

QUICK START GUIDE

MX90

MOBILE LASER MAPPING SYSTEM

IMPORTANT!

Before initial installation and commissioning of the Trimble MX90 system, read the safety instructions in the *Trimble MX90 User Guide*.

**The *Trimble MX90 User Guide* can be found in the download area
<https://geospatial.trimble.com/products-and-solutions/trimble-mx90>**

1. Product Overview

The Trimble® MX90 mobile laser mapping system is a high-end system, fully integrated with a high-performance laser scanner unit and accurate GNSS IMU unit. It is possible to collect highly accurate and geo-referenced high-density point cloud data even at regular vehicle road speeds.

High precision and high-density point cloud data can be used not only for GIS asset extraction, but also to perform 3D measurements of highway characteristics such as 3D model generation, road surface measurements, road clearance measurements.

For detailed technical details of the Trimble MX90 system, refer to the *Trimble MX90 User Guide*. For detailed information on how to operate the Trimble MX90 system with the Trimble TMI software, refer to the *Trimble TMI Software User Guide*.

2. Safety Instructions

For detailed Safety Instructions regarding handling, installation, operation and storage of the Trimble MX90 system, refer to the *Trimble MX90 User Guide*.

Acclimatisation

The Trimble MX90 system incorporates sensitive electronics and optical components.

Due to variation in temperature and air pressure during airfreight transportation, rapid increase of temperature after unpacking may cause condensation of water inside the main components of the Trimble MX90 system. Water inside component housings can cause short circuits and can damage the instrument when switched on.

Therefore, after air freight transportation, allow a period of 24 hours for acclimatisation in a place with constant temperature and air pressure before switching on the Trimble MX90 system.

Important! It is absolutely mandatory that the user sets the country code of the Wi-Fi module of the MX90 system correctly before first usage.

Connect with your operation device (laptop, tablet) either via LAN cable or Wi-Fi to the MX90 system.

For details, see the Trimble *MX90 User Guide*, Chapter 2 - Operation, Prerequisites to System Setup and Operation.

Access via TMI software: Menu / System Administration / Wifi / MX SCAN Wifi Access Point / Country.

3. Product Components

(1) MX90 - Transportation Case, Sensor Unit:

- Trimble MX90 Sensor Unit
- MX SCAN Cable Control Unit to Sensor Unit, 5 m

(2) Transport Case:

- Trimble MX SCAN Control Unit 2
- Trimble MX SCAN Data Carrier Dock
- Trimble MX SCAN Power Unit
- Trimble MX SCAN Roof Rack
- MX SCAN Cable Power Unit to Control Unit, 3 m
- MX SCAN Cable PWR Source to Power Unit, 5 m

3.1 Trimble MX90 Mission Operating Device

- Controlling via web interface using a web browser, such as Google Chrome, on a tablet or laptop PC.
- Control tablet or PC can be connected via the Ethernet or Wi-Fi with the Control Unit.
- No separate capture software is needed.

3.2 Accessories (optional)

- DMI (Distance Measurement Indicator) and DMI-Cable DMI
- Trimble GAMS Antenna Kit: GAMS (GNSS Azimuth Measurement Subsystem)

4. Vehicle Preparation

For details, refer to the *Trimble MX90 User Guide*.

- Prior to first-time usage of the system, the power supply must be set up according to the description in the main manual.

Safety:

- A DC current supply of **30 A**, or more, is needed by the system.
- Installation of auxiliary battery as backup power source is recommended.
- Securely fasten the Power Unit and Control Unit inside of your vehicle.
- Installation of the Sensor Unit:
 - Roof Rack as far to the rear of the vehicle as possible.
 - Laser and backwards downwards looking camera should have a clear line of sight to the road surface and should not be obstructed by the vehicle.
 - Roof bars should be sufficient to mount the Roof Rack (18 kg) with the Sensor Unit (37 kg).

4.1 Installation of the Trimble MX SCAN Roof Rack

Roof bar installation

- Install two roof bars so that the Trimble MX SCAN Roof Rack can be installed at the rear of the vehicle.

Trimble MX SCAN Roof Rack installation

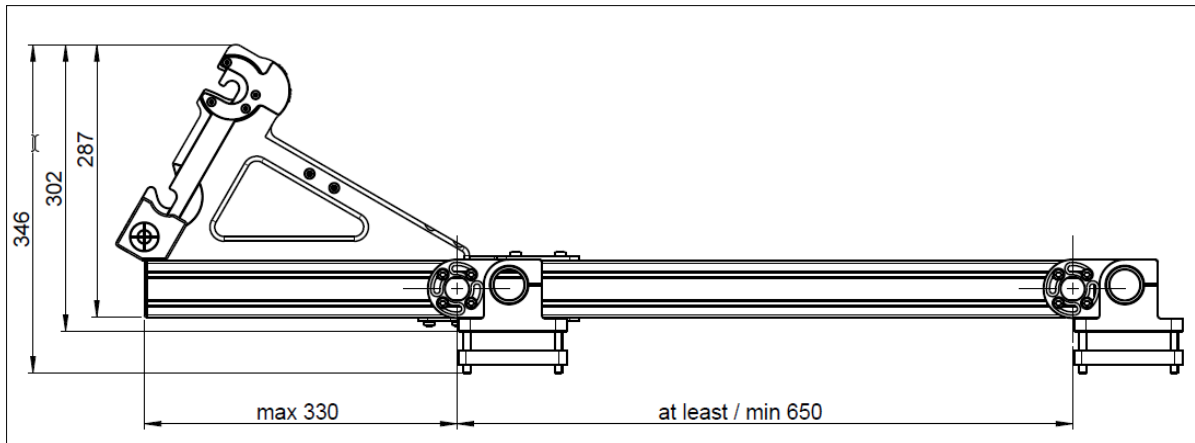
1. Park the vehicle in a level location.
2. Remove the screw bridge of the MX SCAN Roof Rack bracket and place the MX SCAN Roof Rack on the roof bar of the vehicle.
3. Adjust the bracket position so that the MX SCAN Roof Rack is as horizontal as possible.

Restrictions for positioning the brackets:

- a. Distance must be larger than 650 mm between front and back brackets.



- b. The distance from the back brackets to the end of the MX SCAN Roof Rack must be a maximum of 330 mm. The minimum space between mounting brackets must be 650 mm.



4. Attach the screw bridge and tighten all screws on the MX SCAN Roof Rack.

4.2 Installation of the Trimble MX90 Sensor Unit

Important! The weight of the Sensor Unit is about 37 kg. TWO people are required to mount or dismount the system.

The mount mechanism must be prepared *before* lifting the Sensor Unit into position to prevent injuries to people or damage to the Sensor Unit.

1. Two people (one on each side) lift the Sensor Unit into position using the handles.
2. Put the lower rod into the groove of the MX SCAN Roof Rack.
3. Insert the upper rod and fix the Sensor Unit.
4. Tighten the MX SCAN Roof Rack screw to secure the Sensor Unit.



4.3 Installation of the Power and Control Units

1. The Power Unit and Control Unit are installed inside the vehicle.

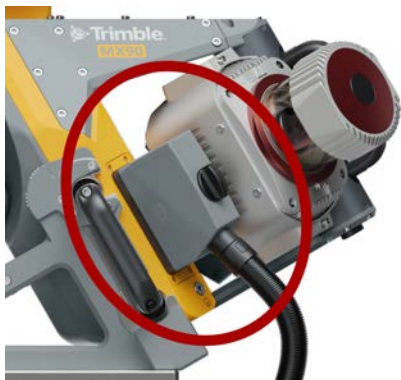
Important! Ensure that the vent holes in each unit are always uncovered. The MX90 system can only be operated using the Control Unit 2 (CU2). Do NOT attempt to use an MX90 system with any older Control Unit.

2. Each unit must be thoroughly secured to stay safe while the vehicle is moving.



4.4 Cable Setup

1. Check the connection polarity of the port and connect the sensor cable to the Sensor Unit. After connection, fix with the mounting screw.



2. Install the system power cables.
 - a. Connect the cable between the Control Unit and Power Unit.

b. Connect the cable between the Power Unit and vehicle power.



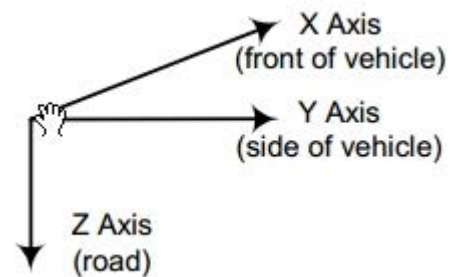
3. Connect the grounding point of the Power Unit and the Sensor Unit to vehicle body.

4.5 Measure Lever Arms



The lever arms of the standard system are set by default in the MX90 system. Only the vehicle height (see vehicle settings in TMI-software / Settings) needs to be saved once as a preset.

Only when using **additional sensors such as GAMS and DMI**, measure the 3 axis distance from the origin mark of MX SCAN Roof Rack (vehicle frame) **to** the center of GAMS and DMI seen in the following figure. Be aware that position and attitude determination can be affected by poor lever arm measurements to the order of ~1 cm.



5. Start the Trimble MX90 System

5.1 Start the Trimble Mobile Imaging TMI

Important! Before starting, please make sure all connections are secure and the recording SSDs are inserted and locked.

1. Trimble MX SCAN Control Unit 2 (CU):
Insert or check, if inserted SSD in designated port is locked.



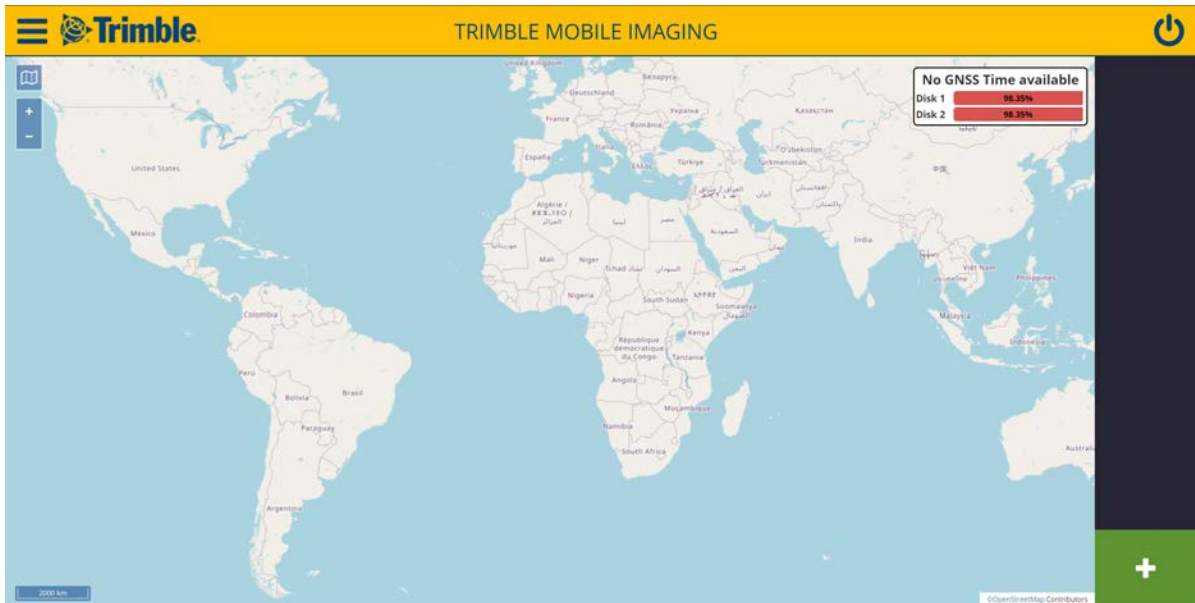
SSD1: Data of laser (1/2), Navigation (GNSS, IMU), panoramic camera

SSD2: Data of oblique cameras (1 to 3)

LAN: Connect to MX90 system via Ethernet cable

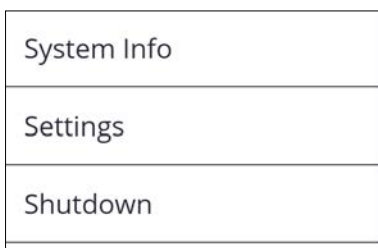
2. Turn off engine “auto-start/stop” function.
3. Start the vehicle.
4. Turn on the system - (**after the vehicle is started!**)
5. Start the Trimble MX90 System.
 - a. Press and hold the power button on the Control Unit to switch on the system power (for at least fifteen seconds).
 - b. If the vehicle delivers 12 V power to the Power Unit, the LED on the Power Unit will be constantly green.
 - c. During the system start-up, the LED of Sensor Unit and Control Unit will blink. This state lasts about 10 seconds.
 - d. After a short time both LEDs will change to solid green. The MX90 system is now ready to operate.
6. Connect your Interface (tablet or PC computer via Wi-Fi or LAN) and open a web browser:
 - a. Google Chrome is recommended (other browsers have not been tested).
 - b. Open <http://tmi.mx-scan.net>.

c. Once connection is established, the main menu window will open:

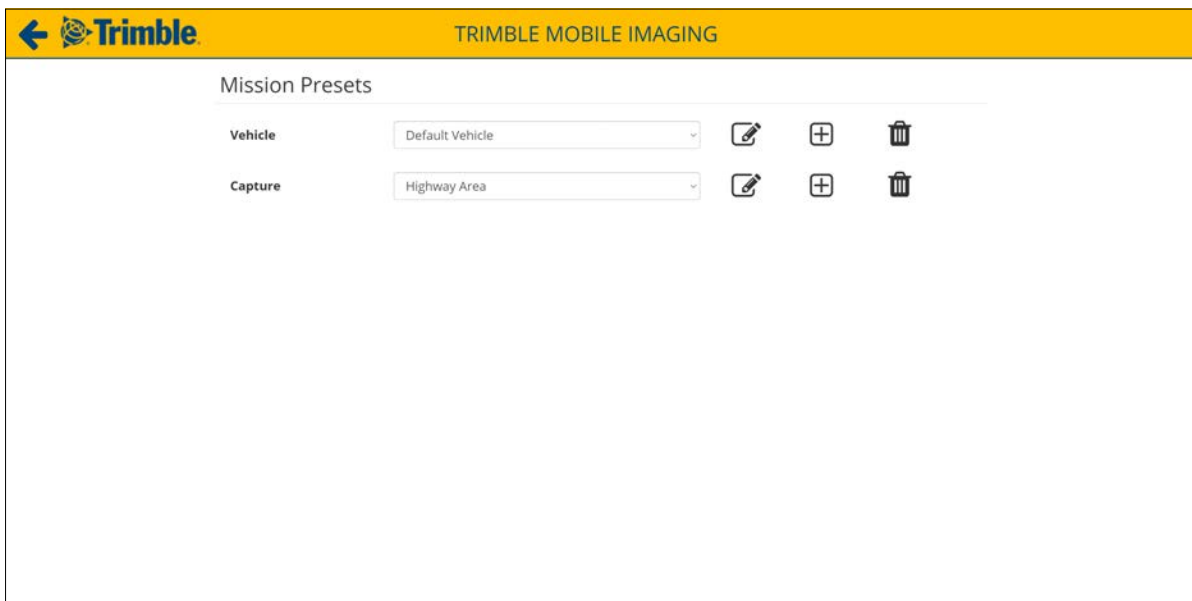


5.2 TMI-capture: Settings (Vehicle/Capture)

1. Press the **Settings** button (Main menu).



2. The following page appears. Create or select mission specific parameter setup:



- **Vehicle settings**

Set the mounting parameters of the sensor on the vehicle. Also set up additional Aiding Navigation Sensors like DMI or secondary GNSS Antenna (GAMS) in this dialog.

Installation Parameter:

Install Height. Ground height to reference point on MX SCAN Roof Rack.

DMI. Check/enter lever arm value, mounting position, *only if DMI is used.*

GAMS. Check/enter lever arm value, *only if GAMS is used.*

- **Capture settings**

- set the camera frame rate (by distance, by time)
- set the laser measurement settings (Laser Repetition Rate, Line speed)

Camera Trigger Settings:

Distance Based. Camera images are captured at constant distance [m].

Fixed Frame rate. Camera images are captured at constant time [s].

Trigger Distance/rate. Enter the measurement interval.


NOTE - The maximum image rate is limited to 10 frames per second!

- **Laser settings**

- **Measurement Prog.** Measurements/second [305 kHz, 507 kHz, 762 kHz, 1017 kHz]
- **Line Speed.** Rotation speed of the scanner mirror (revolution per second) [20 .. 250]

3. Save settings as presets in case it is a new setup.

5.3 TMI-capture: Start Mission

1. To start a mission, press:  (lower right corner of the window).
2. Next window:
 - a. Enter a specific mission name and area name.
 - b. Select Vehicle and Capture presets.
 - c. Press **Next**.
3. To finalize your mission, press **Start**.
4. The mission will start (System will start all sensors).

Navigation alignment must be done first before data logging is allowed!

This procedure could take several minutes to complete (including final NAV alignment)

See section [5.4 Initializing GNSS/IMU](#).

See section [6. In-field Operation Checklist](#).

5. Select one of the following buttons for further status information:





Dashboard: Display system status and other additional information.

Camera: Display images and adjust image quality for each camera.

Nav: Display details of GNSS/IMU.

Laser: Display details about each Laser.

6. Auto-centers map to your actual position, press .
7. Change map orientation (north vs. vehicle), press .

For more information and details, please check the *Trimble TMI Software User Guide*.

Important! To display an online map from OSM as a background map, the Trimble MX90 system needs to be connected to the Internet. Refer to the Trimble MX90 User Guide, chapter 3 Operation, Prerequisites to System Setup and Operation.

5.4 Initializing GNSS/IMU



After starting mission:

1. POS data (GNSS/IMU) is *recorded automatically* once enough satellites are visible and a real-time position is available (*a blue trajectory on the map window becomes visible* – the real-time navigation solution is available).
2. Drive to an open sky environment for more than 30 seconds while changing direction and speed. *The NAV status button should change color from red to orange!*

For optimization of trajectory postprocessing use the following field procedure (*after the Nav status button turns orange!*):

- a. Stop the vehicle in an open sky area with a PDOP of 3.0 (or better).
- b. Stand still for a minimum of at least 3 minutes (the system is automatically collecting static GNSS data in the background).
- c. Start driving. *The NAV status button should change color from orange to green.* The IMU alignment is complete when the NAV status button switches to green.
- d. Now you can start collecting your mission data ...



5.5 Data Capturing

1. To start recording, press the Record button (lower right corner; color changes from green to red):  / .
2. Camera and Lidar data are now recorded (recording button stays red).
3. To stop recording, press the Record button again (color changes back from red to green).

Record lidar and image data only for areas that are project specific. The amount of data depends on the project size/geometry and recording parameter of your sensors (LiDAR and Camera). **Minimum mission time of ≥30min required!**

5.6 Finalize Mission

After data capture is finished, finalize the mission according to the following sequence:

1. Drive for at least 30 seconds while changing direction and speed.
2. Move to an open sky area and stop driving.
3. Stand still for minimum of at least 3 minutes (capturing static GNSS data).
4. Quit mission, press .
- (Attention: navigation data logging is stopped!)
5. Shut down the system by pressing the power button on the Control Unit or inside the TMI software .
6. Wait until the light on the power button of the Control Unit is turned off (this may take up to 90 seconds).

5.7 Download of data from SSDs

1. Unlock both SSDs with the provided key.
2. Remove the SSDs.
3. Connect SSDs with USB 3.0 cable to computer.
4. Insert SSDs in the MX SCAN - Data Carrier Docks connected to the upload computer.

5. Lock both SSDs with the provided key.
6. Download the mission.

6. In-field Operation Checklist

Proposal of a checklist for system operation:

Office procedures

1. Check the system (mechanical check, mounting check, screws, torques).
2. Check settings on the system (lever arms, sensor settings).
3. Prepare field protocol, SSDs drives for system.
4. Check satellite almanac (www.gnssplanning.com/#/charts).

In Field procedures

1. Start the MX90 System. Start the mission in an open sky environment with good GNSS. The trajectory should be visible on the Map window (blue track).
2. Start driving for at least 30 seconds: special maneuver – changing direction and speed (stronger acceleration + break). *The NAV status button should switch from red to orange!*
3. Go to your initialization point (open sky area with good GNSS visibility and PDOP!) and stand still minimum for at least three minutes (capturing static GNSS data automatically in the background).
4. Start driving. *The NAV status button should switch from orange to green!*
When the NAV status button turns green, the user accuracies for the NAV system are met.
5. **Capture data** (Camera+Lidar) – Record/Stop Runs (GNSS/IMU data capturing will continue until mission is shutdown!). Minimum mission time of ≥30min required!
6. Go to an initialization point, on the way there:
Special maneuver – changing direction and speed (stronger accelerate + break)
7. At initialization point again: minimum for at least 3 minutes static logging of GNSS data.
 - a. Stop the mission (stop logging GPS/IMU data) and shut down the system.
 - b. Check the Field protocol (order of runs, direction of runs, date, mission, system-SN).

Office procedures

1. Back up the data.
2. Prepare SSDs for the next mission.

7. Support

If you need support for the Trimble MX90 system or Trimble Mobile Mapping software, contact our Customer Support team via:

- Email: imaging_support@trimble.com
- Phone:
 - APAC: +86-1-088-5775-75824
 - Americas: +1-289-695-4416 or +1-303-635-9200
 - Europe & Middle East: +49-7351-47402-37

Please report your support case as precisely as possible. Please provide:

- a short description of the problem.
- the workflow you used and how to reproduce the problem.
- If occurring during a mission:
 - the location of the mission.
 - environmental conditions.

Also send the following information about your Trimble MX90 system:

- System log file.
- Serial number.
- Duration of the MX90 system usage.
- Photos/video, if useful, to describe the problem.

To register your product or check the status of your system maintenance, please register your system and software at <https://mytrimbleprotected.com/>.

My Trimble Protected enables Trimble users, channel partners, and end customers to streamline business processes for customer engagement and service. As a centralized instrument panel, My Trimble Protected manages registrations, serial number lookups, product catalogs, reports, settings, and locator processes. It allows users to configure, monitor, and optimize each aspect of the process.

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