

TRIMBLE X12

3D Laser Scanner

USER GUIDE

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Release Notice

This is the June 2022 (Version 5A) release of the *Trimble X12 3D Laser Scanner User Guide*.

Regulatory Information

For applicable regulatory information, please see the *Trimble X12 Regulatory Information Document* included with this Trimble product, or consult your Trimble dealer.

Product Limited Warranty Information

For applicable product Limited Warranty information, please refer to the *Limited Warranty Card* and *Extended Warranty Card* included with this Trimble product, or consult your local Trimble authorized dealer.

Registration

To receive information regarding updates and new products, please contact your local dealer or visit www.trimble.com/register. Upon registration you may select the newsletter, upgrade or new product information you desire.

Safety Information

Before you use your Trimble product, make sure that you have read the user manual and understood all safety requirements. Failure to follow the instructions, warnings and precautions may lead to device damage, and/or user injury.

DANGER! INDICATES AN IMMINENTLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, MIGHT RESULT IN DEATH OR SERIOUS INJURY.

WARNING – This alert warns of a potential hazard which, if not avoided, could result in severe injury or even death.

CAUTION – This alert warns of a potential hazard or unsafe practice that could result in minor injury or property damage or irretrievable data loss.

NOTE – An absence of specific alerts does not mean that there are no safety risks involved.

Use and Care

This product is designed to withstand tough environments that can occur in construction applications. However, the scanner is a high-precision electronic instrument and should be treated with reasonable care.

Also see, [Transport and Maintenance, page 85](#).

CAUTION – Operating or storing the instrument outside the specified temperature range can damage it.

CAUTION – Please read carefully the manual before using the instrument. Failure to follow the instructions, warnings and precautions that are in the manual may lead to device damage, and/or user injury.

Permitted Use

- Collecting 3D scans and images.
- Data processing by means of field and office software.

Adverse Use

- Use of the product without instruction.
- Use outside of the intended limits.
- Disabling safety systems.
- Removal of hazard notices.
- Opening the product using tools, for example, a screwdriver, unless this is specifically permitted for certain functions.
- Modification or conversion of the product.
- Use after misappropriation.
- Use of products with obviously recognizable damage or defects.
- Use with accessories from other manufacturers without the prior explicit approval of Trimble.
- Inadequate safeguards at the surveying site, for example when measuring on roads.
- Controlling of machines, moving objects or similar monitoring applications without additional control and safety installations.

WARNING – Adverse use can lead to injury, malfunction and damage. It is the task of the person responsible for the equipment to inform the user about hazards and how to counteract them. The product is not to be operated until the user has been instructed on how to work with it.

Limits of Use

Suitable for use in an atmosphere appropriate for permanent human habitation; not suitable for use in aggressive or explosive environments.

WARNING – Local safety authorities and safety experts must be contacted before working in hazardous areas, or in close proximity to electrical installations or similar situations by the person in charge of the product.

Responsibilities

Suppliers

Trimble is responsible for supplying the product and original accessories in a completely safe condition and providing instruction for safe operation.

Manufacturers of other accessories are responsible for developing, implementing and communicating safety concerns for their products when used in combination with the Trimble product.

Owners and operators

Owners and operators have the following responsibilities:

- Understand the safety instructions on the product and in the user manual.
- Ensure personnel who use the product are trained to safely use the equipment in accordance with the instructions.
- Be familiar with local regulations for safety and accident prevention.
- Inform Trimble immediately if the product becomes unsafe for any application.

Hazards of use

DANGER!



- By working during a thunderstorm you are at risk from lightning.
- Do not carry out field surveys during thunderstorms.

DANGER! Because of the risk of electrocution, it is very dangerous to use poles and extensions in the vicinity of electrical installations such as power cables or electrical railways.

- Keep at a safe distance from electrical installations. If it is essential to work in this environment, first contact the safety authorities responsible for the electrical installations and follow their instructions.

DANGER!



If the battery breaks, contact with the corrosive gel is possible!

WARNING – During the operation of the product, extremities hair and/or clothing can get caught in rotating parts.

- Keep a safe distance to the rotating parts.

WARNING – The absence of instruction or training can lead to incorrect or adverse use of the product and lead to accidents with far reaching human, material, financial and environmental consequences.

- All users must follow the safety instructions provided in the manual.

WARNING – Inadequately securing of the working site can lead to dangerous situations, for example with road traffic or building and industrial construction sites.

- Always ensure that the working site is adequately secured. Adhere to the regulations governing safety and accident prevention.

WARNING – If the accessories used with the product are not properly secured and the product is subjected to mechanical shock, for example blows or falling, the product may be damaged or people may sustain injury.

- When setting up the product, make sure that the accessories, for example tripod, tribrach, connecting cables, are correctly adapted, fitted, secured, and locked in position. Avoid subjecting the product to mechanical stress.

WARNING – During transport, shipment or disposal of batteries, the battery pack can be subject to unintended, mechanical stress which might lead to fire hazards.

- During transport and shipment, users should abide by national and international regulations. Contact local authorities prior to transport or shipment.
- Properly dispose of used batteries.

WARNING – Charging with a device other than the charger provided by Trimble, could destroy the batteries. Fire and explosions can occur.

WARNING – High mechanical stress, high ambient temperatures or immersion into fluids can cause battery leakage, fire or explosion.

- Protect the batteries from mechanical influences and high ambient temperatures. Do not drop or immerse batteries into fluids.

WARNING – If the product is improperly disposed of, the following can happen:

- If polymer parts are burnt, poisonous gasses are produced which may impair health.
- If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.
- By disposing of the product irresponsibly you may enable unauthorized persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.
- The product must not be disposed of with household waste. Dispose of the product appropriately in accordance with the national regulations in force in your country. Always prevent access to the product by unauthorized personnel.

CAUTION – If computers intended for use indoors are used in the field there is a danger of electric shock.

- Adhere to the instructions given by the computer manufacturer with regard to field use in conjunction with Trimble products.

CAUTION – Watch out for erroneous measurement results if the product has been dropped or has been misused, modified, stored for long periods or if damage is observed after transport.

- If any abnormal instrument behavior or results are detected please contact your dealer to arrange a system check.

Laser safety

Before you use the instrument, make sure that you understand this user guide, as well as all equipment, job site safety requirements and regulations.

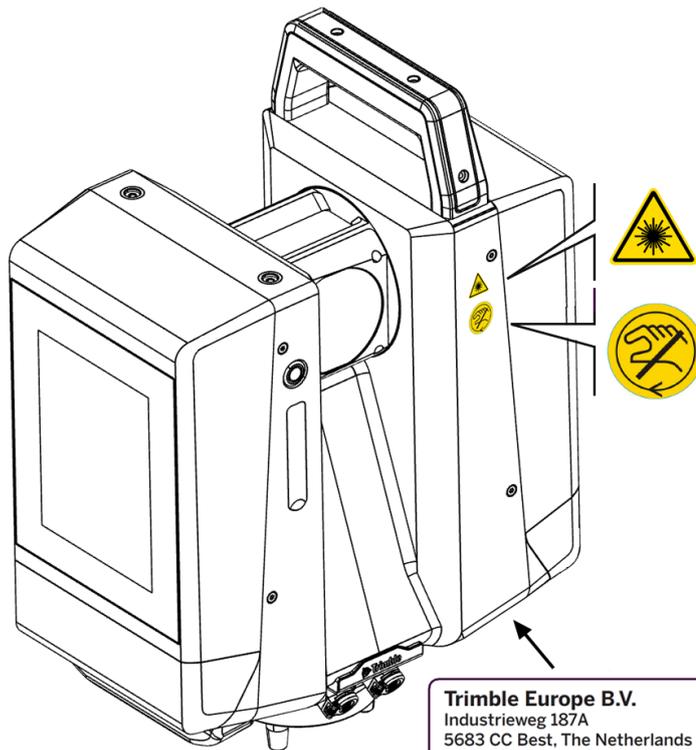
This equipment has been tested and found to comply with IEC 60825-1 2007, IEC 60825-1 2014, and 21 CFR 1040.10, and 1040.11 except for deviations pursuant to Laser Laser Notice No. 56, dated May 18, 2019.

WARNING – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous LED or laser radiation exposure. As with any bright light source, such as the sun, electric welding arcs or arc lamps, common sense applies. For further information regarding safe use of lasers, refer to the IEC 60825-1 2007, and IEC 60825-1 2014.

Laser safety classification

The scanner is a class 1 laser product that has been tested and found to comply with IEC 60825-1 2007, IEC 60825-1 2014, and 21 CFR 1040.10, and 1040.11.

- Laser wavelength: 1500 nm, invisible
- Beam diameter/divergence: ~ 3.5 mm @ 1 m/~ 0.3 mrad (1/e2, half angle)



<p>Trimble Europe B.V. Industrieweg 187A 5683 CC Best, The Netherlands</p> <p>Type: Trimble X12 PN: X12-100-00 SN: X12-6101 HW: 2.0 Power: 24V$\overline{=}$, 3.0A Manufactured: 2022</p> <p><small>Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3, as described in Laser Notice No.56, dated May 8, 2019.</small></p> <p><small>This device complies with part 15 of the FCC Rules: Operation is subject to the following two conditions: 1) This device may not cause harmful interferences, and 2) this device must accept any interference received, including interference that may cause undesired operation. This Class A digital apparatus complies with Canadian ICES-003</small></p>	
<p>Class 1 Laser Product IEC 60825-1 : 2014</p>	<p>MADE IN GERMANY</p>

Battery Safety

WARNING – Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage. To prevent injury or damage:

- Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.
- Do not expose the battery to fire, high temperature, or direct sunlight.
- Do not immerse the battery in water.
- Do not use or store the battery inside a vehicle during hot weather.
- Do not drop or puncture the battery.
- Do not open the battery or short-circuit its contacts.

WARNING – Avoid contact with the rechargeable Lithium-ion battery if it appears to be leaking. Battery fluid is corrosive, and contact with it can result in personal injury and/or property damage. To prevent injury or damage:

- If the battery leaks, avoid contact with the battery fluid.
- If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!
- If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.

WARNING – Charge and use the rechargeable Lithium-ion battery only in strict accordance with the instructions. Charging or using the battery in unauthorized equipment can cause an explosion or fire, and can result in personal injury and/or equipment damage. To prevent injury or damage:

- Do not charge or use the battery if it appears to be damaged or leaking.
- Charge the battery only in a Trimble product that is specified to charge it.
- Be sure to follow all instructions that are provided with the battery charger.
- Discontinue charging a battery that gives off extreme heat or a burning odor.
- Use the battery only in Trimble equipment that is specified to use it.
- Use the battery only for its intended use and according to the instructions in the product documentation.
- Cover battery terminals with proper insulating tape before disposal to avoid heat generation by an inadvertent short-circuit.

Electromagnetic Compatibility EMC

The term Electromagnetic Compatibility describes the capability of the product to function smoothly in an environment where electromagnetic radiation and electrostatic discharges are present, without causing electromagnetic disturbances to other equipment.

WARNING – Electromagnetic radiation can cause disturbances in other equipment.

- Although the product meets the strict regulations and standards which are in force in this respect, Trimble cannot completely exclude the possibility that other equipment may be disturbed.

WARNING – There is a risk that disturbances may be caused in other equipment if the product is used in conjunction with accessories from other manufacturers, for example field computers, personal computers, two-way radios, non-standard cables or external batteries.

- Use only the equipment and accessories recommended by Trimble. When combined with the product, they meet the strict requirements stipulated by the guidelines and standards. When using computers and two-way radios, pay attention to the information about electromagnetic compatibility provided by the manufacturer

WARNING – If the product is operated with connecting cables attached at only one of their two ends, for example external supply cables, interface cables, the permitted level of electromagnetic radiation may be exceeded and the correct functioning of other products may be impaired.

- While the product is in use, connecting cables, for example product to external battery, product to computer, must be connected at both ends.

CAUTION – Disturbances caused by electromagnetic radiation can result in erroneous measurements. Although the product meets the strict regulations and standards which are in force in this respect, Trimble cannot completely exclude the possibility that the product may be disturbed by very intense electromagnetic radiation, for example, near radio transmitters, twoway radios or diesel generators.

- Check the plausibility of results obtained under these conditions.

FCC Statement, applicable in the U.S.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by Trimble for compliance could void the users authority to operate the equipment.

FOR PORTABLE DEVICE USAGE (<20 cm from body / SAR needed)

Radiation Exposure Statement: This device meets the government's requirements for exposure to radio waves. This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the U.S. Government.

The exposure standard for wireless devices employs a unit of measurement known as the Specific Absorption Rate, or SAR. The SAR limit set by the FCC is 1.6W/kg. *Tests for SAR are conducted using standard operating positions accepted by the FCC with the device transmitting at its highest certified power level in all tested frequency bands.

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Introduction

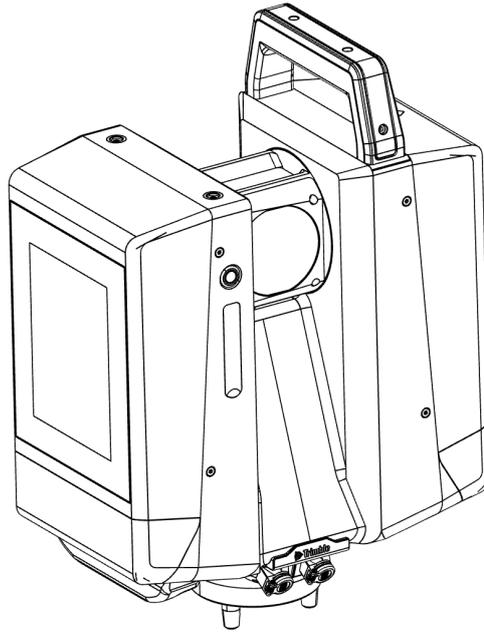
- ▶ [About the Trimble X12 3D Laser Scanner](#)
- ▶ [Technical support](#)
- ▶ [Related information](#)
- ▶ [Product identification](#)

This manual describes how to set up and use the Trimble® X12 3D Laser Scanner. Even if you have used other 3D laser scanner products before, Trimble recommends that you spend some time reading this manual to learn about the special features of this product.

Throughout this user guide, the X12 3D Laser Scanner will be referred to as the instrument.

About the Trimble X12 3D Laser Scanner

The X12 provides superior speed, accuracy and range for large scanning projects. Whether you're doing topographic surveys, as-builts of civil infrastructure, buildings or industrial facilities, the X12 will capture high quality scan data and imagery in the most challenging environments. Scan with confidence and produce results you can trust for new construction and complex renovation projects.



Technical support

If you have a problem and cannot find the information you need in the product documentation, contact your local dealer. Alternatively, go to the **Support & Downloads** area of the X12 Scanner webpage (geospatial.trimble.com/X12). Select the product you need information on. Product updates, documentation, and any support issues are available for download.

Related information

For more information about this product, please go to geospatial.trimble.com/X12.

Product identification

The instrument type and the serial number of your product are indicated on the label located at the bottom of the instrument. Please provide the model and serial number to your local dealer if you need support or service.

Trimble Europe B.V. Industrieweg 187A 5683 CC Best, The Netherlands	
Type: Trimble X12 PN: X12-100-00 SN: X12-6101 HW: 2.0 Power: 24V  , 3.0A Manufactured: 2022	Class 1 Laser Product IEC 60825-1 : 2014
<small>Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No.56 , dated May 8, 2019. This device complies with part 15 of the FCC Rules: Operation is subject to the following two conditions: 1) This device may not cause harmful interferences, and 2) this device must accept any interference received, including interference that may cause undesired operation. This Class A digital apparatus complies with Canadian ICES-003</small>	MADE IN GERMANY

Description

- ▶ Inspecting the shipping container
- ▶ Features
- ▶ Power supply
- ▶ Charger and battery packs

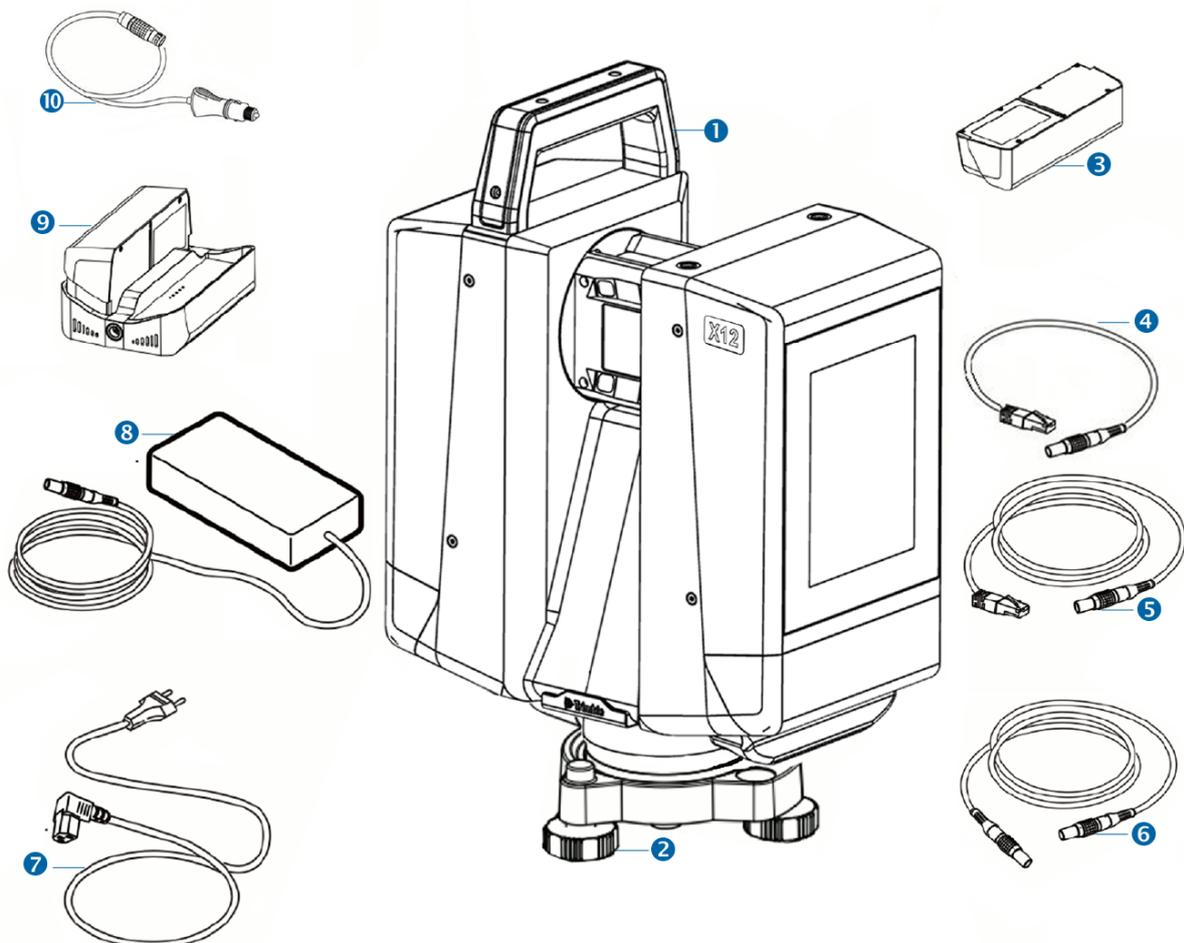
Inspecting the shipping container

The X12 3D laser scanner is packed inside an instrument case and transported inside a cardboard shipping box with two foam inserts around the case.

Inspect the shipping container. If the shipping container arrives in poor condition, examine the equipment for visible damage. If damage is found, immediately notify the carrier and your Trimble sales representative. Keep the shipping container and the packing material for the carrier to inspect.

Trimble recommends that you keep the shipping box and foam inserts in case you need to transport the instrument. The shipping box and foam inserts provide additional protection for the instrument. See [Transport and Maintenance, page 85](#).

When you unpack the instrument, check that all ordered items are received. Below is an example of the items in the instrument case:

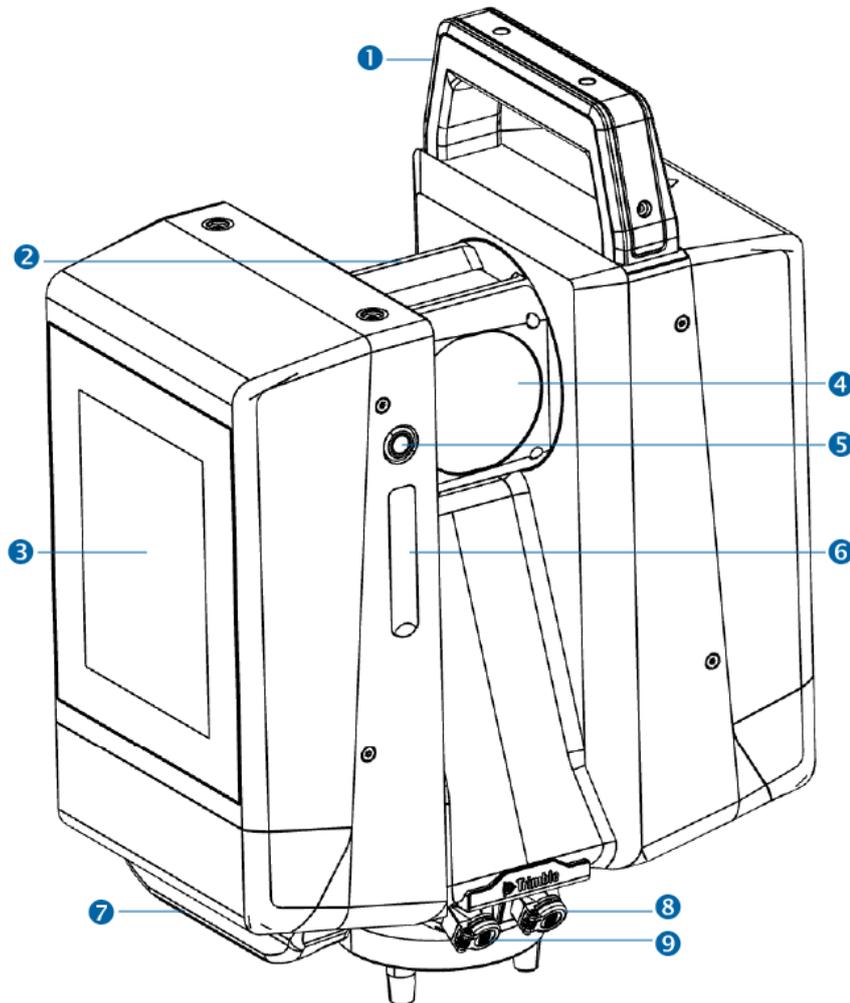


Item	Description	Item	Description
1	Trimble X12 3D laser scanner	8	X12 power supply for the scanner and charger
2	Tribrach	9	X12 battery charger
3	X12 battery (x4)	10	Car adapter charging cable
4	Ethernet cable 0.5m	11*	SD card 128 GB
5	Ethernet cable 5m	12*	USB with User Guide
6	Extension cable for (8)	13*	Documents: Quick Start Guide, Warranty Activation Card, Certificate of Calibration, Regulatory Information Document
7	Power cable with international adapters for (8)		

* Not illustrated.

Features

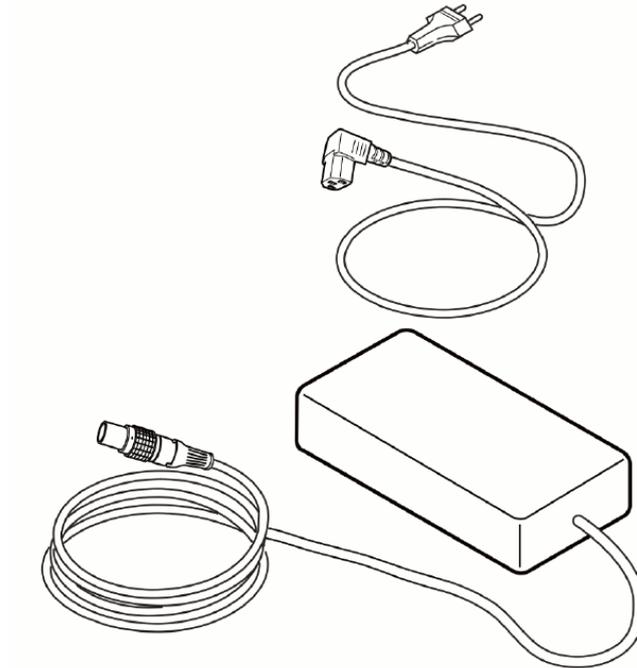
This section describes the general features of the instrument.



Item	Description	Item	Description
1	Upper handle	6	SD card slot and Micro D-SUB connector
2	Integrated camera and illumination	7	Lower handle
3	Touch screen display	8	Power supply connector
4	Rotating mirror for laser	9	Ethernet connector
5	ON/OFF button		

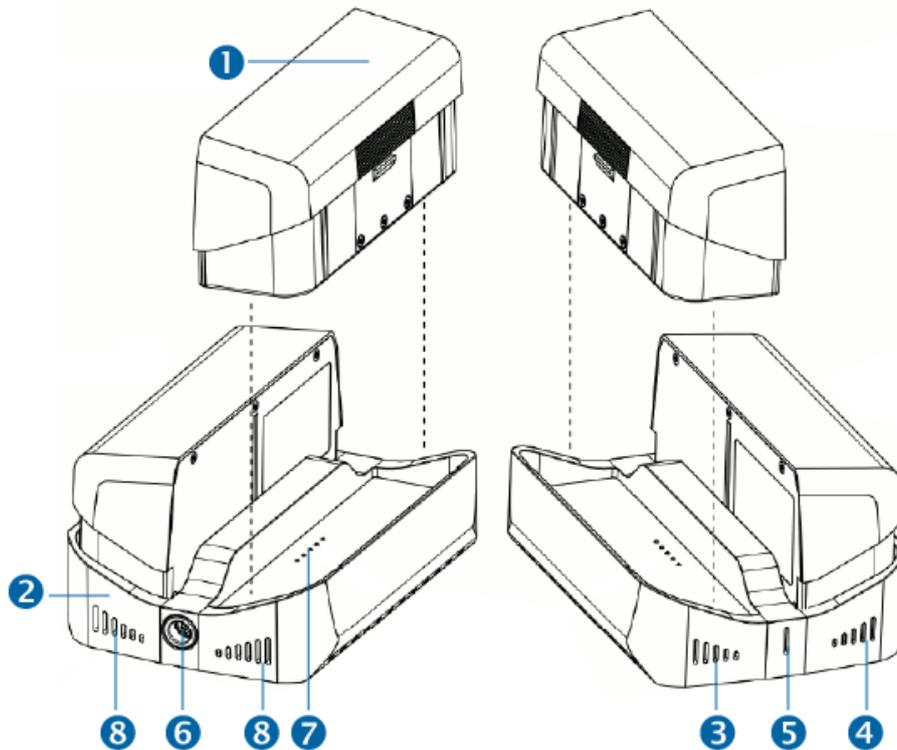
Power supply

The power supply can be used as an external power supply for either the scanner or the charger.



The power supply is intended for indoor use. **The power supply should only be used in dry locations.**

Charger and battery packs



Item	Description	Item	Description
1	Battery (× 4)	5	Blue power indicator LED
2	Charger (× 1)	6	Connector for the power supply or car charging cable
3	Slot 1 battery status indicators	7	Connector plugs for connecting charger and battery
4	Slot 2 battery status indicators	8	Ventilation slots

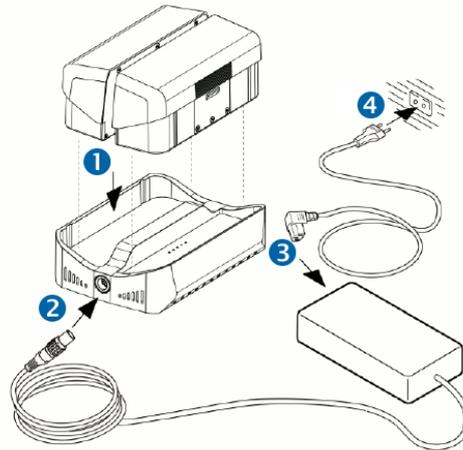
Setup

- ▶ Charging the battery packs
- ▶ Battery and power supply
- ▶ Setting up the tripod
- ▶ Setting up the scanner
- ▶ Scanner base plate
- ▶ Inserting the SD card

Charging the battery packs

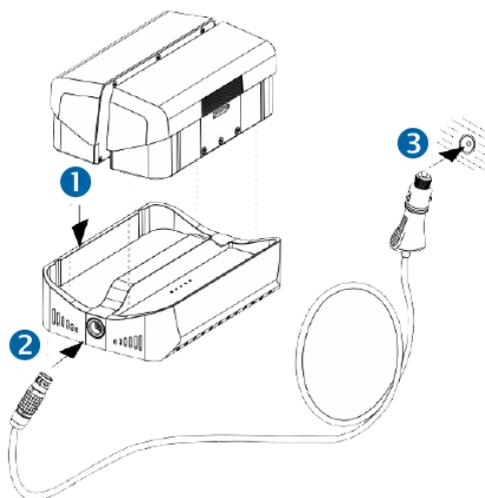
To charge the battery packs with the charger:

1. Place one or two battery pack(s) onto the charger after ensuring the correct alignment.
2. Connect the power supply cable to the charger.
3. Connect the power cable to the power supply.
4. Connect the power cable to the main power supply (100 ... 240 V AC).



To charge the battery packs with the car charging cable 12 V:

1. Place one or two battery pack(s) into the charger after ensuring the correct alignment.
2. Connect the car charging cable to the charger.
3. Connect the car charging cable 12 V to the car charging supply 12 V.



Charger LED indicators

The charger's LED indicators will display the current status of a battery after an initialization period of approximately 30 seconds.

- Blue power LED: active, power on

-  All 5 LED red: X12 Battery is too hot ($> 40\text{ }^{\circ}\text{C}$)

-  LED 1 and 5 red; LED 2, 3 and 4 off: X12 battery is too cold ($< 5\text{ }^{\circ}\text{C}$)

-  LED 2, 3 and 4 red; LED 1 and 5 off: Power supply is too low (minimum voltage $\geq 11\text{ V}$)

The overall charging capacity of the battery is divided into five parts. Each LED corresponds to a fifth:

-  LED 1: $0 < 20\%$

-  LED 2: $20 < 40\%$

-  LED 3: $40 < 60\%$

-  LED 4: $60 < 80\%$

-  LED 5: $80 < 100\%$

During the battery charging, the appropriate charging state LED flashes.

If the appropriate LED is illuminating constantly, the currently charged fifth of the battery has reached the appropriate level of charge.

When all five LEDs are illuminating constantly, the battery is completely charged and can be removed from the charger. Disconnect the power supply from the charger when finished.

TIP – The battery will be charged fast to 80%. The overall charging state 100% lasts relatively long.

CAUTION – The power supply is intended for indoor use. The power supply and the charger should only be used in dry locations.

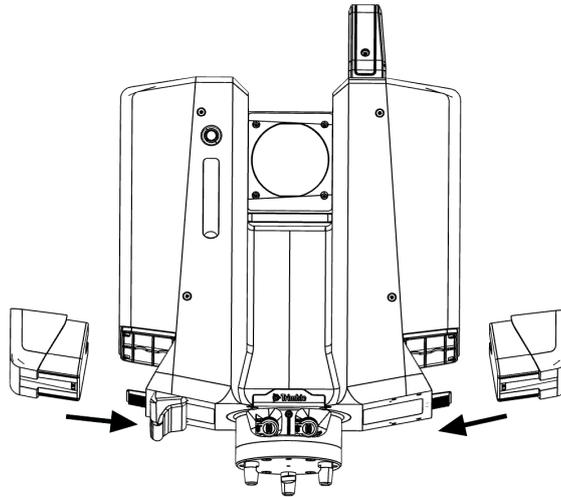
Battery and power supply

The X12 scanner can be powered with batteries for wireless operation or with direct power supply from a cable.

Operating with the battery packs

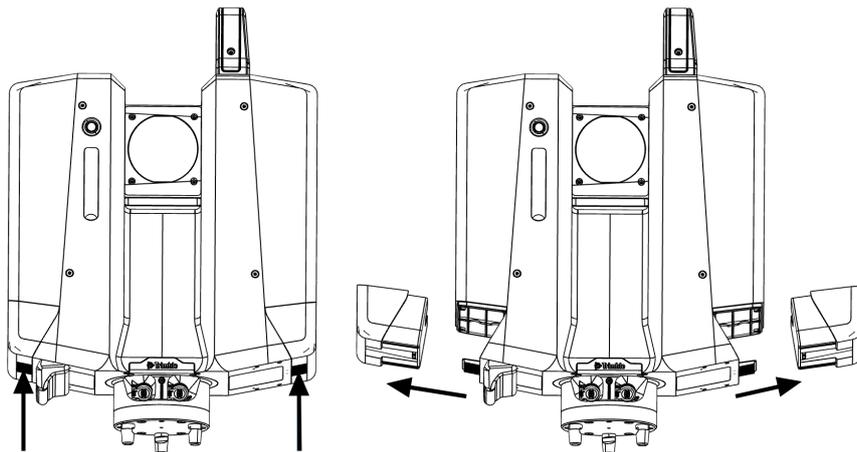
To attach the batteries:

- Push batteries sideways into the attachments on each side of the scanner until the clips latch.



To remove the battery:

1. Hold the battery and press the fixing clip at the bottom.
2. Pull the battery carefully sideways out to detach it.



NOTE –

- Before using the battery for the first time, each of them should be completely charged by the charger.
- When switching batteries, always leave one battery attached to maintain power to the scanner.
- Both battery packs can be removed for charging if the external power supply is connected.
- You can connect the power supply to the scanner to charge both battery packs during operation.

CAUTION – Never remove both battery packs while the scanner is powered on and the power supply is not connected.

Disconnecting the supply voltage while scanning, might result in loss of data and crashing of the system.

If the scanner is operated until the battery is completely empty (total discharge), it has to be recharged immediately. Failure to do this can result in damage to the battery

First usage / recharging the battery:

- Only use the corresponding charger.
- Each battery must be charged by the charger prior to the first usage.
- The permissible temperature range for charging is between 0 °C to +40 °C / +32 °F to +104 °F.
- It is normal for the battery to become warm during the charging process. If the battery temperature is too high the charging process is aborted.

TIP – Both battery packs should always be attached to ensure the optimum weight balance of the scanner. If there is one removable battery not connected, a warning message will appear.

TIP – You can charge the attached battery packs in the scanner by connecting the power supply to the scanner, but in general it will be more productive to charge with the charger.

Period of use and life span of the battery

- The period of use depends on the electrical load, temperature and the age. A battery will last about 2.5 hours.
- A battery only reaches about 70 % of its capacity after being charged properly, the battery pack is exhausted (usually after about 600 – 800 cycles) and must be replaced. Please contact Trimble support or your distributor for a replacement.
- If the battery packs will be stored for a long period of time, the charging capacity should not be more than 60 – 70 % (i.e. up to the third diode indicated on the charger).
- After a longer period of storage, each battery has to be recharged before using it. As soon as the minimum level of the operating voltage of 12 V DC is reached, the battery has to be recharged.

Storing and transporting the battery

WARNING –



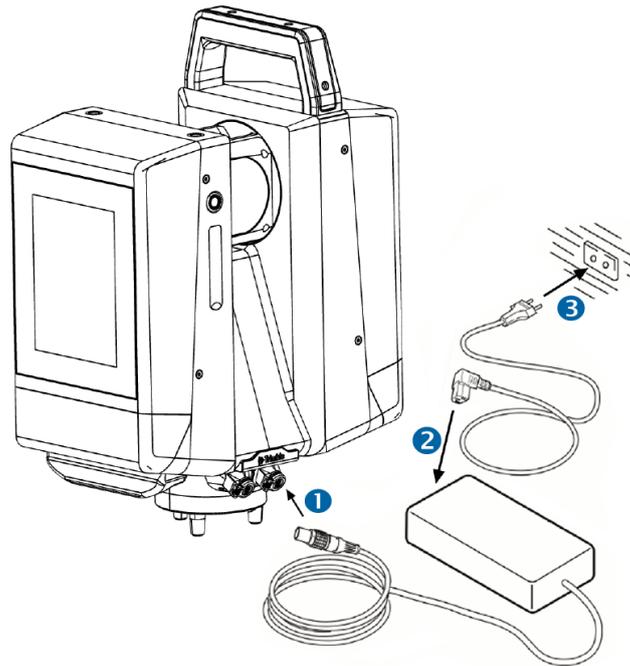
- Never put the battery close or into fire.
- Never put the battery close to easily inflammable or combustible material.
- Never short circuit the poles of the battery with cable or tools.
- The accurate polarity of the battery and the charger must be assured.
- Never dismantle or convert the rechargeable battery.
- If the battery breaks and electrolyte gets in contact with skin or clothes, it has to be washed with water immediately. In case of contact with eyes, please consult a physician immediately.
- The battery has to be protected against use by a non-authorized person.

CAUTION –

- It is not recommended to store a discharged battery (Caution of depth discharge). Storing the battery pack in such a state can damage it permanently.
- If stored, the battery has to be recharged at least every six months.
- The storage temperature should be between 0 °C to 30 °C (32 °F to 86 °F) without any direct variations in temperature to extend the durability of the battery as long as possible.
- The storage location should be dry.

CAUTION – When transporting or shipping batteries, ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping, contact your local passenger or freight transport company.

Operating with the power supply



To operate with the power supply:

1. Connect the power supply cable to the scanner.
2. Connect the power cable to the power supply.
3. Connect the power cable to the main power supply.
4. Power on the scanner.

Setting up the tripod

To set up a Gitzo Series 5 tripod:

1. Adjust the legs on the tripod to the required height. Turn the locks on the tripod legs just enough so they can be extended equally and then tighten the locks so they are secure.
2. Spread the tripod legs wide apart so they lock out for increased stability.
3. Set up on a level, stable surface when possible.
4. Ensure the tripod head is visibly level and if necessary, adjust the leg heights.

To setup a Trimble Trimax tripod:

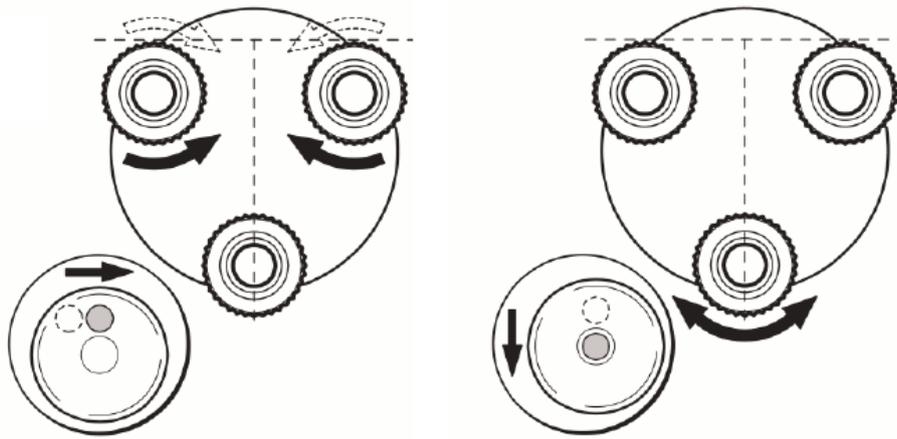
1. Loosen the lock screws to adjust the legs on the tripod to the required height and tighten so they are secure.
2. Spread the tripod legs for maximum stability.
3. Set up on a level, stable surface when possible.
4. Ensure the tripod head is visibly level and adjust the leg heights if necessary.

TIP – It is always recommended to shield the scanner from direct sunlight and avoid uneven temperatures around the scanner. The scanner should always be set up on its tripod. Using the tripod delivered with the system guarantees maximum stability during scanning operations. Please do not put the scanner directly on the ground while scanning.

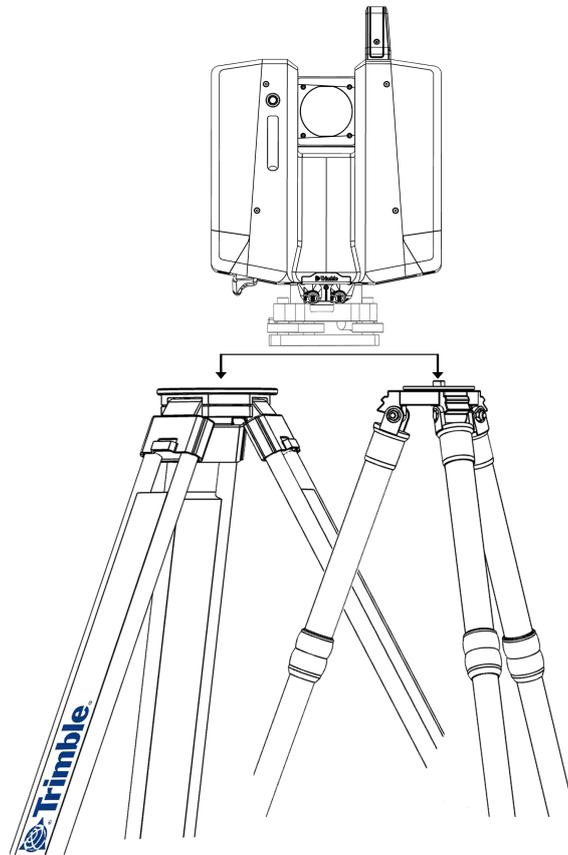
Setting up the scanner

To set up the scanner:

1. Place the tribrach on the tripod and secure it with the central fixing screw.
2. Level the tribrach using the circular level. Turn two of the leveling screws simultaneously in opposite directions. The index finger of your right hand indicates the direction in which the bubble should move. Now use the third leveling screw to center the bubble.



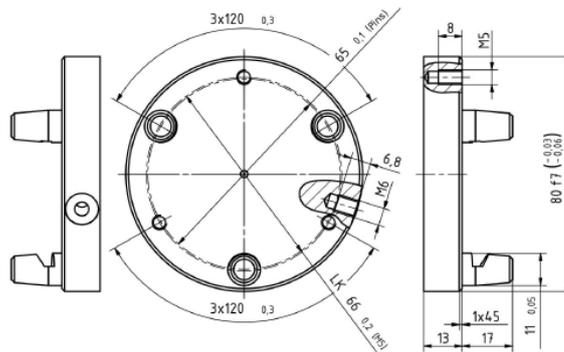
- Place the scanner on the tribrach and secure it with the tribrach's locking lever.



TIP – The scanner can be leveled using the tribrach thumb screws and the integrated electronic level in the onboard UI.

Scanner base plate

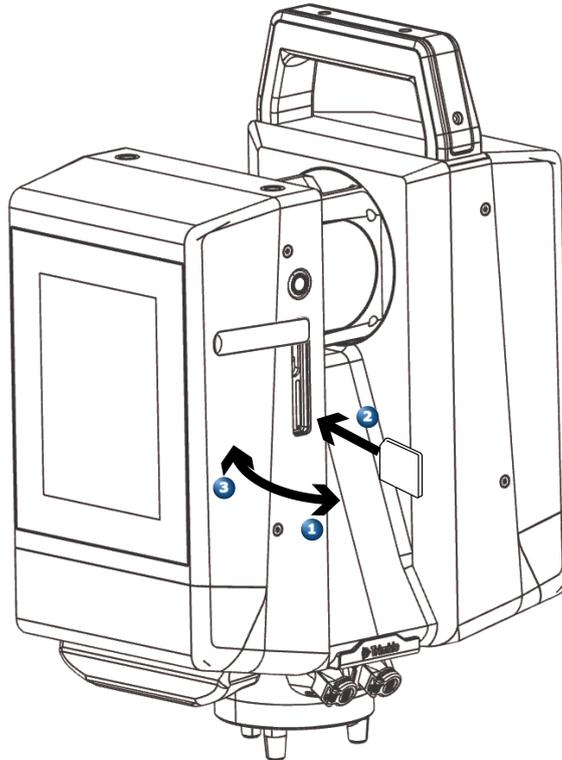
A security thread is integrated at the base of the scanner for special security requirements.



TIP – If you set the scanner upside down, you can use the screw thread at the bottom side of the scanner to fix it for special security requirements.

Inserting the SD card

The SD card and Micro D-SUB port are integrated in the side of the scanner. The cover should always be attached to prevent dirt and moisture from entering these connections.



To insert the SD card:

1. Open the SD card cover.
2. Slide the SD card into the card slot until it clicks into the locked position.
3. Close the SD card cover.

CAUTION – When your project is done, you can copy the project from the internal drive to the SD card for transfer to another computer, see [Copying or deleting projects, page 65](#). The fastest way to transfer large projects is by using the Ethernet cable, see [Mapping Trimble X12 Drive to Windows PC, page 79](#).

A Micro D-SUB port is located above the SD card slot to connect external sensors like PPS pulse, odometer, line sync, external GPS, pulse generators or encoders which may be used to support future applications.

4

Preparing to Scan

- ▶ Additional equipment
- ▶ Targets
- ▶ Positioning the scanner
- ▶ Environmental conditions
- ▶ Miscellaneous

Additional equipment

Trimble Perspective software will enable users to automatically register scans in the field without targets however some applications may require survey control and targets. In this case, additional equipment will be required.

- Total stations with reflectorless measurements are recommended for georeferencing scans. Total stations can survey targets to apply survey control for target based scan registration.
- Targets with mounting equipment.
- Controller, laptop or tablet.

NOTE – Total stations can also be used to georeference scans that are automatically registered with Perspective.

Targets

Paper targets

- Checkerboard pattern, not shiny or reflecting.
- It is recommended to print the dark gray squares on white paper with a laser printer. The targets should be laminated using dulled sleeves for best results. The printed target should be tested for using in the field. Trimble does not guarantee success with printed targets.
- Good recognizable labeling with consecutive numbering for referencing the total station data.
- Affix printed targets with non-reflective adhesive tape.
- Distribute the targets over the scanning area at different elevations.
- The minimum number of targets is three per scan, recommended are five to six.

CAUTION – Affix the targets only on flat surfaces. Make sure targets are not bent anyhow. Round columns or pipes are not recommended and will increase the error of the target fitting enormously.

CAUTION – The paper target should be mounted vertically aligned. This is important for detecting the target center accurately.

Adjustable black and white tilting targets

- Adjustable 6" (152 mm) black and white tilting target, for affixing to pole top and used in multiple survey jobs.
- Contrasting 6" (152mm) black and white pattern
- Matte non-glare target material
- Adjustable tilting axis
- Since the target center is tilt-able, it can be measured perfectly with the scanner as well as with the total station. Before starting a scan, always orientate the tilting target towards the scanner / total station.
- Attach the target via a standard aligning adapter.
- Distribute the targets over the scanning area at different elevations.
- The minimum number of targets is three per scan, recommended are five to six.



Adhesive black and white checker targets

- Checkerboard pattern, not shiny or reflecting.
- Adhesive targets are easier to affix because no tape is required.
- Distribute the targets over the scanning area at different elevations.
- The minimum number of targets is three per scan, recommended are five to six.

Spheres

Spheres can be acquired more accurately than flat black and white checkerboard targets and from any direction without consideration of angle of incidence. Spheres aren't as practical to use when a high number of targets are required. They also require a prism or flat target to be positioned at the same height in order to survey their location with a total station.

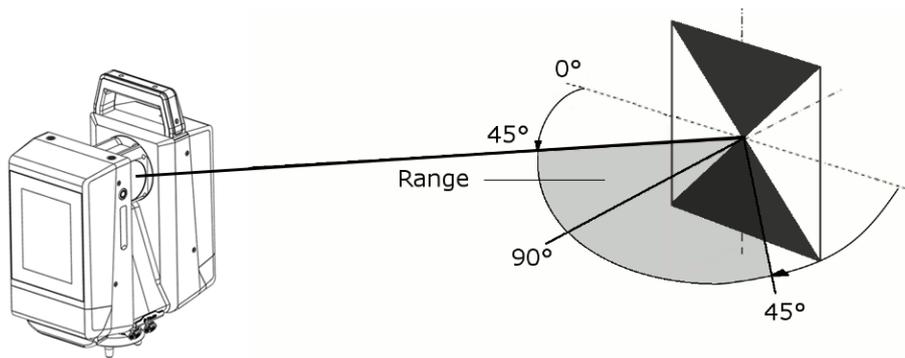
- 100 mm and 230 mm non reflective.
- Distribute the spheres over the scanning area at different elevations.
- The minimum number of spheres is 3 per scan, recommended are 5 to 6.

Positioning the scanner

Below are guidelines for positioning the scanner to ensure accurate and sufficient target acquisition for registration.

- Position the scanner in the center of the target field. Ensure that you have a clear view of the object to be scanned and at least three targets.
- Ensure that the angle of incidence of the laser beam on the target is larger than 45°.
- Angle of incidence is not a concern when using spheres.
- Self printed targets must have a minimum black/white contrast of 6:1 in the scan. Please test this by frontal (angle 90°) scanning a target and analyze the contrast of the target in your field software.
- The recommended distance between the scanner and targets (DIN A4) depends on the scan resolution.

Resolution	Angle of Incidence 90°	Angle of Incidence 60°	Angle of Incidence 45°
Low	1 m to 6 m	1 m to 5 m	1 m to 4 m
Middle	1 m to 10 m	1 m to 10 m	1 m to 8 m
High	1 m to 25 m	1 m to 22 m	1 m to 20 m
High ×2	1 m to 50 m	1 m to 45 m	1 m to 35 m
High ×4	1 m to 100 m	1 m to 90 m	1 m to 70 m
High ×10	1 m to 120 m	1 m to 110 m	1 m to 90 m



TIP – With a smaller angle of incidence, the possible target distance is reduced. The maximum angle based on the normal of the target should be less than $\pm 45^\circ$.

Environmental conditions

Consideration should be given to the surfaces being scanned, weather conditions and temperature prior to scanning.

Unfavorable surfaces

- Highly reflective (polished metal, anodized metal, gloss paint, mirrors)
- Translucent (clear glass, thermo isolated glass)
- Highly absorbent (black)

TIP – To improve the results of the measurement, such surfaces can be colored or powdered.

Difficult weather conditions

- Surfaces that are directly illuminated by the sun have an increased range noise and therefore a larger measurement uncertainty.
- If some objects are scanned against the sunlight or a bright spotlight, the return signal to the optical receiver of the scanner can be too strong in this area and no measured data is recorded. A “black hole” appears in the reflectance image.
- Fog, rain and snow can cause poor measurement results, therefore scanning during these conditions is not recommended.

CAUTION – Don't use the scanner in the rain. Scanning results can be compromised and it's better to protect the instrument from rain.

Extremely high or low temperatures

If the temperature is outside the calibrated operating range of -10 °C to +45 °C (14 °F to 113 °F), an error message is displayed. Scanning is still possible, but the measuring accuracy is no longer specified.

- In very cold temperatures, be sure to warm up the scanner. See the Warm up function of the scanner.
- In very hot temperatures, the scanner will switch off if the upper temperature limit is exceeded to avoid damaging electronic parts. Let the scanner cool down indoors or in the shade.

CAUTION – If the scanner is brought from cold into a warm and humid environment, the glass window on the mirror assembly or in extreme cases even the internal optic can fog up. This may cause measurement errors.

- Avoid large temperature differences and allow the scanner time to acclimate.

Miscellaneous

- Plan your scan stations in advance to optimize the field workflow and ensure you capture the area of interest.
- If targets will be used, plan the locations or even set up targets in advance to ensure at least three targets per scan.
- Before initiating the scanning process, please check if there is enough space on the internal drive (30 to 60 GB per day, depending on your project plan).

Operating the Scanner

- ▶ [Operating with Trimble Perspective](#)
- ▶ [Operating with the onboard user interface](#)

The X12 can be operated remotely using a controller running the Trimble Perspective field software or with the X12 onboard user interface. Depending on user preference and the project requirements, choose between these modes of operation and try to maintain the same workflow throughout the project. Switching between the modes of operation can make project and file management more difficult. Familiarize yourself with the workflow you choose before executing a project.

Operating with Trimble Perspective

Operating the scanner with the Perspective field software offers the users greater visibility and a more intuitive experience in the field. Automatic in-field registration with no targets is possible with the scanner's IMU for precise scan orientation and the software's smart algorithms to register the scans. If there is a scan registration error you will instinctively know to take another scan to increase scan overlap or use the manual registration tools to easily correct any issue. When finished you can refine the registration, report on the results and export the data in the field.

Perspective provides full 2D and 3D viewing to visualize the project as you progress. You can take measurements and add annotations with images for field notes. Perspective also provides data redundancy with automatic transfer of data to the tablet and storage on the scanner's internal drive. With the X12 and Perspective, you can leave the site with confidence knowing the project is accurate and complete.

Trimble T10x tablet

The field software runs on the T10x tablet or any comparable Windows 10 tablet to control the X12. Below are the specifications for the T10x tablet and the recommended system requirements.

- Operating system:
 - Microsoft® Windows 10 (64 bit)
- System:
 - Energy efficient Intel 10th Gen Core i7 Processor
 - 32 GB RAM
 - 1 TB storage
 - 10.1 in (256 mm) 1000 Nits 1920 × 1200 LCD Screen
 - 8 MP rear camera
 - High capacity hot swappable batteries
- Communication:
 - Wi-Fi 802.11ax
 - USB 3.0 × 1
 - LAN Port RJ45 × 1

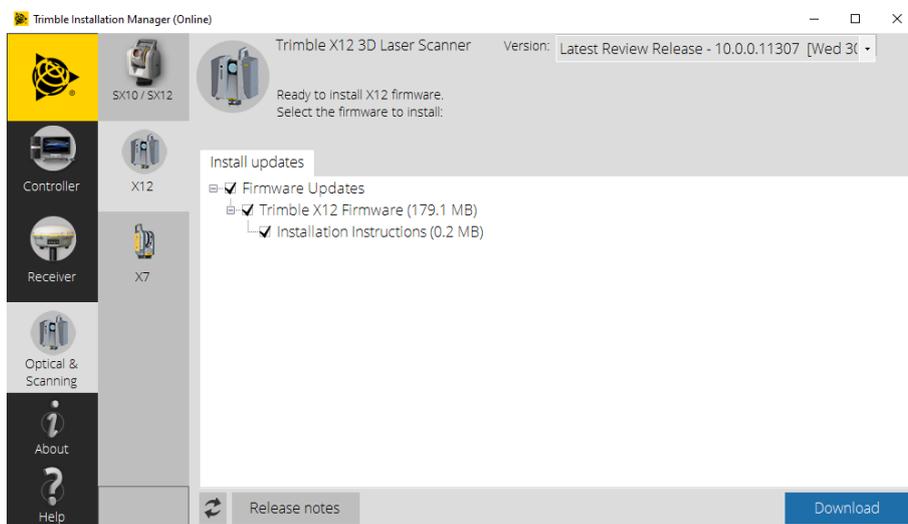
Installing and starting Trimble Perspective

To install the field software, you must first install the Trimble Installation Manager (TIM) on your controller. The link below provides access to the online and offline version of the TIM software. Most users prefer the online version to install and update field software when connected to the Internet.

<https://www.trimble.com/InstallationManager/Index.aspx>

NOTE – You must be connected to the Internet to download the installations for the offline version to install at a later date.

After starting the Trimble Installation Manager, you will be able to install the latest version of Perspective on your controller and update the field software in the future.



To run Perspective, tap the program icon. Perspective will start and display full screen.

Trimble Perspective Wi-Fi connection

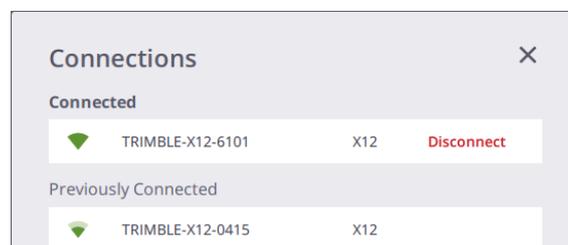
Connecting to the scanner

To operate the scanner with the field software, it must be connected to a controller. The controller can be a T10x tablet or a comparable Windows 10 tablet running Perspective. When the scanner is started, it is available for connection by the field software via Wi-Fi connection.

Follow the steps below to connect:

1. Insert the two battery packs in the scanner. See [Battery and power supply, page 28](#).
2. Power on the scanner by pressing and holding the On/Off button for at least 0.3 seconds:

- The power-up process will start and takes about 20 seconds.
 - Do not touch the screen during startup.
 - The startup is complete after an audible sound.
 - You will be prompted to enter a Wi-Fi password for security. Future startups will not require a Wi-Fi password to be entered. See Start Screen.
3. Start **Trimble Perspective** from the tablet.
 4. If there is no project available, tap **Create New +** to create a new project and the new created project will load.
 5. If there are several projects available, the last loaded project is automatically loaded.
 6. Tap the **Scanner** icon in red to open the **Connections** page. Scanner serial numbers in the range of the controller will display for connection.
 7. Choose a scanner to connect.
 - For your first Wi-Fi connection to the scanner, enter the Wi-Fi password that has been set to the scanner (see [Start screen, page 48](#)).
 - If you have already connected to the scanner with the Wi-Fi with:
 - The same controller, the connection is automatic and does not require the Wi-Fi password.
 - A different controller, enter the Wi-Fi password that has been set to the scanner.
 8. Once the connection is established, the connected scanner is shown in the **Connections**. Tap **Close**.



9. The **Scanner** and **Wireless Signal** icons turn green and the **Battery** icon shows the level of the battery in the scanner.



Wi-Fi settings

The scanner has the wireless 802.11n technology meaning the scanner supports the **2.4 GHz** and **5 GHz** frequency bands. The default factory values for the Wi-Fi settings are respectively **Auto** (2.4 GHz), **Auto**, and **Empty** for the frequency band, the channel, and the region code for each newly shipped scanner.

At the first connection with a new scanner (or in case of an already connected scanner and if the region code of the scanner differs from the region of the controller), the field software applies the region of the controller to the scanner, and keeps the frequency band and the channel unchanged (Auto). During the update process, the scanner is automatically disconnected and reconnected to the controller. Based on the region code, the field software scans the Wi-Fi environment to select the best frequency and channel to use.

When out of the **Auto** mode, you can switch between **5 GHz** and **2.4 GHz**. The **5 GHz** frequency provides a faster data exchange rate at a shorter distance while the **2.4 GHz** frequency offers coverage for further distances, but may perform at a slower speed in the data exchange. Both frequencies can be used with a multitude of channels including indoor-use channels.

TIP – Reset the Wi-Fi settings to **2.4 GHz Auto** mode, before shipping. This setting is legal in all countries and can be used to put the scanner in a legal state before shipping it internationally. See [Settings > About, page 76](#).

NOTE – The **Wi-Fi advanced** settings are enabled only if a wireless connection between the scanner and the controller has been set.

Connecting with the Ethernet cable

When the Ethernet cable is connected to the scanner, the cable is automatically selected as the primary communication type and the connection to the scanner is automatically established.



If the Ethernet cable is disconnected from the scanner, the controller starts searching for a scanner in its vicinity using Wi-Fi.

NOTE – For more information on the Perspective field software refer to the Perspective Help file.

Operating with the onboard user interface

The scanner onboard user interface is available for experienced users that prefer to use the touchscreen display to operate the scanner. This workflow will require the users to be able to register scans in the office with the target-based, plane-based or cloud-to-cloud registration techniques.

The onboard user interface allows the scanner to be operated independent of cables and any external hardware with two rechargeable battery packs installed. The system is equipped with a computer unit which can be controlled via touchscreen to access all menus and parameters.

Powering on/off the scanner

- Power On:
 - Check the lenses to ensure they are perfectly clean.
 - Connect two batteries to the scanner.
 - Press and hold the On/Off button for at least 0.3 seconds.
 - Please do not touch the display during switch on and booting.
 - The power-up process starts and will require approximately 20 seconds to complete.
 - During the power-up process, the deflection unit will spin.
 - The startup is complete after an audible sound.
 - You will be prompted to enter a WiFi password for security purposes the first time the scanner is started. *You have the option to **Skip and Disable Wi-Fi** or enter the password if you choose to operate the scanner with Perspective. See [Start screen, page 48](#) for more information.*
- Power Off:
 - Press and hold the On/Off button for at least 0.5 seconds.
 - The display shows "**Shutdown system! Please wait**"
 - In the event of a system crash, press the On/Off button for at least 5 seconds. The scanner will then switch off.

Touchscreen

To control the scanner via the touchscreen, no special stylus-pen is required. Operate the touchscreen with your fingertips. Menus can be accessed and commands can be executed by clicking on the respective icon or button on the touchscreen with the fingertip.

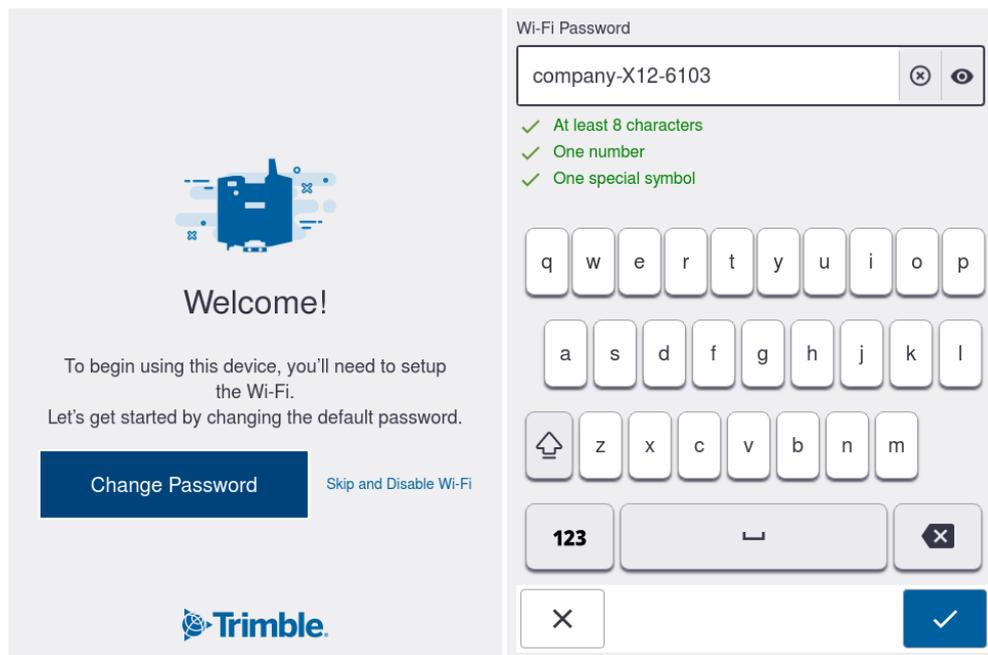
NOTE – All scanning menus have been designed to be operated smoothly with the finger. The capacitive touchscreen reacts only with capacitive variation and should therefore only be operated with your fingertips.

Start screen

After the first startup of the scanner, you will be prompted to change the Wi-Fi password for security purposes. You will be required to enter this Wi-Fi password for the first Wi-Fi connection from Perspective.

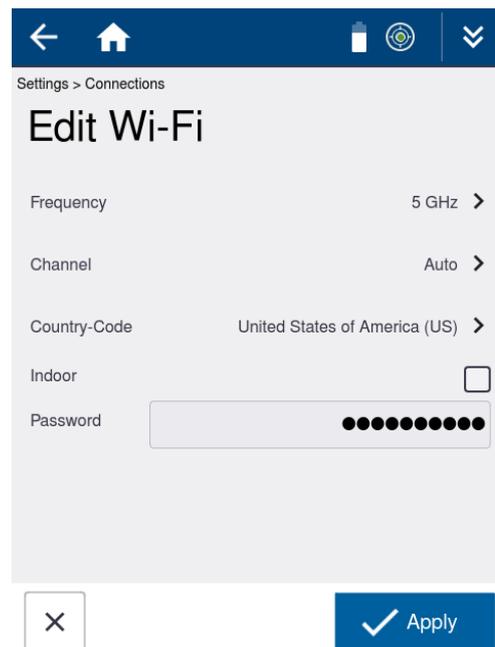
When the **Welcome** screen appears, tap:

- **Change Password** to change the default Wi-Fi password.
- Or **Skip and Disable Wi-Fi** if you intend to operate the scanner with the onboard UI and not use Perspective.



To change the default password:

1. Enter a Wi-Fi Password with at least eight characters, one number and one special symbol. The password requirements will turn green once they are met.
2. Tap  to accept. The **Edit Wi-Fi** screen displays.
3. Modify any Wi-Fi settings (see [Wi-Fi settings, page 46](#)).
4. Tap  to save the settings.

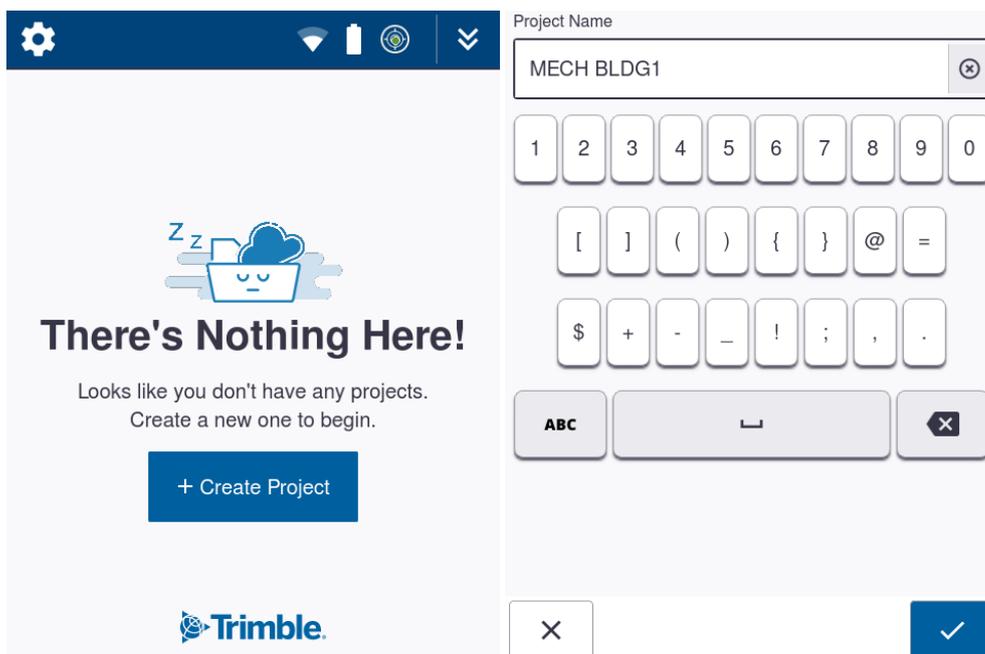


Creating projects

When no projects exist, you are prompted to create one.

To create an onboard project:

1. Tap the **Create Project** button.
2. Tap the **Project Name** field and enter a project name.
3. Tap  to accept. The **Scan Parameters** screen appears.



NOTE – Projects should only be created in Perspective when using a tablet running the field software to control the scanner. Projects created in Perspective will automatically display in the onboard user interface as the active project after capturing the first scan.

Scan and image parameters

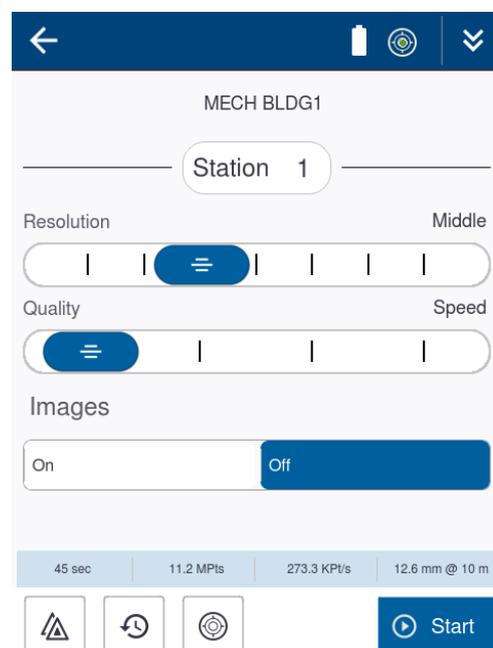
After creating a new project or continuing an existing project, the **Scan Parameters** screen opens where you can set the scan and image parameters for the data to be acquired.

Scan parameters

Setting the required scan parameters is done using the slider bars to set the **Resolution** and **Quality** parameters for the current station. The following scan properties are updated at the bottom of the screen as the parameters are adjusted so you will know the time required and the level of data that will be captured.

- Scan Time = min:sec
- Maximum Points = MPts
- Acquisition Rate = KPts/s
- Point Spacing = mm @ 10 m or in @ 33 ft

NOTE – The units for point spacing can be set to Metric or Imperial. See [Settings](#), page 68.



The table and tips below will help you select the best scan resolution for your project.

Scan Mode	Ideal Distance	Spacing mm @ 10 m	Spacing mm @ 35 m	Spacing mm @ 50 m	Spacing mm @ 80 m	Max. Number of Points	Max. File Size
Preview	--	50.3	175.9	251.3	402.1	698.3 KPts	5 MB
Low	> 1 m	25.1	88.0	125.7	201.1	2.8 MPts	21 MB
Middle	> 2 m	12.6	44.0	62.8	100.5	11.2 MPts	85 MB
High	> 5 m	6.3	22.0	31.4	50.3	44.7 MPts	341 MB
High x2	> 20 m	3.1	11.0	15.7	25.1	178.8 MPts	1.3 GB
High x4	> 40 m	1.6	5.5	7.9	12.6	715.0 MPts	5.3 GB
High x10	> 100 m	0.6	2.2	3.1	5.0	45.0 BPts	33.3 GB

Scanning at short range can result in overlapping scan points and lower resolution scans are often sufficient. Higher resolution scans are most suitable for scanning long range objects.

- A greater number of lower resolution scans will often give you better overall coverage than a fewer number of high resolution scans because you will capture data from more viewpoints and have more overlap for registration.
- The **Preview** scan resolution is not recommended for scans where you will want to take exact measurements due to the low resolution and is only intended for the location of high resolution area scans.
- The **Low** and **Middle** scan modes are good for quickly scanning simple structures at shorter range and for locating higher resolution area scans.
- The **High** scan resolution is optimally suited for most applications.
- The **High x2** and **High x4** scan resolutions are recommended to capture more distant objects or to capture fine details on complex objects, but the scan size will be greater and the scan time will be longer. Consider area scans to save time in the field.
- The **High x10** scan resolution should only be chosen for small area scans or very long range objects. A complete scan with this resolution requires significantly more time, an enormous amount of storage capacity (> 33 GB) likely exceeding a computer's memory.

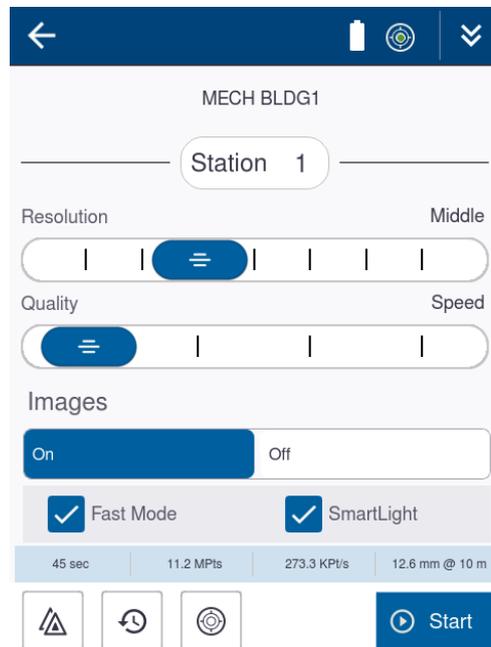
The table and tips below will help you select the right quality setting while taking into account the time required to capture a specific scan.

Scan Mode	Quality Setting / Scan Time			
	Speed	Balanced	Good	Best
Preview	--	0:23	--	--
Low	0:23	0:46	1:34	--
Middle	0:46	1:34	3:07	6:14
High	1:33	3:07	6:14	12:29
High ×2	3:06	6:14	12:28	24:59
High ×4	6:13	12:28	24:57	49:59
High ×10	--	38:58	78:00	156:18

- The higher the quality level, the longer it takes to complete a scan, but the range noise is reduced. With each quality level scan times will be doubled and the range noise will be reduced by a factor of 1.4.
- Consider using higher quality settings in area scans and for special applications where premium data quality is required.
- The **Speed** and **Balanced** quality settings are suitable for most applications because the range noise is still low.
- The **Good** and **Best** quality settings will help reduce noise in more difficult outdoor environments.
- Range noise reduction may not be as noticeable on short range scans.
- Depending on the roughness of the surface the reduction in range noise may be smaller, particularly when scanning on bright surfaces at short distances.

Image parameters

When the **Images** mode is turned on, the scanner captures images after completing the scan. The camera will produce an impressive 80 MP panorama with parallax free HDR images to complement your scan data.

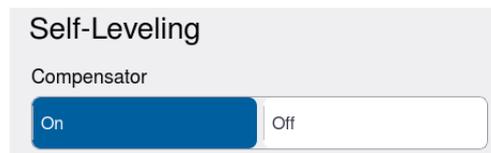


The scanner always takes HDR images and the HDR algorithm determines the number of images required for HDR exposure based on the current lighting conditions.

- **Fast Mode:**
 - Activate the **Fast Mode** for most lighting conditions to save time. The **Fast Mode** will capture 2-5 images from each position depending on the lighting conditions. The image acquisition is approximately 2 minutes.
 - When the **Fast Mode** is deactivated, 3-11 images will be taken from each position, increasing the image acquisition time to approximately 2 minutes 30 seconds. In extremely bright or dark ambient conditions you may consider deactivating the **Fast Mode** if getting the highest quality panorama is more important than saving time.
- **SmartLight:**
 - The integrated **SmartLight** mode should be activated to improve color quality in poor lighting conditions and completely dark environments.
 - The **SmartLight** mode can also be activated in all lighting conditions for general overall improvements and to speed up image acquisition time.

Leveling the first scan

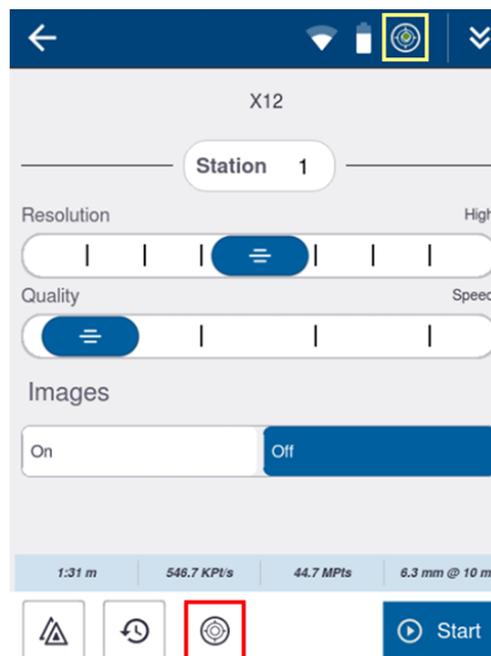
Before starting the first scan on the project, it is recommended that you level the scanner. It isn't necessary to level every scan but it's a good practice to level the first scan to use as the reference scan for registration.



First make sure the **Compensator** is turned on. See [Settings, page 68](#).

Next, check the level bubble in the status bar highlighted in yellow below to see if the level bubble is green or red.

- If the level bubble is green then the scanner is level.
- If the level bubble is red the scanner is unlevel. Tap the electronic level bubble in the status bar to open the full screen electronic bubble. Refer to [Setting up the scanner, page 33](#) section for instructions on leveling with the tribrach.

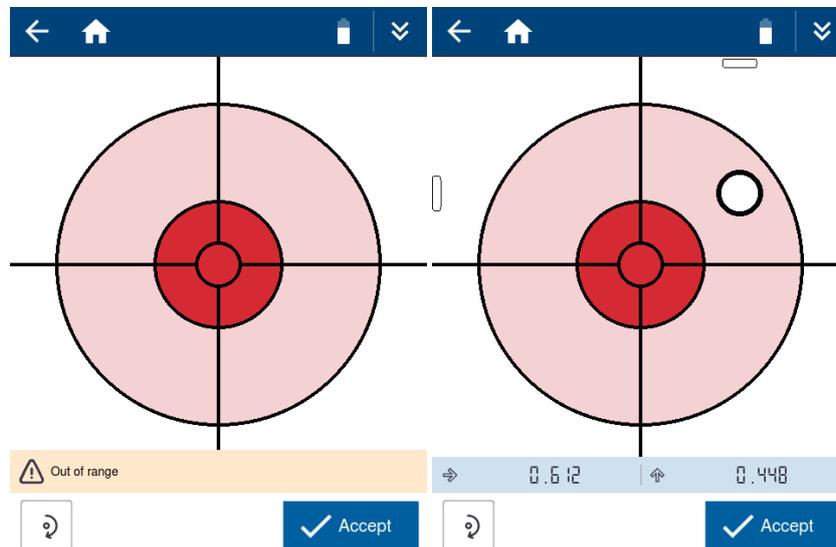


NOTE – The level bubble in the status bar will dynamically update as the scanner is leveled.

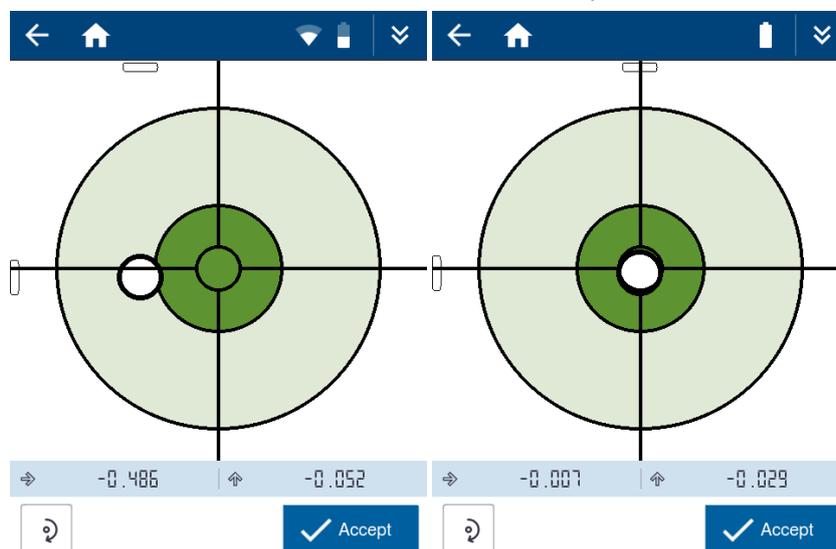
- The electronic bubble will display in red without the bubble when the scanner is out of range and you must manually level the tripod until the white bubble appears for finer

adjustment with the electronic bubble.

- The electronic bubble will display red with the bubble outside of the red target area when the scanner is not leveled.



- The electronic bubble will display green with the bubble inside the green target area when the scanner is leveled within compensation range of $\pm 0.5^\circ$. The target will turn green once the bubble touches the outer edge of the target but it is important to center the bubble on the green target to ensure the scanner remains within compensation range throughout the full scan. Tap **Accept** when satisfied.



- Tap  to execute a level calibration. If you level the scanner perfectly and rotate 180° and it is no longer level then you should perform a level calibration. This may be required after transport or extended storage. The calibration makes two measurements at 0° and 180° to calculate and store the offset.

Starting a scan

After the scan and image parameters are set, tap **Start** to start the scan.



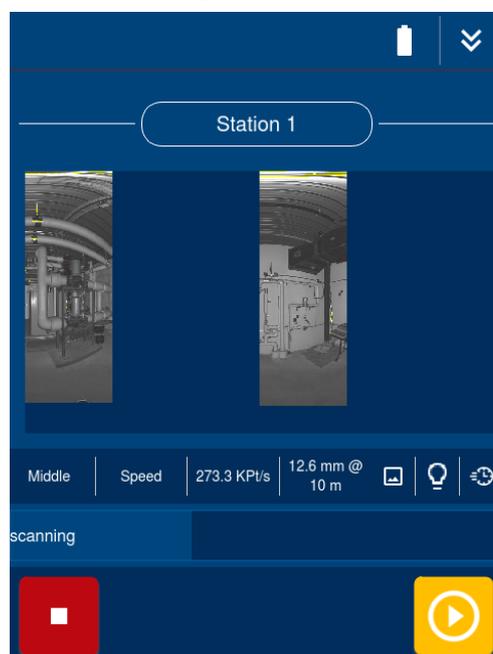
The scan progress screen will appear showing the station number and the progress of the scan. The scan resolution, quality, acquisition rate, point spacing, image and smart light settings are displayed below the dynamic display of the point cloud as it is collected.

NOTE – Stay clear of the scanner during the scanning process to avoid obstruction of data acquisition.

The option to stop or pause the scan during the scan process is available at the bottom of the screen.

Tap:

-  to stop the scan.
-  to pause the scan.
-  to resume the scan after pausing.



The image acquisition will begin after the scan is complete.

NOTE – Stay clear of the scanner during the image acquisition to avoid obstruction of the camera.

Tap:

-  to stop the image capture.
-  to pause the image capture.
-  to resume the image capture after pausing.

After the scan and images are captured, the completed scan screen will display.



From this screen, you can view the scan, the images, the station list, create area scans, retake images or finish to continue with the next scan.

 View and Retake Images

 View Station List

 Zoom Out

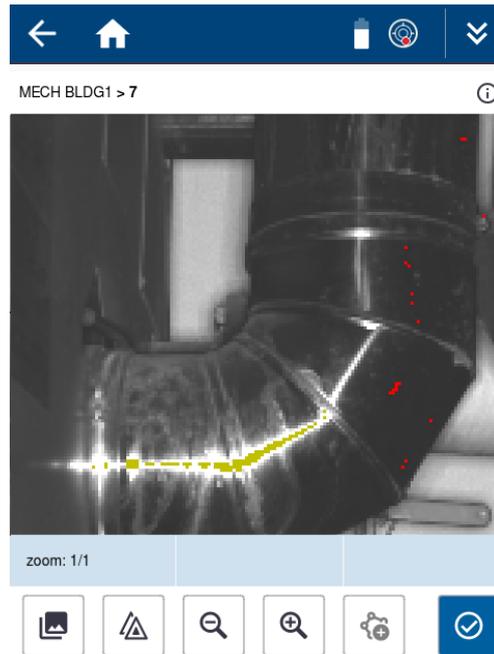
 Zoom In

 Create Area Scans

 Finish and go back to the **Scan Parameters** screen to start the next station.

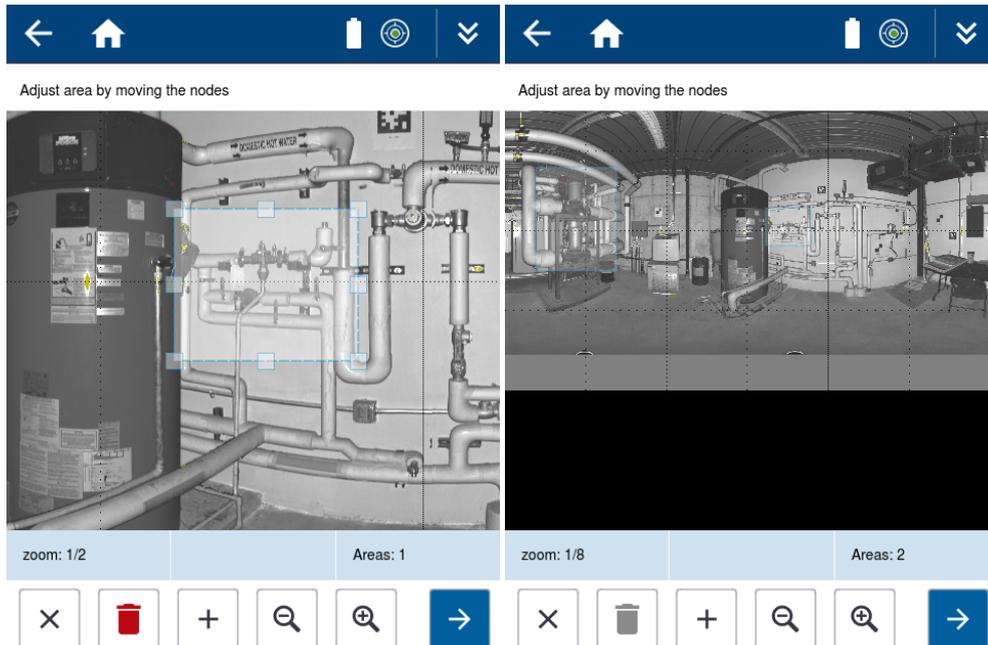
Viewing scans

When viewing the scans, points that were not captured will be shown in red and points that were filtered will be shown in yellow. Tap the **Zoom in** button to more clearly see the point cloud and the uncaptured points (typically black surfaces with very low return signal) and filtered points (typically highly reflective surfaces with very high return signal). Scanning these areas from other lines of sight will often help fill in missing data with overlapping points from other scan locations.



Creating area scans

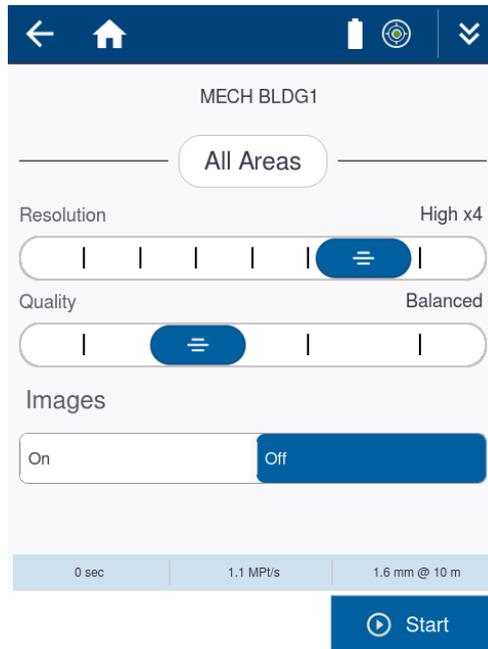
To create area scans, tap  then tap and drag on the scan to define an area. The area can be adjusted by moving the nodes at the corners. The area can also be moved by pressing in the center of the box and dragging to a new location. Tap **Zoom in** to help define the area more precisely.



Tap:

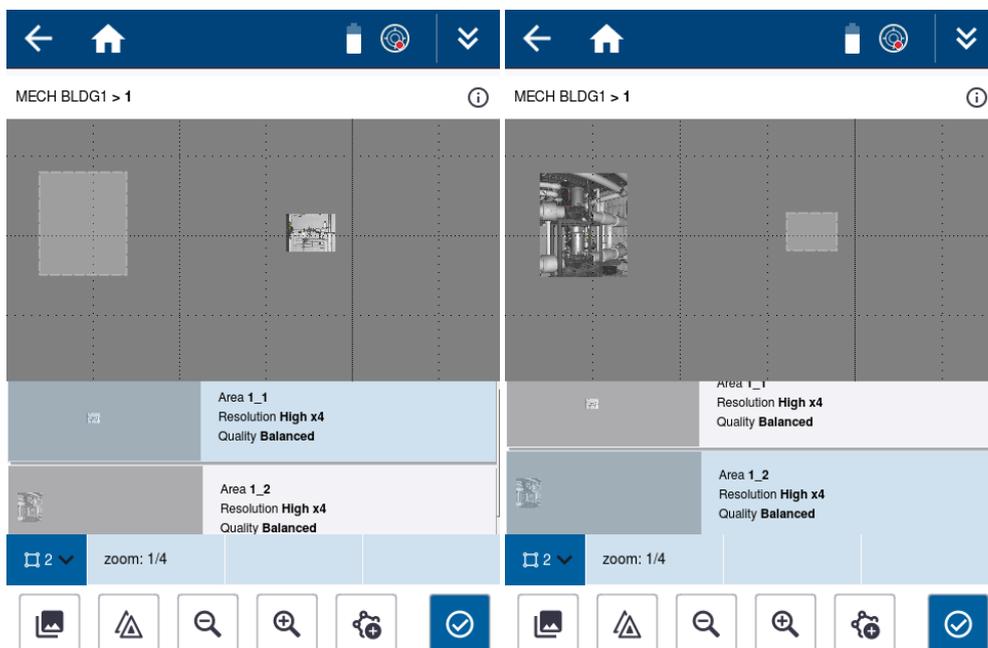
-  to add additional areas.
-  to delete an area.
-  to exit the area scans.

-  to set the scan parameters for the area scans, then tap **Start** to capture the areas.



NOTE – When an area scan is horizontally bigger than 180°, the scanner will scan it with one face.

The area scans will display when complete. You can select them from the area scans list and tap **Zoom in** to view them more closely.

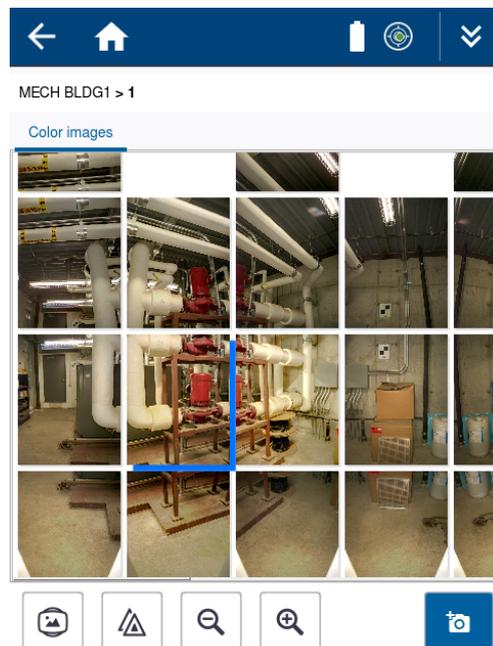


You have the option to create additional area scans, retake images or finish by tapping . When finished, you will be taken back to the **Scan Parameters** screen and the station number will be incremented to start the next scan.

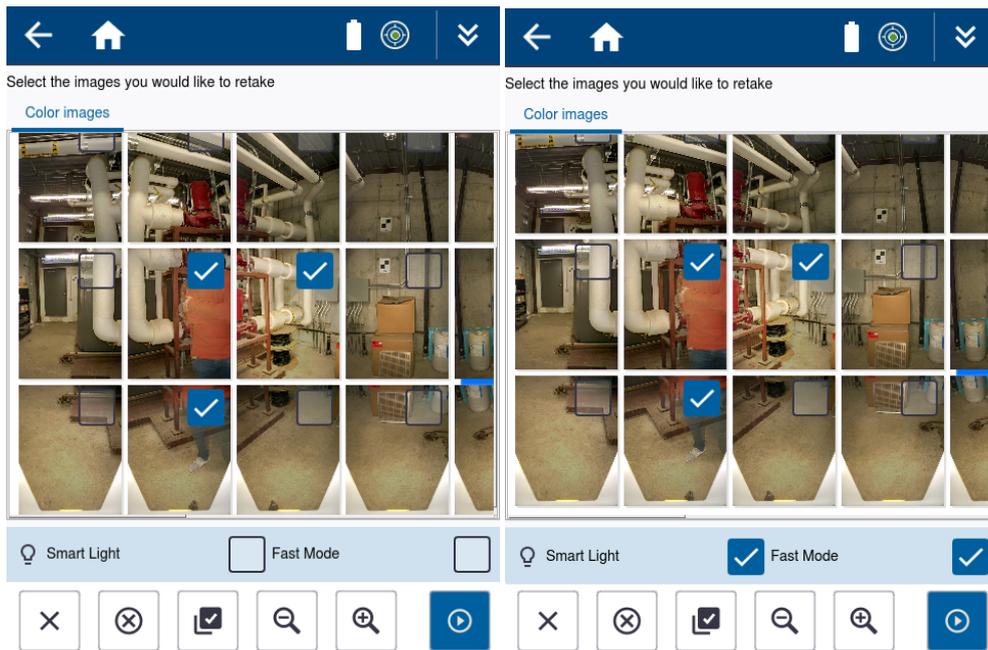
Viewing and retaking images

To view and retake the images, tap . You can review all of the images that were taken for the station and determine if any images should be retaken due to obstruction or bad lighting.

Tap an image to select it. The selected image is highlighted in blue. Tap  to zoom in, and tap  to zoom out.



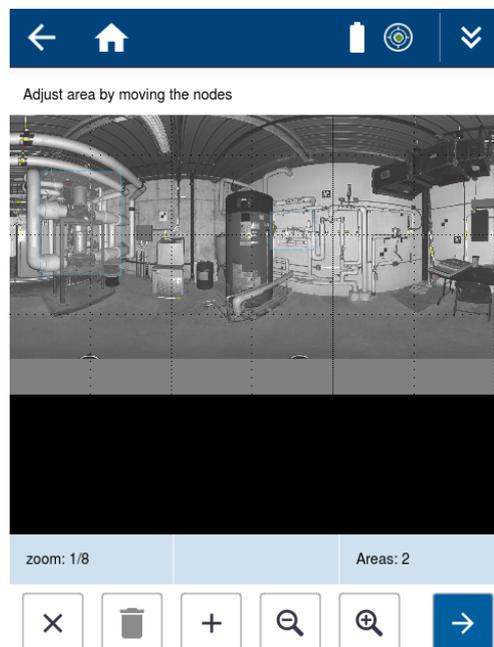
Tap  to select all images or select them individually and a check mark will be added to the images that will be retaken. You have the option to toggle on the **SmartLight** and/or **Fast Mode** before retaking the images.



Tap  to retake the selected images. The images will be updated after they are retaken.

Tap  to go back and select additional images to be retaken.

Tap  to go back to the station view.



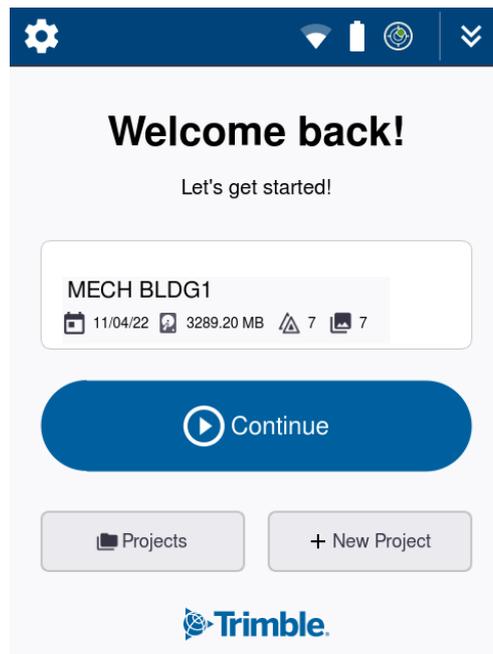
You have the option to create additional area scans, retake images or finish by tapping



When finished, the **Scan Parameters** screen appears and the station number is incremented to start the next scan.

Home screen

The **Home Screen** screen displays when you restart the scanner and projects exist. To access it, tap  icon in the **Status Bar**. The last project you worked on is displayed.

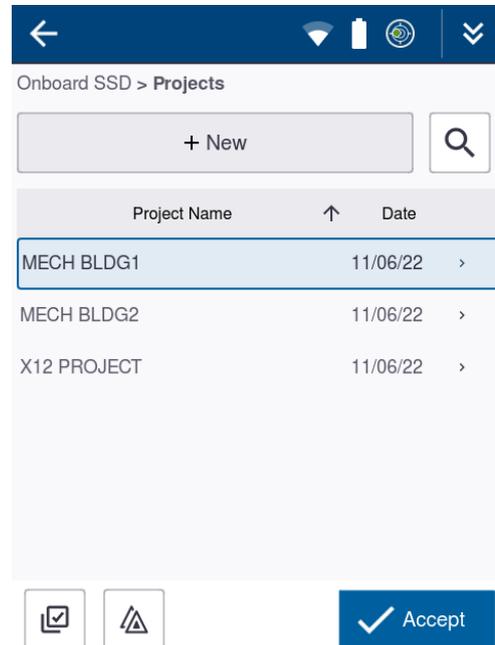


Tap:

- **Continue** to go to the **Scan Parameters** screen to continue working with the last project.
- **Projects** to access the **Projects** list to select another project.
- **+ New Project** to create a new project.

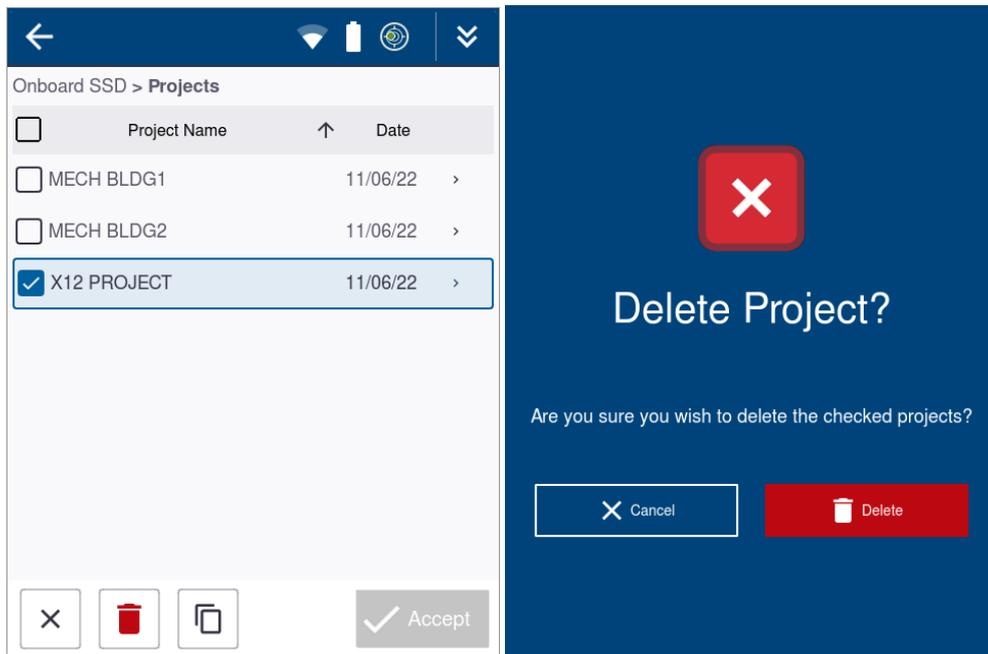
Changing projects

From the **Projects** list, you can select another project or tap **+ New** to create a new project. Tap **Accept** to load the selected project.



NOTE – You should only change or create new projects onboard when you are not using Perspective. Project changes made onboard will not appear in Perspective. If you change projects or create a new project in Perspective it will display as the active project onboard.

Copying or deleting projects



Tap:

-  to select projects to copy or delete.
-  to delete. Make sure you have a backup of your projects prior to deleting.
-  to copy to the SD card.

NOTE – You should only perform file management tasks onboard when you are not using Perspective. Projects deleted onboard will not be deleted from Perspective. Projects deleted in Perspective will be deleted onboard.

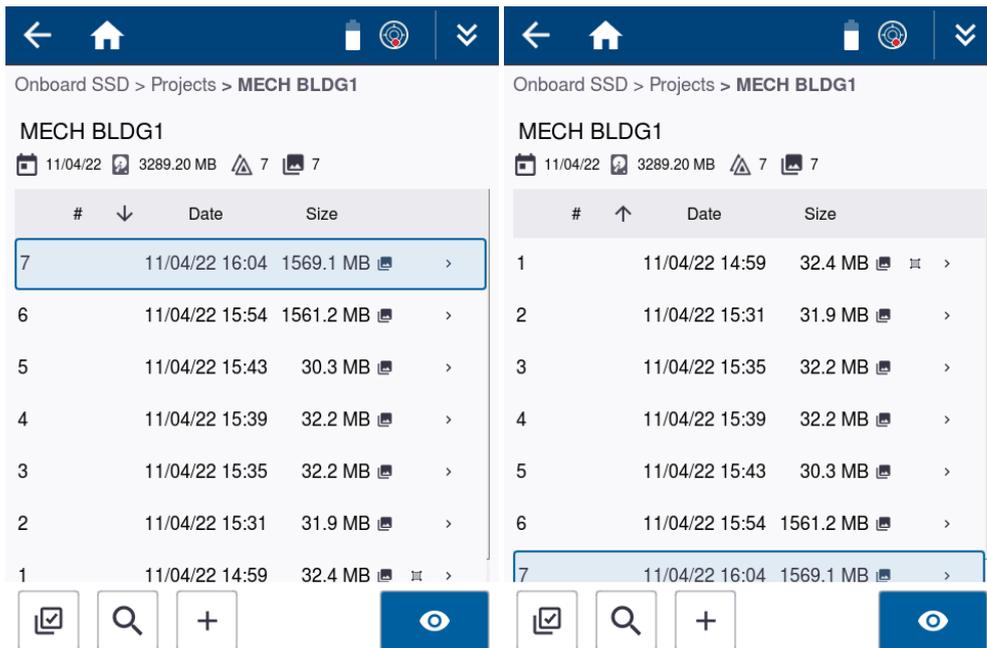
NOTE – The fastest way to transfer the data from the internal drive is by using the X12 Ethernet cable. See [Mapping Trimble X12 Drive to Windows PC, page 79](#) for information on establishing a network connection with the scanner to transfer files.

Viewing project stations

Tap > to the right of a project name to see the list of stations in the project. The up and down arrow will reverse the order of the station list.

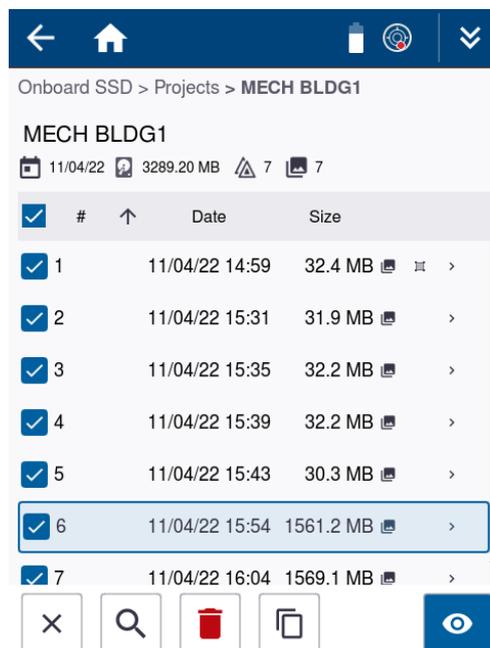
Tap > to the right of a station number to view the scan or select the eye icon in the lower right corner.

NOTE – The  icon indicates the station has area scans.



Copying or deleting stations

Tap  to select individual stations to copy or delete.



NOTE – You should only perform file management tasks onboard when you are not using Perspective. Stations deleted from the onboard UI will not be deleted from Perspective. Stations deleted in Perspective will be deleted onboard.

Status bar

The **Status Bar** at the top of the touch screen will display a range of icons depending on the screen you are in. Below is a summary of the icons and a there function.



Settings. Tap to open the **Settings** screen (see [Settings, page 68](#)).



Wi-Fi is active and can be used. Tap to open the **Connections** screen (see [Settings > Connections, page 69](#)).



Status of both X12 battery packs. See [Status screen > Battery, page 78](#) on the exact capacity.



Level status where the bubble is green when the scanner is level. Tap to open the full screen electronic bubble (see [Leveling the first scan, page 54](#)).



Level status where the bubble is red when the scanner is unlevel. Tap to open the full screen electronic bubble (see [Leveling the first scan, page 54](#)).



Decrease the screen brightness. It appears in the **Status Bar** when the down arrows are selected in the upper right.



Increase the screen brightness. It appears in the **Status Bar** when the down arrows are selected in the upper right.



Go back to the previous screen.



Go to the **Home** screen. See [Home screen, page 63](#).

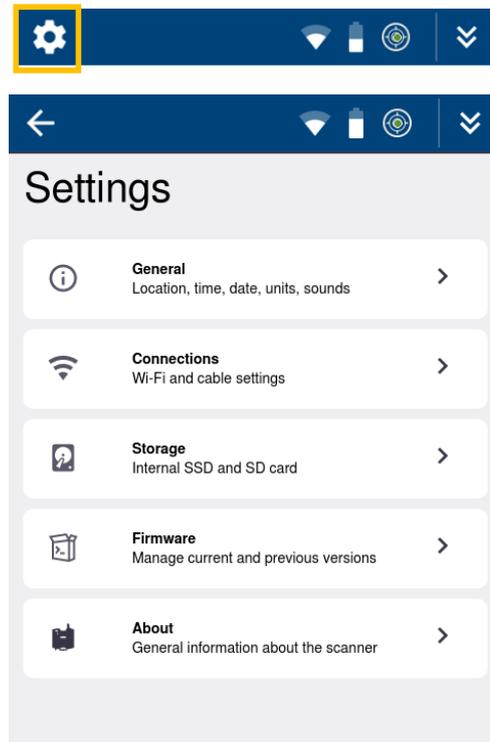


Pull-down for detailed status.

Settings

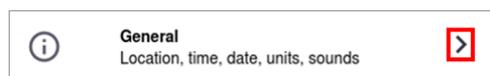
The **Settings** screen provides access to the general system settings, Wi-Fi and cable connections, storage and firmware management and other scanner information.

Tap the **Settings** icon in the upper left corner of the status bar to access the **Settings** screen.

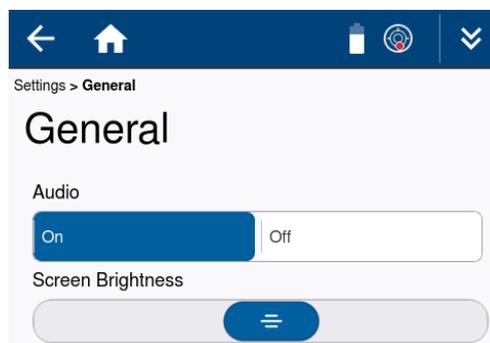


Settings > General

Tap **General** > to access the **General** settings.

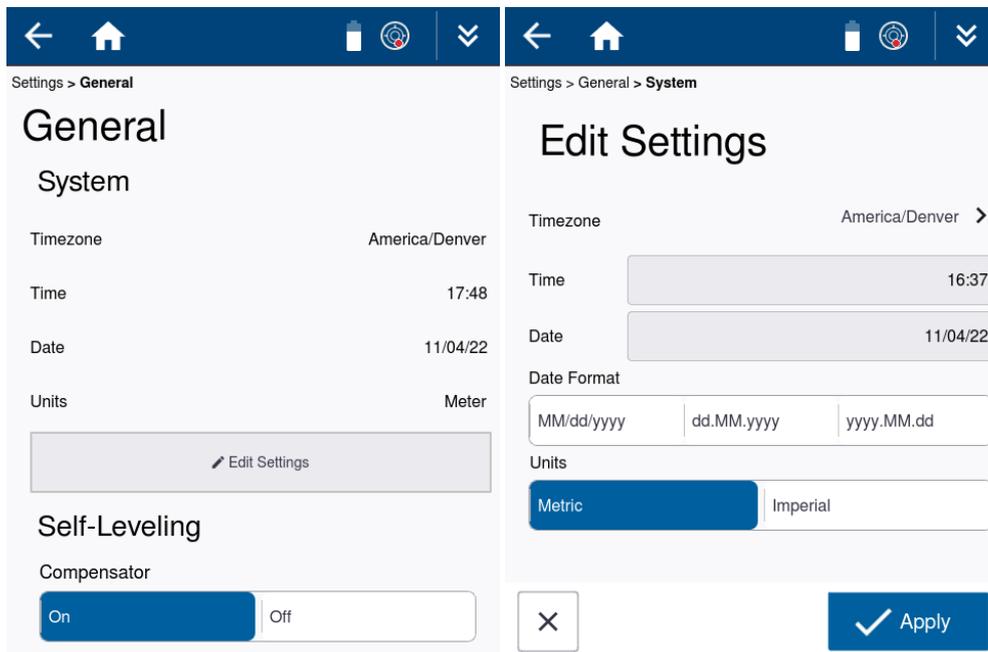


At the top of the **General** screen, you can turn On/Off the audio for sound notifications and adjust the brightness of the screen.



1. Scroll down to see the **System** section.

2. Tap **Edit Settings** to set the **Timezone**, **Time**, **Date** and **Units** to Metric or Imperial.
3. Tap **Apply** to save or **X** to exit.



Self-Leveling is where you can turn On/Off the **Compensator**. It is recommended that you leave the compensator on for the **Tilt** compensation when within a range of $\pm 0.5^\circ$. The **Compensator** can be left on when scanning upside down or tilted at any angle but the **Compensator** will be out of range and the scans will be unlevelled. The **Compensator** should be turned off when scanning on a fluctuating surface like a ship.

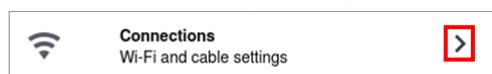
NOTE – Use only the onboard electronic bubble to level. The tribrach level bubble can differ from the electronic level display and should only be used for coarse leveling $> \pm 0.5^\circ$.

NOTE – In Perspective, scans that are taken upside down will be oriented correctly. However when they are tilted towards 90° , there is less accurate IMU information on the rotation and the Z angle of scans. Scans can be oriented at 90° or even flipped to 180° . Manual registration techniques will be required to correctly orient and register tilted scans.

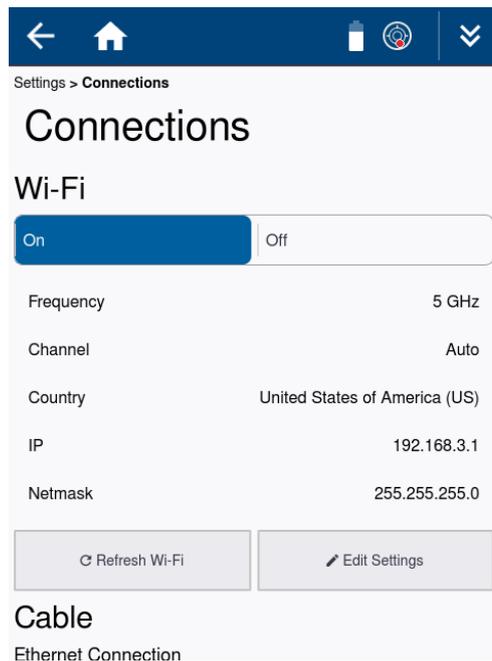
Tap  in the upper left corner to go back to the main **Settings** screen.

Settings > Connections

Tap **Connections >** to access the **Connections** settings.

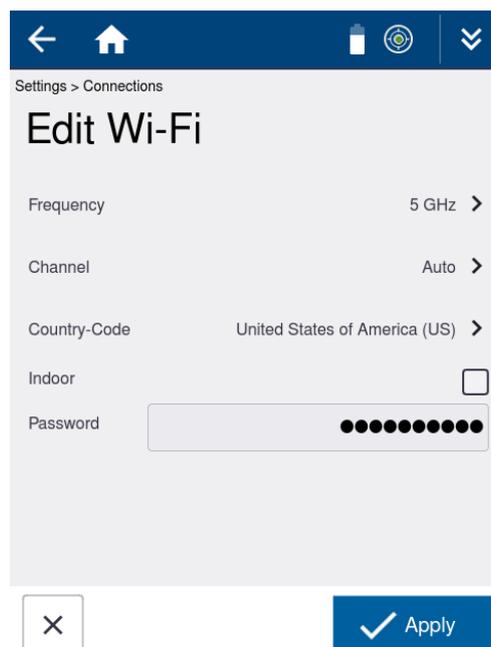


From the **Connections** screen, you can edit the **Wi-Fi** and **Cable** settings:



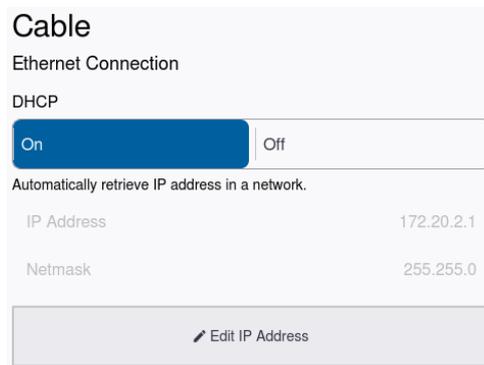
In the **Wi-Fi** section:

- Turn the **Wi-Fi** option On to enable the Wi-Fi connection from the tablet running Perspective. Otherwise turn the **Wi-Fi** option Off.
- Tap the **Refresh Wi-Fi** button to restart the Wi-Fi module.
- Tap the **Edit Settings** button to set the **Frequency**, **Channel**, **Country Code**, option for the **Indoor** use and reset the **Wi-Fi Password**.
- Tap **Apply** to save or **X** to exit.



In the **Cable** section:

- Turn On/Off DHCP for the Ethernet connection.
- Tap **Edit IP Address** to change the IP Address and Netmask.
- Or simply use the default settings.



Settings > Storage

Tap **Storage >** to access the **Storage** screen.

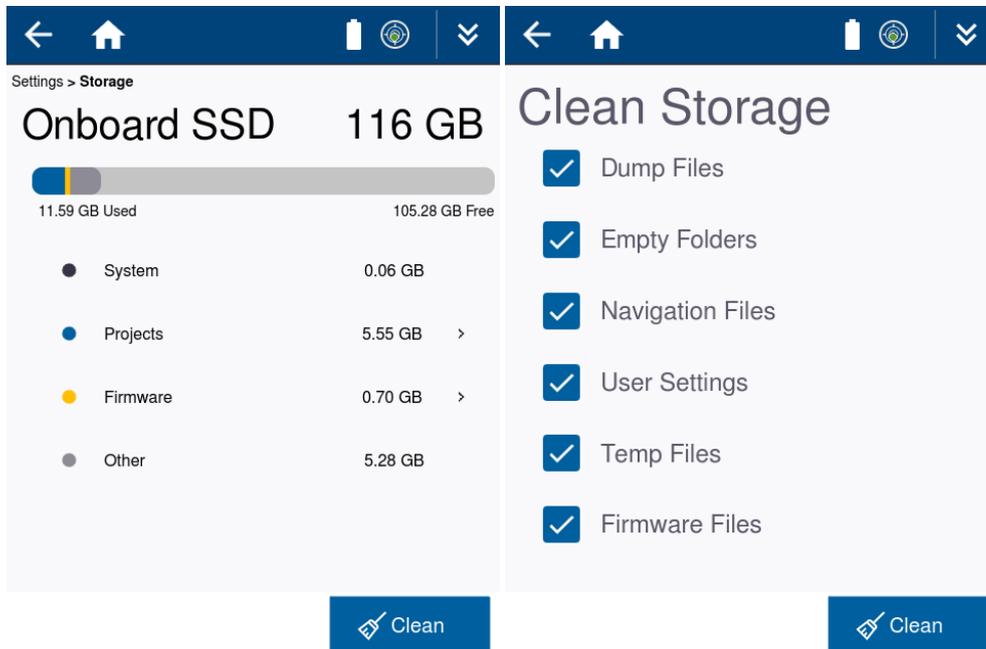


The **Storage** screen displays the status of the **Onboard Solid State Drive (SSD)** and **SD Card**. Tap > on either storage device to access the disk and file management features.



Settings > Storage > Onboard SSD

From the **Onboard SSD** screen, you can manage projects, firmware and clean files to free space when needed.



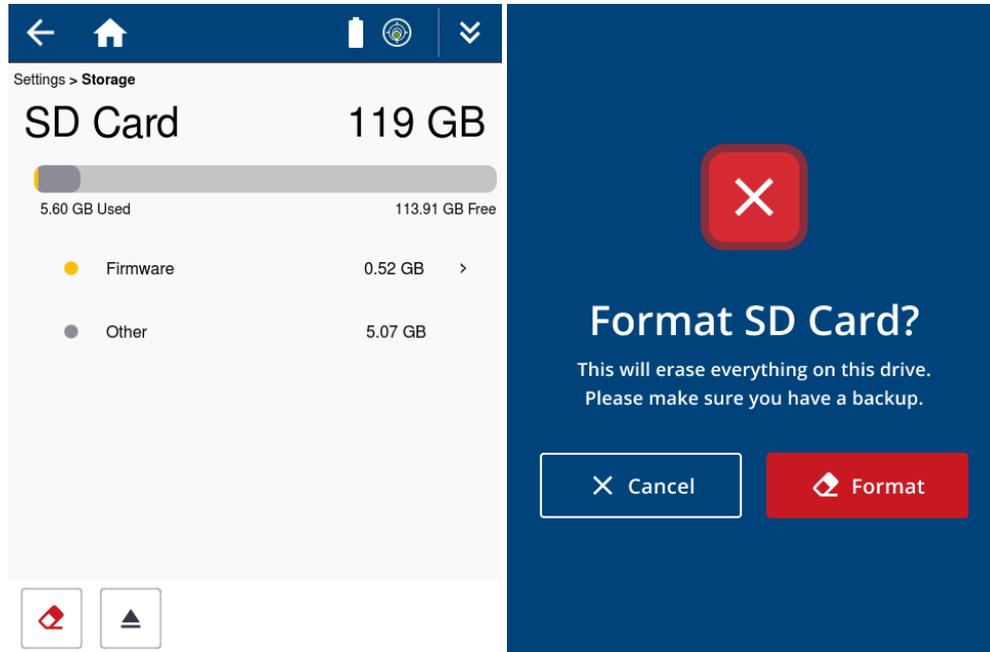
Tap:

- **Clean** to selectively remove files that are no longer required.
- **Projects >** to selectively copy or delete projects or individual scan files.
- **Firmware >** to manage firmware files. [Settings > Firmware, page 74](#).

NOTE – Before deleting a project from the onboard SSD, you should backup the project folder to the SD card or another computer. The fastest way to transfer data from the onboard SSD is by using the X12 Ethernet cable. See [Mapping Trimble X12 Drive to Windows PC, page 79](#) for information on establishing a network connection with the scanner to transfer files.

Settings > Storage > SD card

From the **SD Card** screen, you can manage firmware files, format and eject the SD card. The format function will erase everything on the SD card so make sure you have a backup.



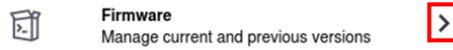
Tap:

- **Firmware** > to manage the firmware files. See [Settings > Firmware, page 74](#)
-  to format the SD card.
-  to eject the SD card prior to removal.

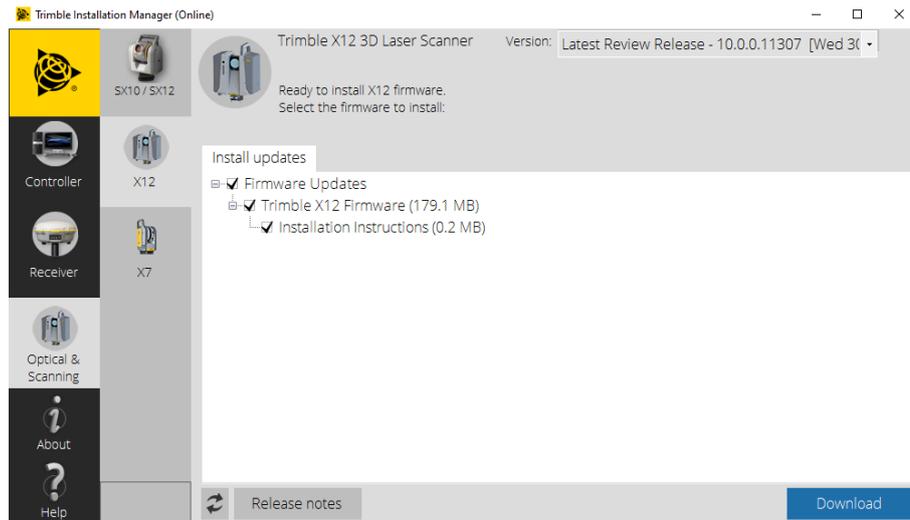
NOTE – Before deleting files from the SD card, it is recommended that you back up the data to another computer especially if project files have been copied from the onboard SSD.

Settings > Firmware

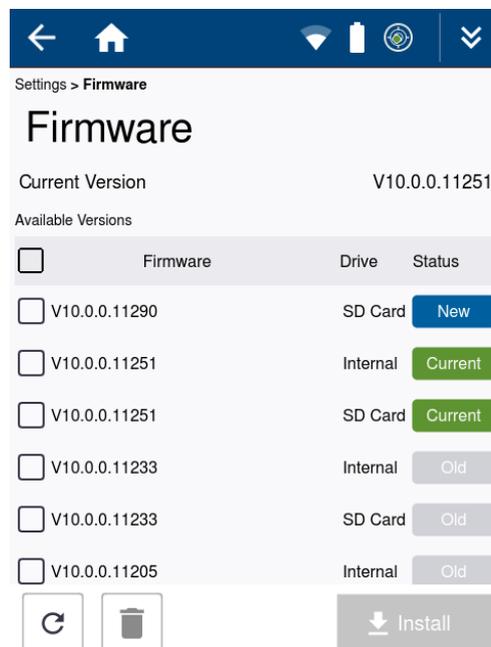
Tap **Firmware** > to access the **Firmware** screen.



The firmware updates are done from the SD card. Firmware will be distributed via the **Trimble Installation Manager** and must be downloaded and placed in the root of the SD card.

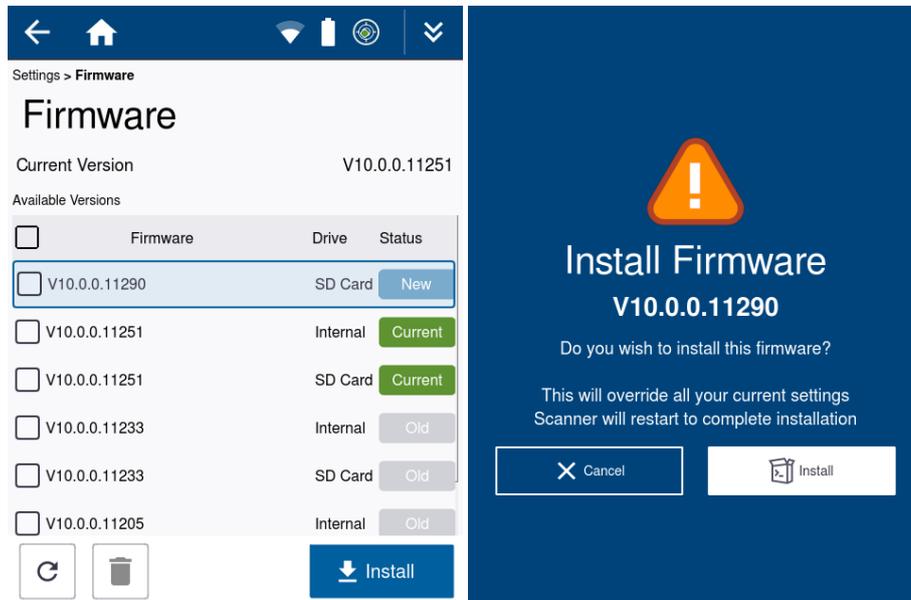


When a new firmware is on the SD card, it will appear in the list of firmware as **New**.



To install a new firmware version:

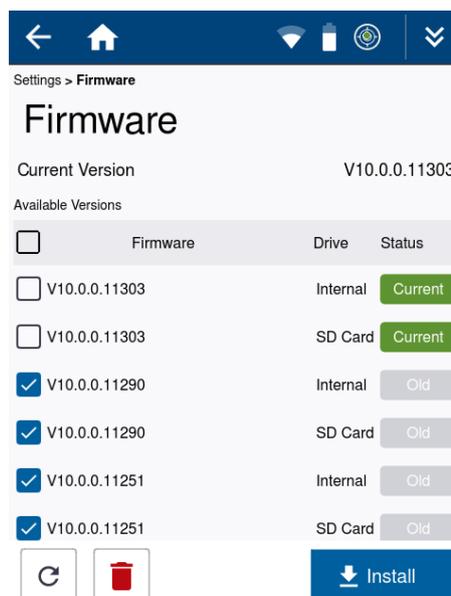
1. Tap the new firmware version so it is highlighted.
2. Tap the **Install** button. The **Install Firmware** screen appears.
3. Tap the **Install** button again. This will override your current settings and the scanner will restart to complete the installation.



To delete an older firmware version from the SD card and the onboard SSD:

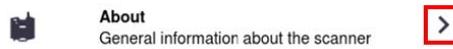
1. Tap the check box of the version you want to delete.

2. Tap  to delete.

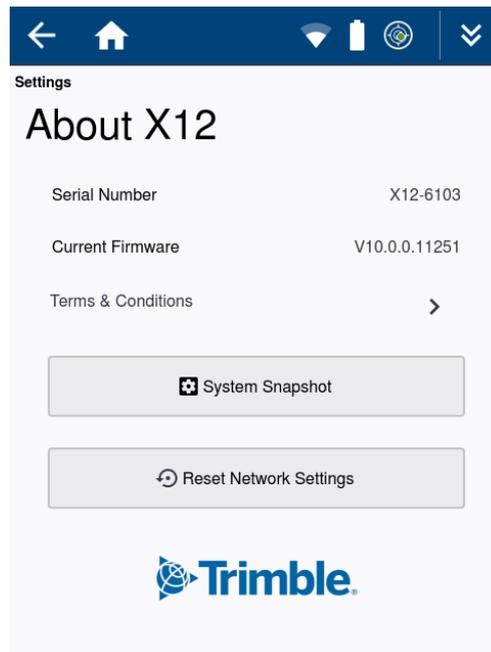


Settings > About

Tap **About >** to access the **About** screen.



This screen provides the X12 serial number, current firmware, terms & conditions and buttons to capture system log files and reset network settings to the default settings.



Tap:

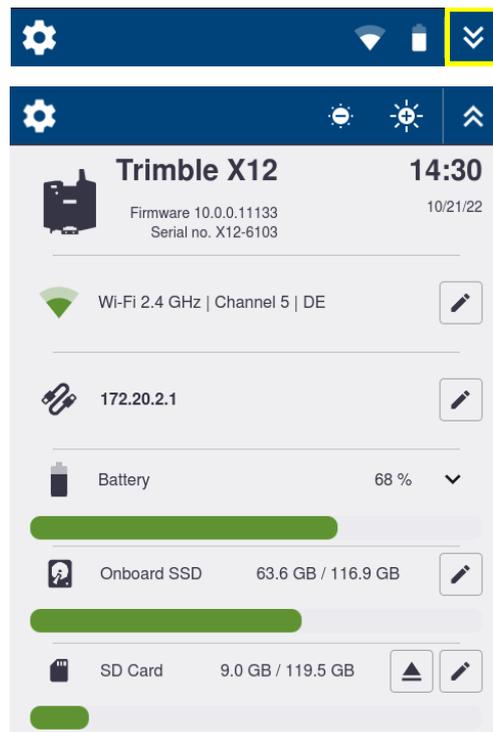
- **System Snapshot** to generate a log file for support purposes. A file with a *.report extension will be saved to the root of the SD card. The file name will include the X12 serial number and date.
- **Reset Network Settings** to reset the Wi-Fi and network settings to the defaults (Frequency to 2.4 GHz, Channel to 5, Country to Germany (De) and Wi-Fi Password to the factory default value).

NOTE – You can capture any screen by touching the screen in an open area until you see a white flash around the edge of the screen. An image file with a *.png extension will be saved to a screenshots folder on the SD card. Screen shots can be helpful for support and training purposes.

Status screen

The **Status Screen** allows users to quickly check details about the Wi-Fi and cable connections, battery power, onboard SSD storage and SD card storage. Editing the connections and managing the onboard SSD and SD card as described in the **Settings** section is also possible from this screen.

Tap the down arrows in the upper right corner of the status bar to open the **Status Screen**.



NOTE – The decrease and increase screen brightness icons will appear on the status bar for quick adjustments.

Status screen > Wi-Fi connection

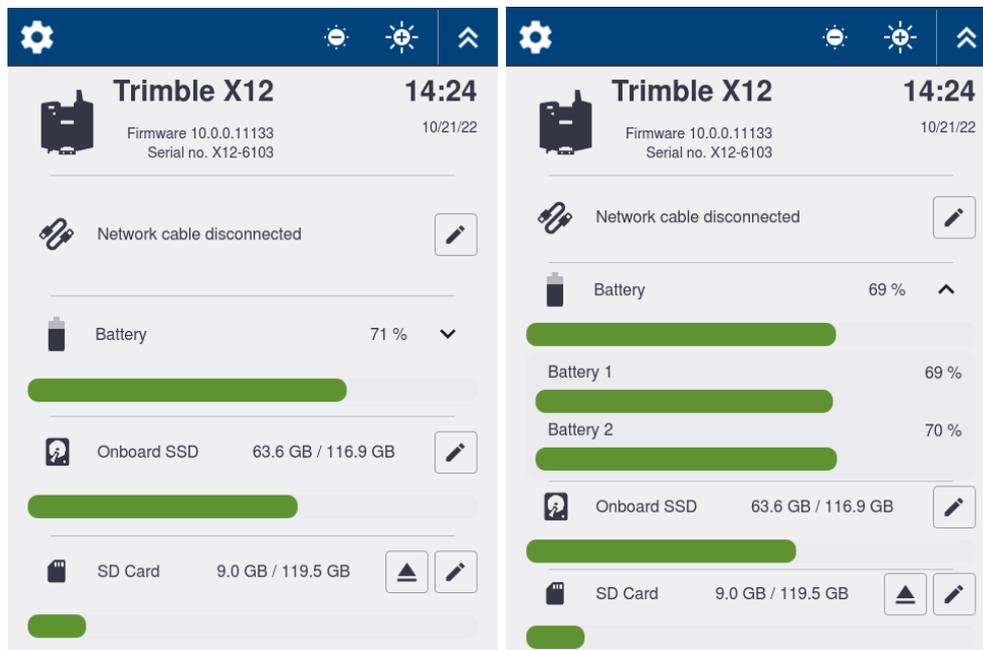
Check the status and the settings of the Wi-Fi connection. Select the **Edit** button to edit the connection settings. See [Settings > Connections, page 69](#).

Status screen > Ethernet cable connection

Check the status and IP Address of the Ethernet cable connection. Select the **Edit** button to edit the connection settings. See [Settings > Connections, page 69](#).

Status screen > Battery

Select the down arrow in the **Battery** section to view the status of both batteries. The scanner uses the power from both batteries simultaneously so the power consumption should be close to the same for both.



Status screen > Onboard SSD

The **Onboard SSD** section displays the amount of disk space used on the internal drive. Select the **Edit** button to manage files on the drive. See [Settings > Storage > Onboard SSD](#), page 72.

Status screen > SD Card

The **SD Card** section displays the amount of disk space used on the SD card.

Select:

- **Eject** to eject the SD Card.
- **Edit** to manage files. See [Settings > Storage > SD card](#), page 73.

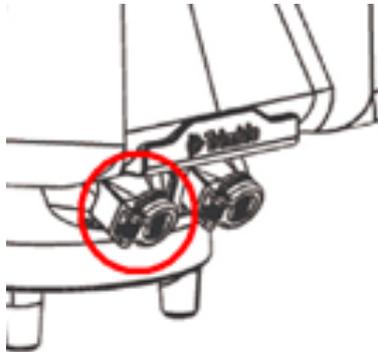
Tap the up arrows in the upper right corner of the status bar to close the **Status Screen**.



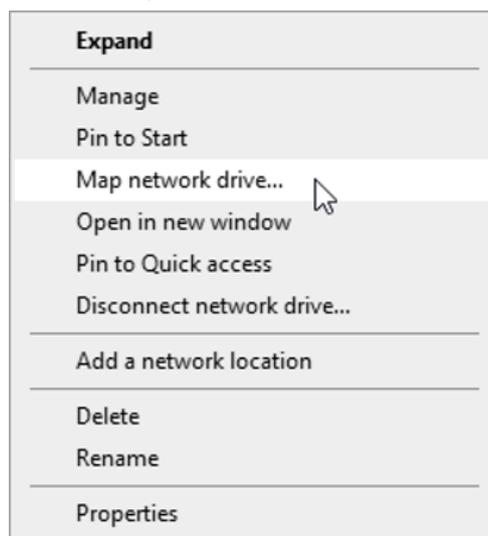
Mapping Trimble X12 Drive to Windows PC

The fastest way to transfer the data from the on-board SSD is by using the Ethernet cable. Follow the instructions below to map the drive to a Windows 10 or 11 PC.

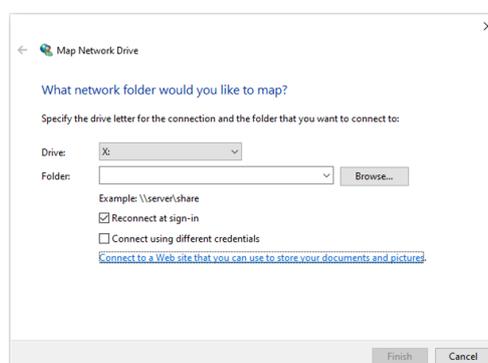
1. Connect the Ethernet cable into the left LEMO port on the X12.



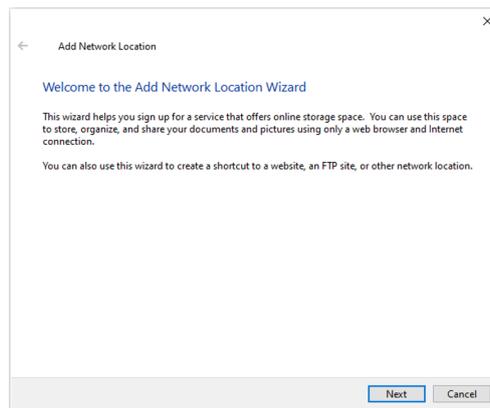
2. Plug the other end of the cable into the Ethernet port on the PC.
3. Right click on **This PC** and select **Map network drive**.



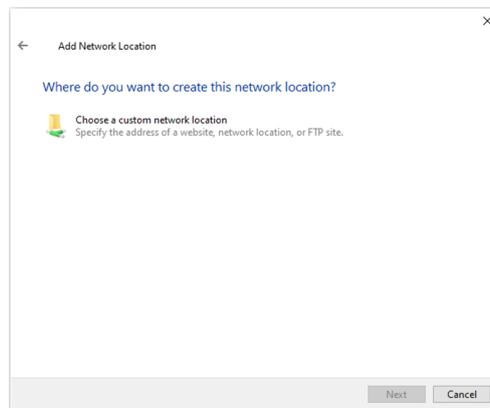
4. From the **Map Network Drive** dialog, select the drive letter you wish to use, make sure that **Reconnect at sign-in** is checked and click the link **Connect to a Web site...**



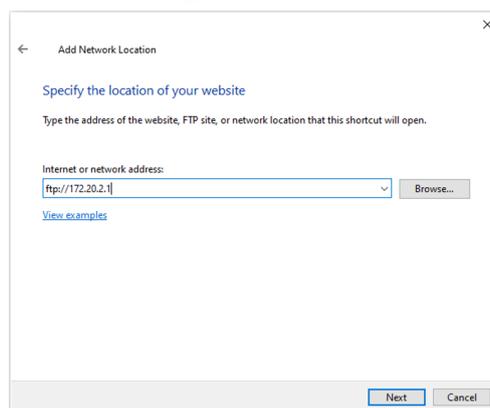
5. Click **Next** on the welcome dialog.



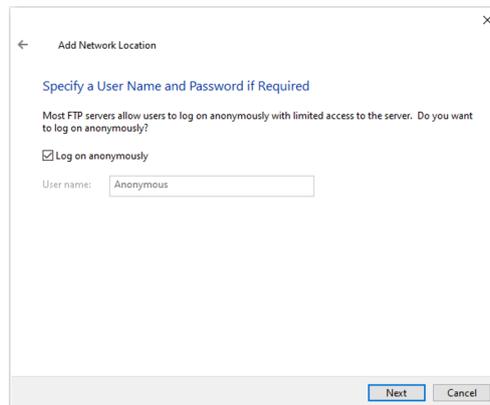
6. Click on **Choose a custom network location** and click **Next**.



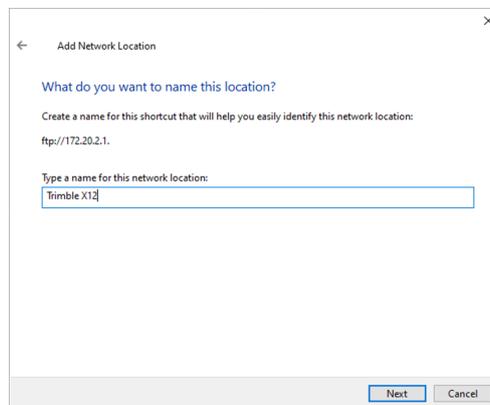
7. In the **Internet or network address** box, type ftp://172.20.2.1 (or whichever IP address is listed on your scanners internet settings) and click **Next**.



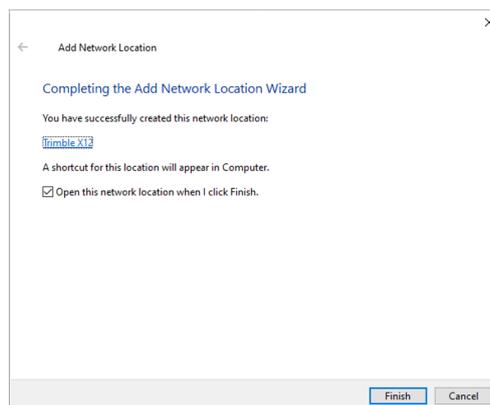
- In the **Specify a User Name** dialog, make sure that **Log on anonymously** is selected and click **Next**.



- Enter **Trimble X12** for the name of the network location and click **Next**.

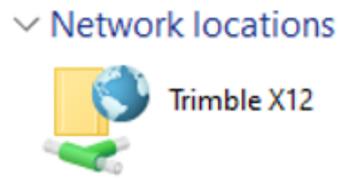


- In the **Completing the Add Network Location** dialog, make sure **Open this network location** is selected and click **Finish**.



- After this action, an explorer window will open showing the project folders that exist on board your X12 scanner. You can now copy or move the required projects onto your PC.

12. After closing this window, the X12 may automatically be added to your Network locations or you may be prompted to add it. The location will be present for future connections when you click on This PC.



Accessories

▶ [Optional accessories](#)

Optional accessories

Optional accessories can be ordered and shipped separately, and some accessories are included in X12 kits. See below for a list of part numbers and descriptions of the available accessories.

- Tripods:
 - 90572-TR: Gitzo Series 5 scanning tripod
 - 90553-TR-SUR: Trimble Trimax survey tripod
- Black and White Targets:
 - 6705-10-TR: Adjustable tilting 150 mm black and white target
 - 28740034: Adhesive 150 mm black and white checker targets (10 pack)
- Sphere Targets:
 - 6703-11-OGC: Trimble 100 mm sphere kit in hard case (10 pack)
 - 6703-20-TR: Trimble 100 mm × 6 sphere kit in soft case (6 pack)
 - 6704-10-TR: Trimble 230 mm sphere kit in hard case (3 pack)
- Miscellaneous:
 - 114050-30: Trimble T10x tablet, WIFI/BT, 32 GB/1 TB
 - 123810-11: X12 Rechargeable Li-ion battery
 - 123810-30: X12 Battery charger
 - 123810-21: X12 Power supply 100-240 V
 - 128041: Ethernet cable 5 m
 - 78607007: Tribrach without optical plummet

Transport and Maintenance

- ▶ Transport
- ▶ Storage
- ▶ Cleaning and drying

Transport

Transport in the field

For transport in the field either carry the scanner in its original transport case or carry the scanner and equipment separately.

Transport in a road vehicle

Never carry the scanner loose in a road vehicle as it can be affected by shock and vibration. Always carry the scanner in its transport case and secure it. It is recommended to transport the scanner in the shipping carton.

Shipping

Please keep the cardboard shipping box and foam inserts for future shipments. Always use the complete original packaging when shipping. Only the original packaging can protect the equipment from shock and vibration during shipment.

Shipping and transporting the batteries

CAUTION – When transporting or shipping batteries ensure that the applicable national and international rules and regulations are observed. Before shipping or transportation, contact your local passenger or freight transport company.

System check after transportation

For units that are exposed to high mechanical forces, e.g. through frequent transport or rough handling, it is recommended to have the instrument checked by a Trimble Service Partner as soon as possible after such a high level of stress.

Storage

Product

Respect the temperature limits of -20° C (-4° F) to +50° C (+122° F) when storing the equipment, particularly in summer if the equipment is inside a vehicle. After long periods of storage, inspect the function of the scanner before using it in the field.

Battery

- Batteries should be fully charged before storage.
- If batteries are stored for long periods, they should be recharged at least once in 6 months.
- The storing temperature should be between 0 °C to +32 °F and +30 °C to +86 °F without extreme variations.
- The storage location should be dry.

Cleaning and drying

Window cleaning procedure

CAUTION –

The scanner aperture window has to be perfectly clean to avoid errors in measurement. Clean the glass pane regularly with the provided cleaning kit:

- Switch off the scanner.
- Washing hands is necessary in order to avoid grease on the cleaning tissue.
- Use gloves to avoid grease on the glass.
- Use only little amounts of the provided detergent to clean the glass.
- Do not use pressure to clean the glass, do not rub.
- Use the lens tissue for wiping in a circular motion from the center to the edge until there is only a thin film of detergent visible.
- Use a new lens tissue for drying the pane, wipe in a circular motion.
- If any smears from cleaning are visible against the back light, repeat the procedure.

Use only the provided cleaning material.

TIP –

- Do not touch the side of the paper that is used for cleaning with your fingers.
- Do not reuse tissues that have been used before.
- Only use lint free lens tissues.
- Do not use air from the pneumatic power system as this can be slightly oily.

Fogging of the optic

If the scanner is cooler than the ambient temperature the scanner's glass, or even the inner optic system might fog.

TIP –

- Avoid large temperature differences.
- Slowly acclimate the scanner to the ambient temperature.
- Do not use anti-fog products.

Damp products

Dry the product, the transport container, the foam inserts and the accessories at a temperature not greater than 40 °C / 104 °F and clean them. Do not repack until everything is completely dry.

Cables and plugs

Cables and plugs must not get dirty and need to be protected from moisture. Dirty cables and plugs have to be air-cleaned.

Troubleshooting

- ▶ Problems with the scanner
- ▶ Problems with the power supply
- ▶ Problems with the battery

Problems with the scanner

Problem	Solution
The scanner is too cold	Start scanning, e.g. perform some preview scans, as the activity helps warm the scanner.
The scanner is too warm	Put the scanner in a cool place out of the sun and leave it powered only in the standby mode.
The control panel does not work correctly	Please turn off the scanner and clean the control panel with a mild cleaner and a soft handkerchief.

Problems with the power supply

Problem	Solution
The electrical supply is interrupted	Check the main cable, connection and fuses.

Problems with the battery

Problem	Possible cause	Solution
<ul style="list-style-type: none"> Errors when loading a battery in the charger State of loading is not shown and the running light is active 	<ul style="list-style-type: none"> Rechargeable battery is depth-discharged but the charger can not initialize or Rechargeable battery is defective. 	<ul style="list-style-type: none"> Turn off the power supply and turn it on again without changing any configuration. Battery has to be replaced, please contact your Trimble dealer.
Red LED blinks rapidly	The charger checks the battery temperature and it is outside the charging range.	<ul style="list-style-type: none"> When the temperature is higher than 40 °C or lower than 0 °C, the charging process does not start until the rechargeable battery pack is within this range of temperature. The discharging temperature could be 60 °C, but because of

Problem	Possible cause	Solution
Red LED blinks slowly	The charging process is too slow; the charger is not able to charge the battery in the given time.	<p>that the rechargeable battery would have to cool down to 40 °C before starting the charging process.</p> <ul style="list-style-type: none">• If the error does not stop by trying any of the methods above, the battery may need to be replaced. Please contact your Trimble dealer.

Technical Data

- ▶ Battery
- ▶ Power supply
- ▶ Charger
- ▶ Ambient conditions

NOTE – All specifications are subject to change without notice.

Battery

Battery	
Description:	2 × Lithium-Ion pack with protective circuit (4S2P)
Rated voltage (Pack):	14.4 VDC
Capacity (Pack) nominal:	6.7 Ah
Operating temperature:	-5 to +50 °C
Loading temperature:	5 to +40 °C
Storing temperature:	10 to +50 °C
• Optimal	5 to +20 °C
Weight:	0.5 kg (1.1 lbs)
Dimensions (w x d x h):	150 × 60 × 43 mm (5.9 × 2.36 × 1.69 ")

Power supply

Power supply	
Input voltage:	100... 240 VAC / 50... 60 Hz
Output voltage:	24 VDC
Output power:	120 W
Operating temperature:	-10 to +45 °C (14 to 113 °F)
Storing temperature:	-20 to +50 °C (-4 to 122 °F)
Protection class:	IP20
Weight:	0.64 kg (1.41 lbs)
Dimensions (w x d x h):	65 × 167 × 37 mm (2.56 × 6.57 × 1.45 ")

Charger

Charger	
Input voltage:	12 to 24 VDC, 8 A
Output power:	16.8 VDC, 2 × 2.1 A

Charger

Operating temperature: 0 to +40 °C

Weight: 0.48 kg (1.06 lbs)

Dimensions (w x d x h): 158 × 108 × 40 mm (6.22 × 4.25 × 1.57 ")

Ambient conditions

	Storage temperature	Operating temperature
Scanner:	-20 to +50 °C	-10 to +45 °C
Battery pack:	-10 to +50 °C	-5 to +50 °C
Power supply:	-20 to +50 °C	-10 to +45 °C

Labeling

- ▶ Scanner
- ▶ Battery
- ▶ Charger

Battery

Trimble Rechargeable Lithium-ion Battery
 41NR19/66-2 N18650CP

PN: 123810-11

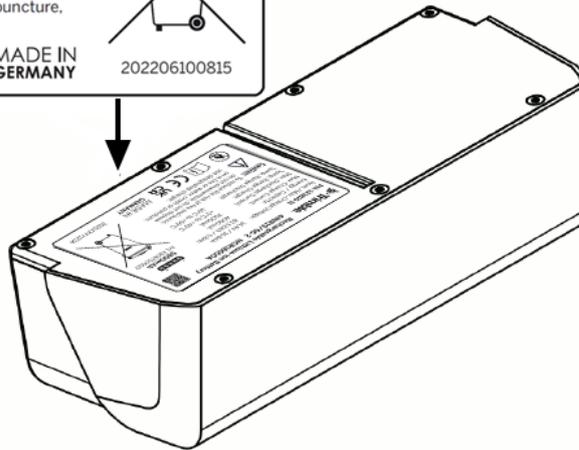
Nom./Max. Charge Voltage:	14.4V / 16.8Ah
Energy / Capacity:	96.48Wh / 6.7Ah
Max. Charge Current:	4000mA
Max. Discharge Current:	7000mA
Temp. Range Charge:	+5°C to +40°C
Temp. Range Discharge:	-10°C to +50°C

6700mAh
 Art: K90BT000026

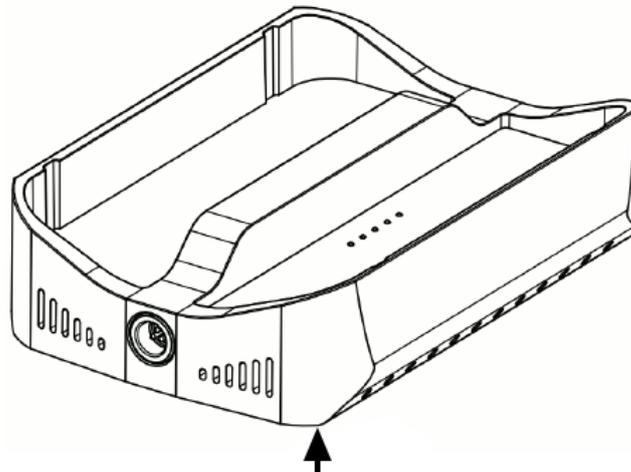
Caution: To reduce the risk of fire and burns, do not disassemble, do not dispose of in fire or water, crush or puncture, use designated charger.

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MADE IN GERMANY



Charger



<p>Trimble Europe BV Industrieweg 187A 5683 CC Best, The Netherlands</p> <p>Type: X12 Charger PN: 123810-30 INPUT: 12-24 VDC, 8 A OUTPUT: 16.8 VDC, 2 x 2.4 A Use only supplies with a 8A overload protection! Manufactured: 2022</p> <p><small>This device complies with part 15 of the FCC Rules: Operation is subject to the following two conditions: 1) This device may not cause harmful interferences, and 2) This device must accept any interference received, including interference that may cause undesired operation. This Class A digital apparatus complies with Canadian ICES-003</small></p>	     <p>MADE IN GERMANY</p>
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