Wireless Copilot
Safe2Fly

Instruction
Manual

Contents

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Warnings

- Don't insert the batteries in the receiver incorrectly.

- Keep the receiver, lanyard, and headphones well away from rotating devices such as model engine propellers.

- The system is for use as an auxiliary information device, and is not a replacement for common sense.

- Signal drop out can sometimes occur due to factors such as surrounding obstacles, atmospheric conditions, model orientation and antenna installation.

- Properly secure the transmitter and antenna in the model.

- Keep the current sensor way from magnetic fields (electric motors, hatch magnets etc) as this will effect the operation. Strong magnetic fields will damage the sensor.

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

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Features

Voice announced status

Easy to operate

Works with any make of radio control set, and any frequency type (AM, FM, PCM, 2.4GHz etc)

An airborne unit which is small and light weight

Stores up to 4 battery sizes (50 to 9999mAH)

Low current draw

Radio Control Transmitter triggered readout

Readout of current amps drawn or percentage capacity remaining mode

Accumulated total mode

Alarms at 30%, 20% and 10% battery capacity remaining

Receiver unit uses low cost AAA Alkaline batteries

Measures up to 100A without current shunt

Non invasive current monitoring

Uses a 433MHz or 915MHz radio link (depending on hardware version)

Optional Altimeter with over height alarm

Low battery warning on airborne system

Receiver Unit low battery alert

Low cost

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Specifications

System

Frequency: 433MHz or 915MHz (depending on hardware version)

Maximum Range: 304m (1000 feet)

Receiver

Power: 2 x AAA alkaline batteries

Running Time: up to 100 hours (depends on volume and readout rate)

Speaker or Head Phone Option

Low Battery Alert: 2.7 volts.

Size: 90mm x 56mm (3.5" x 2.2") [L x W]

Weight: 70g (2.5oz) [including batteries]

Transmitter

Input Voltage: 4.8V to 6V (4 or 5 cell battery pack or BEC).

Radio Control System Battery Alarm: 4.6 volts

Current: typically 25mA @ 5V

Typical Output Power: 10mW

Current Sensor Maximum: typically 100A.

Size: 45mm x 30mm x 7mm (1.77" x 1.18" x 0.28") [L x W x H]

Weight: 10g (0.35oz)

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Receiver Battery
To install or replace the receiver batteries:

Unscrew the 4 screws on the back of the case.

Remove the back of the case

Insert or replace the batteries observing the polarity indicated on the battery holder

Replace the back and screws

USE ONLY ALKALINE AAA BATTERIES
The unit will work with standard Heavy Duty Batteries but the operational time will be significantly reduced.
**DO NOT USE** lithium batteries

WARNING
The receiver has a protection device that will protect the sensitive electronic components against reverse polarity damage. The protection device will cause excessive current to flow in the batteries which may cause the batteries to explode, leak or catch fire.

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Transmitter Installation

Find a suitable location in the model that will allow access to the buttons especially if you need to change the battery size frequently.

We suggest using loop & hook fastener (Velcro) to mount the board inside the model.

Connect the servo lead from the transmitter to the Radio receiver using a channel that can be controlled from the Radio Control set if you want to use the "Report On Demand" feature (you may have to use a Y-lead).
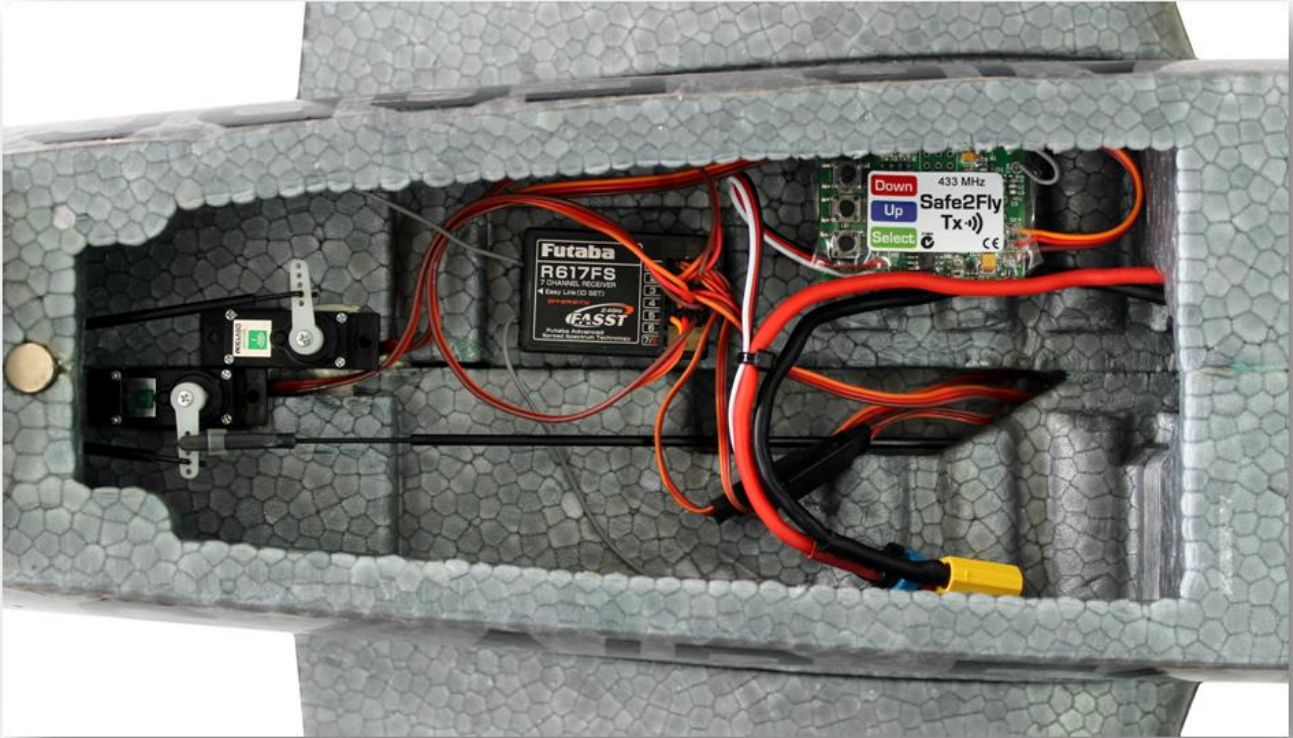

The transmitter is velcroed in next to the plane's receiver. Note the use of zap-ties around the current pickup sensor and the battery lead to provide strain relief.
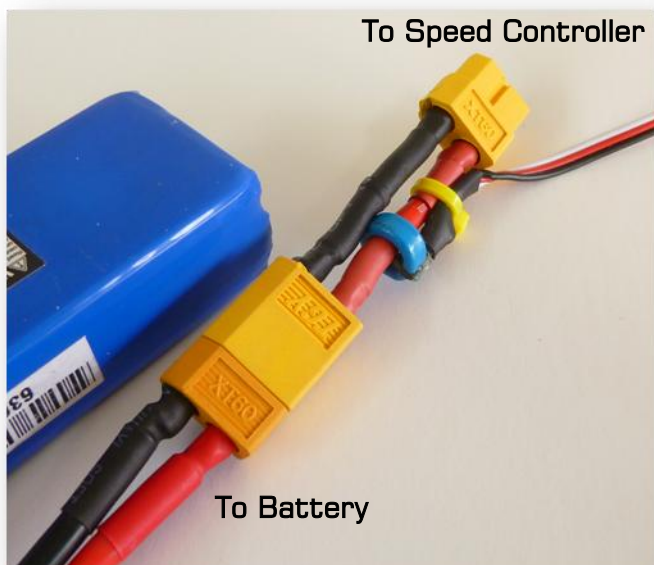
Observe the orientation of the current sensor. When on the positive wire (red wire), the flat end of the sensor should point towards the battery, and the lead should follow the wire back to the speed controller. When on the negative wire (black wire), the flat end should face *away* from the battery, with the lead heading back towards the battery.

Note the use of a home-made adapter between the battery and speed controller, which allows the transmitter to be moved easily between models. This adapter can be made using two short pieces of wire, some heat shrink, and any male/female connectors you prefer.

Take the antenna wire and run that in two directions if possible, keeping it away from metal parts and as far from the radio control receiver as is possible. Secure it with sticky tape.
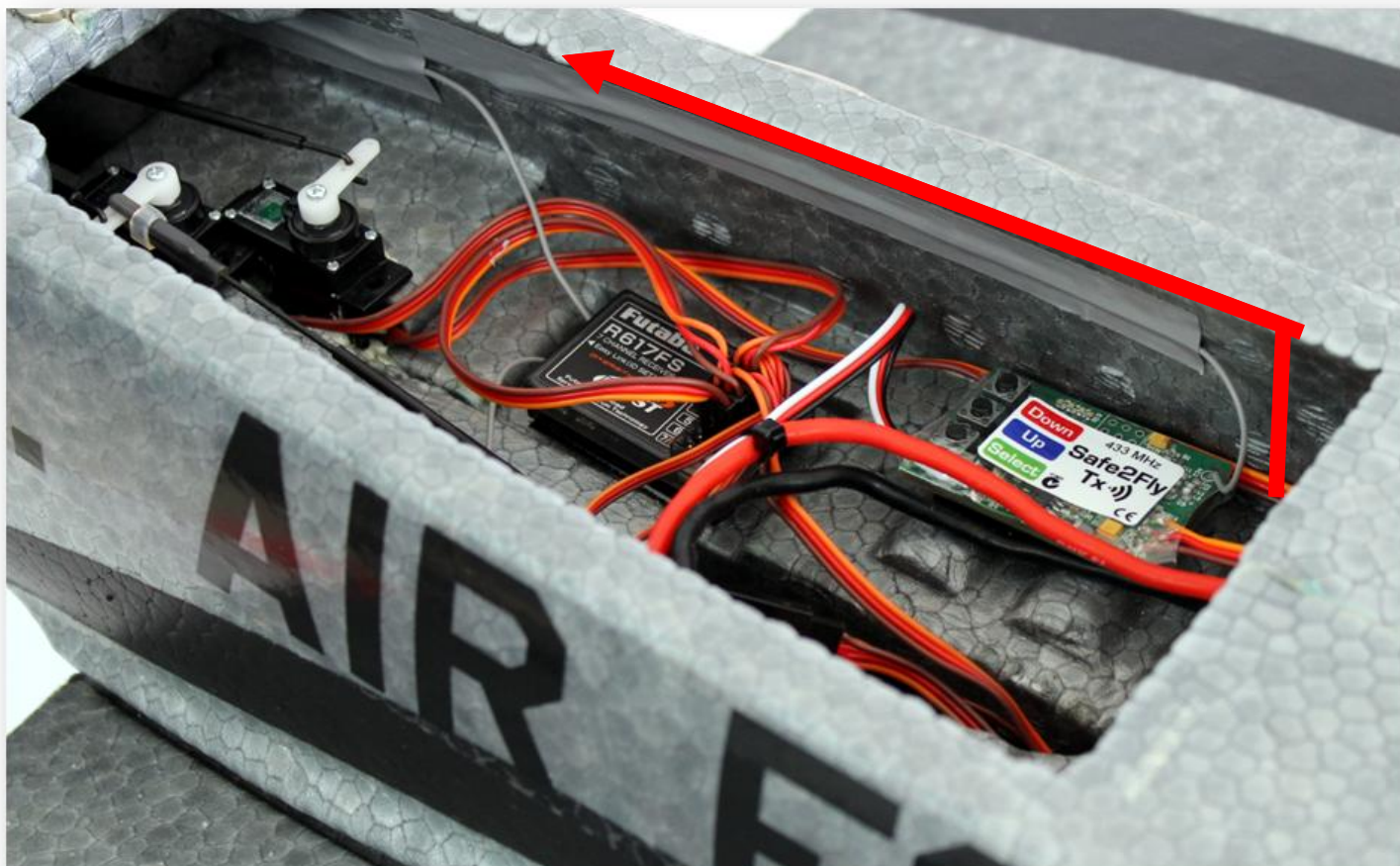
A closeup view of the transmitter installed in a T-28 Trojan. Note the position of the aerial which runs in a straight line along the fuselage.

Antenna Installation Notes:
Good antenna installation is required to maximise the range of the system. If you experience low range try moving the antenna position and direction.
The transmitter operates on a shared radio band so interference is possible, which may also reduce the operating range of the system.

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The following shows the diagrams and pictures used throughout the manual

The receiver has two buttons, "Func" and "PWR", as well as a power indicator LED. The receiver is shown in this manual using the following picture:

Power
("PWR")

Function
("Func")

Power Indicator
LED

The transmitter has three buttons labeled 'SELECT', 'UP', and 'DOWN'.
It also has four LEDS labeled 'A', 'B', 'C' and 'D'.
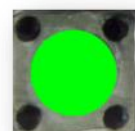
LED's
D, C, B, & A

Down

Up

Select

Note:
An illuminated LED is de-
noted by:

A button press is shown
by a button coloured
bright green.

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Power

Power On/Off by pressing the 'PWR' button. The receiver will announce "*POWER ON*" or "*POWER OFF*".

$$\text{``}Power\ On\text{''}$$

$$\text{``}Power\ Off\text{''}$$

The orange LED visible from the front will flash briefly every 3 seconds when the power is on. The receiver will auto power off after 30 minutes of inactivity to save the battery. Every time the receiver announces a message the auto power off time is reset.

If the receiver announces "*POWER LOW*" at any point, the internal AAA batteries need replacing.

Volume

Speaker or headphone volume is set using the 'FUNC' button when the receiver is operating normally.

1. Press and hold the 'FUNC' button to change the volume setting.
2. The receiver will announce the volume level by counting either up or down between the numbers 1 (minimum) and 15 (maximum) while the 'FUNC' button is held down.
3. Release the 'FUNC' button when you achieve the required level. This setting will be saved, and is not lost when the device is turned off.

Binding

Your Safe2Fly module should come pre-bound to the Wireless Copilot receiver.
If the LED's on the transmitter scan back and forth, that means you have an unbound transmitter module. You can also use this procedure to bind to a receiver.

The label on the back of the Wireless Copilot receiver has a 10 digit Bind ID number. This ID number needs to be entered into the Safe2fly transmitter so that it can communicate with that receiver. If you can't read the label for any reason you can get the receiver to announce it instead (see below)

To bind the transmitter to the receiver:

1. Switch on the transmitter

2. Ensure receiver power is off. Put the receiver in bind mode by pressing and holding the 'FUNC' button and then press the 'PWR' button. It will then announce that it is in binding mode.. The receiver will sound a couple of short beeps to tell you it is in the correct mode.

Beep
Beep

3. *(If you can read the serial number off the back of the receiver, you can skip this step).*
    Press the 'Func' button on the receiver. A 10 digit number will be called out followed by "OK", then another 3 digit number will be read out. The first 10 digits are the serial number and the last 3 are the software version of the receiver.
    If you want the receiver to repeat the number, simply press 'Func' again.

"1234567890"
"OK"
"101"

4. Switch off the transmitter the press and hold both the 'SELECT' and 'DOWN' buttons while switching on the again. The receiver should announce "Binding On".

Power Off

⬇

Power On

"Binding On"

5. While the receiver is still in bind mode, you will need to enter the ten digit ID from either step 2 or the back of the receiver . When all 10 digits have been entered all the LED's will blink on and off, the binding process is now complete.

To Enter a Number:

Press the up/down buttons until the right number is announced via the receiver.
(In this case 'Down' was pressed)

⬇

"Zero"

⬇

Press the select button once you have selected the correct number. The receiver will now announce "OK".

Repeat this process until all ten numbers have been entered

6. If the numbers are correct, the receiver will say "Binding Off" and all the LEDS on the Safe2Fly will blink - if not, you will have to repeat the process.

"Binding Off"

7. Switch the transmitter off to stop the LED's blinking and to complete the binding. Switch the transmitter back on to begin using it.

Note on Binding:

If you have more than one transmitter module, repeat the above process for each of them. You can bind an unlimited number of transmitters to one receiver.

A transmitter can only be bound to one receiver at a time - if it is bound to another receiver, it will not work with the previously bound receiver.

Default Batteries

By default the transmitter has four pre-programmed battery sizes:

A) 1300
B) 1800
C) 2200
D) 2650

These correspond to the 'A', 'B', 'C', and 'D' LED's.

Read Out Current Battery Size

To get the receiver to announce the battery pack size for the currently selected pack, press the 'SELECT' button once. The receiver will read out the battery size in milliamp hours - for example: *"1 3 0 0 "*.

"1 3 0 0 Milliamp Hours"

Change Battery

To select another pack press and hold the 'SELECT' button for more than 1.5 seconds. This is to prevent accidental changes to the pack size. The selection will continue to step and cycle around the battery packs until the button is released.

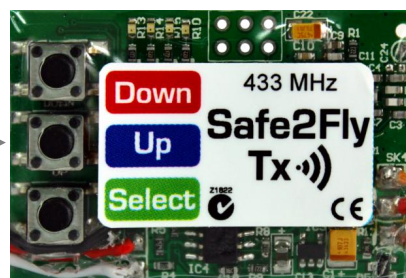

1.5 Seconds

Set Battery Size

To set the pack size, use the following procedure:

1. Select the pack to change using the above method and as indicated on the LEDs.

2. Press and hold the 'SELECT' and 'DOWN' button for more than 1.5 seconds.

1.5 Seconds

3. The 'D' LED will start to flash, and the receiver will announce *"ZERO"*.

"Zero"

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4. Use the 'UP' or 'DOWN' buttons to scroll around from 0 to 9. The receiver will announce the current digit as you press the up/down keys.
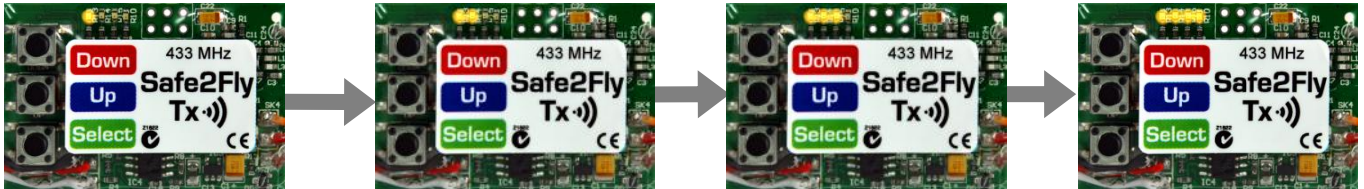
  Or

5. To move to the next digit, press the 'SELECT' button.

6. Note: The setting starts at the thousands digit and moves towards the units digit. The LED for the current digit will blink on and off. For example, if you wanted to enter 1350 milliamp hours as your battery size, you would enter '1', '3', '5' then '0'.

7. After the fourth digit has been entered and select has been pressed, the receiver will announce the battery pack size for you to double check, for example *"1350 Milliamp Hours"*. You can't set a battery pack size lower than 50mAH or higher than 9999mAH

"1 3 5 0 Milliamp Hours"

Tip:

Over time your battery packs will lose capacity. If you are running out of battery before the alarm points are announced, reduce the programmed size setting of the battery pack, or replace the battery.

The system has three modes of operation: normal mode, current monitor mode and percentage readout mode.

- Normal mode will generate capacity remaining percentage alert readouts at 30%, 20%, and 10% battery capacity remaining.

- Current monitor mode allows you to check the current drawn from the battery in real time. This is useful for setting up a model, checking the battery, speed controller and motor are operating within the specified operational limits. Current readouts stop when battery reaches 50% capacity or the "On Demand" readout feature is used.

- Percentage readout mode reads out the percentage of battery capacity remaining at the set interval. The standard 20% and 10% readouts and warnings will still occur as normal, although there will be no 30% readout.

The current or percentage readout can also be stopped at any time by toggling the 'On Demand' control on the Radio Control transmitter. When the current or percentage readouts stop, they are reactivated only when the transmitter is switched off, and then back on.

Any settings will be restored each time power is switched on, so they only need to be set once.

1. Press and hold the 'Up' button (for current monitor mode) or the 'Down' (for percentage readout mode) on the transmitter for 1.5 seconds, with both devices already switched on.

   Note: *Each time this is done the setting will toggle between on and off*

Current monitor mode

Or

Percentage readout mode

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2.   The receiver will announce *"MILLIAMP ON"* (current monitor mode) or *"PERCENT ON"* (percentage readout mode).

"*Milliamp On*"
Or
"*Percent On*"

3.   The system will now announce a number. This is the interval between readouts in 10 second increments. Use the 'Up' and 'Down' buttons to adjust the rate from 30 to 90 seconds. Press the 'Select' button to complete and store the current settings.

> **Note:** These modes may only be enabled one at a time. If current mode is being used, and percentage mode is switch on, the current mode is automatically switched off.

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By default the accumulate mode is off, and every time the Safe2Fly transmitter is switched on it will expect the battery to be 100% charged. This mode is fine if you use all the battery pack power in each flight.

When you don't use all the battery pack power in a flight (Jet turbine power pack, powered glider) use the accumulate mode. In accumulate mode the battery capacity remaining total is saved when switched off. When switched on again the remaining battery capacity is announced.

1. Press and hold the 'Select' button while switching on the transmitter to enter configuration setting mode. On power up, the current setting of the accumulate mode will be announced, followed by "Setting Remaining" (If your Safe2Fly has the height option installed, press 'Select' to skip over the height setting). Use either the 'Up' or 'Down' buttons to toggle the setting "On" or "Off". Press 'Select' to save the setting, if you haven't pressed 'Up' or 'Down', then the setting will remain unchanged from the previous setting. The transmitter is now in accumulate mode.
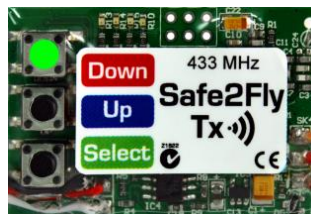
Power Off

Power On

"Setting Remaining"

"On"

2. To reset the battery total to 100% when the battery pack has been fully charged do a single press of the UP button. The receiver will announce "100%" to confirm the resetting process.

"1 0 0 Percent"

On Demand Readout

The servo output from the Radio Control receiver can be used to trigger the percentage remaining readout on demand. Every time the servo signal goes through its mid point in either direction, the Safe2Fly transmitter will announce the current battery remaining information. This is limited to once a second in the transmitter.

This would normally be triggered via a switch on the radio control transmitter set. Every time the switch is toggled, the receiver will announce the percentage remaining.

If your radio has no free switches, any spare channel can be used - such as the rudder stick on a rudder/elevator model.

"9 5 Percent"

You can also use the "On Demand" channel to readout the battery size that is set without having to get inside the model and press the SELECT button.

To do this toggle the "On Demand" channel twice very quickly (if you are using a switch for example change the position of the switch then bring it back to its original position as quickly as you can). The readout will be the same as if you pressed the SELECT button once. This feature is very useful if you want to check you have the correct battery capacity set without accessing the transmitter module.

x1

"1 3 5 0 Milliamp Hours"

Some models of the Safe2Fly transmitter come with an onboard altimeter.

The altimeter is used to generate an over ceiling height alarm or readout the present altitude of the model in feet ABOVE GROUND LEVEL (AGL).

The 'On Demand Readout' sentence will have the present height appended to it. For the following example, the battery has 72% remaining, and the model is at a height of 335 feet AGL.

"7 2 Percent,

Height 3 3 5"

It is possible to have a small lag in the altitude calculation and it may also take a short time for the air pressure to equalize depending on where the Safe2Fly transmitter is installed. This is normal operation and is only noticeable if you descend very rapidly.

If the model exceeds the programmed height ceiling an alarm will be announced every 30 seconds until the model descends below the ceiling.

For example, if the ceiling height is 400ft, the alarm could be the following:

"Warning - Over Height,

4 5 0"

Set Ceiling Height

1. Press and hold the 'Select' button while switching on the transmitter to enter configuration setting mode. If the altimeter functionality is present, "Setting Height" will be announced. If you want to skip the ceiling height entry but want to hear what it is set to press the SELECT button, the current ceiling height will be announced.

**Power Off**

Power On

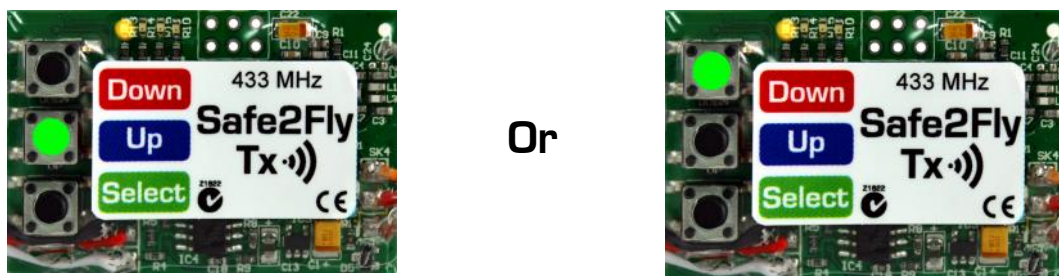*"Setting Height"*

"Height 8 0 0"

2. To set the a new ceiling height use the UP or DOWN button to set each digit of the ceiling starting at the most significant digit (thousands). Each time you press the SELECT button you will advance to the next digit and the corresponding LED will blink (the same procedure as setting the battery capacity is used).

A) The 'D' LED will start to flash, and the receiver will announce *"ZERO"*.
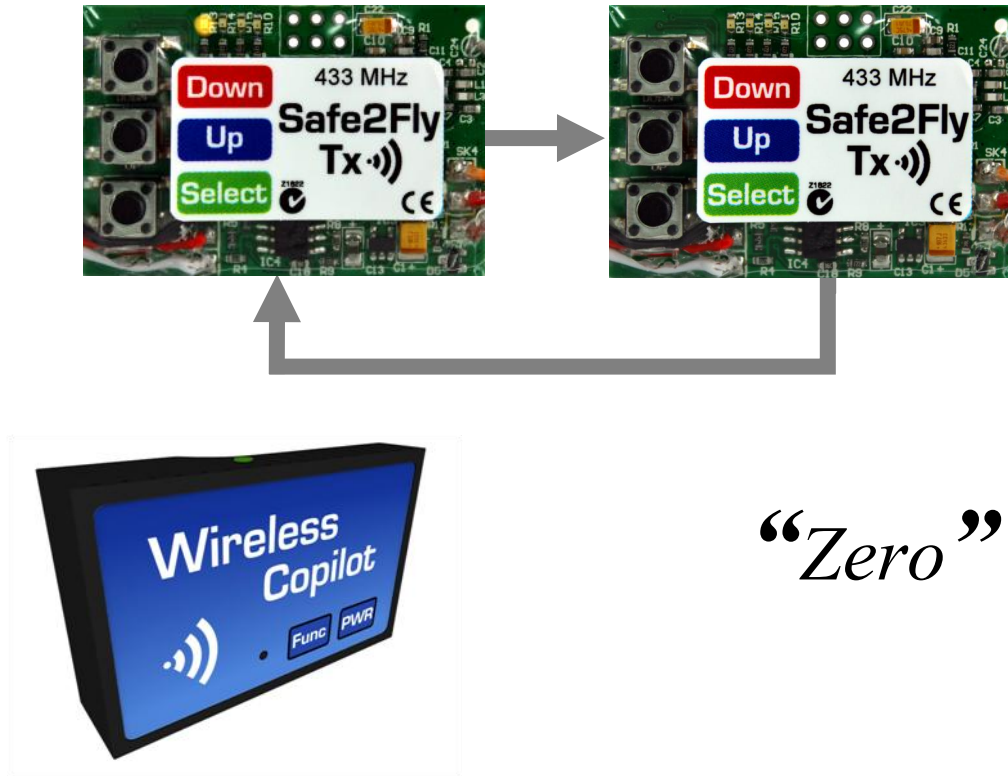
"Zero"

B) Use the 'UP' or 'DOWN' buttons to scroll around from 0 to 9. The receiver will announce the current digit as you press the up/down keys.

Or

C) To move to the next digit, press the 'SELECT' button.

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D) Note: The setting starts at the thousands digit and moves towards the units digit. The LED for the current digit will blink on and off. For example, if you wanted to enter 400 feet as your height ceiling, you would enter '0', '4', '0' then '0'.
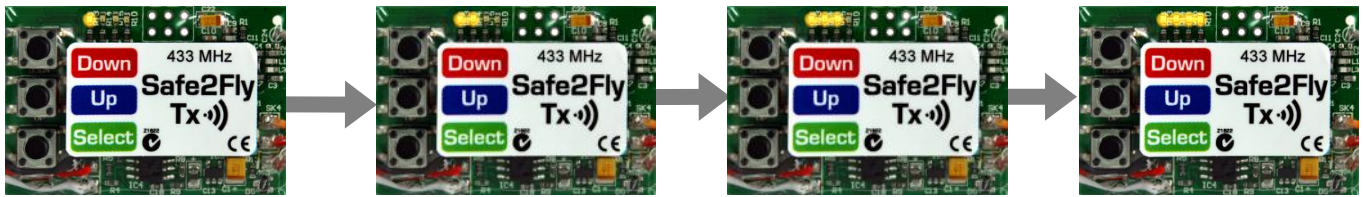
E) After the fourth digit has been entered and select has been pressed, the receiver will announce the height ceiling for you to double check, for example "0 4 0 0".

$$\text{``}0\ 4\ 0\ 0\text{''}$$

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3. When four digits have been entered the new ceiling height will be announced and then the next item in the configuration list can be set.

Startup

1. Turn on the receiver.

"*Power On*"

2. Turn on the transmitter in the aircraft;

Power Off

⬇

Power On

3. The receiver will announce *"BATTERY ON"* if everything is working correctly.

"*Battery On*"

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Messages

If operating in normal mode the system will announce *"30%", "20%" and "10%" "remaining"* as the battery goes flat. It is suggested that you prepare to land with 20% remaining.

"*30 Percent Remaining*"

"*20 Percent Remaining*"

Calibration

The transmitter is factory calibrated and should never require re-calibration.
The current pickup is matched to the transmitter, and so it can't be used on another transmitter.

Warning:
Over time the zero point may drift and this can be recalibrated out if necessary.
To do a zero offset recalibration, press and hold 'SELECT, 'UP' and 'DOWN' buttons for more than 1.5 seconds with the Wireless Co-pilot transmitter turned on. Make absolutely sure that there is **NO CURRENT** flowing through the current sensor when you enter calibration mode. The LED's will flash back and forth as the calibration process is executed and the receiver will announce "Ok" when it is complete. Cycle the transmitter power for the new calibration data to take effect.

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Quick Reference Guide

Quick Reference Key

Symbol	Meaning
H	Press and Hold for >1.5 seconds
S	Single short press
-	Not pressed

Transmitter Quick Reference

These functions are selected by pressing and holding the buttons on the transmitter as power is applied.

Select	Up	Down	Function
H	-	H	Enter BINDING mode
H	-	-	Configuration mode
H	H	H	Factory Test mode

These functions are selected by pressing and/or holding the transmitter buttons when the power is on.

SELECT	UP	DOWN	FUNCTION
S	-	-	Announce current battery size selected
-	S	-	Reset Accumulated total to 100% (Accumulate mode enabled).
H	-	-	Advance to the next battery size. While the button is held it will automatically step through the batteries A → D until the button is released.
-	H	-	Toggle battery current draw readout
-	-	H	Toggle percentage remaining readout
H	-	H	Edit the capacity of the currently selected battery
H	H	H	Calibration mode

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Receiver Warning Messages

"20% Remaining"
You should land soon. There should be enough battery power to go around should your landing approach need to be aborted.

"10% Remaining"
Make an immediate landing, as the Electronic Speed Controller's automatic shut off of the motor will occur very soon to protect the battery pack from over discharge.

"Battery Low"
Radio control receiver voltage is critically low, land immediately!

"Power Low"
The Wireless Copilot receiver batteries are low and need replacing.
Tip: It's a good idea to carry a spare set of AAA batteries with you to the flying field.

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