Falcon

FAI approved device for F5J competitions with flight data recording

Manual version: 1.0

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Introduction

The Falcon module was designed to provide a lightweight compact device with onboard TFT display for use in FAI approved F5J competitions. It can be also used in other applications where measuring and recording flight data over time is required.

The Falcon module is able to record data from various inbuilt sensors for later review. Competition parameters are displayed on its onboard display. For communication with Android or iOS device, it uses a BLE communication. It uses state of art pressure sensor, fast 18Hz GPS receiver, super accurate 3 axe accelometer and super sensitive microphone to detect environmental nose level (ENL). For storage it uses sold state memory.

Key features

- Lightweight at only **18 grams** with JR cables.
- Small: 48 mm x 17 mm x 9 mm.
- Integrated **F5J FAI** altitude/time switch.
- Integrated color TFT display.
- Integrated GPS receiver with its own rechargeable battery to keep GPS clock running
- Integrated automatic precise flight time recording function for F5J flying
- Records various flight data for later review.
- Wide range of input power: 4 – 12 volts DC. Normally taking power from your aircraft receiver supply.

How it works

The 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 10cm. 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.

Module has an onboard color TFT display for displaying different data.

For storing data, the module has a solid-state flash memory chip.

Specifications

Board Dimensions	48 mm x 17 mm x 9 mm
Weight	18 grams
Temperature Range[1]	-10°C ~ +60°C
Input Voltage Range	4.0 – 12.0 volts DC
Input Current	70 mA
Measured Voltage	4.0 – 12.0 volts DC
Basic recorded data	Altitude, vario, servo pulse, battery voltage, GPS position, ENL, …

[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 Falcon hardware.

The JR male connector is used to connect it to the radio-controlled aircraft's onboard receiver, which powers the module and detects servo pulse. The JR female connector serves as a servo pass-through or as output for the F5J time switch function (connect it to ESC). Onboard color TFT display is used for displaying different parameters.

Onboard GPS receiver with build in GPS antenna needs no metal / carbon area above it to work correctly With the help of internal rechargeable battery, GPS position will be 3D after 5s from power on!

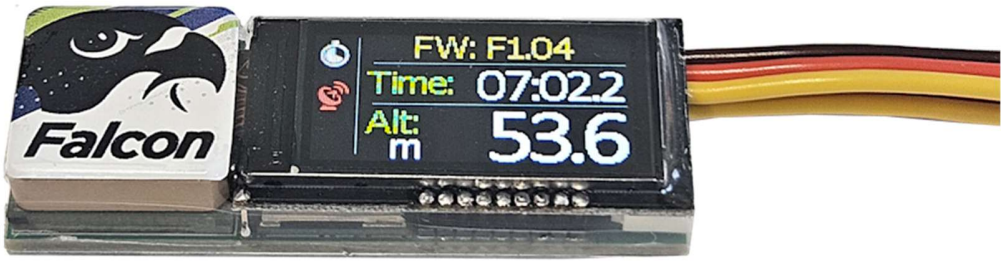


Figure 1: The Falcon module.

Using the Falcon module

Powering the module

To power the module ON, plug the 3 pin male connector cable into the throttle channel on the R/C aircraft receiver and then plug the ESC/servo into module's servo pass-through female connector. If you do not require control of the motor/height limit function, you can plug the module into any free channel on the receiver. Be sure to observe proper polarity when plugging the connector into the receiver.

For non-R/C use attach a battery of the correct voltage to the servo pass-through connector. A JST style connector can plug directly into the 3 pin pass-through female connector. Again, be sure to observe proper polarity or damage may result. The 3 pin pass-through female connector is oriented with the same polarity as the adjacent servo wires.

Mounting the module

When mounting the module please assure there is no metal / carbon above GPS receiver antenna (Falcon label) and that logo sticker on module is facing down!

The module can be mounted in one of two ways:

- The recommended method is **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 and 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 flight data.

Be sure that the module is not touching any metal surfaces. Although unlikely, there is a possibility of shorting the metal contacts on the module, which could 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 and test the aircraft's radio systems before flying with the Falcon module installed, to verify that all connections have been made correctly and there is no system interference.

Operation

Each time you turn the module ON, it will set zero altitude and start logging data to circular buffer.

When take-off is, history data is saved to flash memory. In flight, module saves all data from connected sensors/modules to onboard memory. When module is in flight, recoring icon is visible on its display .

When landing is detected, module stops recording data and recording icon dissapears.

Status icons

Module has 3 different status icons which are showing its state of work.

Internal clock not synced to GPS time

clock synced to GPS time

Bad GPS reception

valid 3D GPS reception

BT connection established

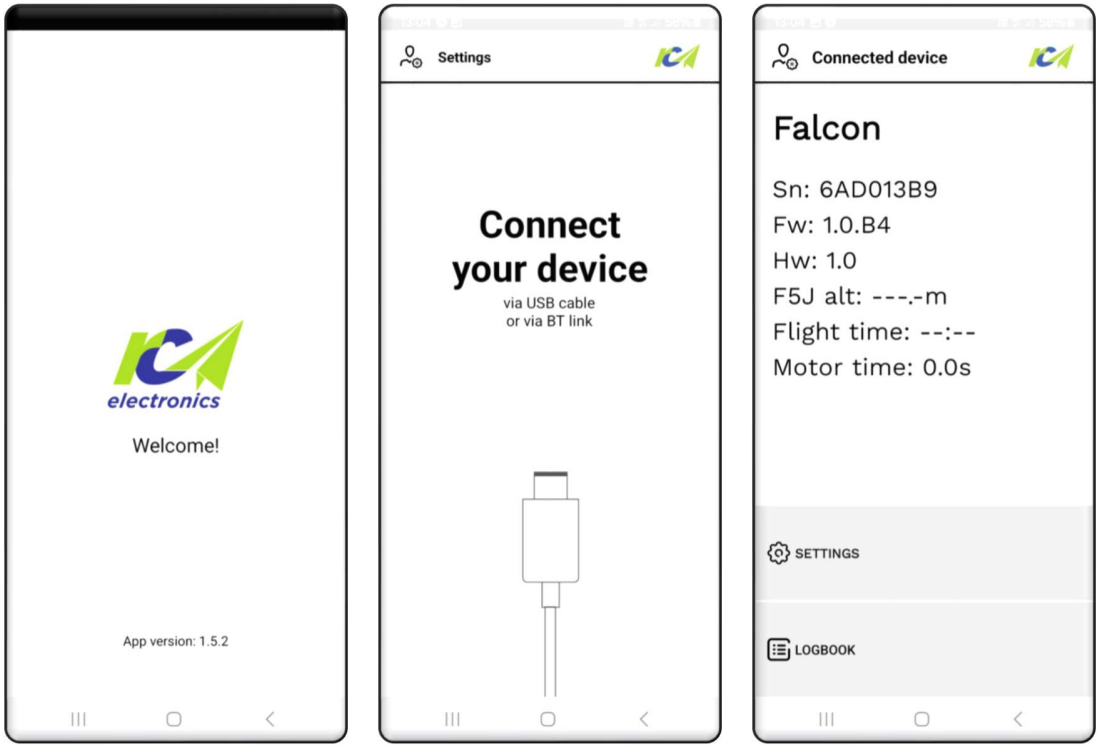
in flight mode

Connecting module to the RC electronics application

Please note! At the moment there is no iOS application jet. We are working on it and will publish its release on our Facebook page and website once ready.

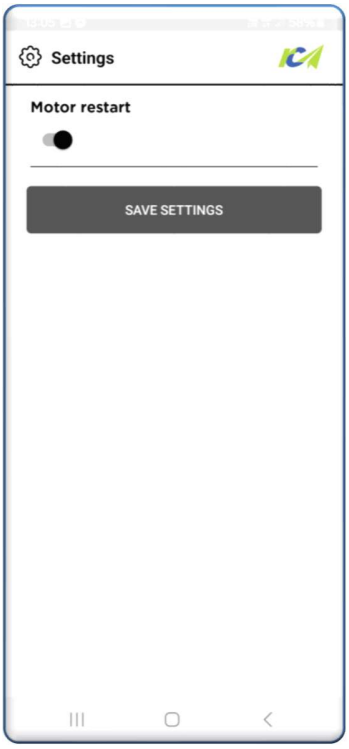
Connect the module to any Android / iOS device where RC electronics app was installed from Google Play / Apple store. Unit connects automatically when powered on and app is running!

Run RC electronics App and power on Falcon unit. How to set up Application, please refer to the application manual!



You will be able to see basic info, set the settings and download the IGC flight from device when connected.

Unit settings:



Motor restart:
When enabled, firmware version changed from F to S, then module can be used in CAT2 category of events where motor restart is allowed, for CAT1 events, motor restart has to be set to off. Every time user changes this setting, start altitude on module will reset to - - -.-m!

Settings are set only after "SAVE SETTINGS" button is pressed. If user uses back function, new settings are ignored!

Unit logbook:

Select flight from dropdown list and press "DOWNLAOD FLIGHT" button. After flight is downloaded, user will be asked if he wishes it to upload it to his www.rcmodelspot.com account.

Before upload user must set his www.rcmodelspot.com login data into RC electronics application settings

Pressing "CLEAR LOGBOOK" button, will clear the log files from internal memory

Firmware update

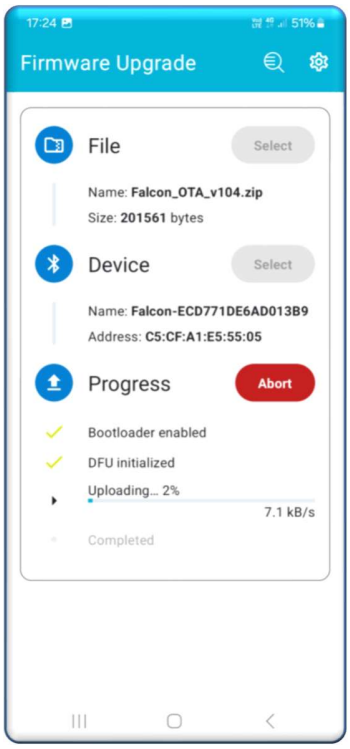
For updating the unit, we are using special app which can be installed from Google Paly or Apple store

App name is DFU (Nordic Semiconductor)

Please install the app, then download new update file from our website. It will be zip file which you store to downloads folder of your mobile device.

Then run the DFU app, select zip file, turn on Falcon and select it under devices and press update.

After update unit will reset itself and new version will be in use. In case user tries to upload wrong zip file to the Falcon, the unit will reject it!



Revision history

September 2024	Initial release of user manual.