



TABLE OF CONTENT

WHAT IS THIS?	2
WHAT IS FLARM?	2
WHAT IS FANET?	3
WHY IS THIS USEFUL FOR FREE FLIGHT?	4
ARE THERE OTHER SOLUTIONS OUT THERE?	4
HARDWARE SUPPORTED	6
GETTING STARTED	7
POWERING ON AND OFF THE TTGO T-BEAM V1.X	7
CHARGING THE BATTERY ON THE TTGO T-BEAM V1.X	8
FLASHING GXAirCom FIRMWARE	9
EXPRESS CONFIGURATION	12
SETTING UP WITH LK8000 ON ANDROID.	16
SETTING UP WITH XCSOAR ON ANDROID.	21
SETTING UP WITH XCTRACK ON ANDROID.	26
USING GXAirCom	29
EXTRA CONFIGURATIONS AND OPTIONS	30
BROADCASTING TO INTERNET (AirWhere Live Map)	30
GROUND STATION MODE	31
GROUND STATION WITH OLED SCREEN	34
FIRMWARE UPDATE USING WEB INTERFACE	35
PRINTING A 3D HOUSING FOR THE HARDWARE	39
TROUBLESHOOTING QUICK SHEET	39
FINAL NOTES	41

WHAT IS THIS?

GXAirCom is a software solution written and programmed by Gerald Eichner to work in low budget hardware devices that uses LoRa frequencies.

It's main purpose is to send and receive the geographical position of other devices running any software compatible with the FANET protocol, in real time, using radio frequencies.

It has been tested to have a direct useful range of more than 20km on flying aircrafts on ideal conditions, and can be expected to be above the 10km range when on visual line of communication.

It works on FANET (Flying ad-hoc network), a radio network protocol adopted by many flying aircrafts, specially on the free flying community, that uses the 868mhz or 915mhz band.

It also can be used to broadcast positions to internet from an internet connected device (airborne or ground station), that receives all the radio signals, process and upload their positions to a website where the flying aircrafts can be viewed from any web browser.

Other commonly used systems are ADS-B, ATCRBS transponder, and FLARM, but they tend to be more expensive, battery hungry, or heavy to carry.

Some nice explanation on FANET and FLARM can be found on this XCMAG publication.

<https://xcmag.com/paraglider-reviews/naviter-oudie-5-pro-and-xc-review/>

We copy / Paste the text about Flarm and FANET for this manual.

WHAT IS FLARM?

The FLARM system (FLight alARM) is all about making us electronically-visible to other aircraft for the purpose of collision avoidance. It has a working range of about 20km and is particularly useful if you fly in an area with a lot of sailplane traffic, such as in the Alps.

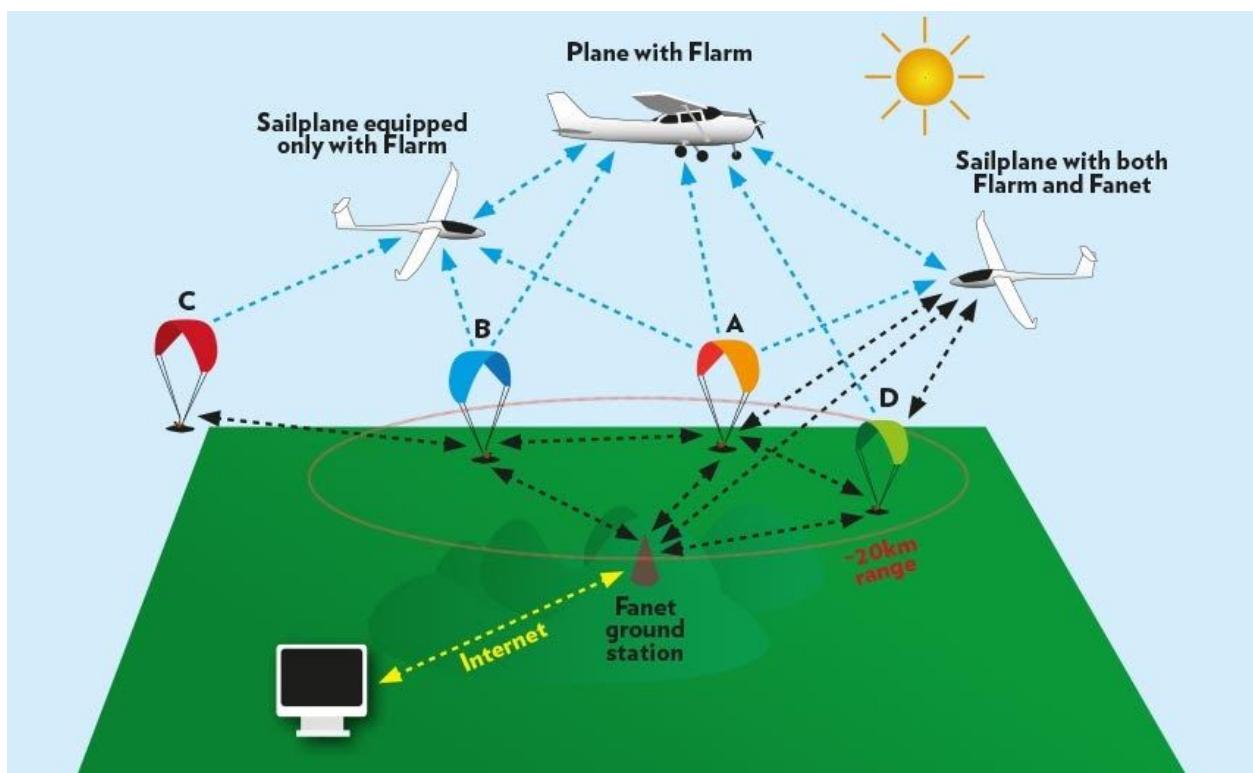
All sailplanes have it in Switzerland, Germany and France, and the Flarm (we're done with all the capital letters from here on) website claims that more than 50% of general aviation air traffic, including planes and helicopters, have it in Europe (including the UK). More than 20,000 drones also use Flarm, according to flarm.com.

Flarm then does away with the need for expensive and power-hungry transponders, allows us to be seen by our fellow pilots, and goes some way to future-proofing ourselves against the rise of the drones.

WHAT IS FANET?

FANET (Flying Ad-hoc NETwork) meanwhile is an open-source network designed to pass data between instruments over a low-power radio connection. The way the system is designed each instrument acts as a relay, so information can be passed much further by bouncing through intermediate instruments.

As well as positional data the system can be used to send messages between instruments, eg status updates. By adding ground stations into the network they can act as gateways to the internet, so you can receive up-to-date weather information, or send your position to live-tracking servers without the need for a mobile phone or satellite internet connection.



WHY IS THIS USEFUL FOR FREE FLIGHT?

For airsports like Hang Gliding or Paragliding, where you want to keep your flying instruments to the lightest and cheapest possible, and with more crowded airspaces every day, and more pilots getting into the sport, keeping situational awareness gets complicated. Sometimes you are flying with 10 friends and when you start turning into a thermal, you lose sight of them and they blend into the landscape and makes it impossible to find them again even when you know that they are nearby. Til now, only workaround was to call them on the radio and ask for their location, hopping that their answer would be so clear and detailed that you can narrow their position and eventually find them.

Now with the use of this devices, instead of talking through the radio, you will see them in your flight computer screen.

It will also tell you when they are climbing, and how far, so you can fly to them with ease, even when you are having trouble spotting them in the air.

It also allows you to be aware of other aircrafts on the vicinity that you didn't account for, and avoid close encounters.

It's like flying with a very expensive radar without the "expensive" part.

With this kind of devices, the radio communications are no longer needed for position reporting or for good climbing spots. You just need to see your screen and figure out if that pilot that is climbing really well is within your reach to join.

In fact, this improvement on situational awareness is so "quantum leap forward" that at the time of this writing, it's forbidden to use on Hang Gliding or Paragliding competitions because the one who uses it has a noticeable advantage over the other pilots.

So if we start using this kind of devices, there would be no more excuse of not seeing every closeby aircraft all the time.

It's important to add that this devices are not meant to function as Flight Avoidance collision system but it can help the pilot to avoid difficult situations beforehand.

ARE THERE OTHER SOLUTIONS OUT THERE?

As a matter of fact, GXAirCom is not the first software to implement the FANET or a similar protocol for free flying applications.

A few other good solutions are out there, offered free of charge, and with lots of pilots already using them from a while ago.

To mention two:

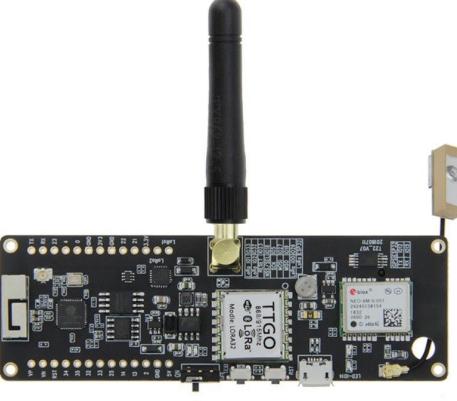
AirWhere.co.uk, by Phil Colbert, has a really good implementation of this software, with lots of pilots using it already all over the world, use similar hardware and has a lot of configuration options at the moment, and its 100% compatible with GXAirCom.

Its code is not open source at the moment.

SoftRF, by Linar Yusupov. It has a lot of documentation. Has been tested on Sailplane Races, and its code is open to the public, so any programmer can take a look inside it. It has an active GitHub website, with lots of documentation and information on this kind of devices, and it also implements more communication protocols with extra hardware equipment - Intended more for the sailplane community than the hang gliding or paragliding community.

The newer TTGO T-Beam models are arriving with SoftRF pre installed on it, and you can configure them to work with FANET protocol, making them 100% compatible with GXAirCom.

HARDWARE SUPPORTED

<p><u>LILYGO® TTGO Meshtastic T-Beam V1.1</u> <u>ESP32 433/868/915/923Mhz WiFi Bluetooth</u> <u>ESP32 GPS NEO-6M SMA 18650 Battery Holder With OLED</u></p> <p>Tested on: T22_V1.1 20191212 T22_V1.0 20190612 It also works without the Oled display.</p> <ul style="list-style-type: none">• Full featured software implementation.	
<p><u>LILYGO® TTGO T-Beam V0.7 ESP32 868/915Mhz WiFi Wireless Bluetooth Module GPS NEO-6M SMA LORA 32 18650 Battery Holder</u></p> <p>TTGO- TBeam T22_V05 (20180608) Tested TTGO T-Beam T22_V07 (20180711)</p> <ul style="list-style-type: none">• Full featured software implementation.	
<p><u>Heltec Wifi Lora 32 (V1 tested)</u></p> <ul style="list-style-type: none">• Only working on Ground station mode.	

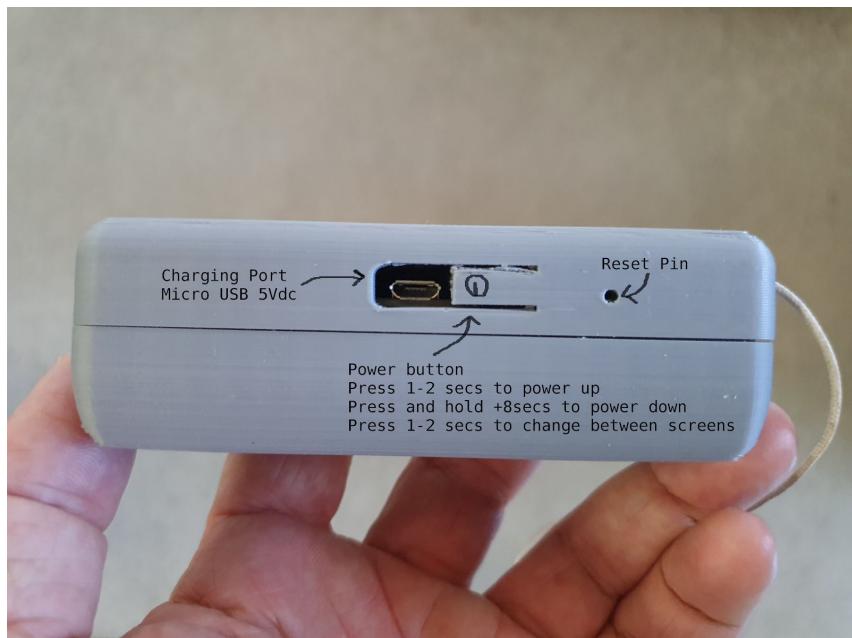
GETTING STARTED

POWERING ON AND OFF THE TTGO T-BEAM V1.X

The newer TTGO T-beam units have a power push button instead of a switch. This makes a configurable switch that needs some understanding.

For powering on the unit you need to “Short Press” the power button (one or two secs). On our printed 3d housing the power button is a small tab just to the right of the charging usb port, that if you press you will feel it “clicks” the power button on the board. It's a little hard to press but it's intentional, so it will be difficult to power on while stow on the harness during your ride to takeoff.

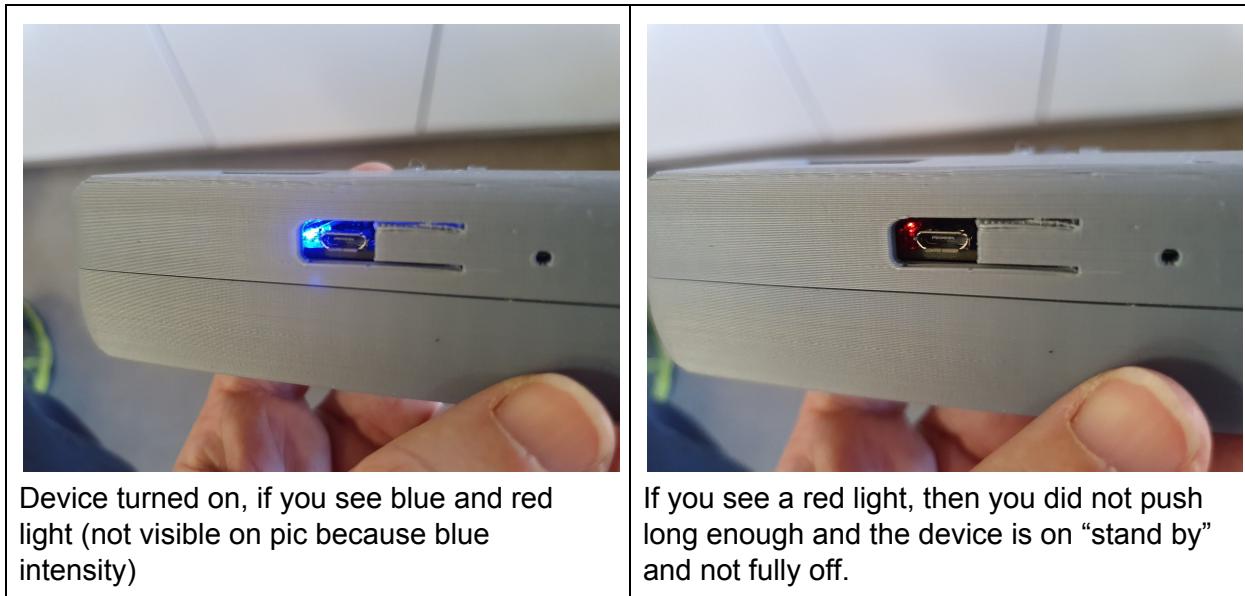
Next to the power button tab, there is a small hole for accessing the “soft reset” button, if the device gets locked or “software frozen” and you don't want to open the case to remove the battery.



For powering off the unit you need to “Long Press” the power button. This is tricky, as it's takes about 8 seconds. On the TTGO V1.1. with OLED when you power off the device, it shows a

“power off sequence” on the screen and then it turns off the screen. Keep pushing the button at least 4 secs after the screen is off.

If you fail to do so, you will see that even when the screen is off and the device stops working, there is a tiny red led behind the Oled Screen (on our printed 3d case you can see it through the charge port hole behind the screen). This means that the device is on “stand by” and we are guessing that it will drain the battery at a really slow rate.



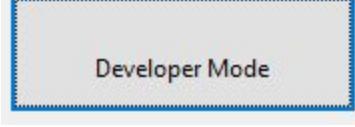
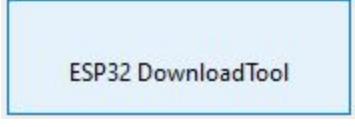
CHARGING THE BATTERY ON THE TTGO T-BEAM V1.X

In order to charge the battery on the TTGO T-beam we recommend to use a 5v USB source. This could be a computer or a standard cell phone wall charger. Try to avoid fast chargers, as they can send higher voltages to the TTGO and can damage it.

Once you connect the device to the power source it will power up. You can power it off (push and hold the power button for 8 secs) so it can charge with the screen off.

FLASHING GXAIRCOM FIRMWARE

(Tested On TTGO T-beam and Heltec)

1. Download and install a driver for the CP210X USB to UART bridge from SiliconLabs prior to first use of the ESP32 tool.	CP210X USB to UART bridge from SiliconLabs
2. Download and Install ESP32 flash download tool (Unzip all in a folder that can be named /flasher/	https://www.espressif.com/en/support/download/other-tools
3. Download the latest version of GXAirCom and extract the zip file so you can see 5 binaries and one jpg with instructions.	Firmware
4. Run “Flash_Download_Too.exe” and select Developer Mode, then select ESP32 Download Tool (Locate the exe file inside /flasher)	 

5. Configure the ESP32 Download tool as follows:

Look the unzipped firmware and select each bin file in a different line:

- bootloader_dio_40m.bin @1000
- partitions.bin @ 8000
- boot_app0.bin @ e000
- firmware.bin @ 10000
- spiffs.bin @ 3d0000

SPI SPEED set on 40MHz,

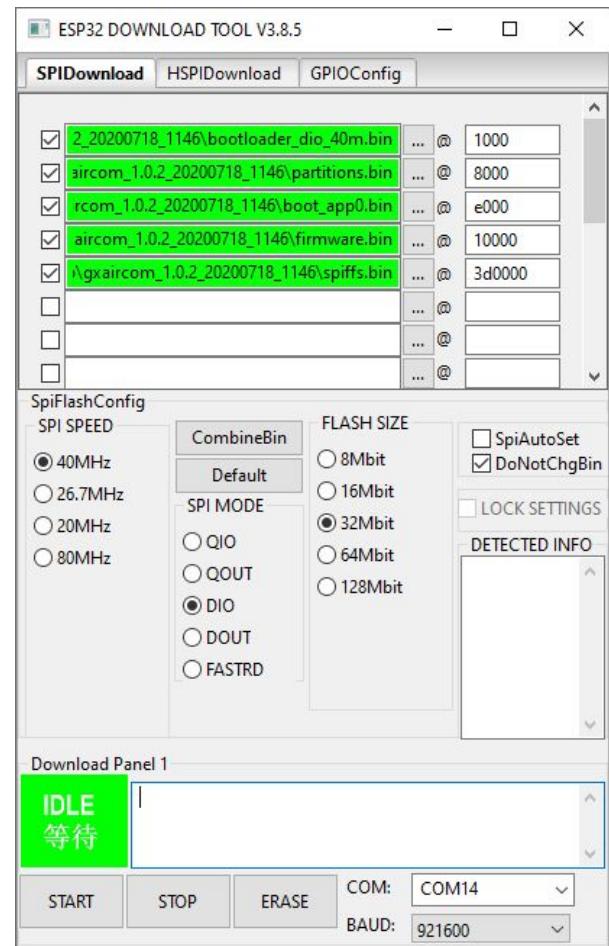
SPI MODE set on DIO

FLASH SIZE set on 32Mbit

Checked DoNotChgBin

Click on the COM select list and take mental notice of what COM ports are available at that moment

Select BAUD: 921600

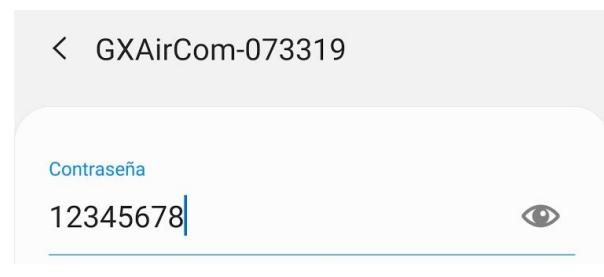


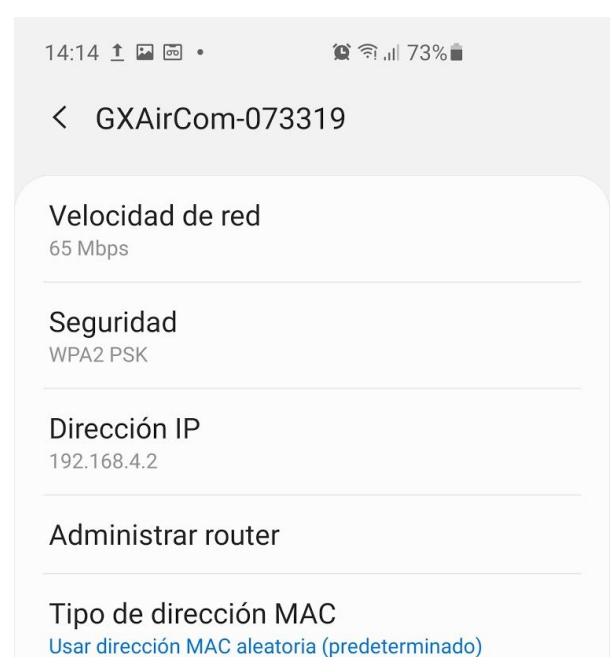
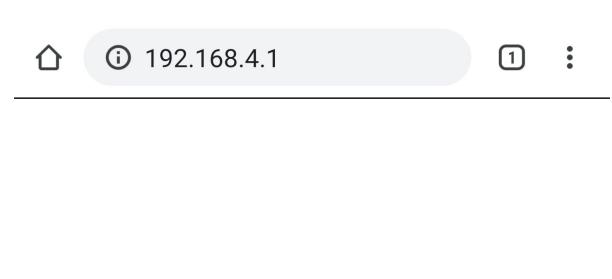
6. Connect the hardware (TTGO T-beam) to the usb port on the computer, and turn on the board if it does not turn on automatically. For flashing the board is recommended to have the battery REMOVED so the board will only get power from the usb, to avoid an issue on step 9. Windows should recognize the device. Now click again on the COM Select list and look up for the new COM port that was not there on previous step, and select that port. (In my case COM 14).

<p>7. Click ERASE. The software will start erasing the memory on the hardware. It Will change states as pictured</p>	
<p>8. Now hit START. It should take from 30 seconds to about 1 minute to flash. Wait for the Finish icon.</p>	
<p>9. Disconnect the hardware from the USB, turn it off, and turn it on again.</p> <p>On V1.0. and V1.1 TTGO Boards, you need to long press the power button at least during 7 seconds to fully turn the device off.</p> <p>If you flashed the TTGO T-Beam with a battery installed, during the the first start after flashing, there would be a bright led that wont turn off on the first time.</p> <p>The workaround could be to flash the TTGO without a battery installed, so it will turn off as soon as you disconnect.</p> <p>You can also do two power cycles:</p> <ol style="list-style-type: none"> 1. Long press power (7 secs). Unit turns off but light keeps on. 2. Short press power (2 secs). Units turns on again. 3. Wait 10 secs (unit settles). 4. Long press power (7 secs). Unit should turn off and lights turn off too. 	

EXPRESS CONFIGURATION

In this guide we will use our smart phone to get into the configuration menu. The follow is intended for a TTGO T-Beam version V1.0 or V1.1, with or without oled, connected to LK8000 software by BLE running on an android phone as a main flight computer.

<p>1. Power on the device. Wait for a few seconds, and look up for a broadcasted network named GXAirCom-XXXXXX where the "X" are numbers or letters specific to your device.</p>	
<p>2. Connect to it using 12345678 as password.</p>	
<p>3. After some seconds it could pop up a message saying that the internet is not available on this network. Disregard and keep the connection.</p>	

<p>4. Once connected, on some phones you can “Tap” on the network and it will pop up some info as in the picture. Here you can access the config directly by hitting “Administrador Router” (Spanish for Router Manager) There could be different presentations, or maybe just a “clickable IP” that will say: 192.168.4.1. If this is not possible, go to step 5. If it worked for you, go to the step 6.</p> <p>Note: Sometimes this step will point you out to a wrong IP, like 192.168.4.250. Ignore this step and go to step 5.</p>	
<p>5. If the above didn't work, you then should open your default internet browser and type on the address bar:</p> <p>192.168.4.1</p> <p>Hit enter, or Go, or Navigate.</p>	
<p>6. Main menu should appear on your browser.</p>	

7. Go to “settings” menu.

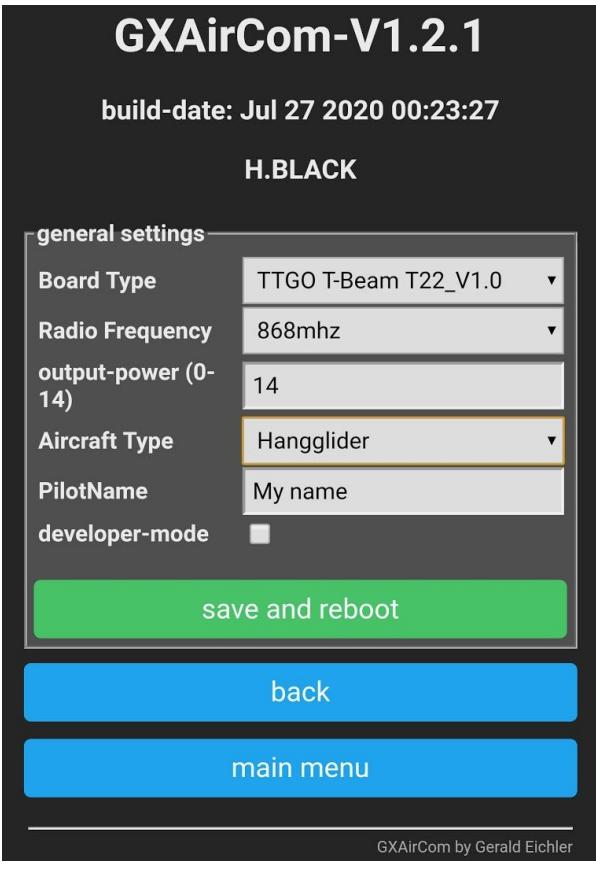


8. Go to “general” menu.

- Set the board Type. Default is TTGO T-Beam T22_V1.0
- Set Radio Frequency. 868mhz default for Europe, 915mhz on USA.
- Set the output power. Default 10, max 14. Minimum 0.
- Set Aircraft Type. Default Paraglider
- Set your Pilot Name as it's going to be broadcasted out.
- Hit save and reboot.

Your device will reboot. Your wifi connection with your phone will be dropped.

Wait a few secs and then if your cell phone did not reconnect automatically it means that you are near another stored wifi router and the cellphone connected to that one. Go to your wifi settings on the cellphone and look again for the GXAirCom-XXXXXX network and manually reconect to it.



9. Open the browser again on 192.168.4.1 for the main page

You can now see that your Pilot Name appears on the main screen, meaning that your general configurations are fine.

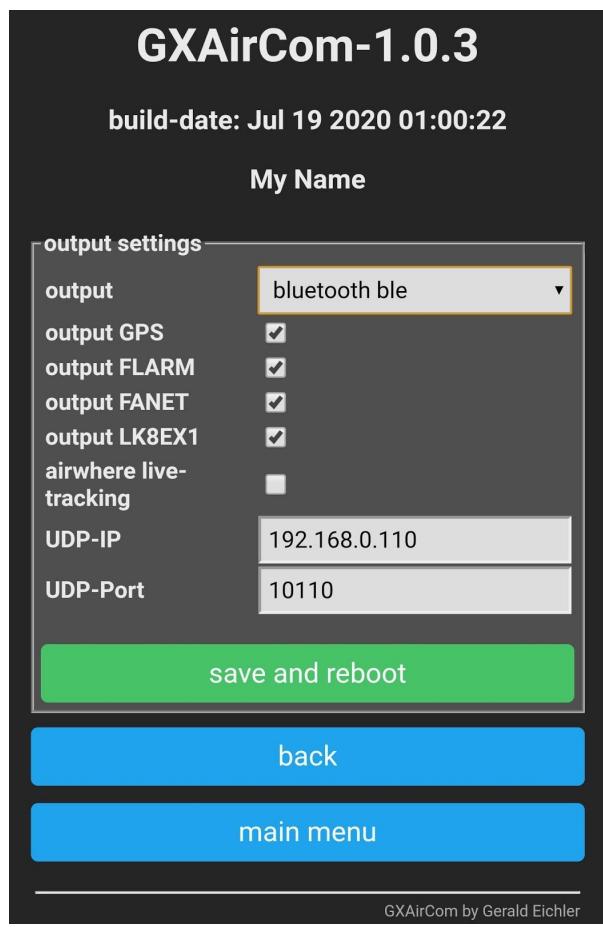


10. Go again into settings but select the "output" submenu.

Here we configure how the device will communicate to the flight computer.

Select output as "bluetooth ble".

Save and reboot.



11. That's it. You have a working GXAirCom communication device.

Go to next step to learn how to configure Lk8000 under android to receive FLARM Data.

We intend to produce another section going through all the other configuration options.

SETTING UP WITH LK8000 ON ANDROID.

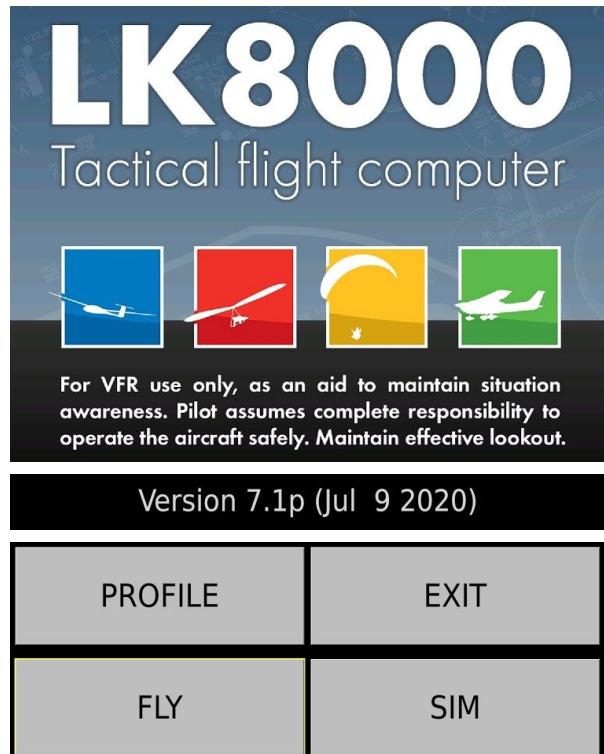
It's strongly recommended that you study the LK8000 documentation and manuals, to learn about the possibilities of FLARM that this software offers. This manual is not intended to explain any of that, as it's only for connecting GXAirCom to LK8000.

<p>1. Power on the GXAirCom Device. (Short press on the power button should do the trick). It's recommended to wait for a Sat Fix before proceeding.</p>	
<p>2. Open your android Bluetooth connections and look on available devices for GXAirCom-XXXXXX</p> <p>Click over it to pair it with your phone. No password needed.</p> <p>(Pull down the upper bar twice, look for the bluetooth icon, and press and hold should do the trick)</p> <p>After pairing for the first time It's recommended that you restart your GXAirCom. Turn it off fully wait 5 secs and then turn it on.</p>	

3. Verify that you have the latest LK8000 Beta installed on your phone. If not, go to the Play Store and look for it. The beta is the one with the RED ICON. We tested on Version 7.1p from July 9th 2020

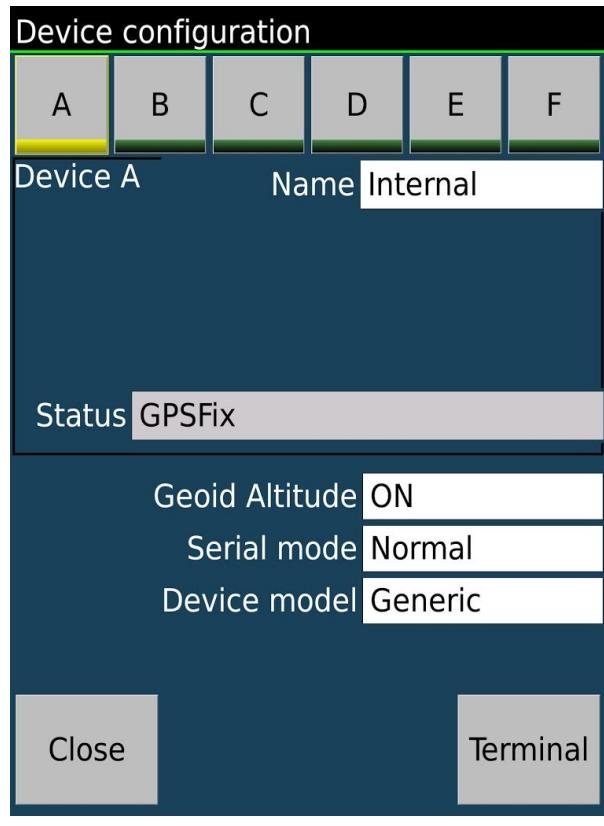
Open LK8000 App.

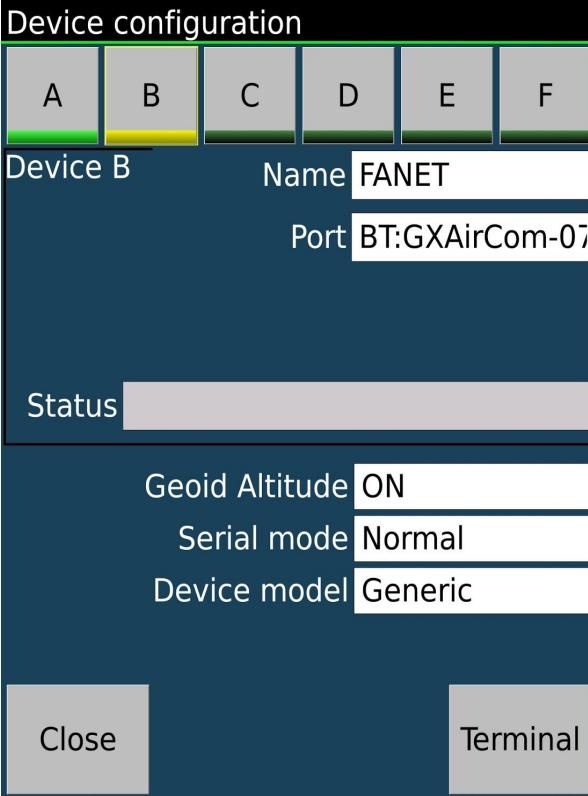
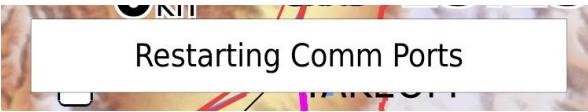
Select FLY



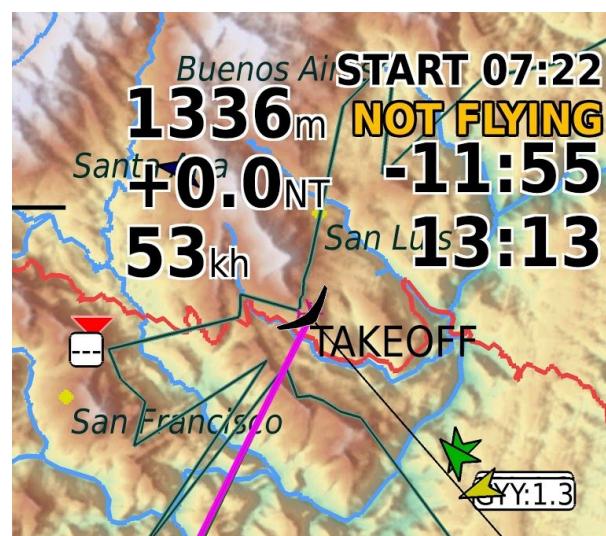
4. Go to Menu - Config 2/3 - LK8000 Setup - Device Setup

To enter menu, click on the lower right part of the screen. Select Config twice to get to Config 2/3.

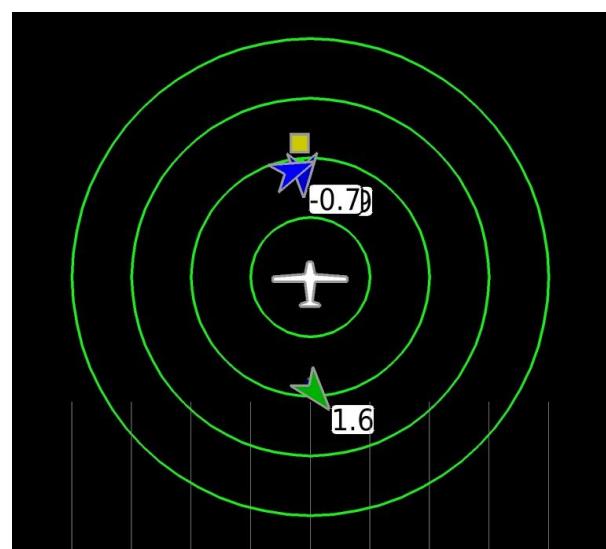


<p>5. Select Device B and configure as follow.</p> <ul style="list-style-type: none"> - Name: Search for protocol called FANET and select it. - Port: Search for the BT:GXAirCom-XXXXXX that you paired on step 2. <p>Click "Close"</p>	 <p>Device configuration</p> <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th></tr> </thead> <tbody> <tr> <td>Device B</td><td>Name FANET</td><td></td><td></td><td></td><td></td></tr> <tr> <td></td><td>Port BT:GXAirCom-07</td><td></td><td></td><td></td><td></td></tr> <tr> <td colspan="6">Status</td></tr> <tr> <td colspan="6">Geoid Altitude ON</td></tr> <tr> <td colspan="6">Serial mode Normal</td></tr> <tr> <td colspan="6">Device model Generic</td></tr> <tr> <td colspan="3">Close</td><td colspan="3">Terminal</td></tr> </tbody> </table>	A	B	C	D	E	F	Device B	Name FANET						Port BT:GXAirCom-07					Status						Geoid Altitude ON						Serial mode Normal						Device model Generic						Close			Terminal		
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Geoid Altitude ON																																																	
Serial mode Normal																																																	
Device model Generic																																																	
Close			Terminal																																														
<p>6. A few seconds latter you should see a pop up message saying "Restarting Comm Ports", and a few seconds latter, a second message saying "FLARM DETECTED".</p> <p>It means that the software is connected to the GXAirCom device and it's receiving information.</p> <p>If the software does not restart the com ports, try going into "Menu - Config 3/3 - Reset Comms" and it should do the trick.</p> <p>That's it. You are good to go. If there is traffic around you should see it as per the next pics.</p>	 <p>Restarting Comm Ports</p>  <p>FLARM DETECTED</p>																																																

6.1. Main Screen with traffic enabled



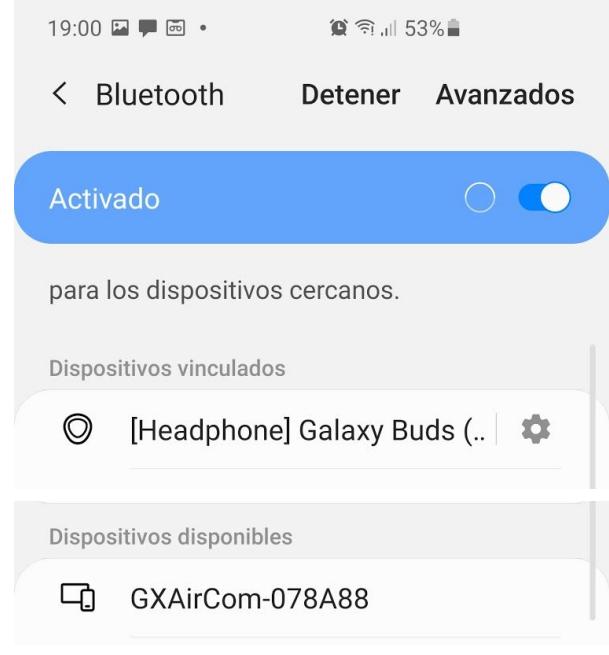
6.2. Flarm Radar (Page 5)

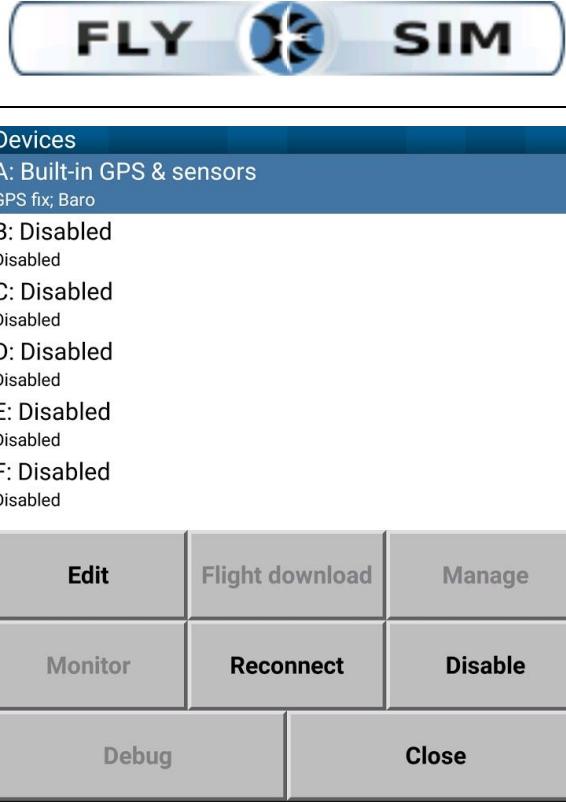
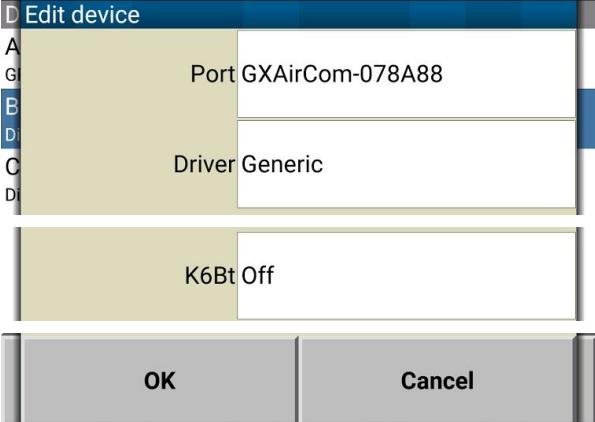
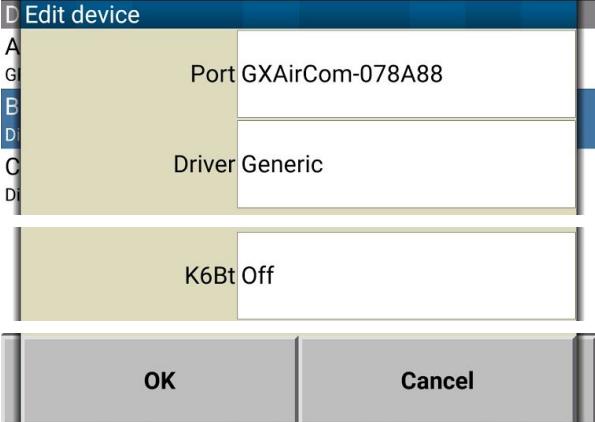


6.3 Flarm list of received aircrafts

4.1 TRF 1/1	Dist	Dir	Avg	Alt
GAYY			8.6 km	
« 3°	-0.7		235 m	
ISAZA			8.8 km	
«12°	-0.5		411 m	
dd8951			10.6 km	
178°»	+3.5		486 m	
dd8a42			11.0 km	
« 4°	+0.0		208 m	

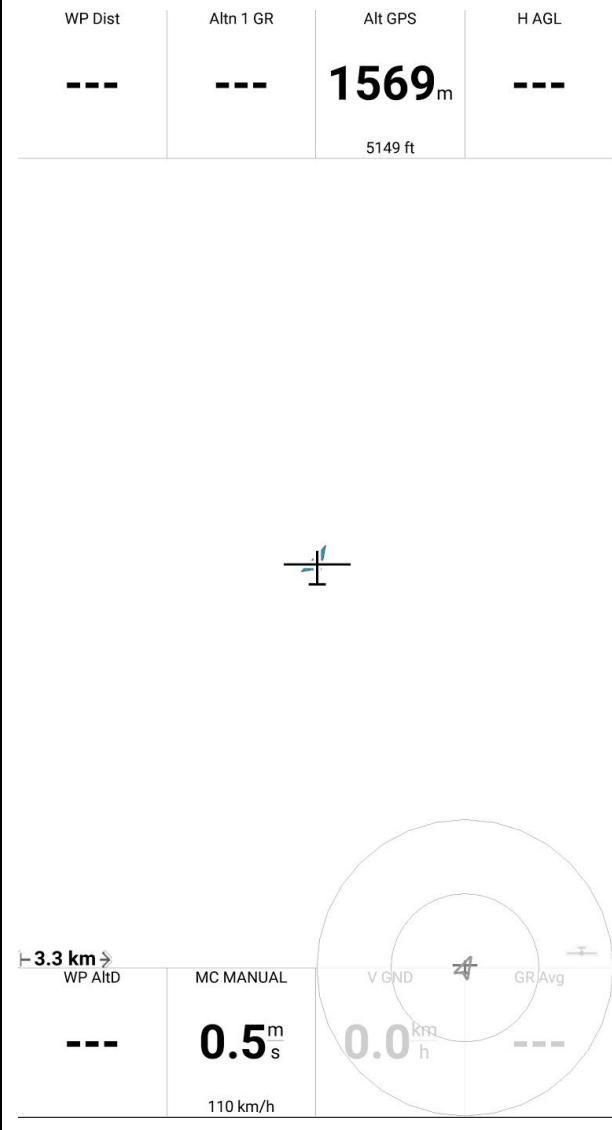
SETTING UP WITH XCSOAR ON ANDROID.

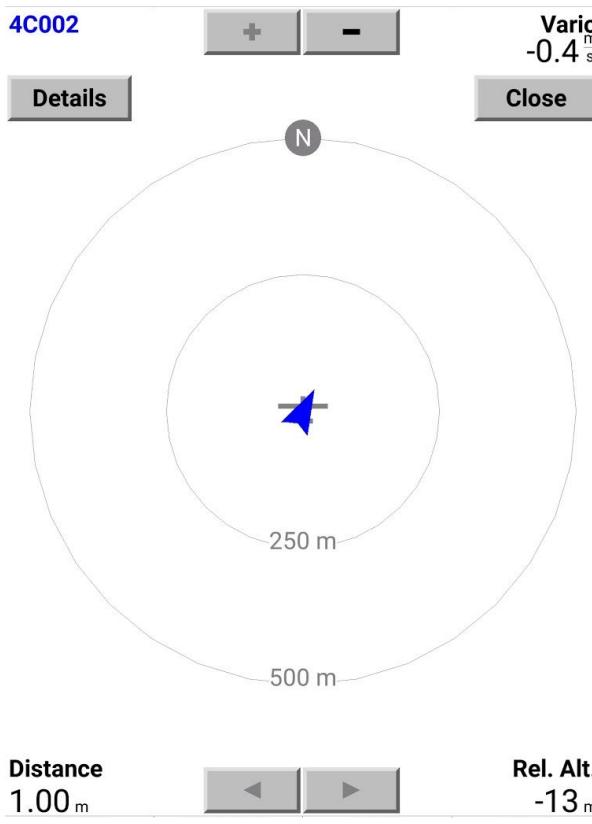
<p>1. Power on the GXAirCom Device. (Short press on the power button should do the trick). It's recommended to wait for a Sat Fix before proceeding.</p>	
<p>2. Open your android Bluetooth connections and look on available devices for GXAirCom-XXXXXX</p> <p>Click over it to pair it with your phone. No password needed.</p> <p>(Pull down the upper bar twice, look for the bluetooth icon, and press and hold should do the trick)</p> <p>After pairing for the first time It's recommended that you restart your GXAirCom. Turn it off fully wait 5 secs and then turn it on.</p>	
<p>3. Verify that you have the latest XCSOAR installed on your phone. If not, go to the Play Store and look for it.</p> <p>We tested on v6.8.15-Android</p> <ul style="list-style-type: none"> - Open XCSoar App. - Select FLY 	<p>XCSoar v6.8.15-Android</p> <p>Quit</p>  <p>XCSoar 6.8</p>

	<p>What do you want to do?</p> 
<p>4. Go to menu (double click on the lower right corner) - Config 1/3 - Devices</p> <ul style="list-style-type: none"> - Select device B:Disabled, and click on Edit. 	<p>Devices</p> <p>A: Built-in GPS & sensors GPS fix; Baro</p> <p>B: Disabled Disabled</p> <p>C: Disabled Disabled</p> <p>D: Disabled Disabled</p> <p>E: Disabled Disabled</p> <p>F: Disabled Disabled</p> 
<p>5. Search for your GXAirCom-XXXXXX on the Port list, select it and choose Generic as the Driver. Press OK.</p>	
<p>6. If you have a sat fix on the GXAirCom you should see that the Device B has been detected as per the image. You can also test it by clicking on Monitor.</p>	<p>Devices</p> <p>A: Built-in GPS & sensors GPS fix; Baro</p> <p>B: Generic on Bluetooth GXAirCom-078A88 GPS fix; FLARM</p>

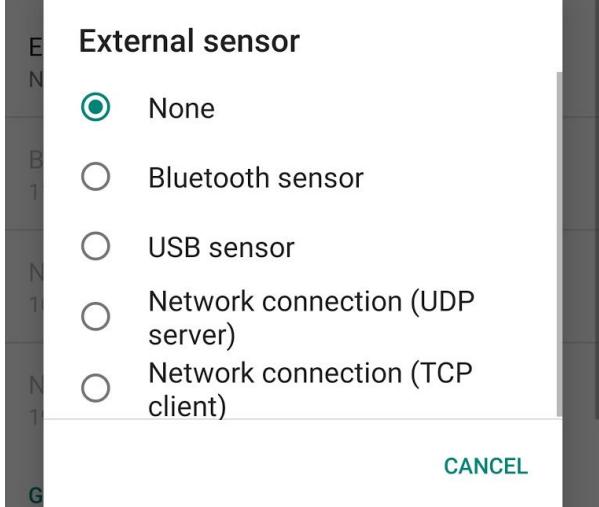
	<table border="1"> <tr> <td>Edit</td><td>Flight download</td><td>Manage</td></tr> <tr> <td>Monitor</td><td>Reconnect</td><td>Disable</td></tr> <tr> <td colspan="2">Debug</td><td>Close</td></tr> </table>	Edit	Flight download	Manage	Monitor	Reconnect	Disable	Debug		Close
Edit	Flight download	Manage								
Monitor	Reconnect	Disable								
Debug		Close								
<p>6.1. Monitor testing should show text coming in from the GXAirCom. \$PFLAA is actually the traffic information that is being send to the software.</p>	<p>Port monitor: Bluetooth GXAirCom-078A88</p> <pre>\$LK8EX1,999999,1584.80,10,99,3.98,*20 \$GPRMC,161610.00,A,0610.74824,N,07534.91183,W ,0.154,,260720,,,A*6F \$GPVTG,,T,,M,0.154,N,0.285,K,A*2C \$GPGGA,161610.00,0610.74824,N,07534.91183,W,1 ,06,1.23,1584.8,M,2.7,M,,*41 \$LK8EX1,999999,1584.80,10,99,3.98,*20 \$GPGSA,A,3,28,06,05,17,09,19,,,,,,2.96,1.23, 2.70*04 \$GPGSV,3,1,11,02,34,299,,05,36,210,26,06,37,3 45,19,09,18,099,33*73 \$GPGSV,3,2,11,13,04,209,,17,34,036,24,19,32,0 12,26,24,05,283,*73 \$GPGSV,3,3,11,28,63,138,25,30,15,166,,51,52,2 60,28*40 \$GPGLL,0610.74824,N,07534.91183,W,161610.00,A ,A*77 \$LK8EX1,999999,1584.80,10,99,3.98,*20 \$LK8EX1,999999,1584.80,10,99,3.98,*20 #FNF 4,C002,1,0,1,C,C0C908DC40CA2FA60000133F \$PFLAA,0,4,3,-1,2,04C002,27,0,0.0,0.0,0.6*19 \$PFLAU,6,1,2,1,0,144,0,235,446*55</pre>									

7. Now you have traffic on your main navigation screen with a small radar on the lower right corner. If you click on it, it will open up the big radar info.



7.1. Radar page.	 <p>The radar screen displays a single target located exactly at the center of the display. The target is represented by a blue arrow pointing upwards. The radar has concentric circles indicating ranges of 250 m and 500 m. At the top of the screen, the identifier "4C002" is shown in blue. To the right of the identifier are two small buttons with "+" and "-". In the top right corner, the word "Vario" is followed by "-0.4 m/s". On the left side, there is a "Details" button. On the right side, there is a "Close" button. Below the radar, the text "Distance 1.00 m" is displayed, along with two small navigation buttons (left and right arrows) and "Rel. Alt. -13 m".</p>
7.2. Details page	<p>FLARM Traffic Details (4C002)</p> <p>Callsign --</p> <p>Change callsign</p> <p>Distance 1.00 m «45°</p> <p>Altitude 1556 m -86°</p> <p>Vario -0.2 m/s</p> <p>Pilot --</p> <p>Airport --</p> <p>Radio frequency --</p> <p>Plane HangGlider</p>

SETTING UP WITH XCTRACK ON ANDROID.

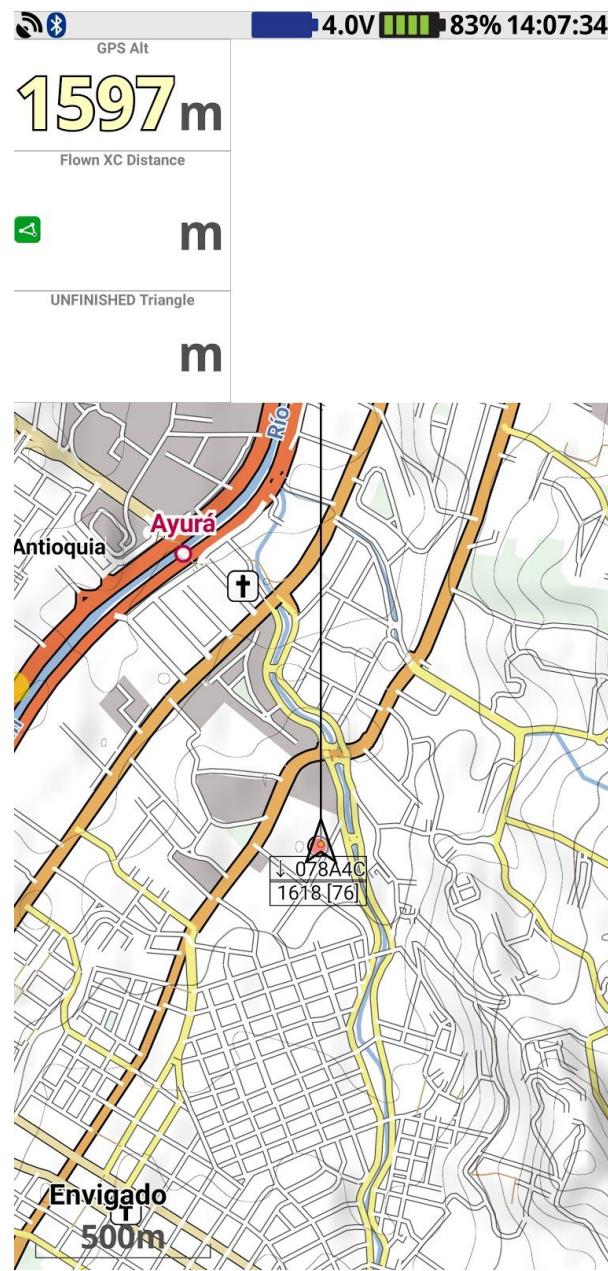
	<p>Connection</p> <p>External sensor None</p>
<p>5. Select Bluetooth sensor</p> <ul style="list-style-type: none"> - Find your GXAirCom device on the list and select it. 	 <p>External sensor</p> <p> <input checked="" type="radio"/> None <input type="radio"/> Bluetooth sensor <input type="radio"/> USB sensor <input type="radio"/> Network connection (UDP server) <input type="radio"/> Network connection (TCP client) </p> <p>CANCEL</p> <p>LE ↔ GXAirCom-078A88 AC:67:B2:24:8A:8A</p>
<p>5.1. Verify barometer. When you select an external sensor on XCTrack, it assumes that it's a barometer, so it changes your settings to "Use External Barometer".</p> <p>If your device has an internal barometer, (such as a Samsung Galaxy S series) we suggest that you select Use Internal Barometer.</p>	<p>Atmospheric pressure sensor</p> <p>Use internal barometer <input checked="" type="checkbox"/></p> <p>Use external barometer <input type="checkbox"/></p> <p>Calibrate</p> <p>Acoustic vario</p> <p>☰ ☒ <</p>

6. That's it. You now should have GXAirCom configured to work with XCTrack.

You can see that on the main screen there is a new Bluetooth ICON saying that it's connected to an external Bluetooth device and it's receiving info.

If you are within reach of other FANET devices, you now can see them on the main screen as a red dot, with the ID and the GPS altitude of the aircraft traffic.

Also you will have the battery voltage of the GXAirCom unit on the main bar.



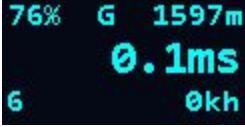
USING GXAirCom

The full potential of GXAirCom is only seen when used with a good flight computer that can process all the information that GXAirCom recollects from other aircrafts.

We prefer LK8000 as our main flight computer and it “talks” really nice with FANET devices like GXAirCom, as it actually has a special protocol written by the same programmer of GXAirCom, in order to communicate seamless with the device. LK8000 software is free and it has a lot of support and documentation so you can learn everything about it online. (<http://www.lk8000.org/>)

Nevertheless, the OLED version of GXAirCom has some nice implementations for flying so it can be used (almost) as a standalone version. The only problem is that the current OLED screen is “too small” to be used while airborne. The programmer is looking at some bigger screen options at the moment that could be of practical use while flying, as a standalone version.

As of version 1.2.0 the programmer has implemented the following screens for using as a “standalone version”. You can switch between them by briefly (short) pressing the power button.

<p>Main navigation screen. “76%” is the battery percentage. “G” means that you are on the ground, ie moving at less than 15km/h. If speed goes above 15km/h for 10 secs, it changes to “F” (flying). If you go below 15km/h for 60 seconds, it goes back to “G”. “1597m” is the height according to GPS data. “0.1ms” is the climb rate according to GPS data. “6” is the number of currently locked sats. “0kh” is the ground speed according to GPS data.</p>	
<p>List Screen. It shows all the other aircrafts currently detected by the device. It automatically changes between them showing information on each of them. When you are not flying (ie below 15km/h) the radar graph shows north up to figure out the relation to the detected aircraft. When flying it shows the radar graph on Track Up, so the detected aircraft is shown in relation to your actual heading.</p>	
<p>Closest Screen. It shows the same info that List Screen but it does not change between aircrafts. Instead it shows the closest one so you can keep track of it.</p> <p>The info displayed: “76%” Battery Status. “N or T” mode of the radar orientation. “LIST” - “CLOSEST” name of the page. “-39” the strength of the received radio transmission. “78AC04” ID of the detected aircraft. “43m” the horizontal distance to the aircraft. “-12m” the vertical position of the aircraft in relation to your position 0. “0.0ms” the vertical speed reported by the other aircraft.</p>	

EXTRA CONFIGURATIONS AND OPTIONS

Now that we managed to get everything working, let's take a look inside the other configurations that we can implement to explore all the possibilities that GXAirCom can offer.

BROADCASTING TO INTERNET (AirWhere Live Map)

Taking advantage of the network that Airwhere has managed to put already, GXAirCom can broadcast your position as other pilot positions to the internet, so you can see them on the AirWhere live map at <http://airwhere.co.uk/live/live-tracking-paragliding.php>

It can be used as an airborne broadcasting unit, connected to a mobile phone with internet service (data). In this configuration it will be dependant on cell phone coverage to broadcast efficiently.

This system does not store the tracklog so it does not work as a flight logger. It only works as a live feeder, to see the actual or “last known” position of any device that was received on the last 24 hours.

To configure broadcasting follow the next guide:

1. Connect to your GXAirCom device using wifi and go into “settings” menu.

If you don't know how to do this, take a look at the previous section named “Express Configuration”, and go through steps 1-7.

GXAirCom-1.0.3

build-date: Jul 19 2020 01:00:22

general

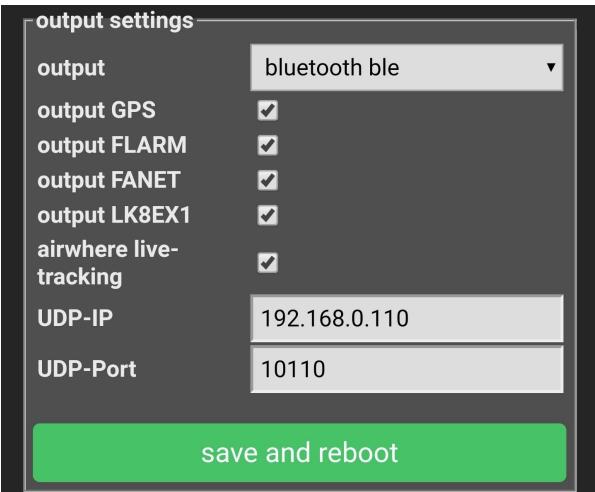
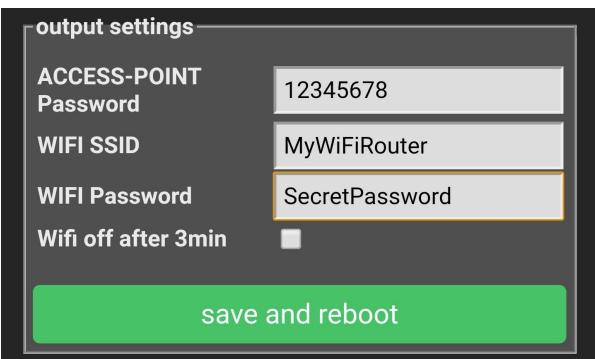
ground-station

output

wifi

main menu

GXAirCom by Gerald Eichler

<p>2. Once more, under “settings”, go to “output” and check (enable) airwhere live-tracking.</p> <ul style="list-style-type: none"> - Click “save and reboot”, wait for the GXAirCom to reboot and connect to it using wifi once more. 	
<p>3. Once more, under “settings”, go to “wifi” and configure the WIFI SSID and WIFI password of device that will be sharing its internet connection to the GXAirCom.</p> <ul style="list-style-type: none"> - We strongly recommend leaving ACCESS-POINT Password to 12345678, as if you change it and forget about it the only way enter into the config menu again would require a full erase and reflash of the whole firmware. - Wifi off after 3min should be unchecked (disabled) - Click “save and reboot”, wait for the GXAirCom to reboot and connect to it using wifi once more. 	

GROUND STATION MODE

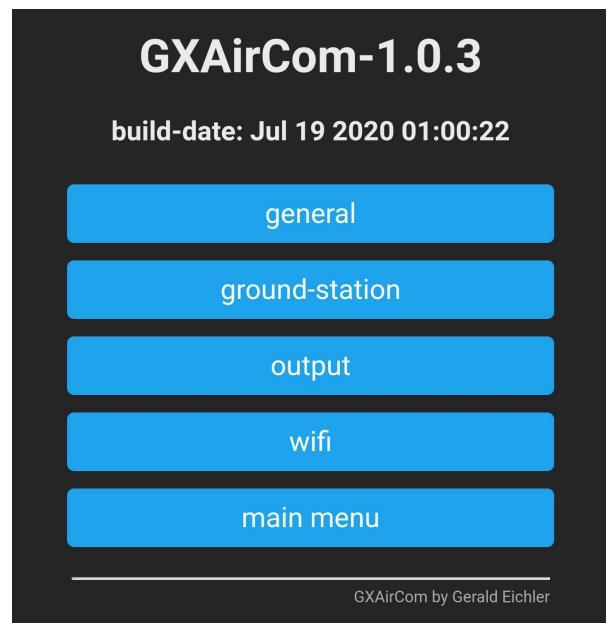
A ground station is mainly used to have a stationary device with a good external elevated antenna and connected to the internet, so every pilot on the proximity that has a FANET compatible device would be received by that ground station and uploaded to the airwhere live map for internet tracking and following. This mode works not only on the TTGO T-Beam, with integrated GPS module, but also on the Heltec Lora ESP32 that does not have a GPS built in.

In this mode, the device would not broadcast his own position to other aircrafts via LoRa, and will be limited to receiving positions.

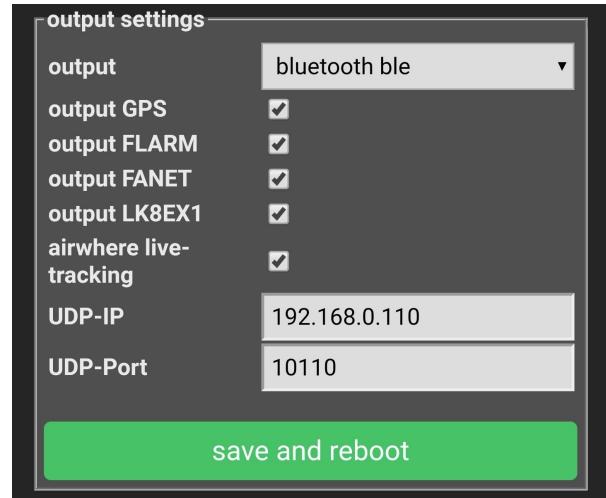
To activate a working ground station that broadcasts the pilots to the AirWhere live map, you need to follow this procedure:

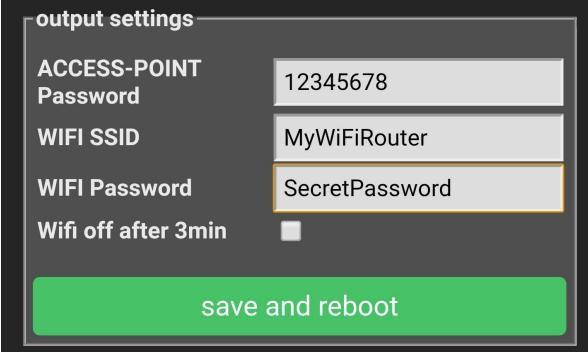
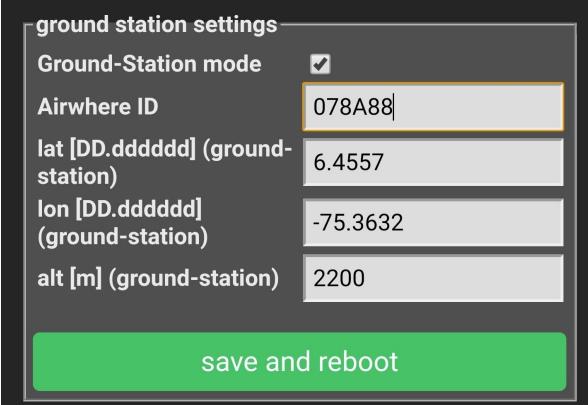
1. Connect to your GXAirCom device using wifi and go into “settings” menu.

If you don't know how to do this, take a look at the previous section named “Express Configuration”, and go through steps 1-7.



2. Once more, under “settings”, go to “output” and check (enable) airwhere live-tracking.
 - Click “save and reboot”, wait for the GXAirCom to reboot and connect to it using wifi once more.



<p>3. Once more, under “settings”, go to “wifi” and configure the WIFI SSID and WIFI password of the router that is connected to internet.</p> <ul style="list-style-type: none"> - We strongly recommend leaving ACCESS-POINT Password to 12345678, as if you change it and forget about it the only way enter into the config menu again would require a full erase and reflash of the whole firmware. - Wifi off after 3min should be unchecked (disabled) - Click “save and reboot”, wait for the GXAirCom to reboot and connect to it using wifi once more. 	
<p>4. Finally, under “settings” go to “ground-station”</p> <ul style="list-style-type: none"> - Check Ground-Station mode (enable) - Select an Airwhere ID. If you don’t have one for the ground station, you can always put the same 6 digits of your device - Write the coords of where your ground station is going to be located. It’s not really necessary if your device has a built in gps like the TTGO T-beam, but if your device is indoors with an external antenna for LoRa, but does not receive sat information, then this coords will be used to visually place the Ground Station on the airwhere live map. - Click “save and reboot”. You have now configured a Ground station. 	

GROUND STATION WITH OLED SCREEN

On devices with an Oled Screen such as “Heltec ESP32” or the TTGO T-beam with Oled, GXAirCom has some nice implementations as a GROUND STATION, as follows:

Startup Splash Screens	 GXAirCom 1.0.1 ID:AAA000
<p>Then the device starts a loop of images of the ground station mode, looking for FANET packets to identify.</p> <p>It shows off all the different types of aircrafts that are coded at the moment.</p> <p>Obviously, any unknown type would be treated as a UFO.</p>	        
<p>Once a FANET package is received, the software will process it and will identify the type of aircraft, and then it changes to an information screen on that particular aircraft.</p> <p>If more than one aircraft is detected, the screen will start changing between all of them.</p>	 <ul style="list-style-type: none"> - 07D4B8 Unique 6 digits ID of the transmitter - -39db The strength of the signal. - 25 The total packages received since initialized. - Daniel Velez: The broadcasted name of the pilot as defined on the general settings - alt: 1596m Altitude MSL according to GPS (or pressure sensor if available) - speed: 0kmh Ground speed measured from the GPS of the transmitter. - 0.3m/s Vertical speed (climb rate) calculated from GPS height (or pressure sensor if available) - 0deg: Heading of the aircraft. - 6.179087 -75.571833 GPS position. Latitude and Longitude, given on DD.DDDD format.

Ground Station mode with OLED is a great way of visually knowing what is the GXAirCom Ground Station receiving nearby, so if you have one of them at takeoff, you can check really fast and easy if your personal GXAirCom is transmitting and being received by the Ground Station. Just wait to appear on the screen.

It also has a nice feature associated with the way GXAirCom was written. As it can show a device that is transmitting, but does not have a gps lock yet so it does not show on any flight computer, and is not being broadcasted yet to the internet airwhere live map. On this particular event, the device would be shown as UFO on the screen as its position is still Unknown.

Once you get a sat lock on the transmitter, then it will change the icon type to whatever type was selected on the general configuration of that particular transmitter.

It also works to visually see the strength of the transmission, so you can short out any antenna or transmission issues beforehand, only by looking and comparing the information on the screen from different devices nearby.

FIRMWARE UPDATE USING WEB INTERFACE

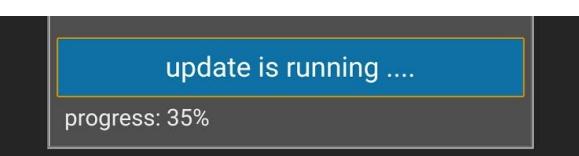
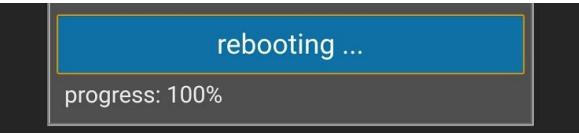
As this software tends to be a work in progress, you could find yourself wanting to update the firmware to the latest one, in order to get the newest improvements, bug corrections, or just visual and aesthetics that the programmer implements from time to time.

Luckily for you, there is a really easy way of doing so. Even for the common user that got the unit from someone and does not trouble itself with the flashing or the building.

So the step by step is quite simple:

1. Get the latest firmware from the Firmware Archive. You can download it on your smart phone or on a computer with WIFI.	Firmware
2. Extract the file. Initially you only need the “firmware.bin” unless the update suggests to flash “spiffs.bin” also. Put the extracted files “firmware.bin” and “spiffs.bin” on a place easy to access from the file manager of your device / computer.	
3. Power up the GXAirCom unit and let it settle for a few seconds (15 or 20	

<p>seconds), but no more than 2 minutes, or you could find yourself with the 3 minutes wifi off option and loose the connection while trying to log into it.</p>	
<p>4. Look up for the wifi network on your device. Remember that it is named GXAirCom_XXXXXX.</p>	
<p>5. Connect to it using 12345678.</p> <ul style="list-style-type: none"> - Ignore the fact that there is no internet connection on this network if your phone / computer tells you, and keep the connection active. (Ignore the message) 	

<p>6. Now go to the web browser and type 192.168.4.1 on the address bar, and hit Go (Enter)</p>	
<p>7. Main menu should appear on your browser.</p> <ul style="list-style-type: none"> - Before starting it is wise to go to “info” first and take a screen capture of all the configurations (scroll screen capture, or two screen captures will take all the info) so you can restore everything if you lose your data - Select “firmware update” 	 <p>GXAirCom-1.0.3</p> <p>build-date: Jul 19 2020 01:00:22</p> <p>info</p> <p>settings</p> <p>firmware update</p> <p>GXAirCom by Gerald Eichler</p>
<p>8. Go to select file and look up for your “firmware.bin”.</p> <p>9. Once selected, click “start upgrade”</p>	 <p>upgrade by file upload</p> <p>Seleccionar archivo firmware.bin</p>
<p>10. You should see the progress bar or a message like this one. On some android phones this progress bar could get frozen, but it does not mean that the software is not being updated. Just wait for at least 1 minute.</p>	 <p>update is running</p> <p>progress: 35%</p>
<p>11. Once finished, the progress bar should change to “rebooting...” and your device would reboot.</p> <ul style="list-style-type: none"> • On some android phones this progress bar could get frozen, but it does not mean that the software is not being updated. Just wait for at least 1 minute. <p>If the update version also changed something on the web interface, you need to update “spiffs.bin” too, following the steps but selecting “spiffs.bin” in the step 8, instead of “firmware.bin”</p>	 <p>rebooting ...</p> <p>progress: 100%</p>

That's it. You only need to check that everything went smooth.

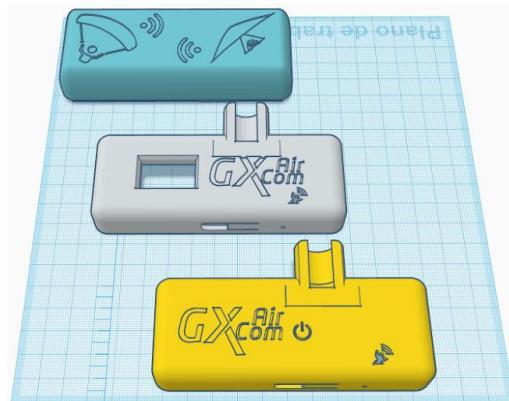
If your device it has an oled screen you can check the newer version on the splash screen. If not, then you can log into the wifi again (steps 4-6) and you should see the version on the main page.

Usually you will also have all your configurations. But it's wise to check them once more, entering each menu and if everything looks ok, just hit back (don't update and reboot as its slow) to keep the config unmodified.

PRINTING A 3D HOUSING FOR THE HARDWARE

We have designed a “print and use” 3d housing to protect the TTGO T-Beam hardware running on GXAirCom. You just need to download the correct files for your specific model of board, and send them to a local 3d printing service shop or to your geek friend that has one on the garage and has run out of ideas on what else to 3d print.

Click the image to explore the files and download the STL that suits your needs.



TROUBLESHOOTING QUICK SHEET

Symptom	Workaround
GXAirCom does not power up. All the LEDs and the screen are off. No response.	<ol style="list-style-type: none">Do the procedure for turning the unit off and on once more by pressing and holding for at least 10 secs the power button, then wait for 4 seconds, then press and hold the power button 2 seconds.Get the battery out. Check polarity (Be aware that if the polarity is wrong, the device could have been damaged permanently).Connect the device without the battery to a USB port without the battery and check if it starts up automatically.

	<ol style="list-style-type: none"> 4. Check the battery voltage with an external device. 5. Put the battery again in the device (Polarity check) 6. Connect the device again to an external power source. 7. If you are not lucky, try to connect the device to a computer with all the “flashing software installed” (Follow flashing GXAIRCom steps). 8. IF the computer recognizes a Com port, then reflash the device with latest firmware. 9. IF the computer does not recognize the device, then it's probably damaged.
GXAIRCom screen does not display anything.	<ol style="list-style-type: none"> 1. Restart the device (fully off, then on) 2. Search for the wifi network of gxaircom and connect to it. Go into general settings and select the correct board (TTGO V1, TTGO V0.7 or Heltec). Restart and try again.
GXAIRCom does not receive any sat info.	<ol style="list-style-type: none"> 1. Restart the device (fully off, then on) 2. Leave the device with the antenna facing up in a place with clear view of the sky, avoiding dense trees or thick roofs. If it's a cold start it could take up to 10 minutes for a lock on some cases. 3. Open the case and check that the gps antenna (small ceramic piece glued to the top of the battery) is in good state and place, facing up.
GXAIRCom does not connect to my bluetooth.	<ol style="list-style-type: none"> 1. Restart the device (fully off, then on)
GXAIRCom does not show on my phone wifi for configuration, or drops out the connection.	<ol style="list-style-type: none"> 1. Probably you have “turn off wifi after 3 minutes” selected on the options to save battery. This causes the wifi to disappear after 3 minutes so you only can configure the device during the first 3 minutes after turning it on. Try to turn off the device and turn it on again. 2. If you have a wifi, but it connects and disconnects, look if your phone is preferring another wifi network that has internet. Manually connect to the GXAIRCom or delete all the other local networks so the phone will connect to the GXAIRCom network.

	<p>3. You could have selected the wrong board. The TTGO V0.5-0.7 has a memory issue so to handle bluetooth and wifi at the same time you need to select it on the general settings. If you already have configured bluetooth but did not select the right board, then your device would be inaccessible. The fix is to do a Clean Flash of the whole firmware to regain access to the web configuration option of GXAirCom.</p>
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FINAL NOTES

This is a work in progress. It can change at any time. It's prone to human error, and is really sensitive to hardware variations from the manufacturers. We can not give any kind of warrant for the operation of this software. Feel free to contact us for any issues that you find, bugs, suggestions, etc. We will try to find the time to address any problems or implement any upgrades necessaries to keep this project working.