset, and possibly reset it. Measurements start after about 15 seconds from the power connection.

## 7. Altitude measurement.

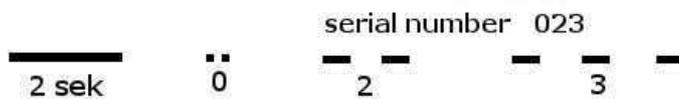
Altimeter can be powered from any battery with a voltage of 3.3 V to 6V. Altimeter's contacts have 2mm spacing, so be sure to use the appropriate plug. At the end of this manual there



are addresses of online shops where you can buy these connectors, and the names of these connectors. The figure shows the power connection. Altimeter is protected against reverse connection of power supply.



After connecting the power, LED blink once or three times. This is a state reset. After a time of 2 seconds the LED is blinking, then displays the serial number of the altimeter. You can stop the display of the short connection of the reset pins.



Altimeter can be reset without a computer (as far as we indicated in the settings "Manual reset 'Yes'"). We should wait until the LED will blink 3 times (if altimeter is not reset) and then short for a moment two free contacts of the connector (marked in the figure as data contacts or reset). LED will blink with single flashes.

Altimeter is ready for measurement. Reset by shorting the contacts does not erase the previous measurement. The start of the measurement (indicated by 2 blinks) deletes the previous data.

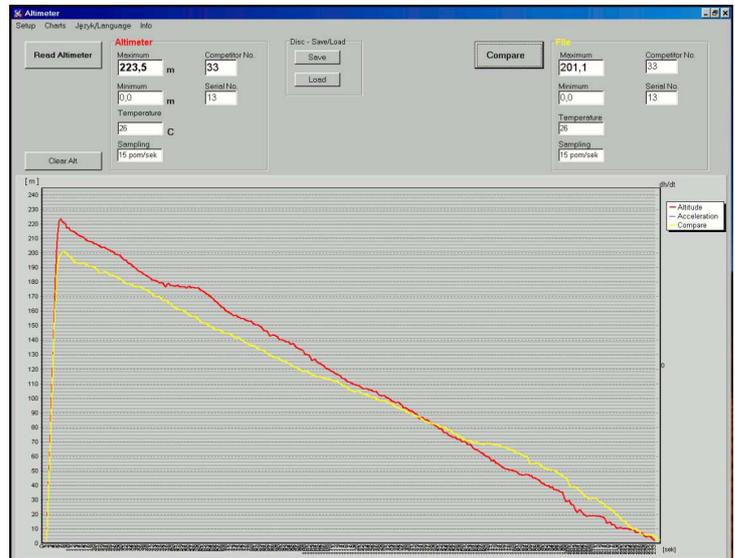
Measurements are taken 15 seconds after disconnecting the battery or reset. They are not stored in nonvolatile memory only in the so-called instantaneous. Only after the detection of previously programmed measurement triggering value, the last 32 and current measurements are saved. altitude measured before the launch is regarded as a reference, or the amount of '0'. Start of measurement (ie, exceeding the pre-programmed "altitude of the start of measurement") is signaled by double blink of diode. Current measurements are saved in memory. After a minimum of 2 seconds after the triggering of measurement altimeter verifies if the model is dropping. If it reached the altitude of less than 7m, and the model will not get lower, 32 more measurements will

be taken, and the cycle is completed. The end is signaled by three blinks of LED (as in the absence of zeroing). You can disconnect the battery and connect the altimeter to the computer to read data. If the end of the measurements was not detected automatically, you must short the contacts for a while (like the return to zero). The measurement is completed

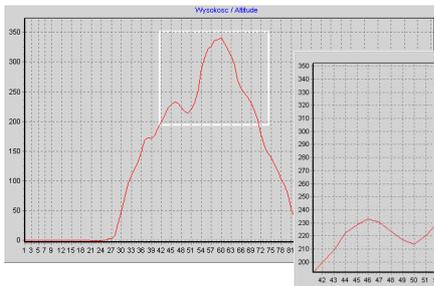
## 8. Reading of measurements.

After the flight, check if it has been measured. Start of measurement is indicated by two blinks of the diode. The end of the measurement (detection of land level or the end of memory) is indicated by a three blinks of LED. However, if after the flight the LED blinks twice, it means that level of the landing has not been detected - but the measurements were made. You can disconnect the battery - until this time measurements were recorded in the memory. When connected to a computer, the altimeter's LED should blink three or four flashes (this depends on the parameter settings "reset manually - as described above). This means that the measurement was registered. 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.



Read data can be saved on your computer HDD by pressing "Save" in the panel "Drive - Read / write. 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. Use your mouse to mark the interesting part of the chart. During zooming it is important to mark from left to right. Any selection from right to left returns to the view of the entire chart. Below are the charts after the increase.



Graphs of the flight 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 assuming the temperature, that was measured by the altimeter. However, in many cases, the temperature may differ significantly from the actual value. It is enough that before installation, altimeter is exposed to sunlight or a competitor will keep it in his

hand. The measured temperature may then vary up to several degrees C. 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).

In the handling software of the altimeter (from version 5.2010), temperature correction is possible. After typing in the "Temperature" field of the new value and pressing "Enter" key, measurements will be re-converted and displayed. It is recommended that the start cards had additional line, which keeps the ambient temperature.

### Filter

If the altimeter was not properly mounted and subjected to a direct effect of air flow, it also works on its dynamic pressure, which distorts the measurements. Also wind gusts interfere. The graph can be seen as a clear "pin", which differ substantially from the correct chart. You can then use a filter that removes these erroneous measurements. The measurements are filtered multi-stages. First, discard the "pins". He then calculated the average and again rejected the measurements are wrong, but taking into account this average. The result is as smooth graph.

The data read from the altimeter, or read from the disk can be filtered in using **Filter** button on the left side of the screen.

Data for comparison, can be filtered using the button at the **Filter**, which is under the "Compare" button.

After filtration, two graphs are drawn - before and after filtration. By clicking the left mouse button on the chart, you can delete it. When you change the parameter settings of the filter can filter out the data again, no need in re-load measurements.

Filter parameter can be set settings tab in the Filter

### The "altimeter" has its own instructions. Is displayed when you press "Help"

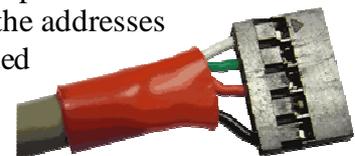
## 9. USB Adapter

As described earlier, to connect the altimeter to a computer you need a special adapter. There are offered two types of adapters: with charger and without t charger. You can also try to make



cable for connecting the altimeter yourself. To do this in a typical USB cables cut off one plug (leave the plug connected to a computer) and isolate the wire length of approximately 1.5 cm. Then color-coded wires as in the photo should be soldered (or tightened) to the appropriate connector pins. Please note that the pin spacing is 2mm. Below are listed the addresses of shops and types of connectors needed

for the implementation of the cable. Free contact must be filled so that one could not connect the altimeter in the opposite way.



[http://www.tme.eu/pl/katalog/?art=ZL265-5SG#id\\_category%3D100035%26zl265-5sg](http://www.tme.eu/pl/katalog/?art=ZL265-5SG#id_category%3D100035%26zl265-5sg) connector for soldering

<http://www.maritex.com.pl/pl/shop/products/ggid/9326>

PBMS05S-LF connector for soldering  
BLMS05 Crimp Terminal Housing, 5-pins, single row – clamped connectors  
BLMT Metal terminal, for BLMS and BLMD type housings

## 10. Charging the battery

Using adapter charger you can recharge rechargeable lithium-polymer (Pol Lid) batteries. There are available pin connectors where the battery should be connected. Charging is indicated by LED. When the LED is off charging is finished. As a source for supplying the charger you can use any computer, connecting the adapter to the USB connector. Computers even when switched off supply this voltage. Now mobile phones have chargers which have the USB connector. You can use them as power source.



Battery connector

[www.tme.pl](http://www.tme.pl)

NXG-03 plug shield

NXG-T contact

[www.Maritex.com.pl](http://www.Maritex.com.pl) Crimp Terminal » Crimp with pitch 2.00mm

HS-03 plug shield

HST-LF contact

CAUTION!! In the connector shield cut off two small blocking tongue that are placed on both sides, so that the plug is not stuck in the charger-adapter connector.

