

# User Manual XC Tracer II



## Quick Start Guide

XC Tracer II, based on the proven and reliable XC Tracer, is a highly accurate variometer powered by a solar cell. XC Tracer II is using data multiple sensors (9 DOF IMU, pressure sensor, GPS) to compute the real time climb rate and altitude, avoiding the undesired time lag that conventional variometers suffer from due to data filtering. The GPS also provides real time flight speed and direction. All the relevant data is then sent in a custom data string to an iOS or Android tablet or phone via Bluetooth Low Energy. Of course the variometer still indicates the lift / sink rate with beeping tones!

Use the velcro to attach XC Tracer II to the shoulder strap of your harness, or to your cockpit, or onto your thigh. *(NB. Do not attach it to your helmet or hang it round your neck using a cord!)* Position the device in such a way that the solar cell catches as much sunlight as possible during the flight.

Switch on XC Tracer by pressing and holding the red button until you hear beep-beep. The GPS will then search for a fix. The vario will make some beeping sounds once the GPS has a fix, and the orange LED will start blinking every 2-3 seconds. Don't worry if you forget to switch on XC Tracer before taking off, you can switch it on whilst flying.

The vario won't beep on the ground, but as soon as you're flying XC Tracer II will indicate the lift / sink rate with beeping tones. XC Tracer II has four volume settings: mute, gentle, medium and loud. You can change the volume setting with a short push of the red button, always cycling from mute – gentle - medium – loud – mute – gentle etc.

Once you've landed, turn off XC Tracer II by pressing and holding the red button until you hear beep-beep (after approximately 3 seconds). XC Tracer II will then switch off and the LED will stop blinking.

## Introduction

XC Tracer II, based on the proven and reliable XC Tracer, is a flight instrument for paraglider pilots. Many pilots use XC Tracer for competitions and for long XC flights. The lag-free indication of lift / sink makes it much easier to find and core thermals than when using a conventional variometer. You can also use XC Tracer II as an IGC logger – the files are accepted by the FAI for competitions.

XC Tracer II has a built-in solar cell that delivers 3x more energy than is needed for running the device (when oriented perpendicular to the sun). The surplus energy is stored in a lithium polymer battery. The variometer will run for more than 20 hours with a fully charged battery without any sun, depending on the sound level. The built-in battery can be charged over the Micro USB connector should this ever be necessary.

The device has a built-in Bluetooth Low Energy BLE 4.0 module – the BLE strings that your phone, tablet or e-reader needs are configured in the XC Tracer configuration file. A list of compatible iOS and Android apps and their corresponding BLE string settings can be found on [www.xctracer.com](http://www.xctracer.com). But you can not only use BLE, it is also possible to connect to another device using an USB cable.

Of course XC Tracer II also indicates the climb / sink rate with beeping tones and the good thing is that you can modify the tone settings using the tone simulator on [www.xctracer.com](http://www.xctracer.com).

## Mounting

XC Tracer II uses data from a 9-DOF IMU (9 Degrees Of Freedom Inertial Measurement Unit), and from a pressure sensor, to compute the real-time climb rate and altitude, avoiding the undesired time lag that conventional variometers suffer (due to data filtering). For this reason mount your XC Tracer in such a way that it moves as little as possible whilst you're flying.

*Important: make sure the XC Tracer isn't dangling from a cord or attached to your helmet. The best approach is to attach XC Tracer to your cockpit, or on the shoulder strap of your harness, or on your thigh.*

But when attaching XC Tracer II, please remember that it needs to have the best possible view of the sun in order to maximize solar charging.

## Switch On/Switch Off

Turn XC Tracer II on by pressing and holding the red button until you hear beep-beep. Next the battery charge status is indicated by a series of beeps (this feature is described further below). It will then take a further 5-60 seconds for the GPS to get a fix. XC Tracer II will then make beep-beep-beeeeeep and it's now ready for flight.

Turning XC Tracer II off is just the same – press and hold the red button until you hear beep-beep. XC Tracer II will write the log file to the SD card and switch off.

## **Battery Indicator**

After switching the device on the battery charge status is indicated with a sequence of short beeps:

5x Beep means that the battery is charged 95% or more.

4x Beep means that the battery is charged 75% or more.

3x Beep means that the battery is charged 55% or more.

2x Beep means that the battery is charged 35% or more.

1x Beep means that the battery is charged 15% or more.

When the battery is less than 15% charged you will hear a constant beep for one second after switching the device on.

After indicating the battery charge XC Tracer II's GPS now searches for a fix. A beep-beep-beeeeeep indicates that the device is now ready for flight.

## **Energy Management**

Normally the solar cell delivers enough energy to power XC Tracer II and charge the battery at the same time when flying. But on occasion the device might slowly discharge during a flight if it's been in your shadow for long periods, or if the sun is low, or if the sky is overcast etc. Perhaps the next flight might be different, with enough sunshine to power the device and charge the battery; however it's always a good idea to switch off the device immediately after landing.

Should it ever be necessary you can charge XC Tracer II using a Micro USB cable. It takes approximately 5 hours to fully charge the battery so it's best to leave it charging overnight.

## **Automatic Switch-Off**

Automatic switch off is disabled during the first 30 minutes after switching XC Tracer II on, however after that it will turn itself off if it hasn't detected lift or sink for 1 minute – ie. after you've landed. In addition, low-voltage detection will switch the device off if the battery voltage drops below 3.3V.

## **Adjusting The Volume**

XC Tracer II has 4 volume settings: Mute, gentle, medium and loud. You can change the volume setting with a short push of the red button, always from mute – gentle - medium – loud – mute – gentle etc. (NB. The log file is written to the SD card before the device turns off).

## XC Tracer II Configuration File

Connect XC Tracer II to a computer using a Micro USB Cable and once connected, switch the device on by briefly pressing the red button until you hear a beep-beep-beep. XC Tracer II is now running in USB-MSD (Mass Storage Device) mode. XC Tracer II's internal Micro SD Card will appear as an external drive in Windows Explorer or the Mac Finder. You will find a PDF copy of the user manual on the SD card, and also the XC\_TRACER\_II.TXT configuration file. Editing this file in Notepad (Windows) or Text Editor (Mac) allows you to adjust XC Tracer II's settings. The various options are described below:

### # XC Tracer II Configuration File

*serialNumber=6042CE915601*

Serial number of XC Tracer, is used for the IGC logger.

*firmwareVersion=XC\_Tracer\_II\_R01*

Indicates the device's firmware version.

*reset=no*

Setting *reset=yes* resets XC Tracer II to the factory default settings. *Reset=no* is the default setting. After a reset *reset=no* will automatically be set in the config file.

*# supported protocols are None, XCTRACER, LK8EX1 or LXWPO*

Select the BLE protocol her. NB. Only one protocol can be selected at once. Please check at [www.xctracer.com](http://www.xctracer.com) which protocol to choose for your app.

*stringToSend=LXWPO*

In this case the LXWPO protocol will be will be used.

*forwardGPSSentences=yes*

With *forwardGPSSentences=yes* the NMEA strings from the GPS will be sent directly over BLE. Again, please check at [www.xctracer.com](http://www.xctracer.com) if this is necessary of not for your App.

*# supported connections are BLE, USB, BOTH or NONE*

*sendDataOver=BLE*

Her you can choose if data will be sent, and you can also choose the interface over wich the data will be sent. NONE will not transfer any data, with BOTH XC Tracer will send data over BLE and USB.

*# power on USB connector can be ON or OFF*

*powerUSB=OFF*

*powerUSB=OFF* is the factory setting. If you want to connect a Kobo without an external battery you have to set *powerUSB=ON*. XC Tracer II will then internally produce 5V that are

necessary to switch on the USB part of the Kobo. Please be aware that setting powerUSB=ON leads to a higher power consumption, and it may be possible that the internal battery of XC Tracer II is going to discharge slowly during a flight.

*# supported log formats are None, IGC, and KML*

Here you can choose the log format that will be saved on the SD card. You can log nothing, or you can log a signed IGC file for XC Contest and the like, or you can log a KML file that you can import directly to Google Earth. IGC files are logged at 1Hz, and KML files are logged at 5Hz, meaning that position and altitude will be logged 5x per second.

*logFormat=KML*

With *logFormat=KML* you will record a KML file. With *logFormat=IGC* you will log an IGC file, and with *logFormat=None* nothing will be recorded.

*logOnlyWhenFlying=yes*

When *logOnlyWhenFlying=yes* is set then a log file will be recorded once the GPS has recorded a speed greater than 4m/s. The logging will get stopped when you have landed. When you make a top landing the log file will be stopped, and a new log file will get created when you take off again. When *logOnlyWhenFlying=no* is set then a log file will be recorded as soon as you switch on XC Tracer, and the logging will only be stopped when you switch off the device.

*pilotName=Koni Schafroth*

Enter your name here. Please don't use accidentally use any tabs as they will invalidate the IGC file. Spaces are fine.

*passengerName=*

You can enter the name of a tandem passenger here if you like.

*gliderType=Gin Explorer*

Enter your glider make and model here.

*gliderId=14049*

Enter the immatriculation number (if you have one) of your glider here.

*# create your own vario tone settings below*

*beepOnlyWhenFlying=yes*

When this is set XC Tracer II will be silent before takeoff. This is very helpful when you have configured some kind of a thermal sniffer. With *beepOnlyWhenFlying=yes* the variometer will be silent until XC Tracer II detects a horizontal velocity of 4m/s or more during 1-2 seconds. With *beepOnlyWhenFlying=no* the variometer will beep not only in flight, but also when you walk or move.

*setVolume=2*

There are four volume settings, 0-3. With this option you set the volume that the vario will use for beeping. When *beepOnlyWhenFlying=yes* is set then the vario will be silent until you fly. Once you're flying the vario will beep with the volume that you have set. Remember though, that you can change the volume during flight with a short press of the red button.

*dampingFactor=0.00*

Here you can set a damping factor from 0 up to max 10. As soon as you set a damping factor then the vario will react slower to changes in altitude.

*ClimbToneOnThreshold=0.2*

With this setting the vario will begin to beep when the climb rate is higher than 0.2m/s. When you want to use a thermal sniffer then you can set *ClimbToneOnThreshold=-0.5* for example. In this case the vario will begin to beep when the sink rate is less than -0.5m/s. In this way you can adjust the beeping tone so that you know when you're flying in lifting air, despite the fact that you're actually sinking gently. This can be helpful to find and core thermals in weak conditions.

*ClimbToneOffThreshold=0.1*

With this setting the vario will stop beeping when the climb rate is below 0.1m/s. You can also use negative values here, for example -0.51m/s when you use a thermal sniffer.

*SinkToneOnThreshold=-3.0*

The sink tone will be activated when the sink rate is below -3m/s.

*SinkToneOffThreshold=-3.0*

The sink tone will be deactivated when the sink rate is less than -3m/s.

*tone=-10.00,200,100,100*

*tone=-3.00,280,100,100*

*tone=-0.51,300,500,100*

*tone=-0.50,200,800,5*

*tone=0.09,400,600,10*

*tone=0.10,400,600,50*

*tone=1.16,550,552,52*

*tone=2.67,763,483,55*

*tone=4.24,985,412,58*

*tone=6.00,1234,332,62*

*tone=8.00,1517,241,66*

*tone=10.00,1800,150,70*

You must define exactly 12 tones. Additional tones will be deleted from the configuration file, and missing tones will be complemented with values stored in the Eeprom. The tones must be defined ascending from tone 1 of -10m/s to tone 10m/s of tone 12.

*Important: Please avoid using exactly the same climb rate on adjacent tones as it will create problems.*

*tone=1.16,579,527,50* means that with a climb rate of 1.16m/s the vario will beep with a frequency of 579Hz, that the complete tone interval will last 527ms, and that the tone will be audible for 50% of the tone interval. This is a typical tone that is used when indicating climbing.

*tone=-3.00,280,100,100* means that with a sink rate of -3.0m/s a tone of 280Hz will be emitted. As soon as the sink rate changes the tone frequency also changes, depending on the configuration. This creates a nice sink tone (not that a sink tone is ever nice!)

You can create your own tone settings using the tone simulator on [www.xctracer.com](http://www.xctracer.com) and then copy and paste them to the configuration file, or you can simply copy and paste other people's tone settings to the configuration file.

XC Tracer II doesn't actually save the new configuration into its internal memory until it starts up in normal flight mode. So, press the red button briefly to unmount / eject the device from your computer, disconnect it from the USB cable, then turn XC Tracer on as normal.

*Important: Always close the configuration file before you unmount / eject XC Tracer II!!!*



## **XC Tracer II Firmware Update**

Connect XC Tracer II to a computer using a Micro USB Cable and once connected, switch the device on by briefly pressing the red button until you hear a beep-beep-beep. XC Tracer II is now running in USB-MSD (Mass Storage Device) mode. XC Tracer II's internal Micro SD Card will appear as an external drive in Windows Explorer or the Mac Finder. Download the newest firmware for XC Tracer II from [www.xctracer.com](http://www.xctracer.com) and copy the new firmware using drag and drop to the SD card. Now press the red button briefly and the new firmware will start to be installed. During installation XC Tracer II will make a few beeps, then delete the firmware file from the SD card and finally switch off. The new firmware is now installed and the device is now ready to use.

*Important: The information about the firmware version will only be updated once the device has been started up in normal flight mode.*

It's impossible to install incorrect firmware on the XC Tracer II – all that happens is that the incompatible firmware will get deleted from the SD card.

## **Troubleshooting**

In the rare event that XC Tracer II doesn't respond when you push the red button, you can perform a hard-reset by pressing and holding the red button for approximately 1 minute. The battery will then get disconnected from the electronics. After that you can restart XC Tracer II in flight mode, and the device will be functional again.

## **Warranty**

XC Tracer grants a 24 month warranty for material and workmanship. Unsuitable or improper use (for example strong impact, water landing, opened enclosure, software modification, ripped off USB connector, scratched solar cell etc.) normal wear and tear (battery) are excluded from the guarantee.

## Technical Data

Time-lag free indication of climb / sink rate

Data transmission to cell phone / tablet / e-reader using BLE 4.0 and/or USB

Many compatible Apps for Android / iOS

IGC / KML Logger

Extremely easy operation

Firmware update by Drag & Drop

User configurable acoustics / tone setting with tone simulator at [www.xctracer.com](http://www.xctracer.com)

State of the arte electronics including a 9-DOF IMU, GPS, BLE and mems pressure sensor

Solar cell with 22.5% efficiency

Runtime with fully charged battery min. 20h

Size: 57.5 x 57.5 x 17.5 mm

Weight 61g