

RC ALTIMETER #2 PRO

Altitude data recording and monitoring system with
telemetry



Manual version: 1.3

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Introduction

The RC Altimeter #2 PRO was designed to provide a lightweight compact device for measuring and recording altitude over time. It was designed especially for use on board a radio controlled (R/C) aircraft, but would be useful in other applications too.

The RC Altimeter #2 PRO transmits current altitude, maximum altitude achieved in flight, vario and battery voltage at the field via RF link to the ground unit (RC T1000). It also records altitude data, which can be downloaded to a PC through a USB interface.

If RC GPS module is connected to the module it will also transmit latitude, longitude, ground speed and distance from the pilot.

How it works

The RC Altimeter #2 PRO 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 local weather and air pressure variations.

The intended 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.

The module uses a 433MHz two way link to transfer data from your R/C aircraft to the RC T1000 ground module. Data transfer is digital, so there won't be any noise or incorrect data received.

Key features

- Lightweight at only **9 grams with telemetry and JR cable**.
- Small – 37 mm x 19 mm x 7 mm.
- With the **RC T1000** module it will work as a variometer with audio tone.
- Records altitude data for later review.
- Integrated **FXJ switch** function.
- PC **USB** interface for configuration, loading firmware updates and downloading recorded data.
- Export data in *.txt format or as JPG image.
- Wide range of input power: 4 – 20 volts DC. Power it from your aircraft receiver battery.
- Every unit is tested in a pressure chamber up to 950m.
- Transmits current altitude, maximum altitude achieved in flight, vario (climb rate) and battery voltage in real time.
- Supports RC GPS module to record all GPS data in order to see your flight in 3D with Google Earth and an airspeed graph.
- With the RC GPS module it will transmit additional information such as latitude, longitude, ground speed and distance from the pilot.

System requirements

- PC with one of the following operating systems: Win98, Windows ME, Windows NT, Windows 2000, Windows XP, Windows Vista.
- Available USB port.
- 2 megabytes of Hard Drive space.

Specifications

Board Dimensions	1.46" x 0.75" x 0.28" 37 mm x 19 mm x 7 mm
Weight	9 grams
Temperature Range ¹	-10°C ~ +60°C
Input Voltage Range	4.0 – 20.0 volts DC
Input Current	36 milliamps
Measured Voltage	4.0 – 18.7 volts DC
Maximum Altitude ¹	Recorded: 3100.0 meters/feets/yards
Minimum Altitude ¹	Recorded: -3100.0 meters/feets/yards
Memory Capacity	16000 samples.
Displayed Altitude Resolution	1 meter, 1 yard or 1 foot
Output Power	Up to 10mW (10dBm) at 433MHz
Range	Up to 1 km (depends on antenna installation)

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 #2 PRO module.

The module includes a 433MHz transceiver for transmitting data to the ground with a 17 cm long antenna.

The JR cable is used to connect it to a radio-controlled aircraft's onboard receiver which powers the RC Altimeter #2 PRO module.

The 3 pin connector serves as a servo pass-through or as output for the FXJ switch function.

A modular connector is used to interface to a PC for configuration and data download.

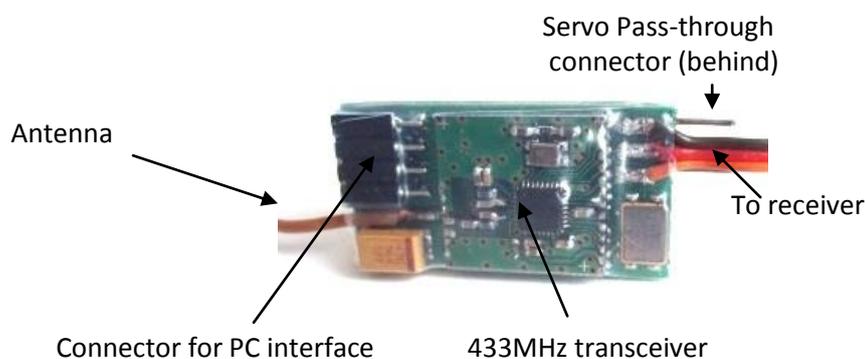


Figure 1: The RC Altimeter #2 PRO module.

Using the RC Altimeter #2 PRO module

Powering the module

To power the RC Altimeter #2 PRO module ON, plug the 3 pin connector cable into a spare channel on the R/C aircraft receiver. If you do not have an open receiver channel, you can plug the RC Altimeter #2 PRO into the receiver and plug that channel's servo into the RC Altimeter #2 PRO 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 #2 PRO 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 outside the aircraft. 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-sided 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.

Do not mount the module on top of power batteries when using electric planes, because they get hot and this can affect the altitude readings by up to 30m.

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

Always range check the aircraft's radio system before flying with the RC Altimeter #2 PRO module installed, to verify that there is no system interference.

For maximum range a full length of antenna should hang free from the fuselage.

Operation

Each time you turn on the module it will set zero altitude and create a new flight. When the module is setting zero altitude, you must make sure that the module is stationary. In order to view data, you must use the RC T1000 module. Via the RC T1000 module you are able to change any logger settings, set zero, erase data and download data from the RC Altimeter #2 PRO to the RC T1000 via a 433MHz link on the field without a computer.

PC USB Interface

The PC USB interface connects to the RC Altimeter #2 PRO module's 4 pin connector. The RC Altimeter #2 PRO gets power from the USB interface so no external battery is required. USB drivers can be downloaded from www.rc-electronics.org (under Downloads -> Software). After installation, a virtual COM port will be created. Please make sure that this virtual COM port number is 1...10.



Figure 2: USB interface.

PC Software

Installation

No installation is required for the RC Altimeter PC software. You can download the software from www.rc-electronics.org. After downloading, run the RC_Altimeter_Logger.exe file. RC Altimeter #2 PRO will only work with PC software version 1.3.0 or higher.

Startup

When you run RC_Altimeter_Logger, the following screen will appear:

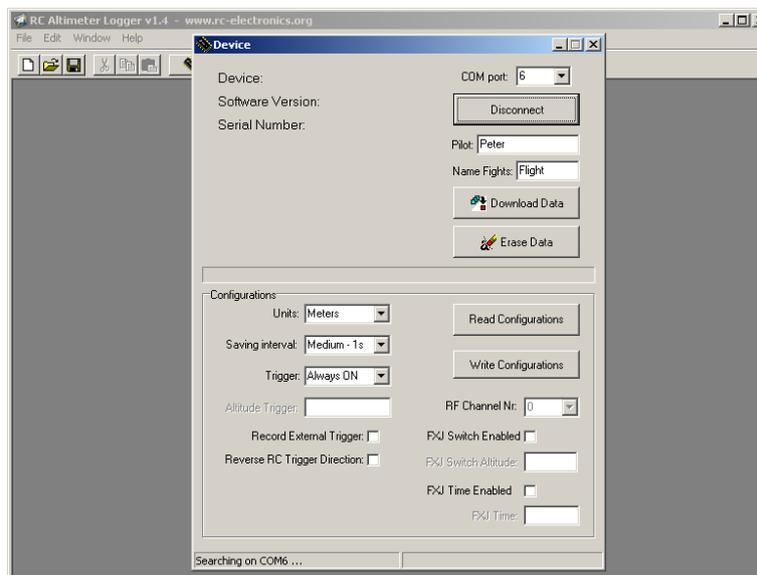


Figure 3: RC_Altimeter_Logger startup screen.

Connecting to the hardware

After you start the software, it will search for the RC Altimeter #2 PRO module on all free COM ports up to COM 10. When it has found the module or when you press the “Device” button, the “Device” window will appear.

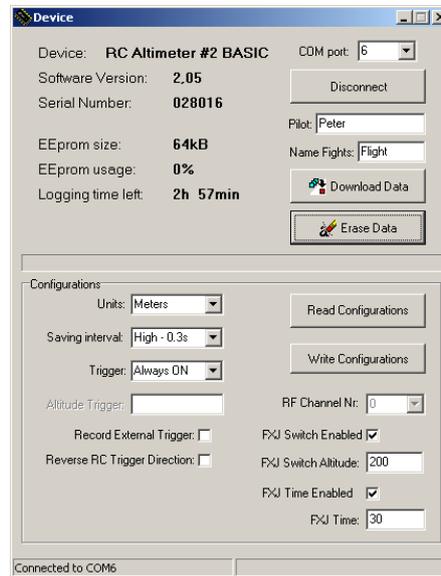


Figure 4: RC_Altimeter_Logger Device window.

If the connection was successful, the status line will indicate “Connected to COMx”. Once connected, module information and configuration data will be read from the module. You can download the recorded altitude data by clicking on the “Download Data” button. You can erase the data by clicking on the “Erase Data” button. You can configure the module with new settings by making selections or entering values in the data entry boxes. In the “Name Flights” window you can give a name to all saved flights and in the “Pilot” window you can enter the name of the pilot. You must do that before you click the “Download Data” button.

Configure the module

Units

This sets the measurement units for the module’s recorded altitude – meters, yards or feet.

Interval

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

Trigger

You can select one of four options: Trigger OFF, Always ON, Altitude Trigger or RC Trigger.

- Trigger OFF: Logging function is turned off and no data will be stored. This option is good if you only want maximum altitude or if you use RC Altimeter #2 PRO with the RC GPS module in order to store GPS data only.
- Always ON: After powering on, the module starts to record altitude data until it is full.

- Altitude Trigger: Recording will start after the altitude measured exceeds the altitude that you entered in the Altitude Trigger box.
- RC Trigger: You must connect the module in a spare receiver channel and then via this channel you can start recording altitude data from your RC transmitter. Tick the Reverse RC Trigger Direction check box to reverse the direction of your selected trigger.

Read Configurations

Click the “Read Configuration” button to download the module’s current configuration data to the screen.

Write Configurations

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

Record External Trigger

If checked, a marker will be recorded with the next altitude record when the RC Altimeter #2 PRO detects a change from min to max or max to min on the channel it is connected to (eg your throttle). This function can be used for aerial photography to know, from what height the photo was taken or when your sailplane is being towed to know, at what altitude you released. It is also useful to mark a point in your flight for later review, so you can see what was happening at that time (eg. what height, were you sinking or climbing ...).

RF Channel Nr

Select on which channel your RC Altimeter #2 PRO will transmit data. In order to work properly you must have set the same channel on RC T1000.

FXJ Switch

If you want to use the FXJ switch function, you must check FXJ Switch Enabled and then you can enter the FXJ Switch altitude. In order for proper use of this function, when you power up RC Altimeter #2 PRO module, the channel to which this module is connected must be at it’s minimum position (e.g. throttle off) or in the position that you want it to be set to when you reach your selected altitude. The module will remember this position and after exceeding this altitude it will mimic the same state on this channel (e.g. when your e-sailplane reaches the set altitude the motor will be shut off). The FXJ switch function has control over that channel for 10 seconds and it is reset by the model flying below 20m.

This function is useful for towing your sailplane when you want to un-hook at the same altitude every time. To do this, connect your tow release servo to the RC Altimeter #2 PRO module.

It is also useful for practicing with electric F3J and F3K sailplanes.

FXJ Time

In order for proper use of this function, when you power up RC Altimeter #2 PRO module, the channel to which this module is connected must be at it’s minimum position (e.g. throttle off) or in the position that you want it to be set to, when you reach your selected altitude. The module will remember this position and after exceeding this motor run time, it will mimic the same state on this channel. The FXJ switch function has control over that channel for 10 seconds. Time starts to count down when you apply change to this channel (throttle) and will reset to the preset value if you have channel position at the same position as at power up for 4s.

Working with data

Description of all flights

All flights graph

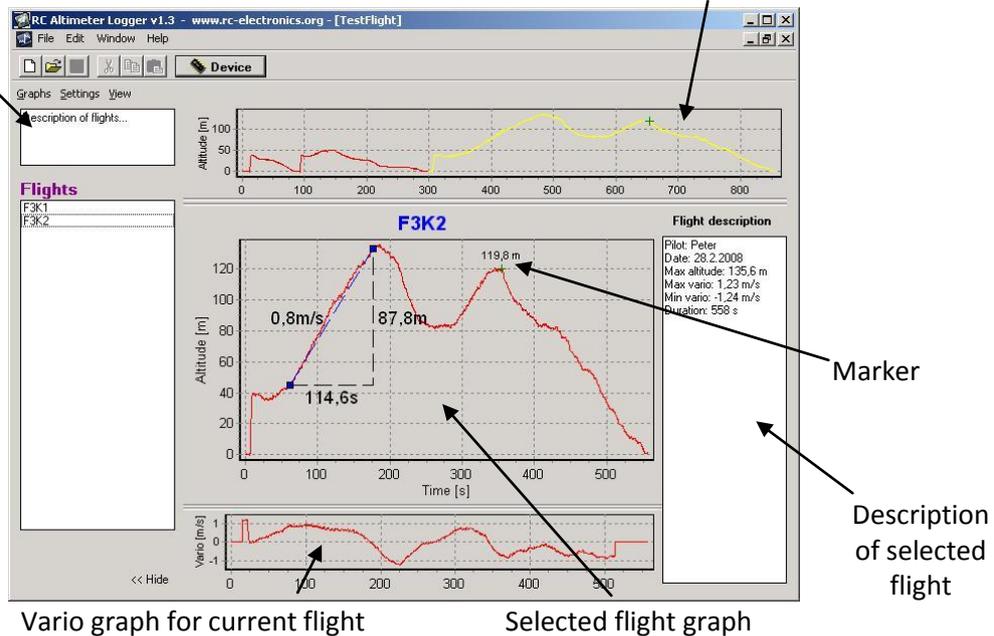


Figure 5: New Flights window.

The selected flight is colored yellow in the all flights graph and is displayed in the selected flight graph. If you click the right mouse button on the graph, you can move it. To zoom it, click the left mouse button on the graph and highlight the area from upper left to lower right.

To restore the graph, click on it with the left mouse button and pull from lower right to upper left. If you click on two points on the graph, you will get details of the time difference, altitude difference and average climb/sink rate between these two points. Recorded markers will be shown as green crosses with marked altitude. The "Flight description" window shows the pilot name, the date of the download, the maximum altitude of the selected flight and its duration. You can add any text in this description or the description of all flights.

Flights

Here are listed all the flights that were stored in the RC Altimeter module. The name of those flights starts with word inserted in "Device" window -> "Name Flights". Flights can be deleted (select the flight and press Delete 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 a flight to rename it.

Graphs

Here you can print an altitude graph or export the data. You have three options for exporting:

- Export ASCII: Current flight will be exported to *.txt file.
- Export Image: Current flight with flight description will be exported to *.jpg file.
- Export GPS data: If an RC GPS module was connected and GPS data was recorded, it will be exported into *.kml file for Google Earth review.

Settings

Here you can set/choose the measurement units for the altitude graph or a speed graph (if GPS data was recorded) and set the vario interval. This vario interval setting will affect the vario graph.

View

Select if you want to swap between the vario and speed (if recorded) graphs.

Firmware upgrade

The RC Altimeter #2 PRO module provides the ability to upload new firmware to the module. No installation is required for the Firmware Upgrade software. You can download it from www.rc-electronics.org.

After downloading, run the Firmware Upgrade.exe file. Select the correct COM port and then specify the new firmware file (RC_Altimeter_v2.xx.hex). After you have selected the firmware file, connect the module to the USB interface so it will run and LED will flash. Wait for about 4 s and click the "Upload" button. If something goes wrong during update, disconnect the module from the USB interface and restart Firmware uploader. Again, select correct COM port and update file and click Upload button.

After pressing the "Upload" button, **quickly connect the USB interface to the RC Altimeter #2 PRO** and the upload of the new firmware will start.

You should only use a firmware update file specifically provided for the RC Altimeter #2 PRO module. Using an incorrect update file will render the RC Altimeter #2 PRO module inoperable.

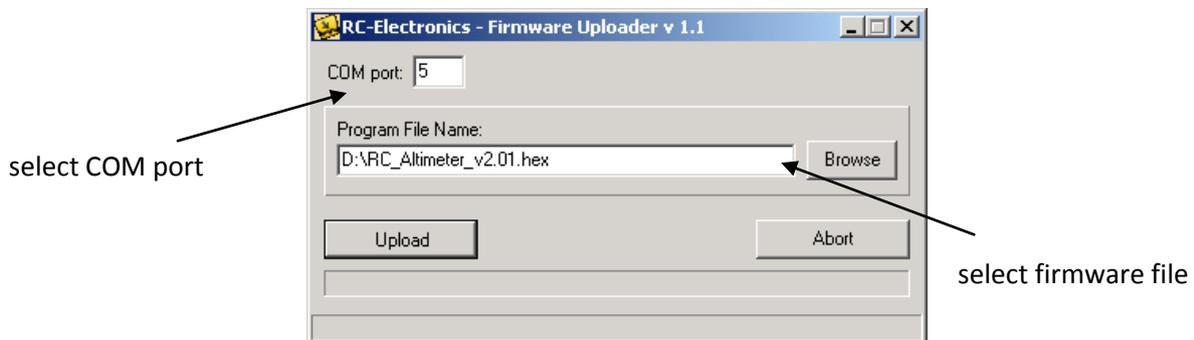


Figure 6: Firmware uploader.