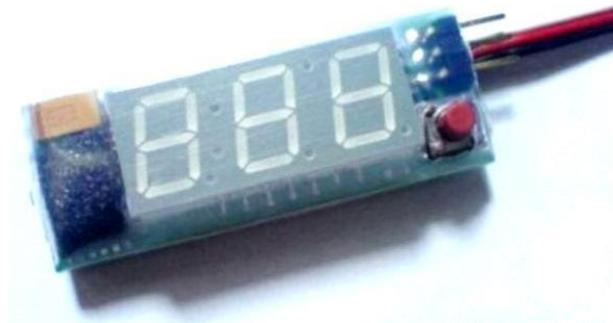


RC ALTIMETER

Altitude data recording and monitoring system



Manual version: 1.1

RC Electronics

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Introduction

RC Altimeter was designed to provide a lightweight compact device for measuring and recording altitude over time. It was designed especially for use onboard a radio controlled (R/C) aircraft, but would be useful in other applications too.

The RC Altimeter provides “real-time” maximum altitude information and battery voltage on the field via its onboard LED display. It also records altitude data for later review on PC through a serial interface.

How it works

The RC Altimeter module uses a high-resolution barometric pressure sensor system to detect small changes in air pressure that occur due to changes in altitude. It is sensitive enough to detect altitude changes of less than one meter. This also makes it sensitive to changes in weather and local pressure variations.

The designed use of this device is for measuring short-term altitude changes in R/C aircraft. Long-term altitude readings will vary considerably due to varying atmospheric conditions. It is best used to measure relative changes in altitude.

Key features

- Tracks maximum altitude and displays it on onboard LED display – find out how high your aircraft flew!
- Record altitude data for later review.
- PC Interface for configuration, firmware updates and data download/review.
- Shows battery voltage in real-time.
- Small and lightweight at only 12 grams.

System requirements

- PC with one of the following operating systems: Win98, Windows ME, Windows NT, Windows 2000, Windows XP.
- Available Serial Port (9 pin connector) or USB port.
- 2 megabytes of Hard Drive space.

Specifications

Board Dimensions	1.93" x 0.75" x 0.43" 49 mm x 19 mm x 11 mm
Weight	12 grams
Temperature Range ¹	-10°C ~ +60°C
Input Voltage Range	4.0 – 20.0 volts DC
Input Current	13 milliamps
Measured Voltage	4.0 – 18.7 volts DC
Maximum Altitude ¹	Displayed: 999 feet/yards/meters. Recorded: 3100.0 meters/feets/yards
Minimum Altitude ¹	Displayed (relative or absolute): -99 feet/yards/meters. Recorded (relative or absolute): -3100.0 meters/feets/yards
Memory Capacity	16000 samples.
Displayed Altitude Resolution	1 meter (1 foot).

¹ Specifications are taken from component ratings and system limits and may not have been tested to the full extent of the specified ranges.

Physical overview

Figure 1 shows the RC Altimeter module.

The module includes an onboard LED display for indicating maximum altitude and battery voltage.

A pushbutton is used to select one of three options (maximum altitude, battery voltage and creating new flight while setting altitude to zero).

The 3 pin connector is used to connect to a radio-controlled aircraft's onboard receiver which powers the RC Altimeter module.

A modular connector is used for PC interface (for altitude data download, configuration and uploading firmware).

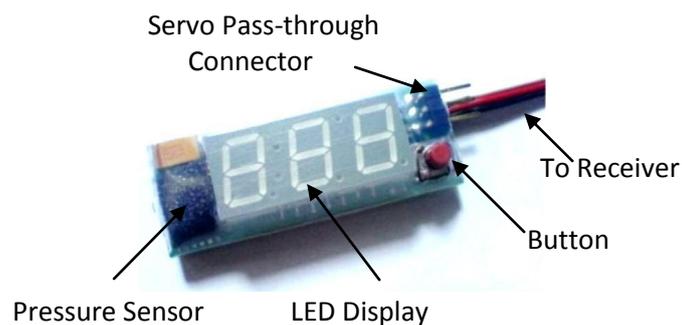


Figure 1: The RC Altimeter module.

Using the RC Altimeter module

Powering the module

To power the RC Altimeter module ON, plug the 3 pin connector into a spare receiver channel on the R/C aircraft. If you do not have an open receiver channel, you can plug the RC Altimeter into the receiver and plug that channel's servo into the RC Altimeter servo pass-through connector. Be sure to observe proper polarity when plugging the connector into the receiver. For non-R/C use attach a battery to the servo pass-through connector. A JST style connector can plug directly into the 3 pin pass-through connector. Again, be sure to observe proper polarity or damage may result. The 3 pin pass-through connector is oriented with the same polarity as the adjacent servo wires.

Mounting the module

The RC Altimeter module can be mounted in one of two ways:

- **Inside the fuselage of the aircraft.** In this case there should be an opening of at least 0.5 sq. cm to allow air pressure inside the fuselage to equalize with the atmospheric pressure. In many aircrafts, the fuselage is not airtight and is sufficiently vented to the outside air.
- **On the outside of the aircraft.** In this case the pressure sensor should be at the right angle to the airflow for maximum accuracy. This means the air stream is flowing across the hole in the pressure sensor, not directly into or away from it. If possible, mount it away from the prop wash, because the measured altitude can increase by over 60 meters due to airflow from the prop.

The module can be mounted using double stick tape, cable ties or Velcro. Velcro is recommended so that the module can be removed and interfaced with the PC for downloading altitude data.

Be sure that the module is not touching any metal surfaces. Shorting the metal contacts on the module will result in a radio system failure.

Also be sure to keep the module away from water, fuel, or other liquids.

Always range check the aircraft's radio system before flying with the RC Altimeter module installed, to verify that there is no system interference.

Operation

If the pushbutton is pressed and held while the module is turned ON, you will erase all stored data and - - - will appear on the display.

When you turn the module ON, software number appears for 2 seconds and the module sets zero altitude and creates new flight. While setting zero altitude, a dot point in right lower angle will be blinking. The module is ready to use when this dot stops blinking. When the module is setting zero altitude, you must make sure that the module will stand still. For lower power consumption, display will turn OFF after 4 seconds.

The first click on the button shows you maximum altitude achieved in flight, the second click shows you battery voltage and the third one will set zero altitude and create new flight.

PC Interface

The PC Interface serial adapter connects to the RC Altimeter module's 4 pin connector. When connected to the PC, the RC Altimeter module still requires external power through either the 3 pin cable connected to an R/C receiver or through the servo pass-through connector.

PC Software

Installation

No installation is required for the RC Altimeter PC software. You can download PC software from our web site www.rc-electronics.org. After download, run RC_Altimeter_Logger.exe file.

Startup

When you start RC_Altimeter_Logger software, the following screen will appear:

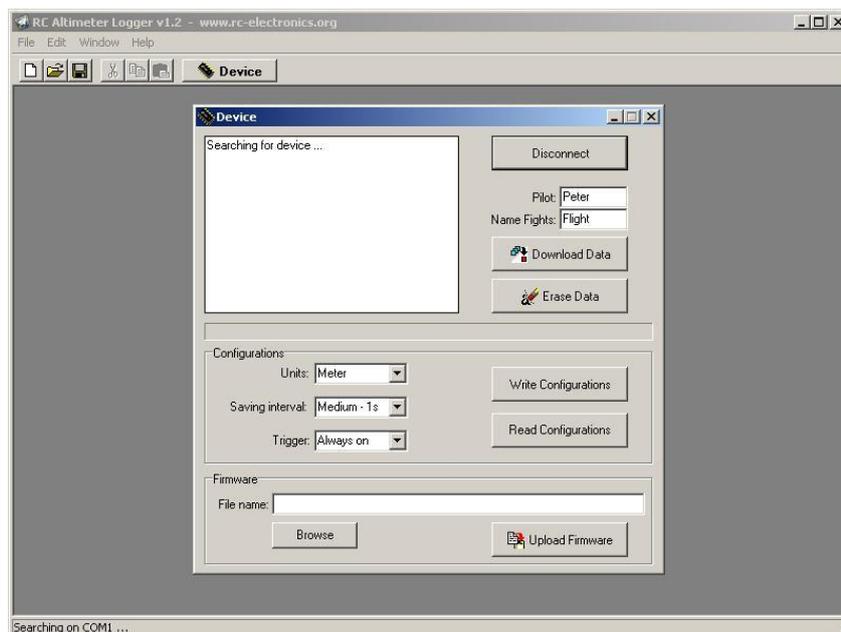


Figure 2: RC_Altimeter_Logger startup screen.

Connecting to the hardware

After you run PC software, it will start searching for the RC Altimeter module on all free COM ports. First you must apply power to the module. When PC software has found the module or when you press on "Device" button, the "Device" window will appear.



Figure 3: RC_Altimeter_Logger Device window.

The information window displays the status. If the connection was successful, the information window will indicate “Connected to COMx”. Once connected, configurations will be read from the module and you can download data by clicking on “Download Data” button or erase data by clicking on “Erase Data” button. You can configure the module and upload new firmware. In “Name Flights” window you can give name to all saved flights and in “Pilot” window a pilot name. You must do that before you click “Download Data” button.

How to configure the RC Altimeter module

Sampling Interval

You can select one of three options: High, Medium or Low. If you chose High, data will be stored three times in a second, if you chose Medium, data will be stored every second and if you chose Low, data will be stored once in every ten second.

Altitude Units

This sets the unit for the module displayed and recorded altitude.

Trigger

You can select one of three options: Off, Always on or Above 2 m.

- Off: Logging function is turned off and no data will be stored. This option is good when you need only maximum altitude, because the module will be able to do the most altitude sampling.
- Always on: After power ON, the module starts to save data until it is full.
- Above 2 m: recording will start after the altitude measured exceeds 2 m.

Read Configurations

Click the “Read Configuration” button to download the module’s current configuration to the PC software.

Write Configurations

Click the “Write Configuration” button to upload the new configuration to the RC Altimeter module. The module will store the new configuration in non-volatile memory.

Firmware Upgrade

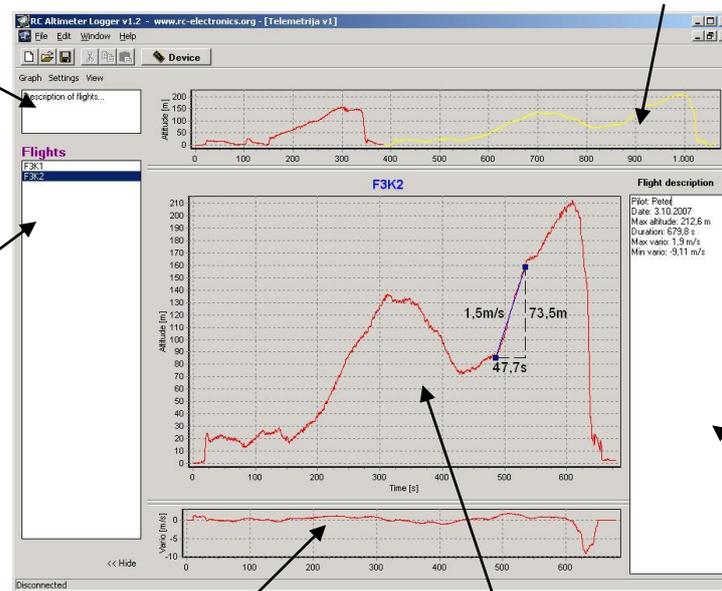
The RC Altimeter module supports the ability to upload new firmware. This allows new features to be installed on the field. To update the firmware, specify the new firmware file (*.hex) and click the “Upload Firmware” button. You should only use a firmware update file specially provided for the RC Altimeter module. Using an incorrect update file will render the RC Altimeter module inoperable. Follow the instructions given by the PC software to install the update.

Working with the data

Description of all flights

All flights graph

List of flights



Description of selected flight

Vario graph

Selected flight graph

Figure 4: New Flights window.

Selected flight is colored yellow in all flights graph and is displayed in selected flight graph. Vario graph for selected flight is shown under flight graph. If you click right mouse button on graph, you can move it. To zoom it, click left mouse button on graph and select area from upper left to lower right. To restore graph click on it with left mouse button and pull from lower right to upper left. If you click on two points on graph you will get info of time difference, altitude difference and vario between these two points. “Flight description” window shows the pilot name, date of download, maximum altitude in current flight, flight duration, max and min vario achieved in flight. You can add any text in this description and in description of all flights.

Graph -> Export

- Export ASCII: Current flight will be exported to *.txt file.
- Export Image: Current flight with flight description will be exported to *.jpg file.

Settings -> Units

You can select in which units altitude and vario will be show on graph.

Settings -> Vario Interval

Enter an interval (in seconds) in which vario will be calculated. This will have an effect on vario graph.

View -> Vario

When checked, vario graph will be shown.

Flights

Here are all flights that were stored in the RC Altimeter module. Name of those flights starts with the word inserted in "Device" window -> "Name Flights". Flight can be deleted (select the flight and press Delete button on PC keyboard or right click on flight -> "Delete"). If you create new flights, it is possible to drag and drop flights from one window to another (double-click or right click -> "Rename" on flight will rename it).