PYXIS GPS

model tracker
Quick Reference Guide **V1.5**
© ffelectronics – August 2022

Introduction

The PYXIS tracker is a free-flight model aircraft recovery system based on the Global Navigation Satellite System (**GNSS**), which uses multiple satellite networks such as GPS, GLONASS, Galileo, Beidou and other regional systems. It does not require the user to transmit any data, operates independently of any telephone or Internet reception, and works anywhere on earth where there is free line of sight to four or more satellites.

The PYXIS tracker consists of a receiver (handheld unit) and a beacon (transmitter installed on the model). Each unit has its own **GNSS** module which makes it aware of its position. A long-range radio link allows the transmission of the model's position to the hand unit which, in combination with the data from a local electronic compass, displays the distance and the bearing in a straight line to the model, whatever the path taken for the approach.
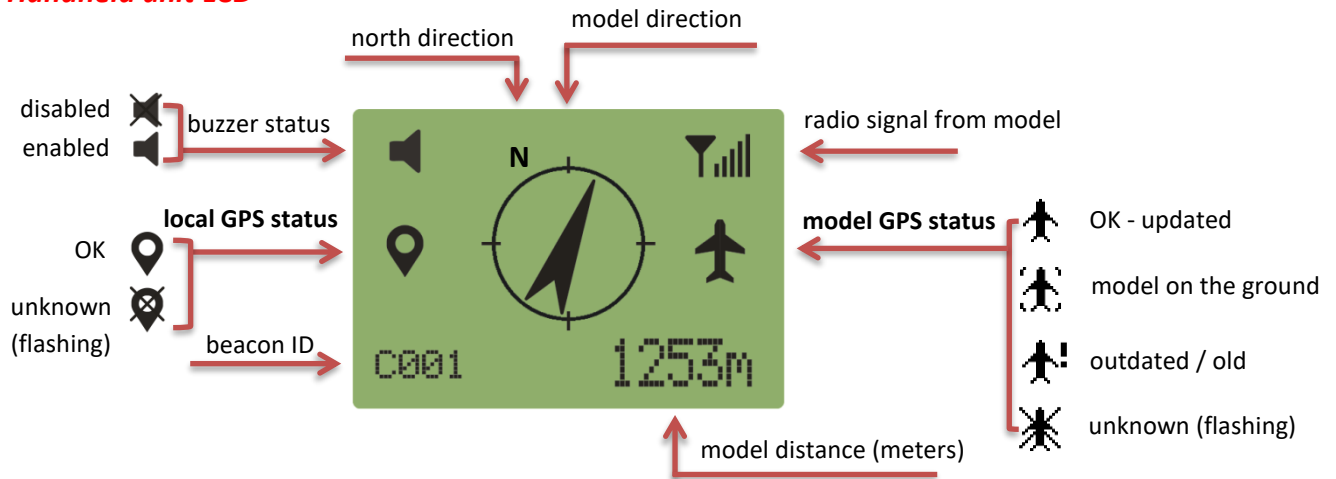
PYXIS Receiver

Switching the receiver ON/OFF

Press and hold the ⏻ button (2 seconds approx.) to switch the receiver ON/OFF

Handheld unit LCD

Multifunction keyboard operation

Press and hold **SETUP** to enter the setup menu. Press and release **UP/DN** to select a menu, press and release **ENTER** to enter the selected menu. Press and release **ESC** to leave a menu.

Standard microUSB socket for battery recharge - recharge status LEDs

The receiver has a standard microUSB socket at the bottom for charging the internal battery via a mobile phone charger, computer USB, microUSB power bank or car cigarette lighter socket and a pair of LEDs to monitor the charging process. Red LED <u>on</u> means that charging is in progress, green LED <u>on</u> means that charging is complete.

Displayed system icons

When turned on, the handheld unit will take some time to acquire its position. During this period the **local GPS status icon** is displayed flashing and crossed ⊗. When the position is acquired, the icon is displayed solid ⬤.

The PYXIS handheld gets the model position from the messages that the beacon cyclically sends. The **model GPS status icon** will temporary display solid ✈! (outdated position stored) or flashing/crossed ✳ (beacon never located previously) until the handheld unit receives an updated GPS position from the beacon. When it does, it will display solid ✈. If the model is on the ground the **model GPS icon** will display solid ✈.

Compass calibration

🛈 the calibration of the internal e-compass is recommended the very first time the system is used, and every time the handheld unit is moved to fields many kilometers away.

PYXIS Beacon

Positioning

Position the beacon with the radio antenna wire vertical out of the top of the pylon. If the pylon is made of conductive material (e.g. carbon), the narrower upper part of the beacon (approximately 4.5mm high) should protrude completely from the top of the pylon outline.

Bottom side LED indications

The green and red LEDs visible on the bottom side of the beacon provide various indications. The red LED goes shortly <u>on</u> during the beacon transmission. The green LED indicates the status of the GPS (flashing = GPS acquisition, solid = GPS connected / locked, OFF = beacon sleeping, model on the ground)

Beacon transmission and power saving policy

A smart power management scheme is implemented in the beacon. It periodically transmits its updated position with a time interval that depends on the attitude of the model. When the model is placed on the ground for some time, the beacon goes to sleep and transmits its fixed position at much longer time intervals. If the model is moved or lifted, the beacon will wake up and resume the cyclic transmission of its position updates.

⚠️ The system is designed for outdoor operations <u>only</u>. Placing the beacon and/or the handheld unit inside a building, in the car or under a large metal cover could lead a quick discharge of the batteries because they will constantly search for the GPS signal.

SYSTEM OPERATION

How GPS model tracking works

While the model is flying, the beacon periodically transmits position updates, the radio signal has no obstacles and the range is very long. If the beacon signal is lost when the model lands (it may occur because of uneven ground surface, tall grass, obstacles, etc.) the handheld unit will aim at the last received position. The beacon continues to transmit its position at longer intervals even after landing, therefore during recovery the receiver will be updated on the landing position as the model is approached. The receiver permanently stores the last known coordinates when turned off and restores them when turned on, that allows you to complete the recovery even at a later time.

Retrieval

⚠️ The retrieval is possible <u>only</u> if the **local GPS icon** is displayed solid ⬤ and the **model GPS icon** is also displayed solid ⬥. In these conditions the arrow on the LCD aims at the model and the meter counter indicates its distance in a straight line. If the model is on the ground the **model GPS icon** will display solid ⬥ .

ℹ️ Depending on the sky conditions and the position of the satellites it may take a few minutes before the icons become solid and the system can operate.

If no position updates from the beacon are received (beacon not powered, discharged battery or searching the GPS signal), the **model GPS icon** will be displayed as follows:

- solid with an exclamation mark next to it ✈! that means that the handheld unit is pointing in an outdated position (the latest position received from the same beacon)

- flashing with a cross on it ✖ that means that the handheld unit has never received position information from that beacon. In this case no distance is shown and the arrow just aims at the magnetic North direction

⚠️ It is highly recommended that the receiver is turned on and displays the solid **model GPS icon** ✈ before launching the model

How to hold the receiver during tracking

Hold the receiver horizontally when retrieving the model. If the tilt angle of the receiver exceeds approx. 40 degrees, a warning message is displayed on the lcd.

Hold the receiver vertically and lift your arm to improve the reception of the radio signal from the beacon when it is extremely far away and it is difficult to get position updates.

SYSTEM SETTINGS - MENU ITEMS

Press and hold **SETUP** to enter the setup menu. The following describes each available menu item.

LRN BEACON ID menu (learn beacon ID)

Each beacon is manufactured with a 4-digit unique identifier (beacon ID). This menu allows to bind a new beacon to the handheld unit receiver. Currently the receiver is capable to handle up to 30 beacons.

- Enter **SETUP > LRN BEACON ID**
- Choose a free slot in the displayed list of beacon identifiers (ID1, .., ID30)
- Confirm the desired slot with ENTER
- power ON the new beacon and accept or discard its beacon ID when it appears on the LCD

SET ACTIVE ID menu (set active ID)

The receiver can track one beacon at a time. This menu allows to change the tracked beacon.
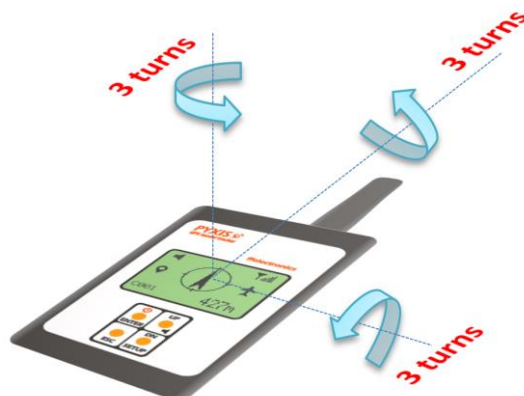
- Enter **SETUP > SET BEACON ID**
- Choose the desired beacon from the displayed list of beacon identifiers (ID1, .., ID30)
- Confirm with ENTER. The active beacon ID will be changed and displayed in the lower left corner of the LCD

COMPASS CALIB menu (e-compass calibration)

This procedure is necessary to calibrate the integrated magnetometer and accelerometer sensors. Calibrate the compass the very first time the receiver is used and check or repeat calibration from time to time. It is advisable to recalibrate the compass when you move into different fields.

ℹ The compass calibration must be performed in an open area, away from magnetic fields or metal objects. During the compass calibration a progress bar is displayed. The procedure ends automatically after 20 seconds approx.

- Enter **SETUP** > **COMPASS CALIB**
- Rotate the receiver 3 or 4 times for each x, y, z axis in any order as indicated in the drawing below

DEL BEACON ID menu (delete beacon ID)

This menu deletes all stored beacon IDs.

- Enter **SETUP** > **DEL BEACON ID**
- Confirm with <**YES**> if all the stored beacon IDs must be deleted or <**NO**> if they must be kept

TRACKING menu

This entry opens the tracking submenu (default menu automatically entered at power up)

- Enter **SETUP** > **TRACKING**

TRACKING > SET HOME submenu

This menu allows to store the current receiver location as **HOME**

- Enter **SETUP** > **TRACKING**
- Move to **SET HOME** with **UP/DN** and confirm with **ENTER**
- Accept or discard with **UP/DN** and **ENTER**, or **ESC** to discard directly

TRACKING > GO HOME submenu

This menu sets the initial position as a destination position. It is useful for helping to return to the launch position after the model has been recovered, when the home position is hidden by hills, trees, etc. or it is completely lost

- Enter **SETUP** > **TRACKING**
- Move to **GO HOME** with UP/DN and confirm with ENTER
- Direction and distance will refer now to the HOME location and the 🏠 icon will be displayed

🛈 after reaching HOME do not forget to set the receiver to track the beacon again

TRACKING > TRACK BEACON submenu

This menu allows to the track the beacon whose identifier (ID) is the active ID

- Enter **SETUP** > **TRACKING**
- Choose **TRACK BEACON** with ENTER

TRACKING > SHOW COORDIN submenu (show coordinates)

This menu shows the actual recorded coordinates (longitude E/W, latitude N/S) Enter **SETUP** > **TRACKING**

- Move to **SHOW COORDIN** with UP/DN and confirm with ENTER

🛈 The coordinates are shown in decimal degrees format. They can be directly used with other location tracking apps like Google Earth, Google Maps etc.

SYSTEM BATTERIES DURATION

Receiver built-in battery (1000mAh 1C)   :   > 20 hours continuously

Beacon battery (170mAh 20C)   :   > 30-36 hours (estimated)

PYXIS beacon power supply requirements

The Pyxis beacon can be powered with an external power source (e-timer output, shared LiPo etc.) use the supplied red-black soft silicone pigtail.

Observe the polarity carefully and do not exceed the maximum allowed supply voltage. Inverted polarity or a voltage higher than the maximum allowed will cause permanent damage to the beacon.

BEACON BOTTOM VIEW

beacon ID label ➝ C000 ⬚ ⬅ power supply socket

— +
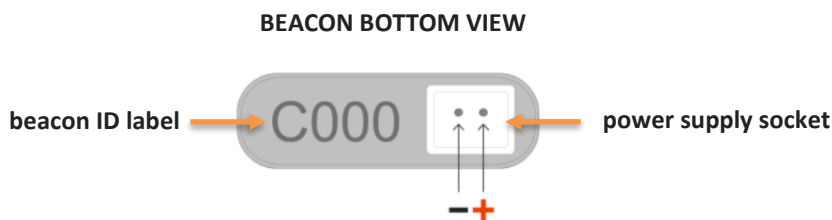
3.7 Vdc nominal (1S LiPo)

⚠ Absolute maximum voltage **8.4Vdc**

⚠ Observe polarities