

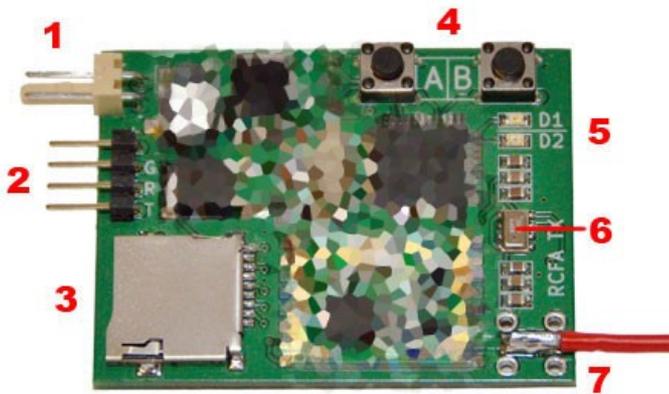
# RC Flight Assist (RCFA)

## Manual v1.3

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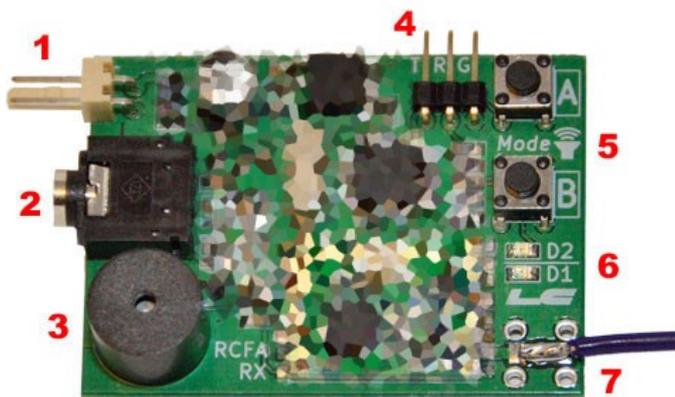
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## 1. RCFA Transmitter (TX)



1. Power plug. Input voltage between 7-12V (2S or 3S Lipo battery),
2. GPS / UART connector. The pins are described overprint: +, G (ground), R (RX), T (TX). The connector is used to connect GPS but also can be used for USB2TTL interface (e.g. update firmware),
3. MicroSD card slot,
4. 2x Buttons. Each button can be pressed short (<0.5 sec), or long (>1 sec),
5. 2x LED,
6. Altimeter,
7. Antenna output. Ready for SMA connector (not included).

## 2. RCFA Receiver (RX)



1. Power plug. Input voltage between 7-12V (2S or 3S Lipo battery). For louder build-in speaker operation it is recommended to use 12V (headphones are not affected),
2. Headphones jack port,
3. Build-in speaker,
4. UART connector. Used to connect RCFA to PC (USB2TTL adapter) or for firmware updates,
5. 2x Buttons. Used to change sound volume and operation mode (Aerobatic or Variometer),  
Short press button A – volume up,

Short press button B – volume down,

Long press button A – turn on aerobatic mode,

Long press button B – turn on variometer mode,

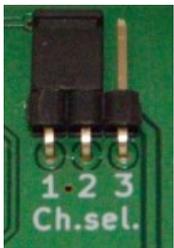
The aerobatic and variometer mode can be turned on at any time. In aerobatic mode the RX sound will indicate the position in the Flight Area. In variometer mode the sound will indicate ascending and descending speed.

The button can be pressed short (<0.5 sec), or long (>1 sec).

6. 2x LED,
7. Antenna output. Ready for SMA connector (not included).

### 3. Radio channel select

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The RCFA can operate on three different channels allowing 3 simultaneous flights. The switch is located on the bottom side on both the RX and TX. To select desired channel put the jumper to the position 1-2 or 2-3 or remove it. The position of the jumper must be the same on RX and TX before powering on.

Note that it may happen that the connection will not work if the antennas are too close to each other. In that case try to keep the RX and TX at minimum 0.5m distance.

To maximize radio range keep the wire antennas straight in both RX and TX. Also try to keep the antennas parallel to each other if possible.

### 4. MicroSD Card

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The system uses FAT32 file system. The MicroSD Card must be formatted before use. Various SD cards from 2GB to 32GB capacity has been tested. Recommended minimum SD class: 4.

The RCFA TX uses MicroSD card for multiple purposes:

1. For the initialization file *rcfa.ini* that contains nearly 30 configurable start up parameters,
2. For GPS Logger output file – Google Earth's kml format,
3. For debug and event log file – *rcfa.log*.

All files: *rcfa.ini*, *rcfa.log* and tracker logs are stored in root folder of SD Card.

**Important!** Due to writing/reading speed limitation of RCFA it is strongly recommended to use empty SD card formatted with FAT32 file system. To ensure proper system operation keep the occupied space below 10MB.

**Important!** Do not insert nor remove SD card while the system is powered on (possible data loss).

## 5. Configuration file – rcfa.ini

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The configuration file *rcfa.ini* must be located in the root folder of SD Card. The template is available to download at [www.littlecircuit.com/download](http://www.littlecircuit.com/download). The file is extensively documented. Please see the *rcfa.ini* content. If the SD card or *rcfa.ini* is missing the system will start with default values. In that case the GPS Logger and other SD related features will not be available. Beside that the system will operate as normal.

## 6. Reference altitude – refalt parameter

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The reference altitude is necessary to properly display fly path recorded by Logger in Google Earth. Without this the plot would often be hidden beneath or suspend over ground level. The true altitude must be matched with the altitude used in Google Earth therefore it can be preset in *rcfa.ini* with **refalt** option. Use the value marked as “elev” displayed at the bottom right corner of Google Earth measured at flight location. Optionally 0.5 can be added to ensure that the lines stay on top of ground level. The **refalt** parameter accepts floating-point number (e.g. 83.5).



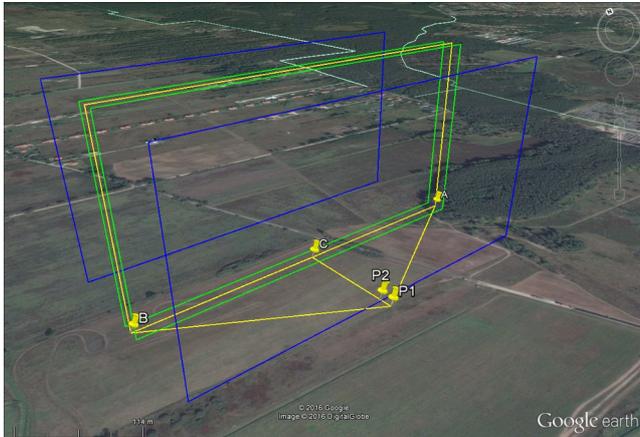
You will notice extended lines beneath Area indicators that are connected to the ground. That shows the **refalt** altitude. It can be very useful if the terrain is not flat.



If the **refalt** is not preset in *rcfa.ini* then it will be automatically set according to GPS sensor but there is high probability that it won't be satisfactory regardless of active satellites or GPS quality, therefore it is important to set the **refalt** manually. Please note that there is no reliable way to automatically set reference altitude. The GPS and altimeter readings can vary every day depending on weather conditions. With **refalt** parameter the system will match current sensor readings with static value therefore the graphs will always be steady good.

## 7. The Flight Area

Typical Flight Area is determined by several indicators:



**P1** – Pilot's position,

**P2** – Direction to the Flight Line,

**A-B** – Flight Line,

**C** – Middle point of the Flight Line inline with points P1 and P2,

**Green Box (Green Zone)**– The area where the aerobatics take place,

**Flight Area (Blue Box)** – The area for GPS Logger automatic start and stop.

## 8. Sounds patterns

### Initial sounds

1. **Configuration received** – After system initialization the TX initiates communication and sends configuration to RX,
2. **No GPS fix** – RX receives signal from TX but number of active GPS satellites is less than 4,
3. **Reference altitude/position ready** – When the TX gets GPS fix the system will set the reference position and altitude. From this moment real-time tracking is active (see *rcfa.ini* for details),
4. **Point P1 set** – Confirmation of receiving point P1 from TX,
5. **Point P2 set** – Confirmation of receiving point P2 from TX,
6. **Flight Area Ready** – Confirmation of valid P1 and P2 points. From this moment the flight can start,
7. **Flight Area Locked** – Confirmation of saved and active Flight Area.

### Sounds during aerobatic flight

1. **Single tone** – Airplane in front of Green Zone (dependent on the distance between airplane and Green Zone),
2. **High tone**→**Low tone** – Airplane is behind the Green Zone (dependent on the distance between airplane and Green Zone),
3. **Three equal tones** – Airplane is beyond the Flight Area boundaries (too far to the left or right side, too high or too low, outside Blue Box),
4. **One silent tone** – Airplane is in the Green Zone (may not be audible in build-in speaker, but is clearly audible in headphones).

### Variometer mode sounds

1. **Sound off** – Horizontal flight,
2. **Low tone**→**High tone** – Ascending altitude (dependent on ascend speed),
3. **High tone**→**Low tone** – Descending altitude (dependent on descend speed).

During the flight several events can occur. The radio communication can temporary break (No connection sound) or GPS fix can be lost (No GPS fix sound).

### Sound test

To hear sounds patterns press and hold button B and power on the RX. The sounds will be played in the following order:

Configuration received → Point P1 set → Point P2 set → Reference position set → Flight Area Ready → Flight Area Locked

If headphones are connected the build-in speaker will be disconnected. Note that the sound quality is better in headphones then in build-in speaker.

## **9. LED summary**

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### 1. RCFA TX initialization status

- 1x Yellow – Radio module disconnected,
- 2x Yellow – GPS module not found,
- 3x Yellow – Altimeter disconnected,
- 4x Yellow – SD card mount error (no card detected),
- 5x Yellow – Ini file not found or read error,
- 1x Yellow+Red – Radio, GPS, SD, INI and Altimeter OK.

### 2. RCFA TX after initialization

- Yellow blinking fast – Waiting for GPS fix or fix lost
- Yellow turned off – GPS fix valid
- Yellow blinking slow – Flight Area Ready to Lock
- Red blinking – SD card operation active (read or write) or GPS Logger active.

### 3. RCFA RX before Flight Area lock (before flight)

- Red blinking slow (every 2 sec) – No connection

Red blinking fast (every <1 sec) – Configuration received

Red blinking fast twice (every <1sec) – Valid GPS fix, reference altitude and position received

Red turned on – Flight Area Ready to Lock

Yellow blinking – Reference position valid. Real-time tracking active.

#### 4. RCFA RX after Flight Area lock (during flight)

##### Aerobatic mode

Yellow blink – The airplane is behind the Flight Line. Blinking speed is proportional to the distance to Green Zone,

Red blink – The airplane is in front of the Flight Line. Blinking speed is proportional to the distance to Green Zone,

Red→Yellow→Red – The airplane is outside the Flight Area,

Red + Yellow (together) – The airplane is inside the Green Zone.

##### Variometer mode

Yellow blink – The airplane is ascending. Blinking speed is proportional to ascending speed,

Red blink – The airplane is descending. Blinking speed is proportional to descending speed.

Note that during flight the pilot will not observe LED on RCFA, although it might be useful for audience.

## **10. RCFA Installation**

Examine the following picture to see how to install RCFA on a plane. It is important to keep the antenna in a straight line situated along the hull. In order to ensure maximum range the antenna should be installed away from other electronic components. Battery and GPS should be placed near the system in a convenient way, however, prevent their movement during the flight. GPS antenna can be mounted inside the hull but should not be overshadowed by many other structural elements.



The optimum position for the RX is such arrangement to the receiving antenna is pointing parallel to the flight zone.

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## 11. The first launch – basics

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This section describes basic way of using RCFA. Many details have been omitted to allow easy start for new users. Detailed information is presented in the following sections of the Manual. Before first use, it is recommended to do the following before installing the system on a plane.

The basic stages of system startup RCFA:

### Preparing the system

1. Format the SD card (FAT32).
2. Upload the file *rcfa.ini* to MicroSD card. The template is available to download at: [www.littlecircuit.com/download](http://www.littlecircuit.com/download). Create new empty file named: *rcfa.log*.
3. In the *rcfa.ini* set parameter **refalt** (see section reference altitude) and set **log=3**.
4. Connect GPS, and insert the MicroSD card to the slot

### Starting receiver (RX)

1. Power on the RX. The red LED will blink every 2 seconds.

### Starting the transmitter (TX) - initialization and waiting for a GPS fix

1. Power on the TX.
2. Wait about 5-10 seconds for the system initialization, during which the yellow LED will be turned on.
3. Observe the LEDs on TX. Shortly after the initialization is finished yellow LED goes out, and a moment later both LEDs (yellow and red) light up simultaneously. If the LED does not light up at the same time, check the status in accordance with Section LED – summary. The RX sound will be played "Configuration received".
4. Wait for 0.5 to 3 minutes until the GPS position fix. Make sure that the GPS module is directly exposed to the sky (there is nothing obscured). While waiting for a GPS fix, the system determines the reference altitude. After it's done the sound will be played in RX "Reference altitude/position ready".

**Important!** The waiting time for GPS fix is dependent on weather conditions. Cloudy weather decreases GPS accuracy, which directly affects the operation of the entire system.

5. Wait for GPS fix. Observe the LEDs in the RX. The red light will blink until the position is not fixed. Wait until the red LED on the RX will blink twice at short intervals.

### Determining the points P1 and P2

1. Determine the points P1 and P2, by briefly pressing the buttons A (for pilot's position) and B (direction to the Flight Line) in TX. Coordinates of the points can not be identical. The RX will play sounds "Point P1 set" and "Point P2 set".
2. When points are established, the red LED at RX lights up permanently, thereby signaling the readiness for launch. The sound will be played out "Flight Area Ready". From this point you can begin flight.
3. (optional) Flight Zone can be blocked before the flight. Locking the Flight Zone means that the

coordinates will be stored in the internal memory and prevent accidental changes during flight.

**Important!** If the zone is not locked manually, it will happen automatically during start (see parameter "lockspped" in *rcfa.ini*).

## Flight

Before the first flight you should pay special attention to the demonstration of sound "Through the Flight Area demo" available at: [www.littlecircuit.com/sound-patterns](http://www.littlecircuit.com/sound-patterns).

Assuming the default settings, the system automatically starts Logger GPS after the start and stop Logger after landing.

## Landing

After landing, it is recommended to make sure that Logger GPS has been switched off by observing the red LED in the TX, which must be turned off (not flashing).

**Important!** In case of problems examine the EventLog file *rcfa.log*.

## 12. Aerobatic mode – in details

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1. Power on the RX. The red LED will start to blink slowly (every 2 seconds).
2. Connect GPS, insert MicroSD card with *rcfa.ini* and power on the TX. The system will read configuration from SD card, try to initialize GPS module and altimeter. During that operation the yellow LED will be turned on. When initialization sequence is finish the yellow LED will go off and just after that it will indicate the status (see LED summary table). For example if GPS and SD Card are missing the yellow LED will blink 2 times and then 4 times. If GPS and SD card are connected, then red and yellow LED will blink once together indicating that everything works fine.
3. After that the TX will communicate with RX and send configuration (like initial volume and variometer mode – see *rcfa.ini* for details). From that point the red LED on RX will blink much faster. It indicates that the RX is receiving signal from TX.
4. Next step is to wait for GPS fix. It may last from few seconds to 2-3 minutes depending on GPS module, weather conditions, cold or hot start etc. If the signal cannot be found for a longer time try to restart TX and try again. RCFA needs minimum 4 active satellites for operation (3D fix).

If the GPS fix is valid the system will set the reference position. From this moment the red LED on the RX will blink fast twice.

If there was previous area loaded from RCFA's memory the system would check the current position. If the position is near previous (max 100m away) then it will use previous Flight Area. In other case points P1 and P2 must be set again.

**Important!** If the Flight Area is set on airfield A and the pilot go to airfield B, the system will not accept previously memorized area coordinates (from airfield A). In that case in Event Log the message will appear: "Position too far away from Flight Area". The same rule apply to the Flight Zone set in *rcfa.ini* with parameters **p1lat**, **p1lon**, **p2la** i **p2lon**.

5. It is good practice to wait one minute longer after GPS fix to get stronger and more reliable signal from more satellites. That way there is less probability of losing GPS fix during flight (especially inverted).

After that points **P1** and **P2** can be set. Point P1 stands for the pilot's position during flight. Go to that spot with TX and short press button A. Yellow LED will blink and sound will be played in RX. Point P2 indicates the direction to the flight area. Go about 10-20 meters ahead towards the flight line and press button B.

Note that due to GPS aberration or simply because of human perception sometimes the Flight Area may become not just as you desire. You could use some way-points on the ground (lines, roads, trees etc.) to make sure that the Area is perpendicular as you would think it is (see the picture in section 4 and notice that the Flight Area is slightly turned to the left relative to airfield). In that case a test flight is recommended.

You can set point P1 and P2 as many times as you want before the Area is locked. Every time button A or B is pressed you will hear a sound from RX. After every point change the system calculates the new Flight Area coordinates, so you will also hear "Flight Area Ready" sound just after "Point set" sound.

6. If the point P1 and P2 are valid and Flight Area is ready the red LED on RX will turn on permanently. You can do 2 things:
  1. **Start flying.** The system will lock the area automatically and start GPS logger according to settings in *rcfa.ini* file.
  2. You can lock the area manually by long press button A.

When the area is locked (automatically or manually), the coordinates are stored in RCFA's memory and can be used for next flights. You can use manual lock to save the area coordinates and then power off the device (if you plan to fly later).

7. During the flight the RX will generate certain sound tones that clearly indicate the position of airplane. See sound summary for details.
8. It is good practice to ensure that the logger is turned off after landing (red LED in TX is turned off). Then the TX can be switched off, and the SD card can be removed.

## 13. Setting and verification of Flight Zone

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### Method 1: Determine the zone at the airport by using buttons the A and B:

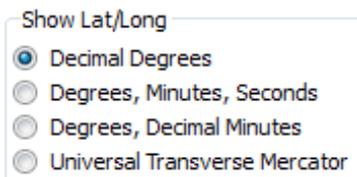
1. Determine the point P1 (short press A).
2. Determine the point P2 (short press B).
3. Lock the Flight Zone (hold A).
4. Run Logger GPS (hold B).
5. The system creates a new kml file on the SD card.
6. Turn off the GPS Logger (again hold B).
7. Power off the device and open the kml file in Google Earth.

If the Flight Area is correct, it can be used the next time you turn on the power. Otherwise, repeat the procedure.

### Method 2: Set the Flight Zone by entering the coordinates of points P1 and P2 in the file *rcfa.ini*:

Set 4 parameters in the file *rcfa.ini* corresponding to the coordinates of points P1 and P2. The coordinates can be determined with the help of Google Earth:

1. Open the *rcfa.ini* file in any text editor (recommended: Windows Notepad).
2. Set the options Google Earth (Menu Tool → Options) to display the coordinates in decimal and press OK:



3. Click on the “Add Placemark” icon:



4. Position the cursor at the desired location corresponding to the point P1, and then copy or rewrite the coordinates of the Google Earth window to file *rcfa.ini*, as shown below:

 A screenshot of the Google Earth 'Add Placemark' dialog box. The 'Name' field contains 'Untitled Placemark'. Below it, the 'Latitude' field is set to '40.634712°' and the 'Longitude' field is set to '-73.772322°'.

```
p1lat=40.634712
```

```
p1lon=-73.772322
```

5. Repeat steps 3-4 for point P2:

```
p2lat=40.634631
```

```
p2lon=-73.772139
```

**Important!** The distance between points p1 and p2 can not be greater than 500 meters.

**Important!** Remove the # sign preceding the coordinate parameters in *rcfa.ini*.

**Important!** Remember to determine the parameter **refalt** file *rcfa.ini*.

### Preview and verification of the Zone Flight

After determining the points p1 and p2 in *rcfa.ini* it is possible to review the Flight Area. To do this, set the parameter **test=1** file *rcfa.ini*. The Area shape is determined also by other parameters: **dist**, **angle**, **awidth** and **refalt**.

When the parameters are set insert the SD card and power on TX. The system will create a new SD card kml file with fixed Flight Zone. Wait until the red and yellow LEDs will flash alternately. Then power off

the device and open kml in Google Earth.

**Important!** When finished, erase parameter **test** from *rcfa.ini*.

## 14. Variometer mode

The RCFA RX can operate in variometer mode. The mode can be activated in three ways: by long press button B on RX or preset in *rcfa.ini* with option `variomode=2`. The variometer mode will also be automatically activated in case the GPS is not connected. In variometer mode the sound is proportional to the ascending and descending speed. There are several options to control variometer sensitivity and behavior. Please see *rcfa.ini* for details.

## 15. GPS Logger

The GPS logger can operate in automatic or manual mode. In automatic mode it will start and stop when the airplane enters and leaves the Flight Area. RCFA will create a new kml file every time Logger start. This is default behavior. If you want to track position regardless of position in Flight Area (e.g. for free flight) you can switch to manual mode by long press button B. The Logger can only be turned on if the GPS fix is valid. If the GPS fix is lost the Logger will pause and resume when fix returns. If the Logger is active the red LED will blink. Beware that the Logger must be turned off before powering off the TX. In automatic mode it shall happen automatically but in manual mode you must disable logger by long press button B again.

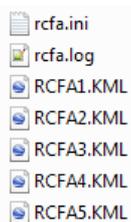
Even if the log is not closed properly it won't mean data loss but the kml file will not open in Google Earth. It can be easily fixed though. In that case you have to edit kml file in any text editor (like notepad) and put missing sentences at the very end of the file (Google Earth standards):

```
</gx:Track></Placemark></Folder></Document></kml>
```

Unfortunately in that case the flight summary with scoring will be lost.

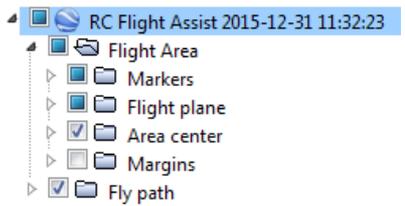
**Important!** If the Flight Area is wider than the twice distance from pilot to flight line then the logger will start immediately after Lock, because the airplane will be inside the Flight Area. for the same reason the Logger will not turn off automatically and must be disabled manually by long press button B.

### File structure on SD card



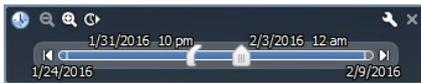
GPS Logger stores position data in *rcfaX.kml* file, where X is consecutive number. Each file can be opened in Google Earth.

### Folder structure in Google Earth



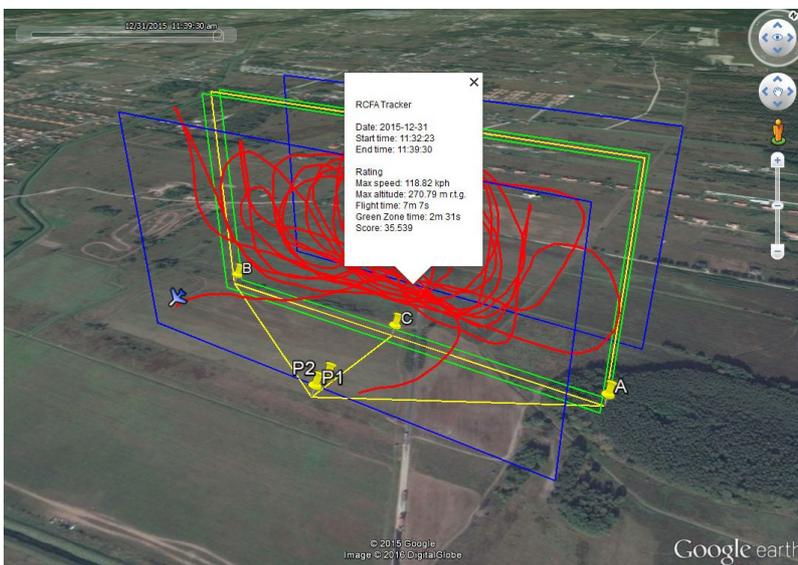
Each opened kml file consist several sub-folders with Flight Area markers, indicators and fly path. The data can be enabled or disabled to show in the main viewport.

### Google Earth time slider



The Logger writes flight path as an animated trace. The animation can be manipulated with Google Earth's time slider.

### Fly path in Google Earth



The fly path recorded by the GPS Logger is represented with red line. The line can be controlled with the time slider.

The flight scoring is available by clicking on the red line. Rating contains:

- Date and time of Logger start and stop
- Maximum recorder speed and altitude relative to ground (pilot)
- Overall flight time
- Time remaining in the Green Zone
- Score – percentage of Green Zone time relative to overall flight time

## 16. UART (USB-2-TTL)

Both RCFA RX and TX can be connected to PC with any USB2TLL adapter (5V logic). This way you can get various additional information about system status but also use future firmware updates. The RCFA RX has dedicated 3 pins (TX/RX/GND) while RCFA TX uses 3 of 4 pins of GPS connector (which are also: TX/RX/GND). You have to install the adapter in your operating system. The connection settings are as follows:

COM Port:

Bits Per Second:

Data Bits:

Parity:

Stop Bits:

Flow Control:

Note that the COM port number may be different. You have to check your operating system configuration. To read the data use your favorite serial terminal (e.g. Putty), or see Real-time tracking in Google Earth section.

Please pay attention to correct UART wire connection:

RCFA to GPS

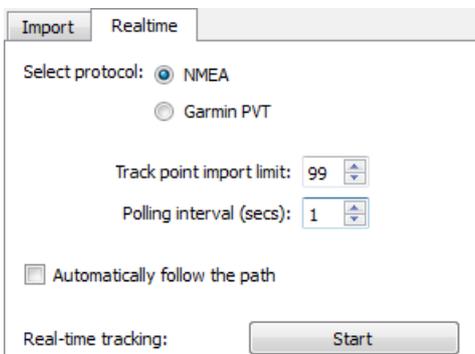
	RCFA		GPS
1.	VCC (5V)	↔	VCC (5V)
2.	GND	↔	GND
3.	RX	↔	TX
4.	TX	↔	RX

RCFA to USB2TTL adapter

	RCFA		USB2TTL
1.	GND	↔	GND
2.	RX	↔	TX
3.	TX	↔	RX

## 17. Real-time tracking in Google Earth

The real-time tracking can be activated in *rcfa.ini* by **txpos=1** parameter. If set, the RCFA TX will send positioning data stream to the RX. To read data connect the RX to PC with USB2TTL adapter (see UART connection to PC section). To visualize real-time tracking you can use build-in feature in Google Earth: Tools → GPS → Realtime



Note that Google Earth feature has limitations. For example the altitude information is ignored. There are several 3<sup>rd</sup> party software available to extend Google Earth capabilities like EarthBridge ([mboffin.com/earthbridge](http://mboffin.com/earthbridge)) or GooPS ([goopstechnologies.com](http://goopstechnologies.com)). It is recommended to use these applications.

## 18. Event Log

The Event Log is useful for checking RCFA status. It is extensive information log that contains initialization status, calculated Area coordinates, Logger status, and other information that can be very helpful in analyzing problems. To activate the Event Log set the **log=3** parameter in *rcfa.ini* and manually create *rcfa.log* file in the root folder of SD Card. The **log** parameter value can vary from 0 (log disabled) to 3 (the most extensive). Every time RCFA is powered on the new log will be append to the end of *rcfa.log* file.

**Important!** It is recommended to always activate the Event Log but in case of slow or older type SD Card it might be better if disabled.

Sample event log content with comments:

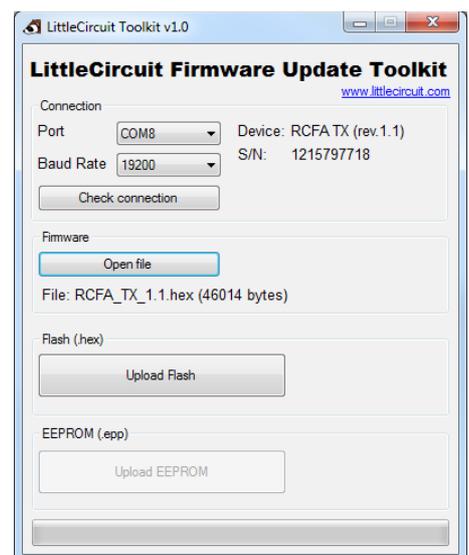
Log event	Comment
--- RC Flight Assist ---	Initial sentence at every RCFA powered on
RCFA.TX.1.1	Firmware version of RCFA TX
1 log=5	List of parameters read from rcfa.ini
1 radio=1	1  → log level
1 altimeter=1	
1 dist=150.000000	
1 angle=60.000000	
1 awidth=270.000000	
1 lwidth=25.000000	
1 margin=1	
1 hlimit=1	
1 variomode=1	
1 hspmin=0.400000	
1 hspmax=5.000000	
1 txpos=1	
1 refsat=7	
1 refalt=109.000000	
1 gpshz=5	
1 logger=1	
1 logfreq=0.500000	
1 floor=1	
1 tzone=1	
1 filter=1	
1 lockspeed=15	
1 volume=10	
1 lowacc=6	
1 INI read OK	Ini read confirmation
1 Radio Freq 1-2	Radio confirmation
1 Radio init OK	
1 GPS init OK	GPS confirmation
1 Altimeter OK	Altimeter confirmation
1 Init sequence complete	End of initialization sequence
2 235955 Ref.Alt=245.554900	Reference altitude taken from altimeter
3 182706 GPS valid	GPS fix valid
1 182706 GPS low Acc	
2 182706 Ref.AltGPS=109.000000	Reference altitude taken from GPS
3 182706 HoG=39.000000	Height over Geoid – GPS information
1 182706 Ref.lat=xx.xxxxxx	Reference position
1 182706 Ref.lon=xx.xxxxxx	

1 183005 P2 OK	Point P2 set	
1 183013 P1 OK	Point P1 set	
2 183013 L.lat=xx.xxxxxx	Calculation of Flight Area coordinates	
2 183013 L.lon=xx.xxxxxx		
2 183013 P1lat=xx.xxxxxx		
2 183013 P1lon=xx.xxxxxx		
2 183013 P2lat=xx.xxxxxx		
2 183013 P2lon=xx.xxxxxx		
2 183013 Flight Area:		Calculation results
2 183013 Clat=xx.xxxxxx		
2 183013 Clon=xx.xxxxxx		
2 183013 Alat=xx.xxxxxx		
2 183013 Alon=xx.xxxxxx		
2 183013 Blat=xx.xxxxxx		
2 183013 Blon=xx.xxxxxx	Flight Area Ready	
1 183013 CAB OK		
1 183036 Logger manual start		Manual GPS logger start
1 183036 rcfa48.kml	The name of newly created kml file	
1 183036 KML open OK	Manual Area Lock	
1 183039 Area saved		
2 183039 Manual lock		
1 193752 Logger manual close	Manual GPS logger close	
	Power off	

## 19. Firmware update

The firmware can be updated in both RX and TX. To update firmware follow the procedure:

1. Disconnect GPS and remove SD card,
2. Connect device (RX or TX) to PC with USB2TTL adapter. The adapter must be available on one of serial ports (COM),
3. Install and run **Firmware Update Toolkit** available at [www.littlecircuit.com/download](http://www.littlecircuit.com/download),
4. The Toolkit will detect available **COM** ports. Choose the correct one,
5. Select Baud Rate from drop down list: **19200**,
6. Press and hold button **A** and power on the device. After that release button **A**,
7. Click **Check connection** button. The device type and serial number (S/N) will be displayed,
8. Click **Open file** button and choose the firmware file to upload. Be careful to select the correct file for connected device. If there are two files available to upload – flash (.hex) and EEPROM (.epp) – first of all choose hex file.
9. The Toolkit will automatically recognize firmware type and activate one of two buttons **Upload flash** or **Upload EEPROM**. It will also show the file name and size for confirmation,
10. Click one of the **Upload** buttons to upload firmware. All buttons will become inactive. The progress



bar will show up at the bottom. Wait until the upload is finished,

11. Power off the device,
12. Repeat the procedure for .epp file if delivered,
13. Repeat the procedure for next device.
14. Go to firmware check section



## 20. Firmware check

It is recommended to do a system check after firmware upload. To run the test put **test=1** at the end of *rcfa.ini* file, insert SD card and power on the TX. The system will write a new kml file and also write to Event Log. Wait until both LEDs blink alternately and power off the device. Open the Event log file and seek for **FIRMWARE TEST OK** or **FIRMWARE TEST FAILED**

In case of test failed repeat the upload procedure.

**Important!** Remember to remove the “test=1” option from *rcfa.ini* when finished.

## 21. Technical information

**Operating frequency (FHSS):** 433MHz/868MHz/915MHz (depending on region)

**Range:** 400±100m (tested in open air with copper wire antenna)

**Average dwell time:** 3 ms

**Average channel return time:** 1 sec

**Input voltage:** 7-12V (2S or 3S LiPo)

**GPS compatibility:** Global Top (MT3318, MT3329, MT3339), u-Blox (M7,M8)

Receiver (RX)	Transmitter (TX)
<ul style="list-style-type: none"> <li>• Headphones: 3,5mm jack port</li> <li>• Average current: 50mA</li> <li>• Size: 51 x 38mm</li> <li>• Weight: ~17g</li> </ul>	<ul style="list-style-type: none"> <li>• MicroSD Card: 256MB-32GB class 4 (FAT32)</li> <li>• Maksimum transmit power: 20dB (100mW)</li> <li>• Average current: 150mA</li> <li>• Size: 52 x 40mm</li> <li>• Weight: ~17g</li> </ul>

## 22. Legal notice

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RCFA radio system is based on RFM69HW module produced by HOPERF Micro-electronics Co., Ltd. The module has been certified: FCC Class V 3M Radiated, ETSI EN300 220(TX). Full test reports are available on [www.hoperf.com](http://www.hoperf.com).

The system meets requirements for CE signature.

The system meets the limitations and qualifications of a spread spectrum transmitter defined in FCC section 15.247

## 23. Safety rules

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**Important!** RCFA is an electronic radio device. Never touch without proper isolation. Possible electrical shock. Possible interference with other radio devices (including radio remote controllers, telemetry systems, transmitters, receivers etc.), causing damage or wrong and unpredictable behavior. Use with extreme caution. Use only for purpose described in this manual. Use only at designated airfields for RC models. Never use in proximity of people and buildings. Do not use if the radio waves could affect nearby people or other devices. Use RCFA only as an assist for flying and always keep limited confidence to its indications. Use with prudence at your own risk.

**The RCFA producer is not responsible for any damage or injury caused as a result of inappropriate system usage.**