User Manual XC Tracer Mini V

Quick Start Guide

XC Tracer Mini V is a high precision solar variometer with GPS and integrated FLARM / FANET. XC Tracer Mini V transmits your position once per second and also your estimated trajectory for the next 20 seconds. Any other FLARM devices in the vicinity can use this information to assess any possible risk of collision. If another FLARM device determines that a collision is possible, it will warn the pilot of the other aircraft. XC Tracer Mini V itself does not warn of possible collisions with other aircraft.

Many pilots use XC Tracer flight instruments for long XC flights and for competitions. But also for pilots with little flying experience an XC Tracer Variometer is the perfect choice. The lag-free indication of lift / sink rate makes it much easier to find and core thermals than when using a conventional variometer. Data like airspeed, altitude, climb, course etc can be sent via BLE (Bluetooth Low Energy 4.0) to a mobile phone, tablet or e-reader.

Attach the XC Tracer Mini V to the cockpit or thigh with the supplied velcro (Important: do not attach to the helmet or hang it around your neck with a leash!). Align the variometer as best you can so that the sun shines on the solar cell during flight. Turn your XC Tracer Mini V on before take-off (or during flight) by pressing the red button until you hear a "beep-beep", then release the button. The GPS will now search for a fix, and as soon as it has a fix the vario makes a beep-beep-beeeeep, and the white LED starts flashing every 2-3 seconds.

The vario will remain silent whilst you're still on the ground, but as soon as you take off it will start beeping. The XC Tracer Mini V has 5 volume levels: silent, quiet, gentle, medium and loud. The volume can be changed by briefly pressing the red button in the following order: silent - quiet – gentle - medium - loud - silent - quiet - etc.

After landing, turn the XC Tracer Mini V off by pressing and holding the red button until you hear a beep-beep in descending order, then release the button. The white LED stops flashing, indicating that it's now off. If you forget to turn it off it will turn itself off automatically if it detects a low battery.

Important: Before disconnecting from the computer, please always eject the SD card on the computer.

WARNING: Charge the battery with the USB cable on the PC or on a 5V charger. Only a 5V connection / charger may be used, do not use Fast Charge / Quick Charge / Super Charge / Turbo Power or whatever. If a voltage higher than 5V is used while charging, the electronics will be destroyed. Never use a cheap charger; this can damage your XC Tracer Maxx II.

We accept no responsibility for damage which occurs when not using the correct voltage for charging!

Introduction

XC Tracer Mini V is a high precision solar variometer with GPS and integrated FANET and FLARM. XC Tracer Mini V transmits your position twice per second and also your estimated trajectory for the next 20 seconds. Any other FLARM devices in the vicinity can use this information to assess any possible risk of collision. If another FLARM device determines that a collision is possible, it will warn the pilot of the other aircraft. XC Tracer Mini V itself does not warn of possible collisions with other aircraft.

Many pilots use an XC Tracer variometer for long XC flights and competitions. The vario has a lag-free indication of lift/sink rate that makes it much easier to find and core thermals than when using a conventional variometer. Data like airspeed, altitude, climb, course etc can be sent via Bluetooth Low Energy 4.0 and/or over USB to a mobile phone, tablet or e-reader.

The XC Tracer Mini V is also an IGC logger, the IGC files are recognized by the FAI for paragliding competitions. The XC Tracer Mini V has a built-in lithium polymer battery, which when fully charged lasts for roughly 30 hours of continuous operation without sunshine. The battery can be charged using the supplied USB-C cable. The XC Tracer Mini V also features a Bluetooth module. Via Bluetooth Low Energy 4.0, data such as airspeed, altitude, climb, course etc. can be sent to a mobile phone, tablet or e-reader. Please visit www.xctracer.com to see which apps need to be configured with which BLE strings.

Mounting

XC Tracer Mini V uses data from a 9-DOF IMU (9 Degrees Of Freedom Inertial Measurement Unit), and from a pressure sensor and a GPS, to compute the real-time climb rate and altitude, avoiding the undesired time lag that conventional variometers suffer from (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 Mini V 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 Mini V, 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 Mini V 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 10-120 seconds for the GPS to get a fix. XC Tracer Mini V will then make beep-beep-beeeeep and it's now ready for flight.

Turning XC Tracer Mini V off is just the same – press and hold the red button until you hear beep-beep. XC Tracer Mini V 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 by 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 Mini V's GPS now searches for a fix. A beep-beep-beeeeeep indicates that the device is now ready for flight.

Energy Management

Normally the energy of the solar cell is sufficient to power the XC Tracer Mini V and to charge the lithium polymer battery during a flight. However, it is possible that due to unfavourable conditions such as mounting the vario in the pilot's shadow, low sun position, cloudy sky etc., not enough energy is supplied by the solar cell to operate the variometer and charge the battery at the same time. In this case, the battery may slowly discharge during the flight. During the next flight it can be different again and the energy is sufficient to operate the vario and recharge the battery at the same time. After landing the vario should be switched off immediately to save energy.

Should it ever be necessary you can charge XC Tracer Mini V using an USB-C cable. It takes approximately 3 hours to fully charge the battery so it's best to leave it charging overnight.

WARNING: attempting to charge your XC Tracer Mini V by placing it in hot sunshine when not flying may result in it overheating and damaging the battery any other components!

WARNING: If necessary, charge the battery with the USB cable on the PC or on a 5V charger. Only a 5V connection / charger may be used, do not use Fast Charge / Quick Charge / Super Charge / Turbo Power or whatever. If a voltage higher than 5V is used while charging, the electronics will be destroyed.

We accept no responsibility for damage which occurs when not using the correct voltage for charging!

Automatic Switch-Off

The automatic switch off is disabled on XC Tracer Mini V. The vario will run as long as the voltage of the battery does not drop below 3.3V. (NB. The log file is written to the SD card before the device turns off.

So you will always to have to switch off the vario yourself after landing!

Adjusting The Volume

XC Tracer Mini V has 5 volume settings: Silent, quiet, 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 – quiet etc.

XC Tracer Mini V Configuration File

Connect XC Tracer Mini V 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 Mini V is now running in USB-MSD (Mass Storage Device) mode. XC Tracer Mini V'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_Mini_V.txt configuration file. Editing this file in Notepad (Windows) or Text Editor (Mac) allows you to adjust XC Tracer Mini V's settings. The various options are described below:

XC Tracer Mini V configuration File

VarioSerialNumber=98D27963B197

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

VarioFirmwareVersion=XC_Tracer_Mini_V_R01

Indicates the device's firmware version.

RadioFirmwareVersion=7.07-0.9.54

Indicates the firmare version of the radio module / FLARM / FANET

RadioExpireDate=20231201

Indicates the expiry date of the radio firmware.

RadioID=200037

This is the Radio ID / Fanet ID / Flarm ID

reset=no

Setting *reset=yes* resets XC Tracer Mini V 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, XCTRACERW, LK8EX1, LXWP0 or LXWPW

Select the BLE protocol her. NB. Only one protocol can be selected at once. Please check at www.xctracer.com which protocol to choose for your app. LXWPW is the same as LXWP0, but with the information of the calculated wind.

stringToSend=LXWP0

In this case the LXWP0 protocol will be will be used.

name of BLE service

bleName=XCT

A name for the BLE service can be assigned here, up to 12 numbers and letters are possible.

 # 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 BLE XC Tracer will send data over BLE.

 # logger configuration

IGC and KML files are logged in parallel. IGC is logged with 1Hz, and KML is logged with 5Hz, meaning that position and altitude will be logged 5x per second.

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 toplanding the log file will be stopped, and a new log file will get created when you take off again. When *logOnlyWhenFlying=no* is set thena 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 II

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 Mini V 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 Mini V 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 five volume settings, 0-4. 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 fron 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!)

Fanet Region

EU868

There is nothing to add here, it only displays the regional Fanet setting

Radio Settings

FANET=ON or FANET=OFF

CollisionAvoidance=ON or CollisionAvoidance=OFF

Here you can disable FANET and / or Collision Avoidance (FLARM).

 # Glider type is HANGGLIDER or PARAGLIDER

Here you can enter either HANGGLIDER or PARAGLIDER.

 # Obstacle warning is NEVER, 1x, 2x, 3x or ALWAYS

obstacleWarnings=not yet implemented

Obstacle warnings are not yet implemented, this will follow in one of the next firmware updates

 # Live tracking in Open Glider Network

liveTracking=yes or liveTracking=no

Here you can define if you want to be visible on OGN / Glidertracker / Burnair. It is recommended to set this to liveTracking=yes, this may help in case of an accident.

You can create your own tone settings using the tone simulator on 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 Mini V 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 Mini V!!!

Radio Firmware Update

The Radio firmware must be updated once a year. In the config file you can see which firmware version is installed and until when this firmware is valid.

After this expiration date Flarm will not work anymore! An update must be done before this date!

Please check the homepage www.xctracer.com if a new Radio firmware (*.efw file) is available. These firmware updates are free of charge, the installation is easy done with drag & drop. For instructions on how to do a firmware update see below.

Collision Warning

XC Tracer Mini V transmits your position once per second and also your estimated trajectory for the next 20 seconds. Any other FLARM devices in the vicinity can use this information to assess any possible risk of collision. If another FLARM device determines that a collision is possible, it will warn the pilot of the other aircraft. XC Tracer Mini V itself does not warn of possible collisions with other aircraft.

XC Tracer Mini V itself does not warn of possible collisions with other aircraft!

XC Tracer Mini V can receive signals from FANET devices on paragliders and hang-gliders and transmit the data to a mobile phone, tablet or e-reader. Depending on the app you use, you will know in real-time where your buddies are! During flight tests, signals were received from FANET devices up to 120 km away.

The open sourc obstacle database is not yet implemented. This feature will get integrated in one of the next firmware releases.

XC Tracer Mini V Firmware Update / How to read flight data

Connect XC Tracer Mini V to a computer using USB-C Cable and once connected, switch the device on by briefly pressing the red button until you hear a beep-beep-beep. XC Tracer Mini V is now running in USB-MSD (Mass Storage Device) mode. XC Tracer Mini V's internal Micro SD Card will appear as an external drive in Windows Explorer or the Mac Finder. Download the newest fligth firmware for XC Tracer Mini V and the newest Radio firmware from 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.

When the XC Tracer Mini V firmware (*.iap file) is updated, the white LED lights up, after a short time a few ascending beeps sound, the firmware file is deleted from the SD card and the Vario switches off. The new firmware is now installed.

An update of the Radio firmware takes a little bit longer, but the process is basically the same.

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 Mini V – all that happens is that the incompatible firmware will get deleted from the SD card.

Troubleshooting

In the rare event that XC Tracer Mini V 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 Mini V in flight mode, and the device will be functional again.

Handling

A variometer is a sensitive device, the sensors and the solar cell can be damaged by strong shocks / impacts. Please only expose the vario to the sun while flying, otherwise the vario can become very hot. This can lead to an overheating of the battery and destroy the battery and the vario! The solar cell can also be damaged by excessive heat. The vario is not waterproof, so do not use it for safety training over the lake. And also do not wash in the washing machine...

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.) and normal wear and tear (battery) are excluded from the warranty.

Technical data

- Size: 69.5 x 49.5 x 16.5 mm
- Weight 43g
- Solar panel with 22.5% efficiency
- 30h battery life without sunshine
- Easy operation
- Lag - free indication of climb/descent rate
- FLARM / FANET, miniaturized antenna
- Open source obstacle database (not yet implemented)
- Data transfer via BLE to mobile phone/tablet/e-reader
- IGC and KML logger, approved by FAI for competitions
- Many compatible apps for Android/iOS
- Freely configurable sound settings/sound simulator on xctracer.com
- Accelerometer/Compass/Gyro/Baro/GPS/BLE/FLARM/FANET
- GPS module with simultaneous reception of GPS and Galileo
- Drag & drop firmware update, USB-C connector
- CE & FCC certification (in process)
- Swiss made