



STONEX® X120^{GO}
SLAM Laser Scanner
User Guide



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Changelog

| GOapp | |
|----------------------|--|
| Version 2.6.6 | <ul style="list-style-type: none"> • Added screen rotation. • Added point size e X-ray modification. • Added button X-Whizz (only X70GO). • Added geotag button (only X70GO for now). • Changed logic for point cloud navigation. |
| Version 2.5.2 | <ul style="list-style-type: none"> • Added X-Whizz button (X70GO only). • Added button for geotag acquisition. |

| | |
|-----------------------|---|
| | <ul style="list-style-type: none"> • Added point list button. • Graphic improvement of preview. • Minor bug fixed. |
| Version 2.2.6 | <ul style="list-style-type: none"> • X70GO management • SC600+ status and info visualization • Other minor bugs |
| Version 2.0.10 | <ul style="list-style-type: none"> • Fixed overheating warning problem. • Real-time display optimised. • Added firmware upgrade warning icon. • Optimised 3D view. • Fixed problem with project page. • Language integration of Spanish, French and Japanese. |
| Version 1.10.0 | <ul style="list-style-type: none"> • Improved compatibility with the new version of the RTK antenna • Set the minimum number of characters for CORS account and password to 3 • Wi-Fi settings for Japan and Israel at 2.4GHz only. |

1. Legal Notice

1.1 Copyrights and trademarks

STONEX®, the STONEX® logo, and X120^{GO} are trademarks of STONEX® S.r.l.

STONEX® GOapp, STONEX® GOpost and STONEX® Reconstructor are trademarks of STONEX® S.r.l.

All other trademarks are the property of their respective owners.

1.2 Environmental recycling

The cardboard box, the plastic in the package and the various parts of this product have to be recycled and disposed of in accordance with the current legislation of your Country.

FOR COUNTRIES IN THE EUROPEAN UNION (EU)

The disposal of electric and electronic device as solid urban waste is strictly prohibited: they must be collected separately.

Contact Local Authorities to obtain practical information about correct handling of the waste, location, and times of waste collection centers. When you buy a new device of ours, you can give back to our dealer a used similar device. The dumping of these devices at unequipped or unauthorized places may have hazardous effects on health and environment.

The crossed dustbin symbol means that the device must be taken to authorized collection centers and must be handled separately from solid urban waste.



FOR COUNTRIES OUTSIDE EUROPEAN UNION (EU)

The treatment, recycling, collection, and disposal of electric and electronic devices may vary in accordance with the laws in force in the Country in question.

2. Introduction

2.1 General

Thank you for purchasing STONEX® X120^{GO} 3D Laser Scanner.

This manual includes important safety directions and instructions for setting up and using the product.

Please read this manual carefully before using, so that our products can serve you better.

When you begin to use the product, we assume that you are a competent user who has read through and understood the contents of this manual and is fully aware of the necessary dangers, warnings, and cautions.

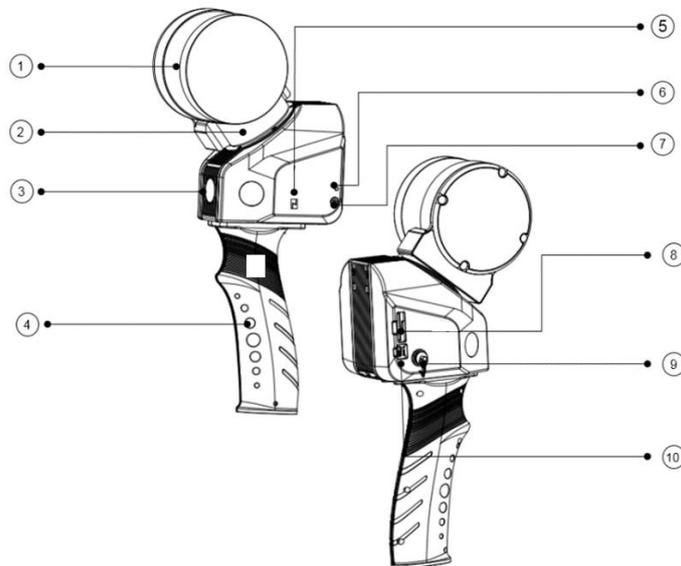
In the event of any discrepancy between the information contained in this manual and the actual, the actual information shall prevail, and the Company reserves the right to make further revisions or changes to this manual without notice.

X120^{GO} 3D Laser Scanner provides a simple and quick way to obtain 3D point cloud data of objects, outdoor or indoor, significantly improving work efficiency and speed.

Laser scanning is an automatic process during which real objects are surveyed and sampled almost completely to determine their location, size, orientation, and shape.

Thanks to its Lidar sensor, X120^{GO} can collect quick, accurate scans in 45 seconds to less than 4 minutes. Its lightweight makes it perfect for multiple easy scans over the scene.

2.2 Description of the system



1. Laser sensor
2. Rotatable Gimbal
3. Camera sensor
4. Handle
5. NFC

6. Status light
7. power button
8. SD card slot
9. Extension interface
10. USB interface

2.3 Precaution for safety

1. Avoid vibrations: when transporting, keep the instrument in the case and try your best to lighten vibrations.
2. Instrument carrying: when carrying, the instrument handle must be hold tight.
3. Check the battery power: before using the instrument, you should check the battery power whether it is enough.
4. Battery maintenance: if the instrument is not in using for a long time, the battery should be taken out from the instrument and stored in separate place. Meantime, the battery should be charged every month.
5. Taking out the battery: it is not suggested to take out the battery when the instrument is on. Otherwise, stored data may be lost. So, it is better to replace the battery after powering off the instrument.
6. High temperature condition: don't put the instrument in high temperature condition for a long time, it is bad for the instrument performance, and it can damage the hardware components.
7. Temperature changing sharply: the sharp temperature changing on the instrument will shorten the distance measurement range. For example, after taking the instrument out from a warm car to a cold condition, wait for some time: it can be used when it adapts the surrounding condition.
8. Noise from the instrument: when the instrument is working it is normal if you hear noises from instrument motors. They will not affect the instrument work.
9. Stored data responsibility: STONEX® should not be held liable for the lost data because of wrong operation.

2.4 Transport and shipping

TRANSPORT IN THE FIELD

1. When transporting the equipment in the field, always make sure that you
 - a. either carry the product in its original transport container,
 - b. or carry the tripod with its legs splayed across your shoulder, keeping the attached product upright.

TRANSPORT IN A ROAD VEHICLE

2. Never carry the product loose in a road vehicle, as it can be affected by shock and vibration.
3. Always carry the product in its transport container and secure it.

SHIPPING

4. When transporting the product by rail, air, or sea, always use the complete original STONEX® packaging, transport container and cardboard box or its equivalent to protect the instrument against shock and vibration.

SHIPPING AND TRANSPORT OF BATTERIES

5. When transporting or shipping batteries, the person in charge of the product must ensure that the applicable national and international rules and regulations are observed.
6. Before transportation or shipping, contact your local passenger or freight transport company.

FIELD ADJUSTMENT

7. After transport, inspect the field adjustment parameters given in this user manual before using the product.

2.5 Storage

Product

Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to technical datasheet for information about temperature limits.

Field adjustment

After long periods of storage, inspect the field adjustment parameters given in this user manual before using the product.

2.6 Cleaning and drying

- Never touch the cover glass with your fingers.
- Use only a clean, soft, lint-free cloth for cleaning.
- If necessary, moisten the cloth with water or pure alcohol. Do not use other liquids.
- Keep plugs clean and dry. Blow away any dirt lodged in the plugs of the connecting cables.

2.7 Definition of indication

For the safe of your product and prevention of injury to operators and other persons as well as prevention of property damage, items which should be observed are indicated by an exclamation point within a triangle used with WARNING and CAUTION statements in this manual.

The definitions of the indications are listed below.

Be sure you understand them before reading the manual's main text.



ATTENTION:

Ignoring this indication and making an operation error could possibly result in death or serious injury to the operator.



CAUTION:

Ignoring this indication and making an operation error could possibly result in personal injury or property damage.



ATTENTION

1. Do not perform disassembly or rebuilding. Fire, electric shock, or burn could result. Only STONEX® authorized distributors can disassemble or rebuilt.
2. Do not cover the charger. Fire could result.
3. Do not use deflection power cable, socket, or plug. Fire, electronic shock could result.
4. Do not use wet battery or charger. Fire, electronic shock could result.
5. Do not close the instrument to burning gas or liquid, and do not use the instrument in coal mine. Blast could result.
6. Do not put the battery in the fire or high temperature condition. Explosion, damage could result.
7. Do not use the battery which is not specified by STONEX®. Fire, electric shock, or burn could result.
8. Do not use the power cable which is not specified by STONEX®. Fire could result.

9. Do not short circuit of the battery. Fire could result.
10. When this product encounters disturbance of severe Electrostatic Discharge, perhaps it will have some degradation of performance like switching on/off automatically and so on.



CAUTION

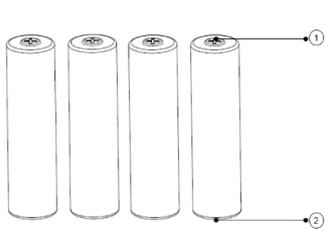
1. Do not touch the instrument with wet hand. Electric shock could result.
2. Do not stand or seat on the carrying case, and do not turn over the carrying case arbitrarily, the instrument could be damaged.
3. Do not drop the instrument or the carrying case.
4. Do not touch liquid leaking from the instrument or battery. Harmful chemicals could cause burn or blisters.
5. Do not drop the instrument. Series damage could result.
6. Before use it, check the central screw is tight.

2.8 Safety standards for lasers

STONEX® X120^{GO} series adopt the class of Laser Product according to IEC Standard Publication 60825-1 Amd. 2:2001. According to this standard, the device is classified as Class 1 Laser Product.

2.9 Battery

The X120^{GO} scanner is equipped with 4 rechargeable batteries as standard, with a single battery capacity of 3350mAh and a voltage of 4.2V. The scanner needs to be loaded with 4 standard rechargeable batteries for normal operation, and the continuous working time of each group (4 batteries) is about 2.5 hours.



1. Positive pole
2. Negative pole

Use the battery properly according to the product specification, do not disassemble or short circuit the battery. Keep away from sources of heat or ignition: over high temperature will make the cell inflate melt the separator, causing short circuit.

The storage area should be cool, dry, well ventilated, out of direct sunlight, away from metal or sharp edge, such as keys pins or wires. Store the battery in a charged state and charge it every 6 months.

Precautions for safety

1. The battery should be placed in the battery clip during transportation to avoid contact with liquids or bumps with hard objects. Do not immerse the battery in water or get it wet. Never use the battery in the rain or a wet environment. When the inside of the battery comes into contact with water, a decomposition reaction may occur, causing the battery to spontaneously ignite or even explode.
2. If the battery accidentally falls into the water, immediately remove the battery and place it in a safe open

area until it is completely dry. Dried batteries should not be used again and should be disposed of properly according to the disposal methods in this article.

3. If the battery catches fire, please use water, water mist, sand, fire blanket, dry powder, and carbon dioxide fire extinguisher to put out the fire immediately. Please select the fire extinguishing method in the above-recommended order according to the actual situation.
4. It is strictly forbidden to use batteries not officially provided by STONEX®. If you need to replace a new battery, please buy it through designated channels. STONEX® is not responsible for battery accidents and device failures caused by the use of batteries not officially provided by STONEX®.
5. The battery storage temperature and humidity requirements are -20°C ~45°C, 45%~90% RH;
6. It is strictly forbidden to use bulging, leaking, damaged batteries and charging them. Do not use it when the battery emits an odor, heats up, the temperature of the battery itself exceeds 60°C, is deformed, discolored, or has any other abnormality. If the battery is abnormal, please contact STONEX® or other agents designated by STONEX® for further processing.
7. Please use the battery in an environment where the temperature is between -10°C and 60°C C. Excessive temperature (above 60°C) may cause the battery to catch fire or even explode. Too low temperature (below -10°C) will seriously damage the battery.
8. It is forbidden to use the battery in an environment of strong static electricity or magnetic field. Otherwise, the battery protection board will fail.
9. Do not disassemble or puncture the battery in any way with sharp objects. Otherwise, battery leakage will cause fire or even an explosion.
10. Mechanical impact, crushing, or throwing of batteries is prohibited. Do not place heavy objects on the battery or charger.
11. The electrolyte inside the battery is highly corrosive. If it accidentally comes into contact with the skin or eyes, please immediately rinse with clean water for at least 15 minutes and seek medical attention immediately.
12. If the battery is dropped or subjected to external impact, please stop using the battery.
13. Do not heat the battery. Do not place batteries in microwave ovens or pressure cookers.
14. Do not place battery cells on conductive surfaces (such as metal tabletops, glasses, watches, jewelry, etc.).
15. Do not use wires or other metal objects to short-circuit the positive and negative electrodes of the battery.
16. If the battery connector is dirty, wipe it with a clean, dry cloth. Failure to do so will result in poor battery contact, resulting in energy loss or charging failure.

Battery storage

17. Please store the battery out of the reach of children and pets.
18. Do not place the battery near a heat source (stove or heater, etc.) and in a car on a hot day. Never store batteries in an environment above 60°C. The ideal storage ambient temperature is 22°C - 28°C.
19. Please store the battery in a dry environment.
20. Do not store the battery for a long time after the battery is completely discharged, to avoid damage to the battery cell caused by the battery entering the over-discharge state, otherwise it will not be able to be restored to use.

Battery care

1. Do not overcharge or over-discharge the battery, otherwise, it will cause damage to the battery.
2. If the battery is left idle for a long time, its performance will be affected.
3. Do not use the battery in an environment where the temperature is too high or too low.

4. Do not store batteries where the ambient temperature exceeds 60°C.

Battery disposal

1. Be sure to completely discharge the battery before disposing of the battery in the designated battery recycling bin. Batteries are hazardous chemicals and should not be disposed of in ordinary trash cans. For details, please follow local battery recycling and disposal laws and regulations.
2. If the battery cannot be completely discharged, do not dispose of the battery directly in the battery recycling box, and contact a professional battery recycling company for further processing.

Battery specifications

| | | |
|----------------------------------|--|---|
| Type | Rechargeable 18650 pointed Lithium Battery With Protective Plate | Positive pole needs to be pointed |
| Rated Voltage | 3.7V | |
| Battery Capacity | ≥3000mAh | Suggested Value |
| Charging Limit | Full Charge Voltage 4.2V Recharging Current ≥1.5A | If the charging current exceeds 4.2V or the charging current is lower than 1A, the charger provided by Stonex® cannot be used |
| Maximum Discharge Current | ≥3A | |
| Battery Protection Board | Conventional Protection Functions Such as Overcharge, Over-discharge, Overcurrent, and Overtemperature | Battery must have its own protective plate, otherwise there is a safety risk, and relevant safety certification is required |
| Battery Outer Diameter-D | 18.0mm ≤ D ≤ 18.9mm | |
| Battery Height-H | 68mm ≤ H ≤ 71mm | |

2.10 About User

1. The X120^{GO} Scanner must be used by trained operators only. When operating the X120^{GO}, please always follow basic safety precautions to prevent injury or damage to equipment.
2. The user is required to be a qualified surveyor or have a good knowledge of surveying, in order to understand the user manual and safety instructions, before operating, inspecting, or adjusting.
3. Do not operate the equipment if it shows obvious defects or damage. Please follow STONEX® service procedure to repair the equipment.
4. Please use only the components and accessories provided by the manufacturer.
5. Before operating the X120^{GO} for the first time, please read this manual completely.

6. The equipment contains electrical components and mechanical parts, so proper operation is required. Do not pull or bend the data transmission line forcibly.
7. Do not push any other objects into the data transmission line interface, place the device out of the reach of children, and do not modify or disassemble the X120^{GO} scanner under any circumstance without the prior written permission of STONEX®. Otherwise, the warranty would not be applied.

2.11 Exceptions from Responsibility

1. The user of this products is expected to follow all operating instructions and make periodic checks of the product's performance.
2. The manufacturer assumes no responsibility for results of a faulty or intentional usage or misuse including any direct, indirect, consequential damage and loss of profits.
3. The manufacturer assumes no responsibility for consequential damage and loss of profits by any disaster, such as earthquakes, storms, floods etc.
4. The manufacturer assumes no responsibility for any damage and loss of profits, due to a change of data, loss of data, an interruption of business etc., caused by using the product or an unusable product.
5. The manufacturer assumes no responsibility for any damage and loss of profits, caused by usage except for explained in the user manual.
6. The manufacturer assumes no responsibility for damage caused by wrong transport or action, due to connecting with other products.

3. Setting up the STONEX® X120^{GO}

3.1 Battery charging

Input: AC 100~240 V /50~60 Hz /600mA (MAX)

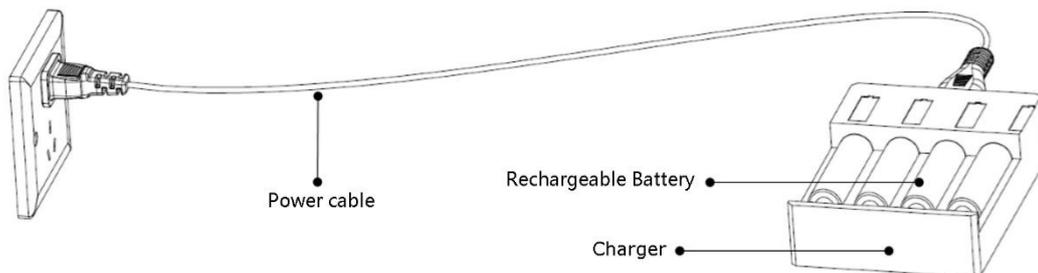
DC 12~24V 2000mA (MAX)

Output: DC 4.2V/1000mA (MAX) × 4

The four buttons A/B/C/D on the charger correspond to a charging slot respectively. Short press for 1 second, the current switches between 500mA and 1000mA; long press for 5 seconds, the two charging modes of lithium-ion battery and iron-lithium battery are switched. This charger defaults to the lithium-ion charging mode, and no switching operation is required.

AC Charging

- 1) Connect the power cord to the charger.
- 2) Put the battery to be charged into the battery slot of the charger, pay attention to the direction of the positive and negative electrodes.
- 3) Connect the power cord to an AC outlet with an output voltage in the range of 100~240V. The battery starts charging, and the battery is fully charged in about 3 hours.

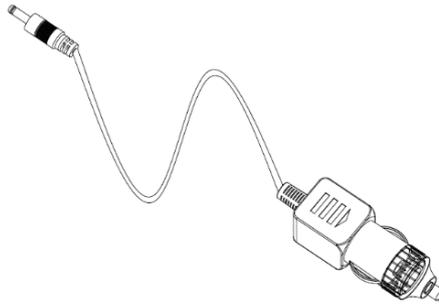


NOTE:

- The charger operating environment requirements are 0°C~40°C, 45%~90%RH.
- For safety reasons, the maximum time allowed by the charger to charge the rechargeable battery is 12 hours, and the charging will be stopped after 12 hours.
- The battery reverse connection or short-circuit charging protection is activated, the charger stops charging, and the error indicator "Err" is displayed.
- Please do not use equipment other than STONEX's official charger for charging.
- In case of damage or deformation of the battery skin, please do not continue to use it and dispose of it in time.
- Please use it in a dry environment and disconnect the power supply in time after charging.
- Please stay away from flammable materials and charge in the isolation area.

Vehicle-mounted charging

- 1) Connect the vehicle-mounted charging cable to the charger.
- 2) Put the battery to be charged into the battery slot of the charger, and pay attention to the orientation of the positive and negative poles.
- 3) Connect the power cord to the vehicle power socket, and the battery will start charging. The battery will be fully charged for about 3 hours.



3.2 Led status

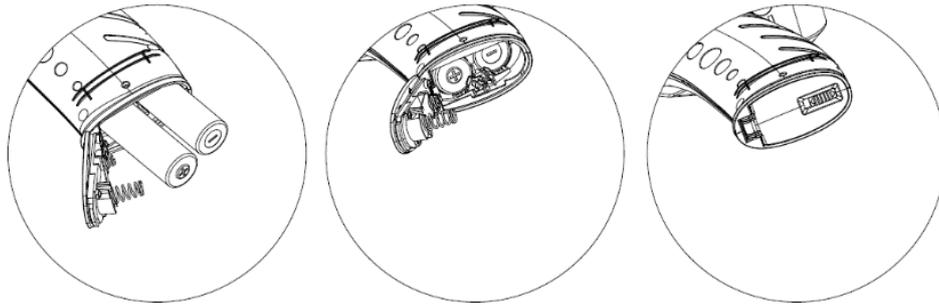
X120^{GO} handheld lidar scanner mainly has three-color status lights (red, yellow, green), which are used to indicate the current scanner working status and battery power information display. Please refer to the following table.

| | Working Status | Indicator Status |
|----------------------|-------------------------|---|
| POWER DISPLAY | Voltage > 14.0V | Green light (flashing slowly) |
| | 14.0V < Voltage < 12.3V | Yellow light (flashing slowly) |
| | 12.3V < Voltage < 11.8V | Red light (flashing slowly) |
| EQUIPMENT UPGRADE | Upgrading | On 200ms, cycle 400ms, white light |
| | Successful update | Steady on or flashing slowly (green, yellow, red) |
| | Upgrade failed | On 200ms, cycle 400ms, red light |
| WORKING STATUS | MCU upgrade | On 100ms, cycle 200ms, white light |
| | Device startup | Light on (green, yellow, red) |
| | Data collection | Light flashing on 800ms, the cycle 1500ms (green, yellow, red) |
| | Shutdown | Blue light flashing |
| SYSTEM SETTINGS | Restoration system | Press and hold the power button for 10 seconds, the status light turns blue, then press and hold the power button for 2 seconds, the status light off, and after 4 seconds, the status light changes to normal battery display mode |
| | Error state | Red light flashing quickly |

3.3 Setting up

Move the **battery** compartment cover lock at the bottom of the scanner handle forward, open the battery compartment cover, load batteries according to the requirements of positive and negative poles, and lock the battery lock in the handle.

Move the battery compartment cover lock backward to lock the battery compartment cover.



NOTE:

- Please check the battery power before starting each time to ensure that it is fully charged.
- Beware of battery falling damage during disassembly and assembly.

Press the scanner on key for 3 seconds for a long time, and the status indicator light is always green (the battery is fully charged). Wait for the laser head to start rotating, and then the equipment starts successfully.

Insert the memory card into the **SD card** slot with the golden finger side facing the back of the scanner.

NOTE: SD card must be inserted, or data will not be collected.

4. Operating the STONEX® X120^{GO}

4.1 How to use X120^{GO} without application

The X120GO scanner can be used without other devices. Follow the rules below for proper use:

- Turn on the scanner by pressing the power button for a couple of seconds and wait for the LiDAR head to start rotating.
- Place the scanner in a stable spot for initialisation. Press the power button once quickly. The green LED will start flashing indicating that the instrument is acquiring data correctly.
- Wait one minute for the instrument to initialise. Make sure that there are no persons or objects moving in front nearby.
- After one minute has passed, begin acquisition normally.
- If you wish to acquire a control point, place the scanner over a target or recognisable point and stand over this point for at least 10 seconds. After 10 seconds resume scanning normally.
- To end the scan, press the power button once quickly. The green LED will stop flashing, indicating the end of data acquisition.

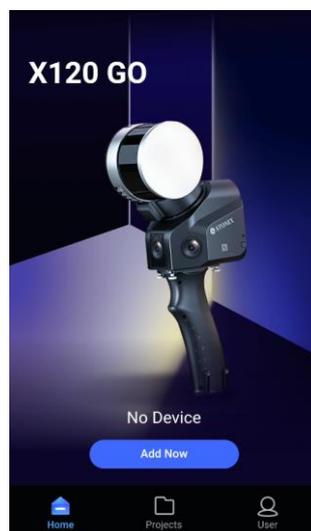
4.2 GOapp installation

GOapp is mobile APP for X120^{GO} for Android (8.0 version or above), which allows to perform operations such as project management, real-time point cloud puzzle display, image preview, firmware upgrade, etc.

1. Download on PC from here: [GOapp for Android](#)
2. Copy the *.apk file on the Android controller using an USB connection.
3. From Android, locate the *.apk file you just copied and click to start the installation.
4. Install it on your devices.

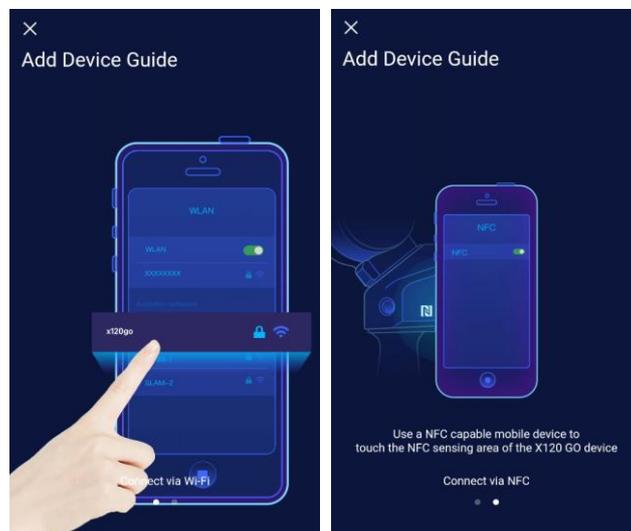
4.3 Device binding

The first time you open the GOapp, you will have the following page, where the **Add Now** button allows to bind a new device.



X120^{GO} supports two ways of binding to the homepage of APP:

1. Wi-fi connection
2. NFC



Wi-fi binding

Open the APP homepage, press and hold power button of X120^{GO} scanner for 3 seconds, wait for about one minute, and connect the Wi-Fi of your mobile phone. The password is 12345678.

X120^{GO} scanner equipment will automatically appear on the homepage.

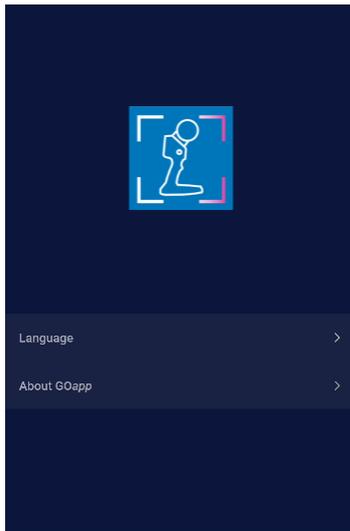
NFC binding

In the pop-up page of adding device boot, slide to the right to switch the second page to display NFC adding device boot.

Turn on the NFC switch of the mobile phone (the mobile phone needs to support NFC function) and stick the upper part of the back of the mobile phone (NFC sensing area) against the NFC tag on the key side of X120^{GO} scanner to connect and bind.

User settings

By clicking the user icon, the user settings page will open. In this page is possible to change the language, by clicking **Language** (English, Italian, Chinese available now), and is possible to check the installed applications version by clicking **About GOapp**.



4.4 Equipment work

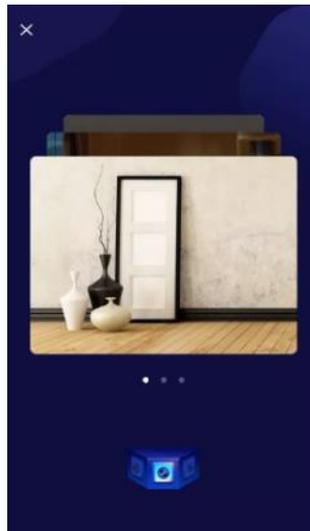
Connect the X120^{GO} scanner through mobile phone Wi-Fi, click on the online device with the green dot logo in the upper right corner of the APP page.



After successful connection, the equipment will be initialized. Click on **Start work** to start the scan.



You can also click on the camera icon  to take a set of pictures. Swipe left or right in the preview interface to switch the preview images taken by three cameras.



Device Status-Connection failed

If the device connection fails, please recheck the device connection status and troubleshoot one by one:

1. Check whether the Wi-Fi of X120^{GO} is connected to the mobile phone.
2. Check whether X120^{GO} status indicator keeps green and bright.
3. Exit the work interface, return to the home page, and check whether there is a green cursor in the upper right corner of the connected device icon.
4. Try to completely close the GOapp, clear the background of GOapp, re-enter GOapp and try to connect to the X120^{GO} device again.

If the connection fails when you re-enter the equipment interface after the above operation, please contact your local dealer for more assistance.

Device status-out of communication range

When GOapp is disconnected from X120^{GO}, the device status will prompt "Not in communication range". It is

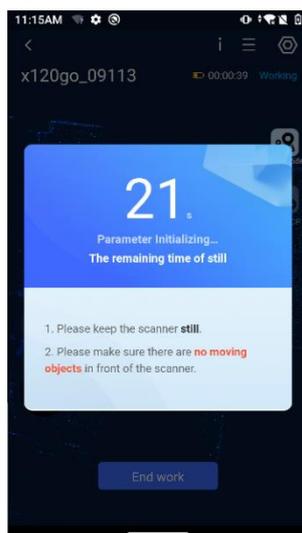
necessary to check whether the mobile phone is connected to the device Wi-Fi of X120^{GO}, or the distance between the mobile phone and the device is too far, and the Wi-Fi signal is weak or disconnected.

Device status - Device activation failed

If a device activation failed message appears, you need to connect the controller (phone/tablet) to an internet connection and open the application. Then the application will be able to perform synchronization.

Parameter initializing

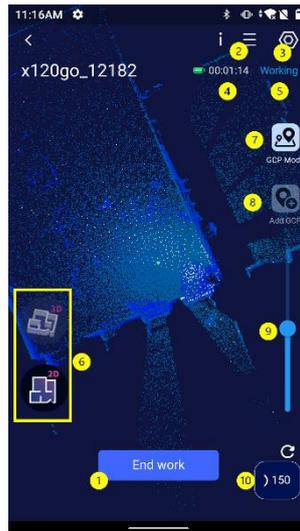
After clicking *Start work*, leave the scanner still to allow the laser scanner parameters to initialise for approximately one minute. Ensure that there are no moving objects in front of the scanner at this stage.



Working page

After connecting X120^{GO} through *GOapp*, the APP enters the standby page, and the system will automatically enter the working page and start to display the laser scanning data in real time by pressing the power button on the instrument.

The equipment interface includes stop acquisition button (1), equipment information (2), settings (3), working time (4), working status (5), switching 2D or 3D display function (6), enter in GCP Mode (7), add a GCP (8), slide bar to see different heights (9), number of images to be saved (10).



Click the *End work* button to stop the acquisition.

NOTE: After the acquisition, check that the count of the images to be saved is zero. If you turn off the scanner before the counter is set to zero, you will lose some images and will have problems in the colorization of the point cloud.

Working-real-time 3D scanning display

When the APP is in the standby interface, press the power key of X120^{GO} device briefly to start the operation, and the page will automatically jump to the 3D scanning display interface.



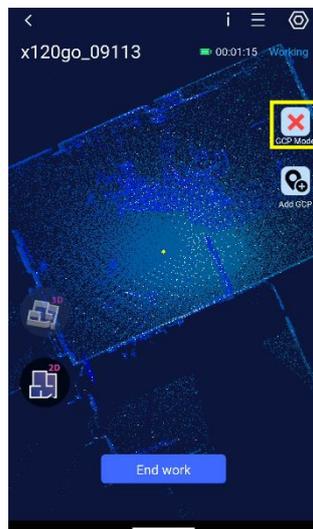
Working-View status information

In the process of X120^{GO} operation, click the "Equipment Information" button at the upper right corner of the working interface to view the current basic status information, motor status information, error status information and SD card information of X120^{GO} in real time.



GCP mode acquisition

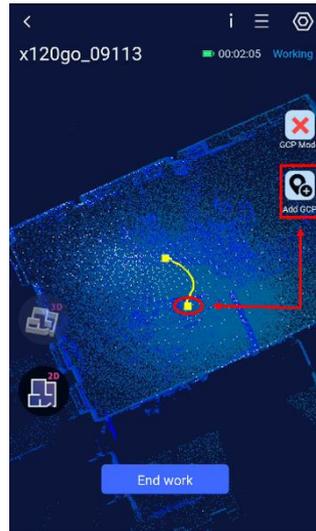
Clicking on the *GCP Mode* icon during a scan session, to enter the GCP acquisition mode.



In this mode it is possible to acquire ground control points while scanning. Once you have moved on to a control point, for example indicated by a target, you must centre the centre of the target via the cross in the base of the instrument. For further advice on how to acquire a GCP, please refer to [Chapter 10.5](#).

At this point, clicking on the *Add GCP* icon will save the point as a GCP. In addition to the message of successful acquisition, the new ground control point will be visible along the motion track by the presence of a yellow square,

one for each point acquired.



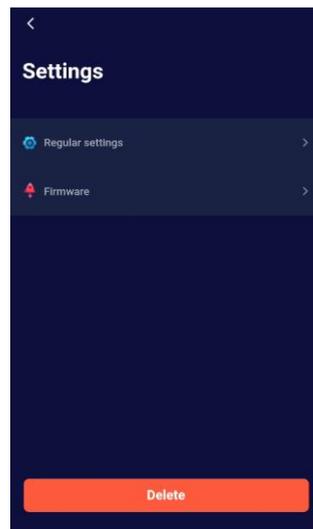
NOTE:

Once you have entered GCP Mode, you will not be able to finish your work by clicking *End work*. You must first click on the *GCP Mode* icon again to exit the point acquisition mode, and then you will be able to end the work.

4.5 Settings

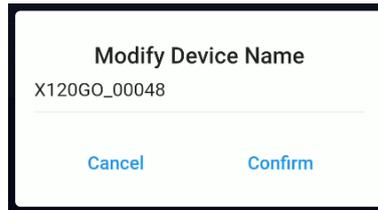
Click the "Settings" button in the upper right corner of the working interface to enter the setting interface. Click *Regular Settings* to enter the setting interface, where you can set the device name, camera parameters and Wi-fi settings.

Click *Firmware* to check the firmware version (refer to next chapter for more details).



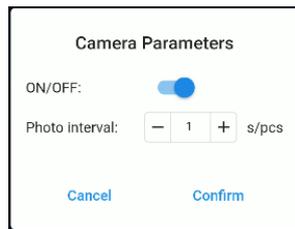
Modify device name

Click on the Device name, enter the content to be modified in the pop-up "Modify Device Name" dialog box, and click "Confirm" to modify the device name.



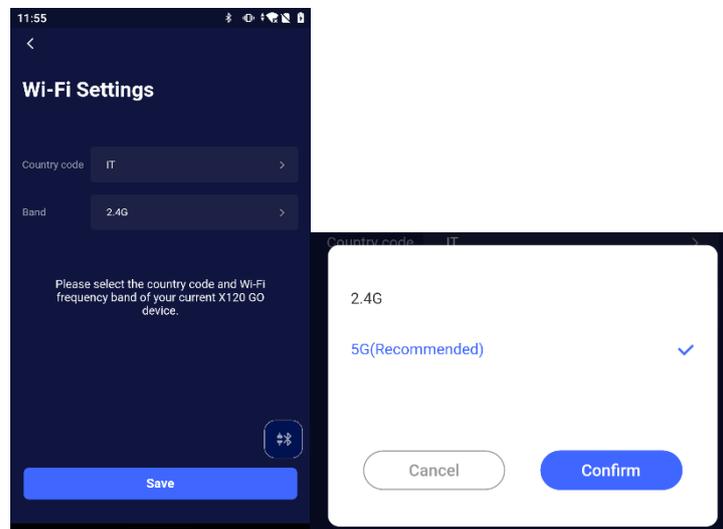
Camera parameters

Represents the frequency at which the cameras are triggered. It is recommended to leave the default setting of 1 s/pcs.



Wi-Fi Settings

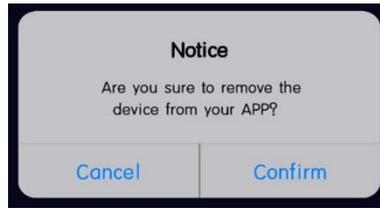
Click on Wi-Fi Settings. Here you can define the Country and the available bands for Wi-Fi.



Once selected and confirmed, wait few seconds for it to be applied.

Delete equipment

If you want to remove the device, click on Delete dialog box, and click "Confirm" to delete the device. The Delete Device function allows you to delete devices that do not need to appear on the front page.



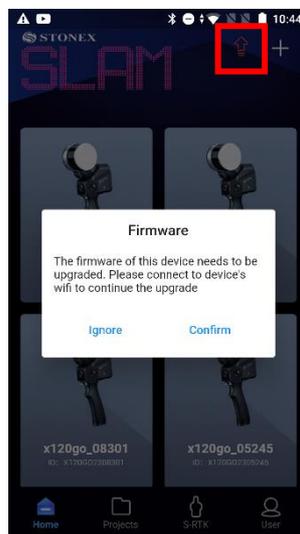
4.6 Firmware

Firmware update will optimize the performance of firmware or device drivers, as well as the performance of processors or other device hardware. Firmware upgrade can also fix the problems found in the old version. On the home screen, the arrow icon indicates the presence of a new firmware download. If white, there are no updates.

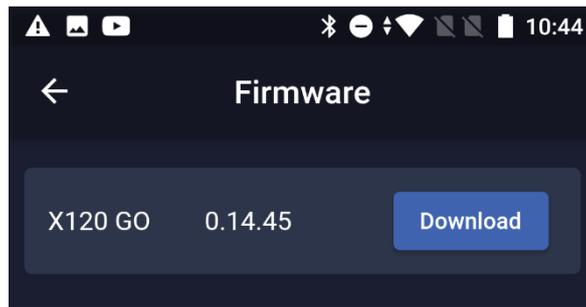


Automatic firmware upgrade reminder

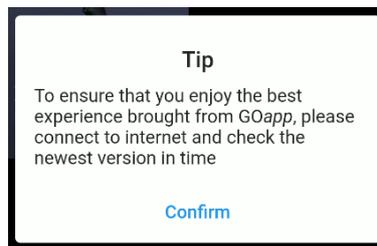
Every time you open the application to log in, the application will automatically detect the latest firmware version and the local current firmware version. If the latest firmware file is not downloaded locally, you will be reminded to download the latest firmware in the pop-up window on the home page, so that you can directly update the firmware after connecting the device. In addition, the arrow icon will turn red, signalling the presence of firmware to be updated.



Click on the red arrow to check the firmware version to be downloaded.



To make sure you have the latest Firmware version, open the application, before connecting to the scanner's wi-fi. Otherwise, the following message will appear.



Latest firmware download

After the firmware of the homepage pop-up window is upgraded, click OK, which will jump to the firmware download window. Click Download to start downloading. Currently, don't operate your mobile phone, wait for the download to complete, and then click OK to exit the firmware upgrade window.

Firmware upgrade process

When the pop-up window on the home page prompts to download firmware, the firmware package will be downloaded locally.

1. When opening the app, log in to the account, click "Download the latest firmware" in the pop-up window to upgrade the firmware, and close the download page after the download is completed.
2. Turn on the X120^{GO} device, connect the device Wi-Fi, click "Home" to enter the device details, click the "Settings" button in the upper right corner of the page, and click "Firmware Upgrade".
3. Click "Firmware Upgrade" in the firmware upgrade interface, and then click "Update". Please wait patiently for the firmware upgrade package to be transmitted to the X120^{GO} device. Do not operate the mobile phone or X120^{GO} device at this time.
4. After the transmission is completed, click OK. At this time, please wait for 35s before manually restarting the equipment. After restarting the equipment, wait for the white light of the equipment indicator to blink and turn green. At this time, the firmware update is successful, and the equipment can be used normally.

In case the latest firmware package is not downloaded on the home page.

1. Turn on the X120^{GO} device, connect the device Wi-Fi, and click the "Home" to enter the device details, and click the "Settings" button in the upper right corner of the page.
2. When checking the firmware upgrade, you need to disconnect the Wi-Fi connection of X120^{GO} device (if the device has not acquired the latest firmware version, you will be prompted to disconnect the Wi-Fi of

the device and re-enter the firmware upgrade page), keep your mobile phone connected to the Internet, and click "Firmware Upgrade".

3. After the download is completed, reconnect the Wi-Fi of X120^{GO} device, exit the firmware upgrade page, and click the device on the home page again to enter the device standby page.
4. Click "Settings" in the upper right corner of the standby page, enter the firmware upgrade page, click "Firmware Upgrade" and then click "Update". Please wait patiently for the firmware upgrade package to be transmitted to X120^{GO} equipment. Please do not operate your mobile phone or X120^{GO} equipment at this time.
5. After the transmission is completed, click OK. At this time, please wait for 35s before manually restarting the equipment. After restarting the equipment, wait for the white light of the equipment indicator to blink and turn green. At this time, the firmware update is successful, and the equipment can be used normally.

4.7 RTK120^{GO} function

Click the icon to enter in the S-RTK page.



To better understand the operation to do in this section see Chapter 7.

4.8 Data download

The results of the scanning sessions are stored in the SD Card.

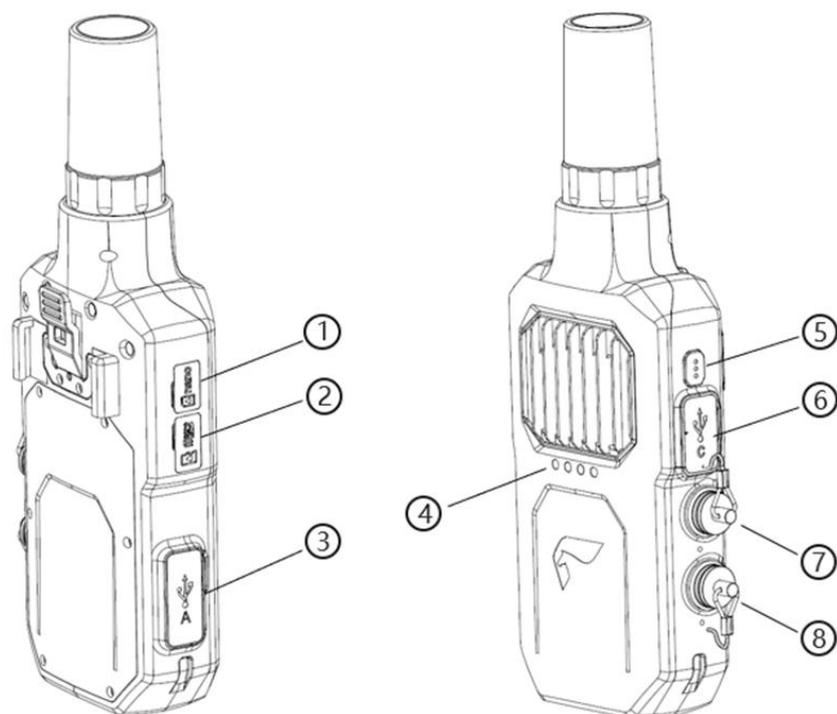
1. Remove the card from the SD card slot
2. Insert it in a SD reader, provided in the scanner case



3. Select the folders of the scans you want to download. Folders are named "SN_XXXXX" and are automatically generated by the system after each data acquisition, and the sequence of data acquisition can be identified according to the size of the tail number of the folder name. The raw data includes Image data, IMU, raster data, laser data, and device calibration files.
4. Copy and paste the folders on your device.

5. RTK120^{GO}

5.1 RTK device information



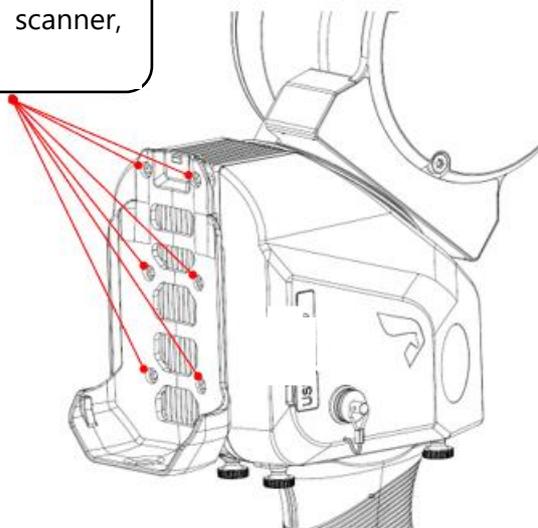
1. Nano-SIM slot
2. Micro-SD slot
3. USB-A interface
4. Status led
5. Programmable function button
6. Type-C (20V)
7. Power socket-1
8. Power socket-2

Assembly instructions

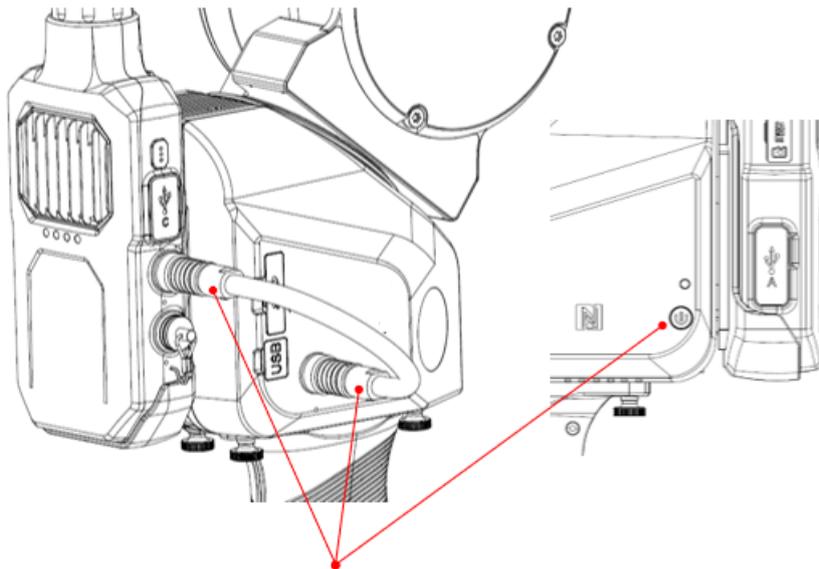
Mount the RTK device holder to the back of the scanner, using the six nails supplied with the device. Follow the instructions in the figures below for correct positioning.

If you purchased the RTK with the backpack, see [Chapter 8](#).

Mount the RTK holder in the back of the scanner, with the six nails.



Connect the RTK device via the connector cable to the scanner. Use one of the two power sockets. Once connected, switch on the scanner in order to switch on the RTK device.



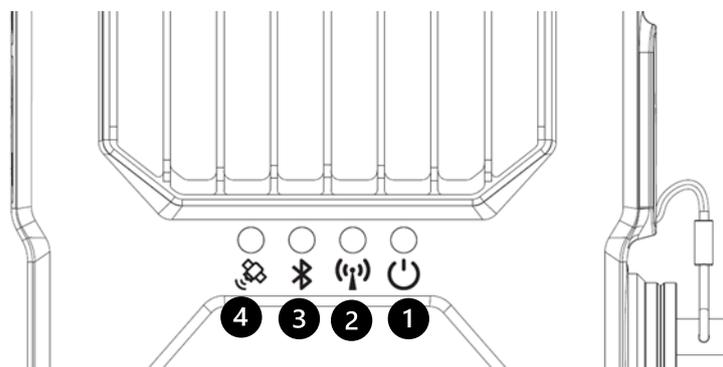
Connect the scanner to the RTK device and power it on.

Led status

The four LEDs refer to:

1. Power supply.
2. Internet connection.

3. Bluetooth.
4. GNSS quality signal.



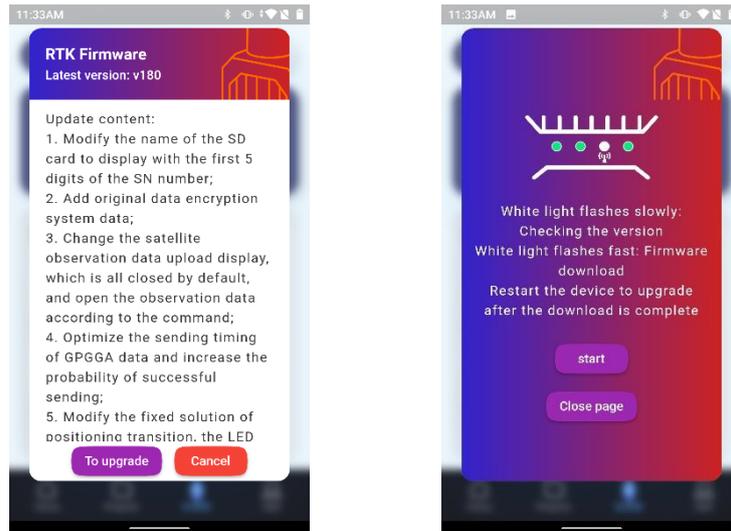
| | Working Status | Status indicator |
|---------------------|----------------------------|-----------------------------|
| POWER SUPPLY | SD card not installed | Red light flashing |
| | System working correctly | Green light flashing |
| | SD card write error | Blue light flashing |
| INTERNET CONNECTION | Not ready to connect | Red light flashing |
| | SIM card read successfully | Green light flashing |
| | Connected to 4G network | Green light still |
| BLUETOOTH | Firmware upgrading | White light flashing |
| | Ready to connection | Red light flashing |
| | Bluetooth disconnected | Red light still |
| GNSS signal | Bluetooth connected | Green light still |
| | Searching satellite | Red light flashing |
| | Single positioning | Red light still |
| | Pseudo-range positioning | Yellow light flashing |
| | Float positioning | Green light flashing |
| | Fixed positioning | Green light flashing faster |

5.2 Firmware upgrade

There are two methods to perform firmware updates, divided into online upgrade and offline upgrade. Proceed with an offline upgrade only if suggested by Stonex.

Online upgrade

Open GOapp and enter in the RTK page. Connect the device with the Bluetooth. If a new firmware is available, the upgrade page will pop up.



Check the update content, and click "To upgrade" button and then click "Start".

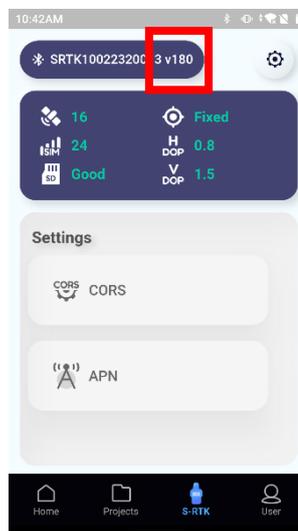
The internet connection led will start blink white (first slow and then fast, and can take some minutes).

Once the light is green, restart the device to complete firmware upgrade.

Offline upgrade

If is necessary an offline upgrade, Stonex will send the user a file. The file will have the extension ".fm". Follow the steps below in order to complete the upgrade:

- Copy this file in the SD card of the RTK, inside the Firmware folder.
- Prepare the device, and turn it on. All the lights will start flashing green at the same time.
- Once the lights start blinking red, restart the device, connect with GOapp and check the firmware version on the main page of RTK.



- If upgrade process fail, please try to format the SD card and repeat all the above steps.

5.3 RTK configuration with GOapp

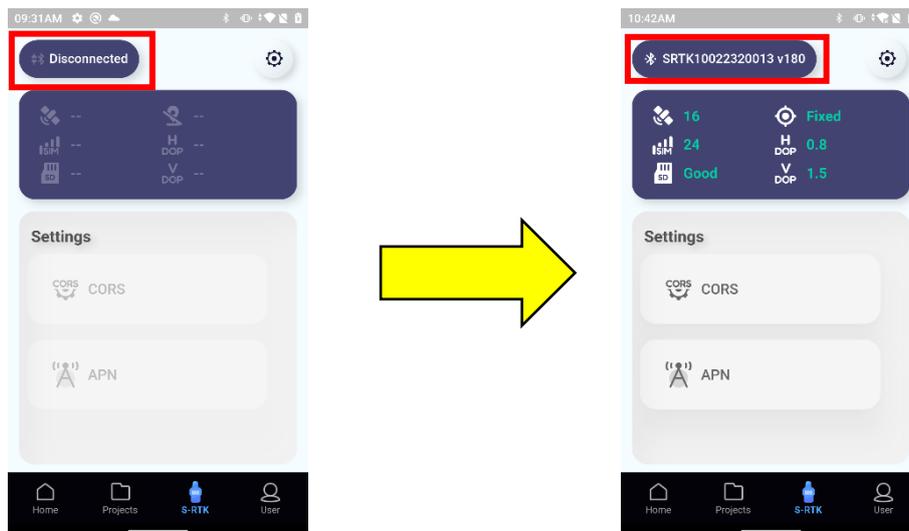
Turn on the X120GO and connect the RTK antenna with the cable. The lights will start flash red.

Switch on the Bluetooth of your tablet or smartphone, so that you can connect through it to the RTK device.

Connect the scanner through the Wi-Fi to your tablet or smartphone. The lights will start turn green as the connections work properly. Open *GOapp* and click on the RTK icon.

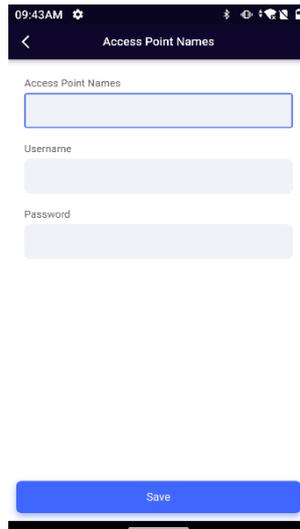


The RTK page will open. If the RTK device and the phone are connected through Bluetooth, the status will pass from *Disconnected* to *Connected*. If is not done automatically, click on *Disconnected* to start the research of the device. Once connected all the icon will be available to be used.



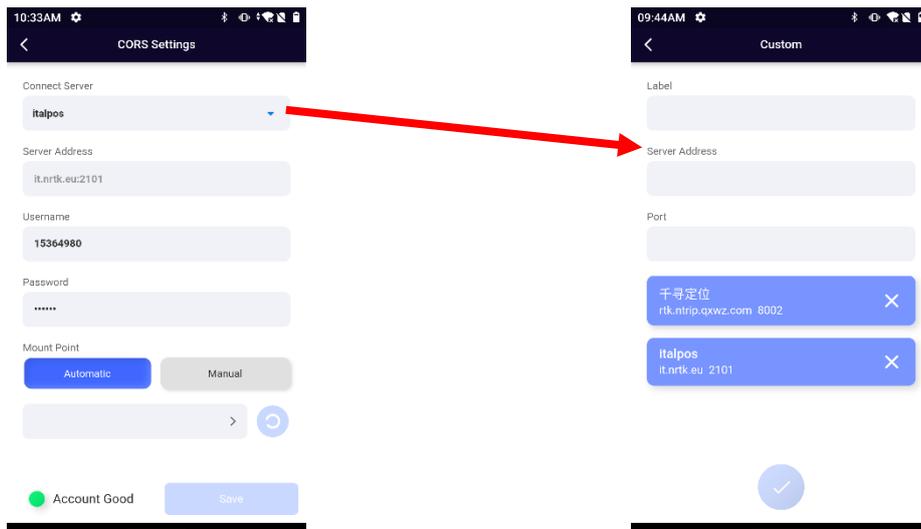
First click on **APN** icon. Here you need to insert the information about the SIM card to enable the communication. Insert the *Acces Point Name*, and if needed the *username* and the *password* of your SIM card. Please, do not use a SIM card with a PIN.

Once done click *Save* to remember the data just insert.



Second click on the **CORS** icon. Here you need to insert the information about the server you will connect to get the correction used in the RTK positioning.

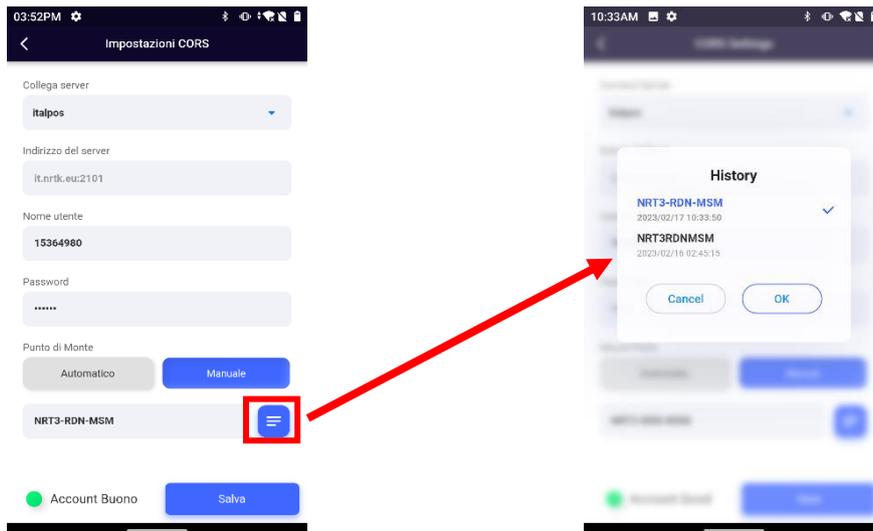
Click *Connect server* and edit the information about the server you want to connect. After connecting the server, enter the *username* and the *password*.



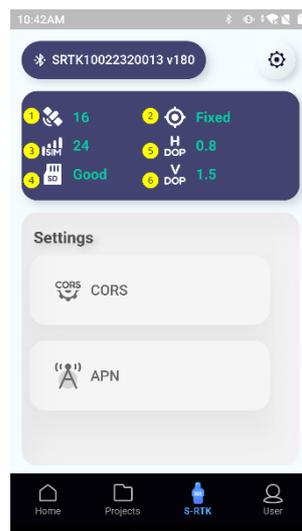
The choice of mount points can be either *Automatic* or *Manual*. If left in automatic, clicking on the grey bar will activate the automatic search for mount points. Choose the desired point from the list and clic *Save*.

If you set the mount point choice *Manual*, click in the grey bar and type in the name of the point. Once you have confirmed the mount point, click *Save*.

Click on the blue square to see the historical list of mount points to which you have connected.



After the settings of APN and CORS the device will be connected and will get corrections for correct positioning. The app will remember the last connection informations, so is not needed to insert them everytime. Just check to connect to the correct Mount Point everytime you use the RTK and clic *Save* to get corrections. In the prinpical RTK page, are shown information about the quality of the positioning.

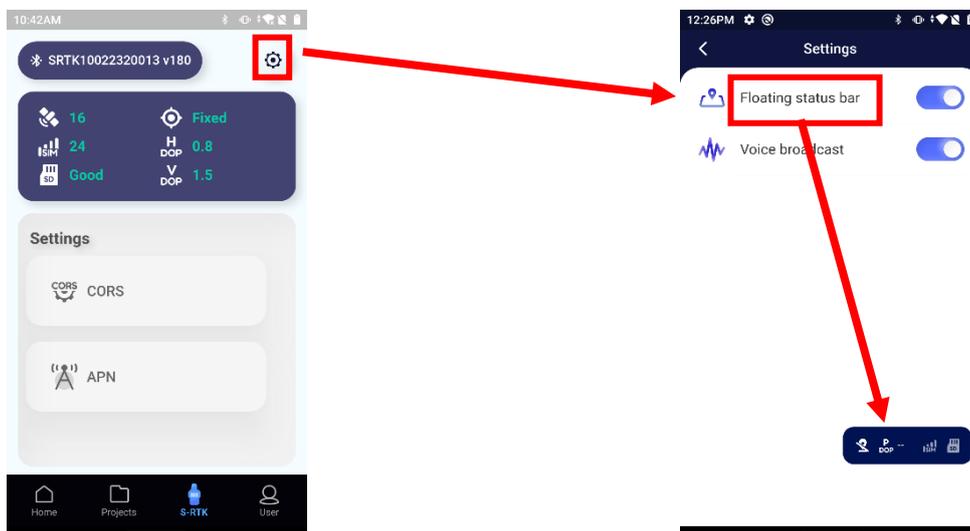


1. Number of satellite visible
2. Positioning status
3. SIM status
4. SD-card status
5. H-DOP value
6. V-DOP value

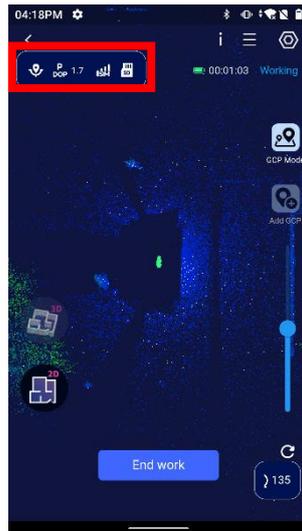
In addition to the colour of the LED, the positioning status is also identified by specific icons.

| | |
|---|-----------------|
|  | No fix |
|  | Single solution |
|  | Float solution |
|  | Fixed solution |
|  | Other |

At the top right, clicking on the gear icon opens a settings menu where you can activate/deactivate the mobile status bar and activate/deactivate the voice transmission of the positioning quality.



By activating the mobile status bar, it will be possible to keep track of the positioning quality even while scanning. The bar shows in order from left to right: positioning status (refer to previous table), P-DOP, SIM status, SD card status.



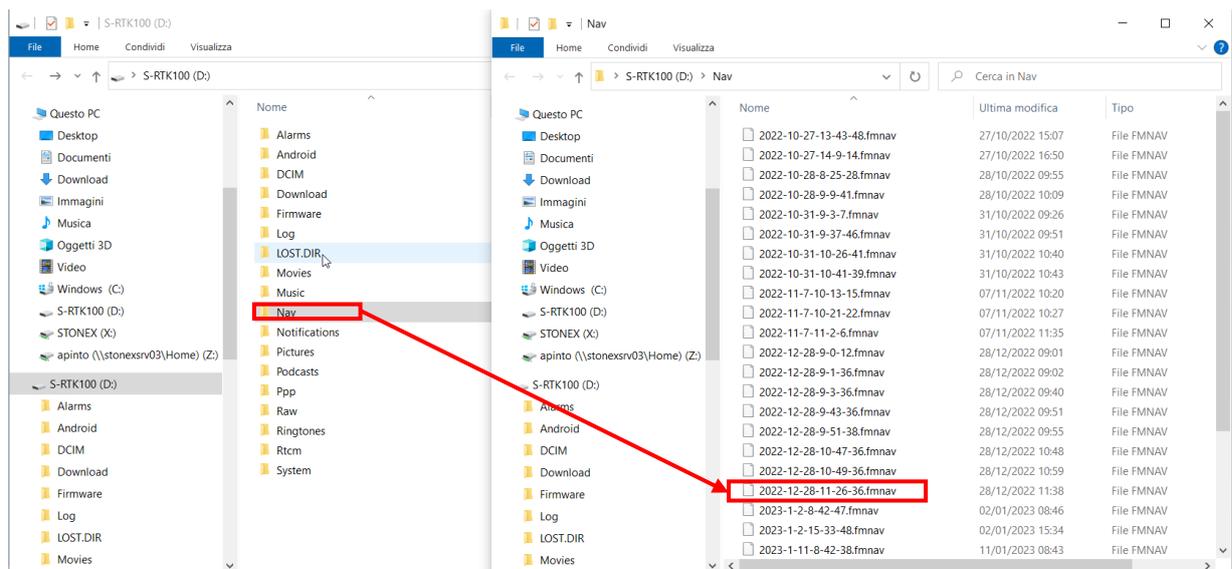
When your positioning status is FIXED, go to the scan page of your X120GO device, and start to scan normally. The information relative to the position will be saved automatically in the SD card of the RTK device.

5.4 GOpst postprocessing

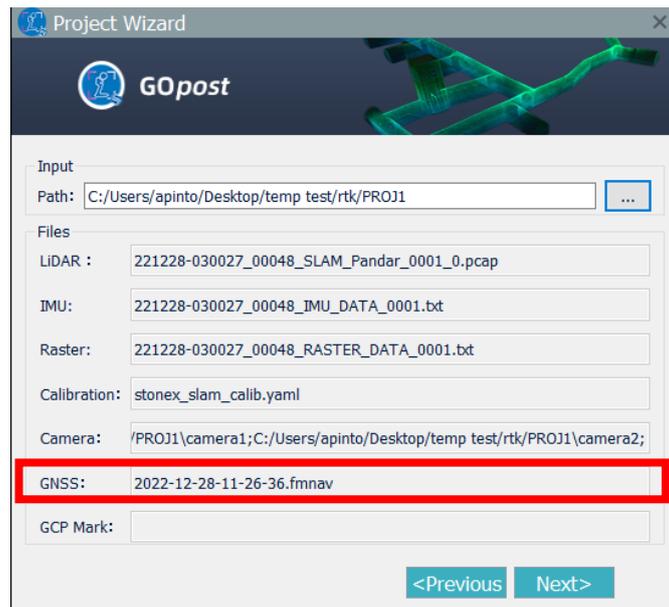
After the acquisition, insert you SD card of the RTK device in your PC to download the data relative to your project. In the memory of the SD card, select the Nav folder, then search for a file with the extension *.fmnav. This file contains the RTK information of the scan. The files are named with the following format:

YEAR-MONTH-DAY-HOUR-MINUTE-SECOND

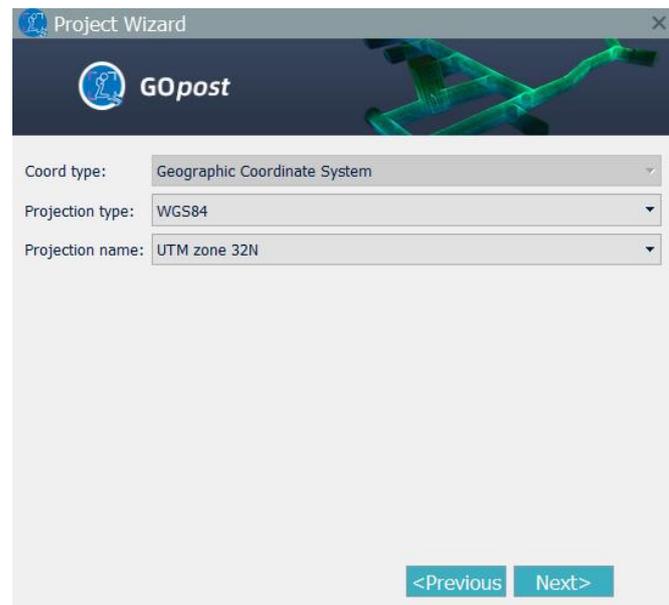
Select the corresponding file with the same date of the scan you want to process. Copy this file in the project folder of your scan. For example, will be selected the file of the 28 December 2022, at time 11.26.



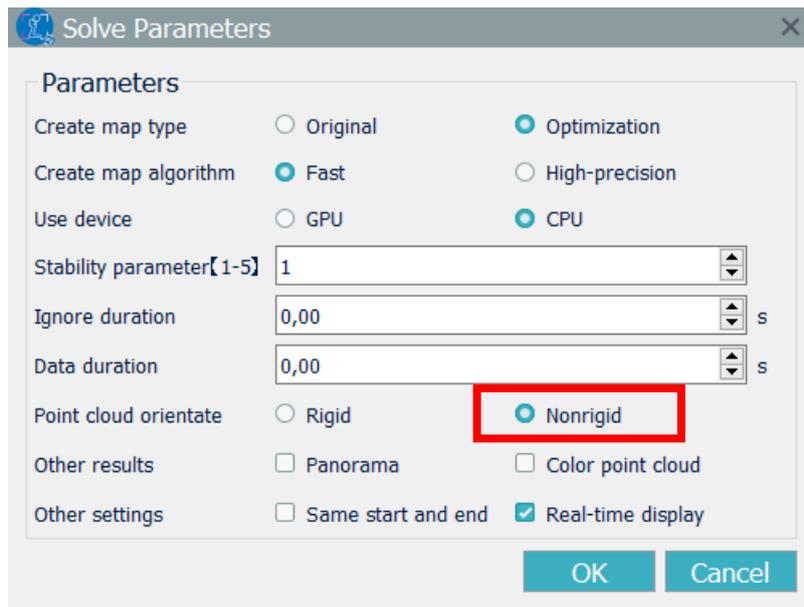
Open GOpst and click New to create a new project. Choose the name and the save path, then choose the input path. Please check that in the GNSS section in the input screen there is the *.fmnav file.



Click *Next*, the software will ask the type of coordinates and the reference system. It should recognize it automatically. If the informations are correct, click *Next*.



Now you can process as for the other case the data, with the One-Click-Solve or with the Step-By-Step procedure. To better use the RTK information, in the orientation phase is preferable to use the non-rigid body method.

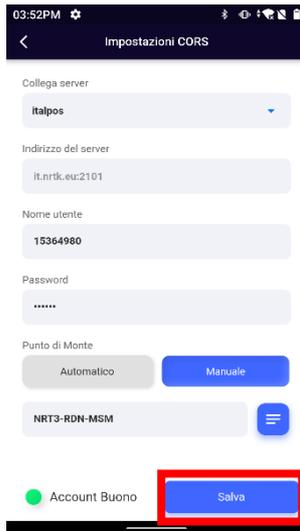


After the processing, the point cloud in the GCP subfolder of the project and all the subsequent point clouds, like the textured one, will be orientate in the reference system of the RTK data.

5.5 Rules for data acquisition

The following rules should be followed for the correct use of the RTK antenna:

1. Before starting a scan, connect the tablet to the antenna via Bluetooth and check the signal quality. Remain in Fixed solution for at least one minute before starting a scan with the instrument. Only data in Fixed solution will be used for orientation.
2. Acquire for at least 50% of the scan duration in Fixed solution. Check the signal status during acquisition.
3. In the case of mixed (indoor-outdoor) acquisition, ensure that at least 50% of the scan is performed outdoors with good signal coverage in Fixed solution. Acquire data outdoors both before entering the area without signal and afterwards, to help the software to better reconstruct the cloud and perform the orientation correctly.
4. If you acquire for a long time in a zone without a good signal (solution is not Fixed), when you return outdoors, return to the RTK screen, and check the connection status. If it does not immediately return to the Fixed solution, click on CORS, and resave the mount point to resume communication.



6. Backpack components and assembly instructions



1. Extension pole
2. Pole base
3. Scanner X120GO holder
4. SA85 antenna
5. SC600+
6. Power bank
7. Connecting cable

Possible configurations



1. GNSS configurations.
2. No GNSS configurations.

Battery life

The power bank suggested has a capacity of 25700 mAh/95 Wh. The expected battery duration depends on the configuration you are using.

- X120GO+SC600+SA85: 4 hours.
- X120GO: 4 hours and 30 minutes.

6.1 Assembly instruction

Install the power bank

Place the power bank in the appropriate section of the backpack. Connect the power bank to the scanner via the type-c cable.



Plug one end of the cable into the power bank "In/out" port and the other into the scanner's type-c port. Pass the cable through the opening in the top of the backpack.



Install SC600+

Insert a SIM card without PIN inside the instrument. Attach the antenna supplied with the instrument to the LTE socket.



Place the instrument in the space above the battery and connect the 2-pin cable into the PWR socket (aligning the red dots) and the 26-pin cable into the DB-26 socket, taking care to secure it well.



Connect the antenna cable to the GNSS1 socket and secure it. Pass the cable through the hole in the top of the backpack.



Install the antenna extension pole

Insert the base of the pole into the slot next to the backpack handle. Close the bracket to lock the base in the shown position.



Screw the long part of the pole into the base.



Install the SA85 antenna

Pass the antenna cable, previously connected to the SC600+, through the appropriate holes in the rod.



Screw the antenna SA85 into the upper part of the pole and secure it.



Install slam X120^{GO}

Remove the handle of the X120GO and screw the quick release onto the back of the scanner, as shown in the picture.



Lower the backpack handle and attach the scanner to the base of the antenna pole. Ensure that the bracket is fully inserted, and that the scanner is secure and does not move.



6.2 SC600+ configurations

Before starting the scan operation, if you are using the X120GO+antenna configurations, you need to connect the SC600+ to the network to obtain corrections for positioning.

First insert a SIM card in the SC600+, following the image on the port of the instrument. Important: the SIM must not have a PIN. Connect you tablet/PC to the SC600+ with the Wi-Fi. The Wi-Fi name is the serial number reported in the back of the SC600+.

Once the Wi-Fi connection is established, open a web page and digit the following port: **192.168.10.1**, you will be redirected to the web interface of the instrument. The page will request to fill two fields. Default credentials below:

- Username: admin
- Password: password

You will enter in the web interface of the SC600+. Here you can set the network and change the SC600+ configuration. You can also control the status of your positioning in the summary page.

| | |
|-----------------|-----------------------------------|
| Station Name | 600P |
| Expire Date | 20230802 |
| Run Time | 13 min |
| Device Model | SC600+ |
| Device Serial | SC624B2200100 |
| GNSS Model | Double Antenna |
| GNSS Serial | Z310415000002-LR21B422121679 |
| Radio Model | TRM121 |
| Radio Serial | TRM12122021014 |
| Longitude | 9°10' 57.50416" |
| Latitude | 49°33' 44.00897" |
| Height | 797.637 m |
| GNSS Status | RTK float (2.0 Sec.) |
| Local Time | 2023-07-04 12:06:49 |
| Internal Memory | 83.632 MB / 234.741 MB (27% Free) |
| Data Memory | 1.677 GB / 7.241 GB (23% Free) |
| Battery Power | -% |
| Power Source | External |

First click on "Network" -> "Network", enable the Mobile net connection. Here you need to set the APN of the SIM card. If the connection is working, you will see the signal level > 0% and the Monet Link Status active. Leave the other parameters as default.

| | |
|---------------------------|---|
| Wireless Net | <input type="radio"/> Client <input checked="" type="radio"/> Hotspot <input type="radio"/> Disable |
| MAC address | E8-4F-25-49-E8-C4 |
| SSID | SC624B2200100 |
| Password | NONE |
| IP | 192.168.10.1 |
| Share Mobile's Net | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Mobile Net | <input checked="" type="radio"/> Enable <input type="radio"/> Disable |
| APN | mobile.vodafone.it |
| User | |
| Password | |
| Do not send tcp-echo(off) | <input checked="" type="radio"/> Yes <input type="radio"/> No |
| Reboot with ping failed | <input checked="" type="radio"/> Yes <input type="radio"/> No |
| Network Type | <input checked="" type="radio"/> Auto <input type="radio"/> GSM <input type="radio"/> CDMA-EVDO <input type="radio"/> LTE |
| Authentication Algorithm | AUTO |
| SIM Card | SIM |
| Modem Version | EG25GBR07A0BM2G_30.1 |
| IP | 100.105.128.67 |
| Mask | 255.255.255.255 |
| Gateway | 10.64.64.64 |
| Signal Level | 76% |
| Mobile Isp | vodafone IT LTE |
| Monet Link Status | Link Connected |
| Monet Status | Internet Access |

Next, click on Port Configuration. Here you must change the Ntrip Client to the IP port you intend to use. Select the mount point you want to access, and enter your user name and password to complete the configuration.

SC600+ SC623A2200002 Test ROVER STONEX

Summary

- System Information
- GPS Status
- Coordinates
- Stockmap Analyzer
- IMap
- Reference Station
- CHMS Configuration
- Tracking Statistics
- Ntrip Server
- Recording
- Port Configuration
- Network
- Administration
- Download
- Language English
- Logout

Ports Summary :

| Port | Status | Band Rate | Protocol | Mode | IP Port | Function |
|--------------|---------|--------------|------------|--------|---------|----------------------|
| Bluetooth | Enable | - | - | - | - | BTFS |
| BT | Enable | 440.121.1847 | SOAIP 3030 | - | - | RTK_C111 |
| COM1 | Disable | 115200 | R5460 | - | - | CHMS |
| COM2 | Disable | 115200 | R5460 | - | - | CHMS |
| COM3 | Enable | 115200 | R5232 | - | - | NMEA |
| Ntrip Client | Enable | - | NTRIP | CLIENT | 8070 | Active (rtk.eu:2101) |
| Ntrip Center | Disable | - | NTRIP | SERVER | 8070 | Caster |
| Socket 1 | Disable | - | TCP | SERVER | 8000 | R549 |
| Socket 2 | Disable | - | TCP | SERVER | 8000 | R549 |
| Socket 3 | Disable | - | TCP | SERVER | 8001 | R549 |
| Socket 4 | Disable | - | UDP | SUNRPC | 8003 | R550 |
| Socket 5 | Disable | - | TCP | SERVER | 8001 | R549 |

Stream input/output available: Unlimited/Unlimited

IO Configuration :

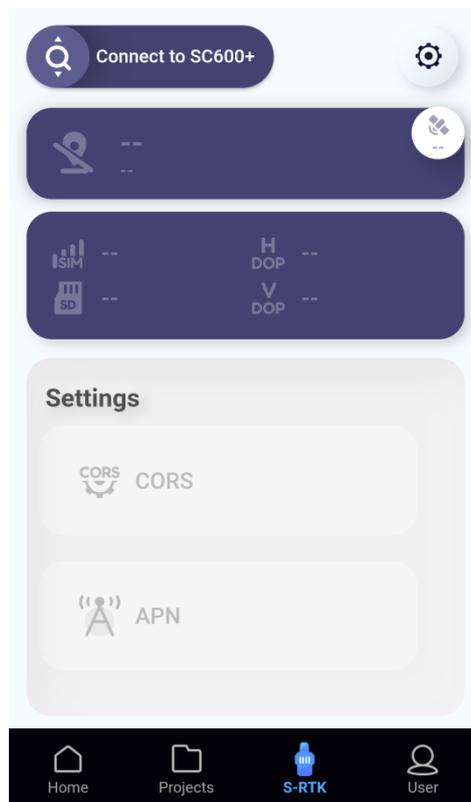
Ntrip Client Enable Disable

| | |
|------------|--|
| IP:Port | rtk.eu:2101 |
| Version | V1.0 |
| Mountpoint | VRS3-RDN-MSM <input type="button" value="Get Mountpoint"/> |
| Upload GGA | 15 |
| User | 15364980 |
| Password | ***** |

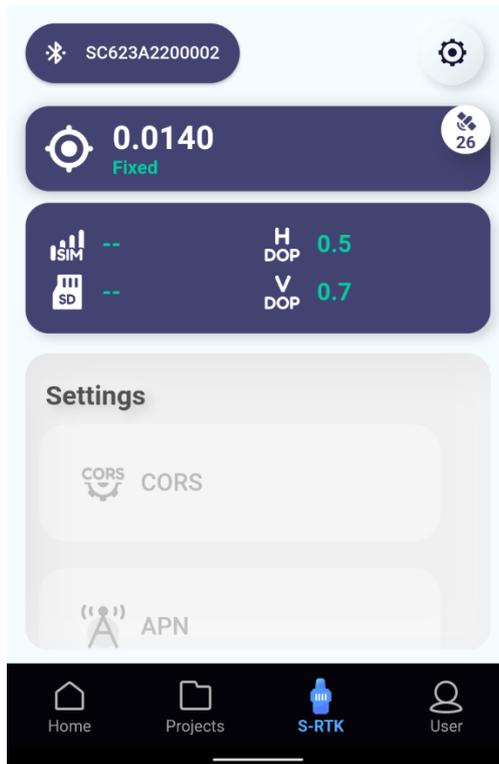
SC600+ status visualization in GOapp

Starting from version 2.2.6 of GOapp, the user can visualize info about the status and solution of SC600+.

First, enter the S-RTK page of GOapp, then click on the top left icon to activate Bluetooth and choose SC600+ as device. Then search for your device on the list of Bluetooth devices that appear and connect.



Once connected, these are the info that you can visualize in the app. If you want, you can also activate the Floating bar to have this information displayed in the acquisition page.



When on field the status is Fixed, the device is ready to work.

SC600+ download data

Once you collected the data, you will need to download the file that will be requested by GOpost to perform the orientation of your cloud. The advice is to perform this action in office.

Turn on the SC600+ and connect to the Wi-Fi of the SC600+. Connect to the web interface. Here click the page "Download" -> "Internal" -> "NMEA".

SC600+ SC624B2200100
600P ROVER

- Summary
- System Information
- GPS Status
- Satellites
- Reference Station
- Ntrip Server
- Recording
- Port Configuration
- Network
- Administration
- Language (English)
- Logout

Home > INTERNAL > NMEA

| Select | Name | Size | Creation Time | Modification Time | Operation |
|--------------------------|----------------|----------|---------------|---------------------|------------------------------|
| <input type="checkbox"/> | 600P172I.dat | 1.232M | - | 2023-06-21 08:34:16 | Upload Email Download Delete |
| <input type="checkbox"/> | 600P172M.dat | 15.863M | - | 2023-06-21 13:00:00 | Upload Email Download Delete |
| <input type="checkbox"/> | 600P172N.dat | 33.857M | - | 2023-06-21 14:00:00 | Upload Email Download Delete |
| <input type="checkbox"/> | 600P172O.dat | 33.915M | - | 2023-06-21 15:00:00 | Upload Email Download Delete |
| <input type="checkbox"/> | 600P172P.dat | 2.580M | - | 2023-06-21 15:04:40 | Upload Email Download Delete |
| <input type="checkbox"/> | 600P173I.dat | 198.509K | - | 2023-06-22 08:22:29 | Upload Email Download Delete |
| <input type="checkbox"/> | 600P173I_1.dat | 3.253M | - | 2023-06-22 08:29:48 | Upload Email Download Delete |
| <input type="checkbox"/> | 600P185L.dat | 3.403M | - | 2023-07-04 12:00:00 | Upload Email Download Delete |
| <input type="checkbox"/> | 600P185M.dat | 1.89M | - | 2023-07-04 12:03:29 | Upload Email Download Delete |

Select All Package Delete Selected Prev (1) Next Back

In this page select the file corresponding to the time you performed the acquisition. Consider that the data are stored in GPS time, so be careful when you select the data you download.

Copy this file in the project folder of your X120GO data.

6.3 Data elaboration

Open GOpst and select "New". Here choose the name of the project and as a platform select "backpack". The software will automatically choose the parameters and offsets to perform the orientation.

If you collected data with SC600+ remember to copy the *.nmea file in the project folder. If you copied them correctly you will see the file in the following page under the GNSS line.

When you imported the raw data, select the desired parameters to create the point cloud. If you collected GNSS data, select Non-rigid as orientation method.

6.4 Data collection rules

Here below are reported some rules that should be followed to obtain a better reconstruction of the data while using the X120GO with the backpack.

1. Keep the backpack on the ground during the initialization phase.
During the first minute of initialization is better to keep the scanner on the ground, with no moving objects in front of it. After the first minute, you can put on the backpack, taking care not to make any sudden movements.
2. Make turns slowly.
When you need to make a turn in your scan, slow down and start turning slowly. This will help the reconstruction of the point cloud.
3. Don't make sudden movements.
When collecting data with the backpack, try to avoid sudden movements. Keep as much as you can a constant speed during your scan.
4. How to end a scan.
When you want to end a scan, please first remove the backpack. Then put it down on the ground and keep it standing for few seconds before ending the scan.
5. Close the loop.
If you close the loop during the scan, before putting down the backpack on the ground, walk about five metres beyond the starting point and then go back to the starting point. This will help the detection and the reconstruction of the cloud.
6. Collect RTK data.
If you are using the antenna with the scanner start the scan in a place where you can clearly see the sky and can have a good connection to the satellites. After the connection with the SC600+, wait one minute before connecting the tablet to scanner in order to check the stability of the signal. During the scan try to not walk too close to buildings and don't walk under trees or similar covered paths. Those things will affect the quality of the positioning. If it is necessary to pass through places with poor signal, ensure that at least half of the scan is carried out with good GPS signal coverage.

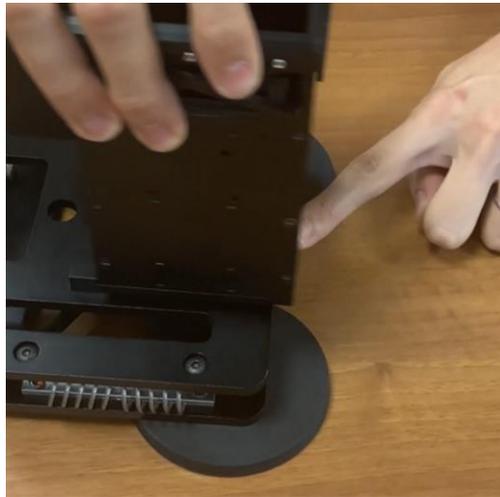
7. Vehicle Mount

Components:

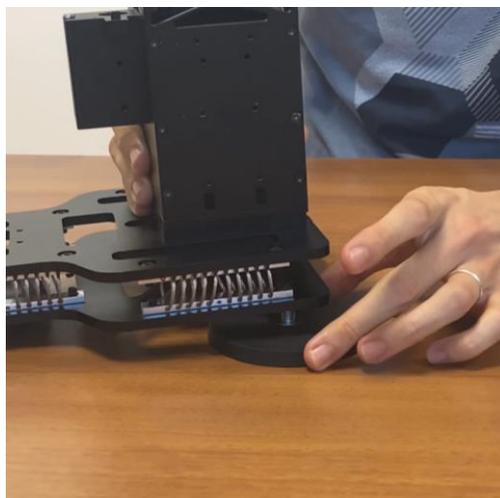
- Suction pads
- Magnets
- SA85 GNSS Geodetic Antenna
- Stonex SC600+ GNSS, 1100Ch, 4G, UHF, WiFi, BT, 10Hz
- External battery X100/X120GO
- X120GO Vehicle pole
- X120GO Vehicle cables kit

7.1 Assembly Instruction

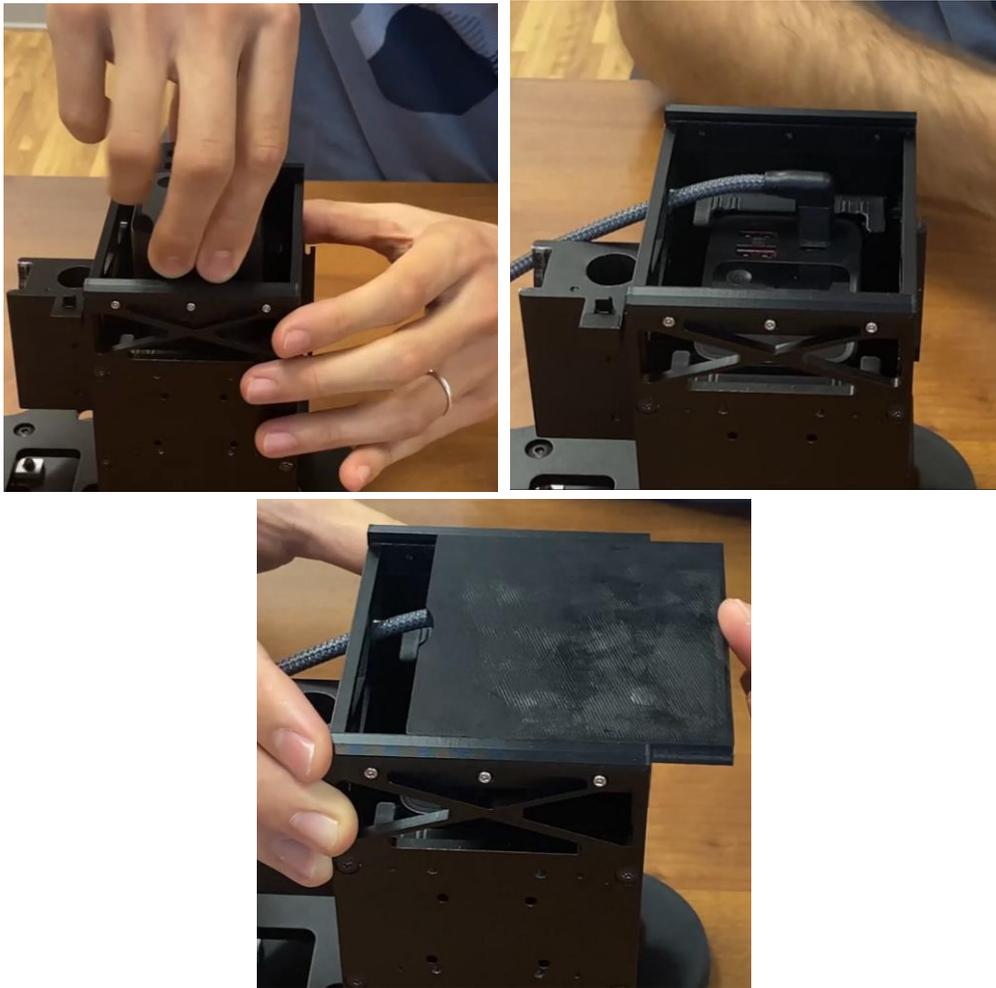
Slide the box onto the platform using the guides and quick release connector.



install the magnet or suction cup holders on the bottom of the platform.



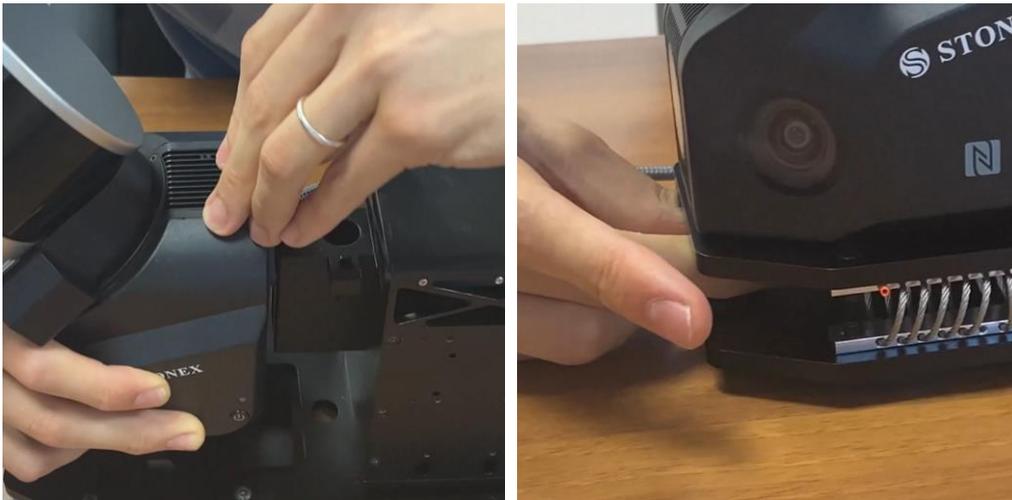
Install the battery and power cable, then place the protection cover.



Install the SC600+ on the dedicated stand with the supplied screws. Make sure the screws are tightened securely.



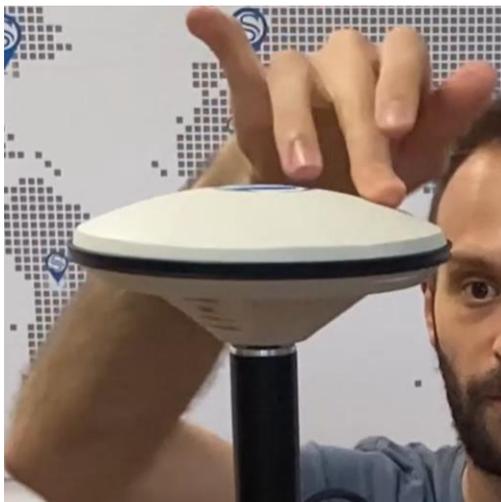
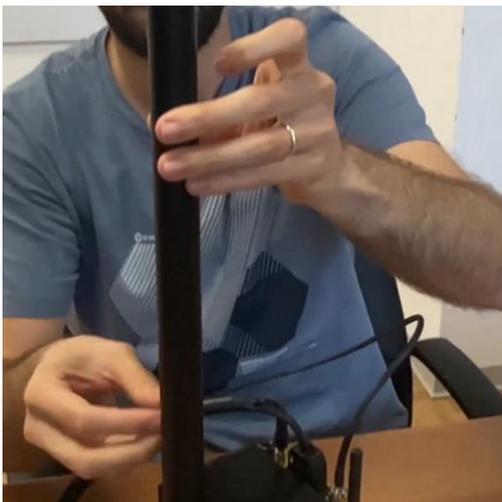
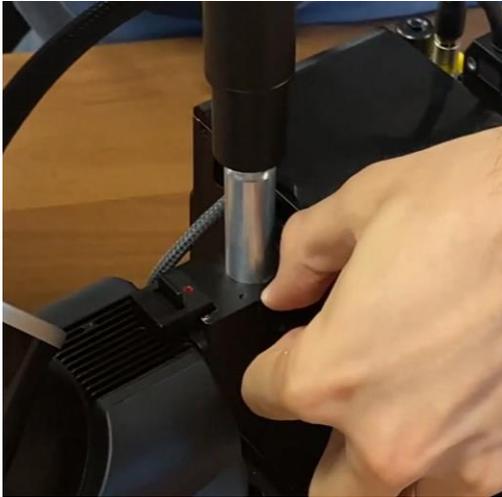
Install X 1 20 GO using the quick-release connector. Tighten the front screw placed under the scanner.



Plug the power cable into the scanner's usb-c port, then plug the power and communication cable with the SC600+ into the respective ports.



Slide the antenna pole into the antenna compartment, then run the antenna cable through it. Finally, install the geodetic antenna and connect one end of the cable to the antenna and the other to the SC600+.



7.2 SC600+ Configuration

Please, refer to Paragraph 8.2.

7.3 Data processing

Please, refer to Paragraph 8.3.

7.4 Data Collection Rules

- Install the vehicle mount on the vehicle and make sure it is held securely. You can install it on the front or on the back of the vehicle.
- The system is integrated; to turn it on, simply press the power button of X120GO. Then turn on the system by pressing on the power button of X 120GO.
- Connect to the SC600+ interface to check the solution. Once the GNSS solution is FIXED, you can connect to the scanner and start scanning. During initialization, the vehicle must remain stationary.
- Once initialization is complete, you can start driving. It is recommended not to exceed 25 km per hour.

Once you have completed the desired route, you can terminate the scan from the application.

8. External panoramic camera



The instrument can process video obtained through the Insta360 X4 camera. This will allow coloring the cloud with spherical images (if one prefers to use this camera over the internal ones) and will allow obtaining 360-degree spherical images that can be measured using GOpst software.

The panoramic camera holder should be mounted on the back of the scanner, aligning it with the 4 holes in the shake. Once mounted, you can mount the camera on top of the holder by securing it with the appropriate screw

Important: The camera should be mounted with the video screen in the same direction as the SD card slot.

Once mounted, the camera should be controlled via the insta 360 application that can be downloaded from the camera website.

Set the camera's video recording as:

- Resolution: 5.7K
- Frame: 30 fps

At this point you can start operating the panoramic camera.

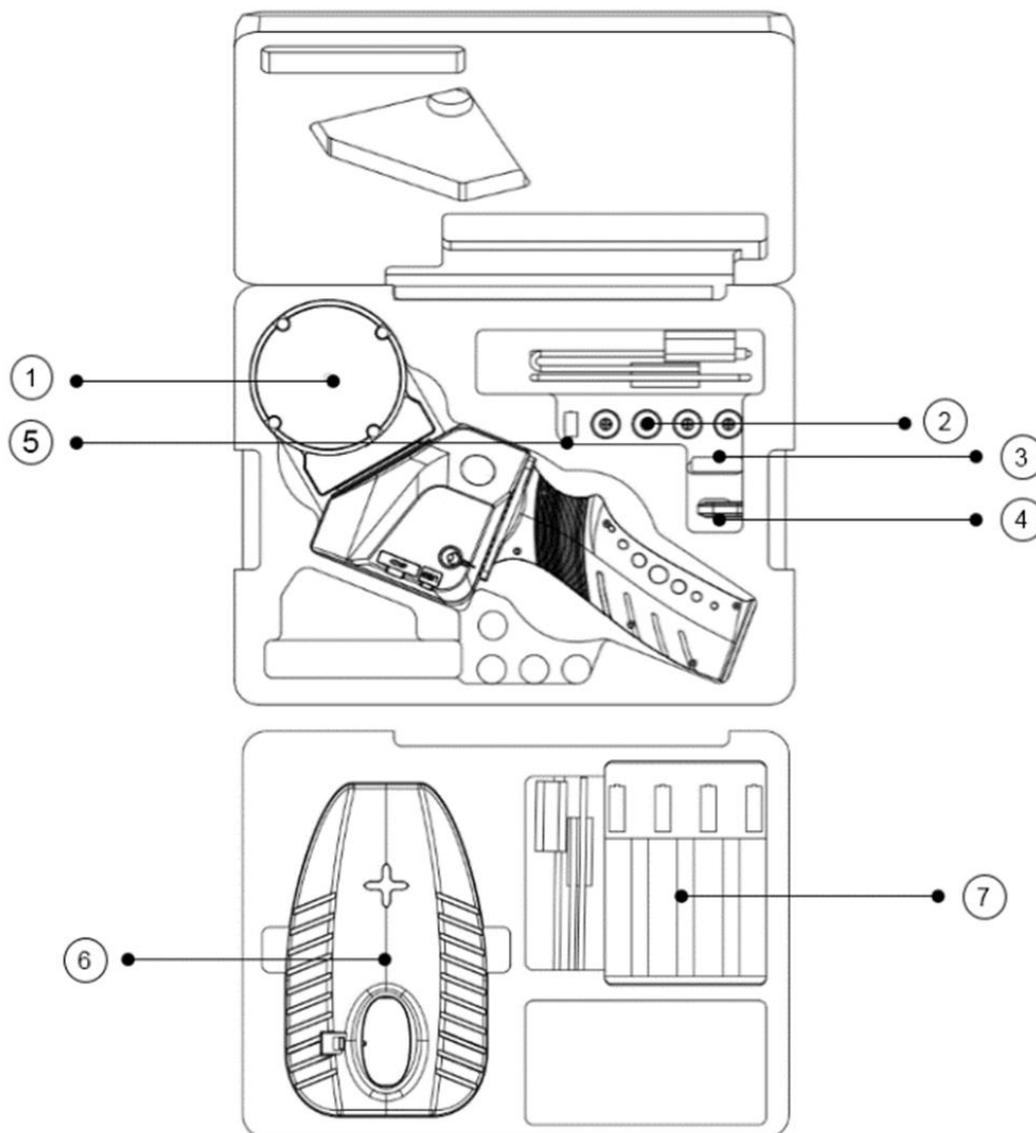
Turn on the scanner, and then turn on the camera. At this point connect the tablet to the scanner. The camera can also be used without the supporting application.

Start the video capture, and then start the scanner to scan. After the initialization minute, before starting with the scan, make movements from right to left by rotating the scanner and the camera (3 times). This is for de post-processing calibration of the camera. When the scan is finished, stop the scanner and then stop the camera.

At this point download the camera data to the computer. Refer to Chapter 4 of the GOpst manual for processing.

9. Technical data

9.1 Bundle components



| N | PART NAME | QUANTITY |
|---|--|----------|
| 1 | Scanner | 1 |
| 2 | Rechargeable battery | 4 |
| 3 | SD Memory card | 1 |
| 4 | SD card reader | 1 |
| 5 | USB License key for GOpst | 1 |
| 6 | Scanner base bracket for GCP | 1 |
| 7 | Battery charging hub, Car/EU/US chargers | 1 |

10. Appendix

10.1 X120^{GO} technical features

PERFORMANCE

| | |
|--------------------------|----------------------------------|
| Max Range | 120 m |
| Min Range | 0.5 m |
| Relative Accuracy | Up to 6 mm ¹ |
| Absolute Accuracy | 5 cm |
| Vertical resolution | 16 channels |
| Scanning Point Frequency | 320.000 pts/s |
| Field Of View | Horizontal 360° Vertical 270° |
| Laser class | 1 |
| Echo strength | 8 bits |

CAMERA

| | |
|--------------|----------------|
| N. of camera | 3 (5 MP each) |
| Cameras FOV | 200°x100° |
| Image | Semi-spherical |

SYSTEM

| | |
|----------------|---|
| Data Storage | 32GB (expandable) |
| Operation Mode | Realtime visualization (Android 8 or above) |
| Communication | NFC, Wi-fi |

PHYSICAL SPECIFICATION

| | |
|------------|-------------------------------------|
| Dimension | 372mm*163mm*106mm (without bracket) |
| Net Weight | 1.6 kg (without battery) |

POWER

| | |
|-------------------|------------------------------|
| Battery Life | 2.5h (each set of batteries) |
| Power consumption | 25W |
| Capacity | 3350mAh×4 |
| Voltage | 20-30V |

ENVIRONMENTAL CONDITIONS

| | |
|---------------------------------|---------------|
| Working environment temperature | -10°C to 45°C |
| Working humidity | <85% RH |
| Waterproof/Dustproof | IP54 |

¹ In controlled environment

10.2 RTK120^{GO} technical features

RECEIVER

| | |
|--------------------------------|----------------------|
| Satellite signals tracked | GPS L1, L2 |
| | GLONASS L1, L2 |
| | GALILEO E1, E5b |
| | BDS B1, B2 |
| Single point positioning (RMS) | Horizontal: 1.5m |
| | Vertical: 3.0m |
| DGPS (RMS) | Horizontal: 0.4m |
| | Vertical: 0.8m |
| RTK (RMS) | Horizontal: 1cm+1ppm |
| | Vertical: 1.5cm+1ppm |
| Data update rate | 20Hz |
| Time accuracy | 20ns |
| Speed accuracy (RMS) | 0.03 m/s |

INTERNAL MODEM

| | |
|---------|------------------------------|
| Network | LTE FDD: B1/B3/B5/B8 |
| | LTE TDD: B34/B38/B39/B40/B41 |
| | GSM: 900/1800MHz |

SYSTEM

| | |
|---------------|-----------|
| Storage | Micro SD |
| Communication | Bluetooth |

POWER SUPPLY

| | |
|-----------------|---------|
| Type-C USB | 20V |
| Aviation socket | 12V-20V |

PHYSICAL SPECIFICATION

| | |
|-----------------------|------------------------------------|
| Weight | 203 g |
| Size | 196mm×80mm×39mm |
| Operating temperature | -20° C to +50° C (-4° F to 122° F) |
| Storage temperature | -20° C to +55° C (-4° F to 131° F) |
| Waterproof/Dustproof | IP54 |

ANTENNA

| | |
|----------|-------------------|
| Size | 27.5mm×56mm |
| Weight | 15.3 g |
| Optional | SA65 for backpack |

10.3 Backpack technical features

PHYSICAL SPECIFICATIONS

| | |
|-----------------------------|--|
| Material | Nylon, carbon fiber, aluminum alloy |
| Volume | 6.5 l |
| Size (without GNSS antenna) | 330mm×240mm×555mm |
| Size (with GNSS antenna) | 330mm×240mm×1050mm |
| Weight | 3.65 kg |
| Configurations | X120 ^{GO} only X120 ^{GO} + SC600 + SA85 |

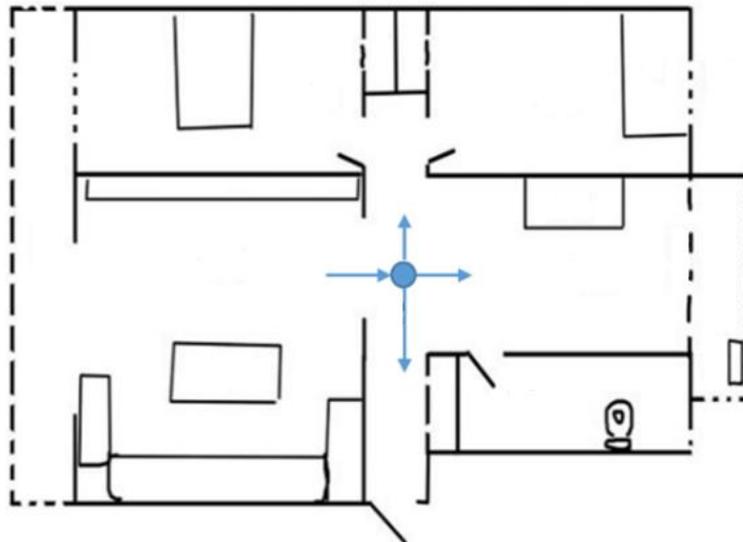
POWER

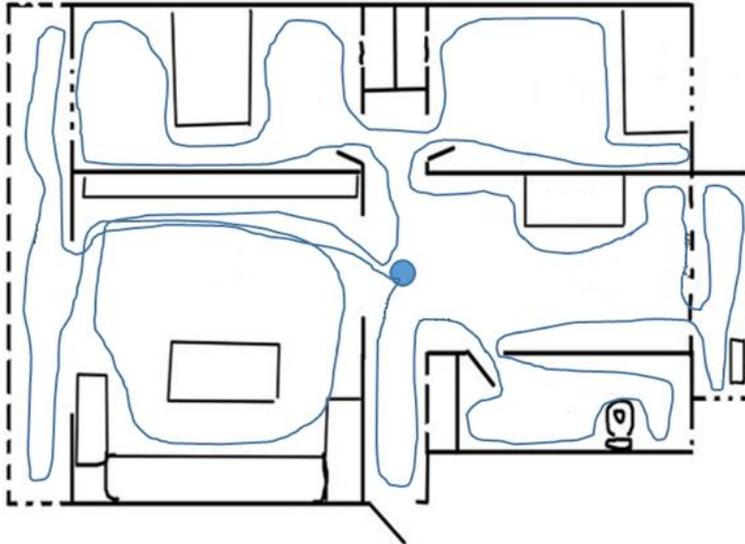
| | |
|------------------|---------------|
| Voltage | 20V |
| Powerbank output | 40W or higher |
| Interface | Type-c USB |

10.4 Data collections instructions

Indoor Climate

If it is an indoor environment, multi-path locations should be selected as far as possible as the starting and ending points of data collection. After the site survey, plan the closed route of the survey area.





Outdoor Environment

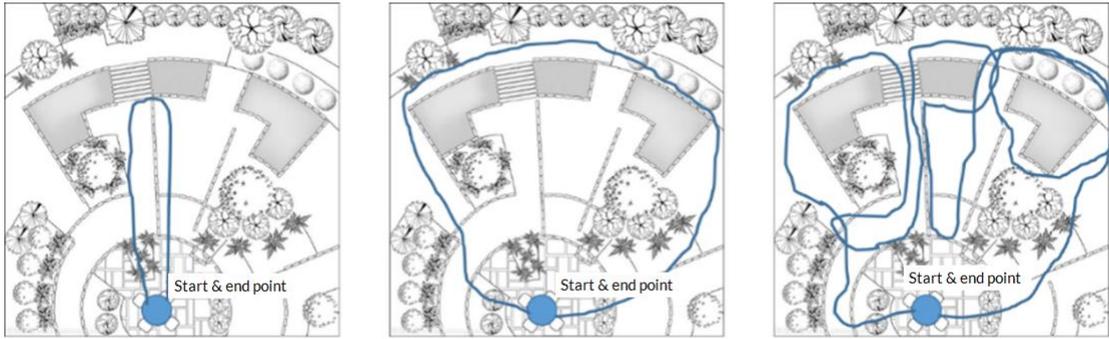
If it's an outdoor environment, besides finding multi-path locations and planning closed routes, it is also necessary to ensure that the measured object is within the effective measurement range of the scanner (because of the different reflectivity of ground objects, the distance is also different).



Notice: A multipath location refers to a location that can be reached from multiple directions.

Closed routes

- 1 The slender closed route is similar to **U-Shaped**, can barely meet the accuracy requirements. If conditions permit, users are advised not to choose this route.
- 2 The trajectory is similar to **O-shaped**, there is no redundant closed-loop, and the accuracy of data calculation is good, which is one of the most basic requirements for route selection.
- 3 **Multi O-route**: the whole track is similar to O-shaped, with many closed circles, and the data solution accuracy is the best. It is composed of many closed O-shaped routes, which greatly improves the data solution accuracy and is the best route planning.

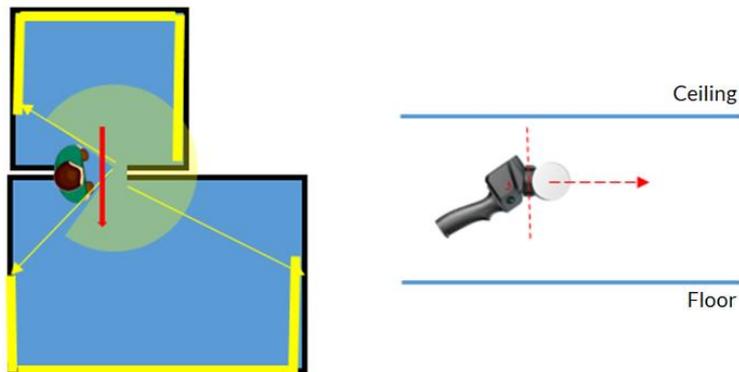


Typical surroundings data collection considerations

X120^{GO} scanner can acquire point cloud data in the range of 360× 270, and the point density decreases with the increase of measurement distance. In the process of data acquisition, the device should be stable and avoid violent shaking, and non-measurement objects such as pedestrians and vehicles should be prevented from blocking the front of the device for a long time, to ensure the integrity of data acquisition.

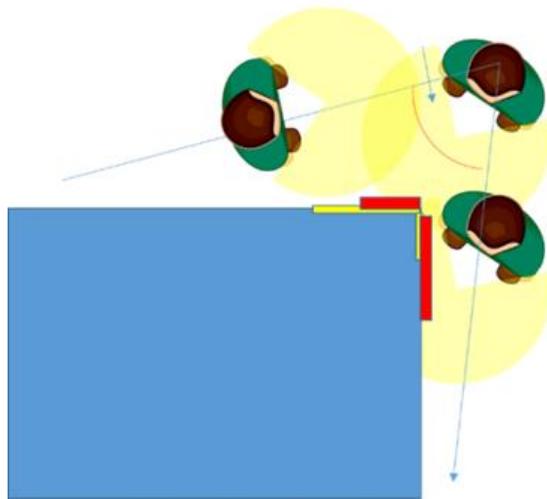
Matters needing attention when passing through the door

When the hand-held scanner passes through the indoor door, it is recommended to pass slowly sideways to ensure that the scanner is relatively stable, and the door is open as much as possible. If the door is closed, when approaching the door, you need to turn the scanner back to the door and open the door with the other hand. During the process of passing through the door, you should fully consider the scanning field of vision and scan the scenes outside the door as much as possible in the room. When closing the door, try to avoid the scanner scanning the moving door as much as possible, to prevent data calculation errors.



Matters needing attention when turning corners

When the hand-held scanner passes through the corner, it is recommended to avoid too fast corners, and the way of the corner should be considered in route planning. Get as many point cloud data at the same position before and after the corner as possible to improve the accuracy of data calculation.



Matters needing attention in large-scale data acquisition

When the scanner is used to collect large-scale data, the whole survey area should be divided to facilitate the data calculation efficiency, improve the calculation accuracy and facilitate the survey area management. Divide the larger survey area into several small survey areas. It is suggested that the planned data collection time of each survey area should be 25-30 minutes, and the overlapping range of survey areas should be at least 30%.

Suggestions for scanning long corridors (Tunnels)

Generally, the data obtained in areas with rich features and textures will have good calculation results. To ensure the calculation accuracy, it is necessary to manually set a feature point with a diameter of about 1 meter every 10 meters or place some objects with complex structures such as chairs and stools in this area. Improve the accuracy of the solution. In addition, during data acquisition, attention should be paid to the incident angle of the laser, and data acquisition should be done in the middle of the corridor or tunnel as far as possible, and meaningless in-situ rotation should not be carried out, to avoid the sudden decrease of the incident angle caused by object occlusion and errors in data calculation.



10.5 Ground control point acquisition

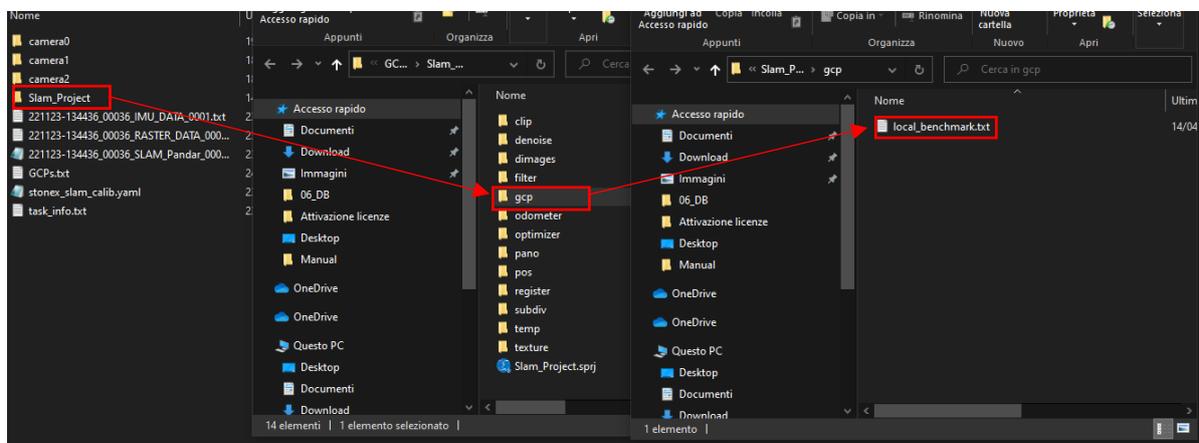
With the X120GO scanner it is possible to acquire control points in two different ways, one that does not require the use of the application and one with the use of the application. It is not possible to mix the two acquisition methods, so if you start the survey by acquiring points in a certain way, you cannot change the way you acquire them. In the case of mixed acquisition, only those saved by application will be considered as GCP.

For both methods, it will be necessary to position the scanner over a recognisable point or target, aligning the desired point with the centre of the cross on the instrument's base. When positioning, it is advisable to move carefully, avoiding abrupt changes of direction or sudden acceleration. When acquiring the point, hold the scanner as still as possible in order to have a better acquisition of the point.

Acquisition by standing over a point without application

With this first method, it will be possible to acquire a control point by hovering over it for at least 10 seconds. This means that when we are in the vicinity of a position that we want to save as a GCP, we will place the scanner on top of it, centring it on the cross in the baseplate. After 10 seconds, we can resume scanning.

This method allows you to acquire control points even when you are not using the application. At the end of the scan, no files containing the acquired points are saved. The coordinates of the GCPs are calculated automatically during post-processing by the software, recognising the points by standing over them. The coordinates of the GCPs are saved in a file called `local_benchmark` within the project subdirectory called `gcp`.

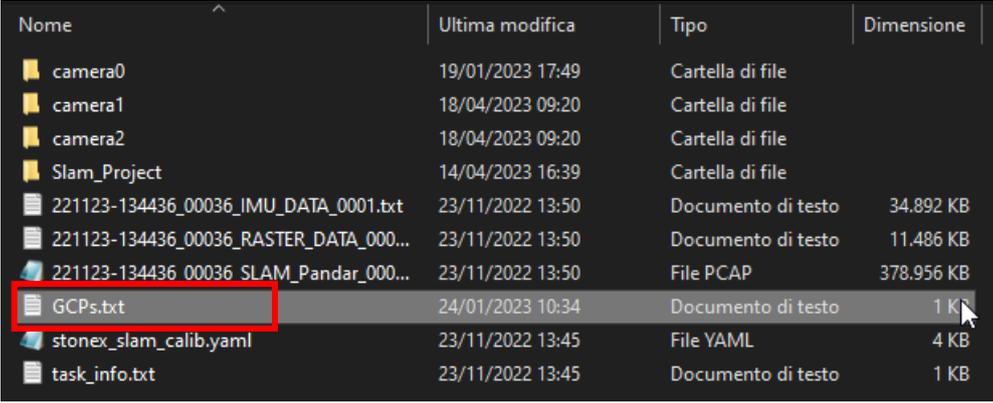


NOTE:

- When positioning on the control point, avoid making sudden or fast movements that could cause problems in cloud reconstruction and point recognition accuracy.
- If you want to acquire a control point on a wall, approach the wall by slowly rotating the scanner in a vertical position and leave the scanner stationary for at least 15 seconds to have a better recognition of the point.
- With this acquisition method, the initialization point is always saved as GCP. So, if you do not want this point, you must delete it from the `local_benchmark` file.

Acquisition via the GOapp application

If you are using the application, points can be acquired via the "GCP Mode" function as explained in [Chapter 5.3](#). When acquiring a point, keep in mind the acquisition tips explained above. The advantage of using this function is that we will be able to reduce the dwell time on a point (by approximately half) and we will be able to see within the application, in the cloud preview, a yellow square identifying the position of the point. In addition, a GCPS.txt file will be created in the project folder, which contains the time references within the point save scan, not the coordinates of the points.



| Nome | Ultima modifica | Tipo | Dimensione |
|--|------------------|--------------------|------------|
| camera0 | 19/01/2023 17:49 | Cartella di file | |
| camera1 | 18/04/2023 09:20 | Cartella di file | |
| camera2 | 18/04/2023 09:20 | Cartella di file | |
| Slam_Project | 14/04/2023 16:39 | Cartella di file | |
| 221123-134436_00036_IMU_DATA_0001.txt | 23/11/2022 13:50 | Documento di testo | 34.892 KB |
| 221123-134436_00036_RASTER_DATA_000... | 23/11/2022 13:50 | Documento di testo | 11.486 KB |
| 221123-134436_00036_SLAM_Pandar_000... | 23/11/2022 13:50 | File PCAP | 378.956 KB |
| GCPs.txt | 24/01/2023 10:34 | Documento di testo | 1 KB |
| stonex_slam_calib.yaml | 23/11/2022 13:45 | File YAML | 4 KB |
| task_info.txt | 23/11/2022 13:45 | Documento di testo | 1 KB |

Again, the actual coordinates of the points will be calculated when processing the data with GOpost and will be saved in the file called local_benchmark in the gcp subdirectory.

NOTE:

- When positioning on the control point, avoid making sudden or fast movements that could cause problems in cloud reconstruction and point recognition accuracy.
- If you wish to acquire a GCP on a wall, approach the wall by slowly rotating the scanner to a vertical position and leave the scanner stationary for at least 5 seconds before adding the point via the app for greater accuracy in reconstructing the point.
- When GCP mode is selected within the app, a short press of the scanner's power button will save a position as a GCP. This type of acquisition does not generate the yellow square in the app, but only saves the time reference in the file "GCP.txt".



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