GLRM

User Guide

General Laser GmbH

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https://glrm.general-laser.at

Contents

1 Introduction

1.1 What is GLRM?

GLRM is an ultra-compact, triple-band RTK GNSS receiver developed by General Laser for high-precision geospatial applications. Whether magnetically attached to an iPhone Pro or iPad via MagSafe, used for static measurements with a mini pole, or mounted on a survey pole, GLRM delivers centimeter-level positioning accuracy in a matter of seconds.

Key features include:

- Centimeter-accurate positioning via Real-Time Kinematic (RTK) technology
- Tilt compensation for reliable measurements even when not level
- Rapid fix in just 5 seconds
- Tracking all GNSS frequencies and all constellations
- Anti-jamming and anti-spoofing
- Compatibility with both iOS and Android devices and applications
- Supports both mobile and classical pole set-up

GLRM is ideal for both professionals and beginners needing high-accuracy GNSS in fields like surveying, construction, GIS, and infrastructure mapping.

When paired with GIS AR applications, it can also transform your iPhone Pro into a precise scanning tool — capturing 3D scans of utilities and work sites and georeferencing them in real time.

1.2 What is the GL Connect App?

GL Connect is the official companion app for configuring and operating General Laser’s GNSS receivers GLRM and GLR across a range of professional applications including surveying, mapping, and construction. NTRIP client included, right from the phone or tablet. Real-time accuracy for surveying, mapping and geolocation on the go.

Users can configure the receiver, manage NTRIP connections, monitor RTK status, and capture accurate positions — all in one app. Location mocking feature in the Android app available.

A detailed user-guide for GL-Connect is available in chapter 3.

1.3 Use Cases

Surveying & Mapping

- Topographic surveys: Capture accurate elevation and terrain models
- Boundary delineation: Define property limits with confidence
- Infrastructure mapping: Record utility lines, roads, and public assets

Construction & Site Management

- 3D site documentation: Georeference LiDAR scans from iPhone Pro using GLRM and GIS/AR apps
- Stakeout operations: Position construction elements precisely on-site
- Progress tracking: Compare real-world status to project models
- As-built documentation: Capture verified, geotagged records of completed work

Geographic Information Systems (GIS)

- Asset inventory: Build and maintain detailed, location-accurate asset database
- Spatial analysis: Support urban planning, zoning, and risk assessment
- Data integration: Enrich GIS/CAD platforms with real-world, high-accuracy data

2 GLRM Quick Start

2.1 Powering GLRM On and Off

GLRM uses a touch sensor to turn on and off. The sensor is located on top the of the long white stripe, visualized in Figure 2.1.

To turn the GLRM on, the following touch sequence is used:

1. Press the touch button for about 1 second or until you see the purple status LED.
2. Release the touch button for a short period (≈ 0.5 s).
3. Press the touch button again and hold for a minimum of 2 seconds or until the status LED starts blink blue, indicating that the GLRM is now turned on and in advertising mode.

Figure 2.1: GLRM touch button location

GLRM can be turned off using the same sequence as for tuning on, or by sending a shutdown command. Additionally, in order to save power, GLRM automatically turns off after no connection was established for more than 30 minutes.

2.2 LED Indicators

GLRM uses three LEDs to indicate the current status of the receiver:

- LED1 (outer) is an RGB-LED and is used to indicate the current state of the GLRM, also referred to as status LED.
- LED2 (middle) is a blue LED which lights up once an RTK FIX solution is obtained.
- LED3 (inner) is an orange LED which starts blinking once GLRM has a valid timestamp from GNSS.

Figure 2.2 visualizes the position of the status LEDs, Table 2.1 shows the status indicated by LED1.

Figure 2.2: GLRM status LEDs

LED1 states:

LED color & mode	**comment**
solid red	GLRM is turned off, USB charging cable is connected, **battery state of charge is low**, soc below 20%
solid orange	GLRM is turned off, USB charging cable is connected, battery soc is between 20% to 95%
solid green	GLRM is turned off, USB charging cable is connected, **battery is fully charged**, soc above 95%
fast blue blinking	GLRM is turning on and initializing
blue blinking	GLRM is turned on and waiting for a connection
solid blue	GLRM is turned on and connected, normal operation
fast red blinking	GLRM is turned on but battery level is critical (less than 8%)
purple	a touch has been detected
short cyan impulse	a short cyan impulse overwriting the normal state, indicates that a valid RTCM message has been received
red impulse	battery soc crossed threshold for battery low state (below 20%) **or** a usb cable was disconnected
orange impulse	battery soc crossed threshold for battery average state (not low and not fully charged)
green impulse	battery soc crossed threshold for battery fully charged (above 95%) **or** a usb cable was connected
fast orange blinking	a catastrophic error has occurred, please try resetting the receiver or contact support
fast orange purple alternating	a catastrophic error has occurred, firmware updates are possible, please try resetting the receiver or contact support

Table 2.1: GLRM state indicated by LED1

2.3 Charging GLRM

To charge your GLRM connect the USB port to a USB charger. GLRM automatically detects the current mode provided by the charger and adjust its charging power accordingly.

If GLRM is turned off, LED1 indicates the battery charging state by color: red means battery low (below 20%), green means fully charged (above 95%) and orange means in-between.

2.4 Connect to GLRM

GLRM uses Bluetooth Low Energy (BLE) to exchange data with your phone.

In order to connect to your GLRM first ensure that your GLRM is in advertising mode, indicated by LED1 blinking blue. Then open the compatible surveying or mapping app of your choosing and connect the external GNSS receiver through the app. Section 3.2 describes how the connection works with GL-Connect.

A list of software partners and compatible apps can be found at glrm.general-laser.at. For a detailed guide about the connection and set-up process please check the corresponding guides of your software solution.

2.5 Tilt Compensation

GLRM offers tilt compensation. This allows for accurate location measurements even if your surveying pole is tilted and not vertical. In tilt compensation mode GLRM directly computes the position of the tip of the surveying pole.

For details on how to enable and use tilt compensation please check the manual of the software solution you are using.

2.6 GLRM antenna offsets

The normal GNSS position output of the GLRM is from the phase center of the antenna.
The tilt compensated position output of the GLRM is from the tip of the pole.

2.6.1 Pole antenna

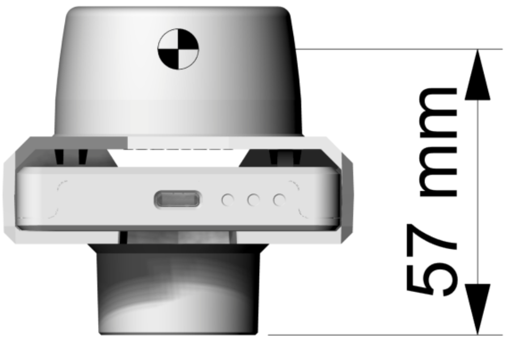


Figure 2.3: GLRM pole antenna offset

The GL-pole is 1.8m meters in length if it is fully extended.

2.6.2 Phone antenna

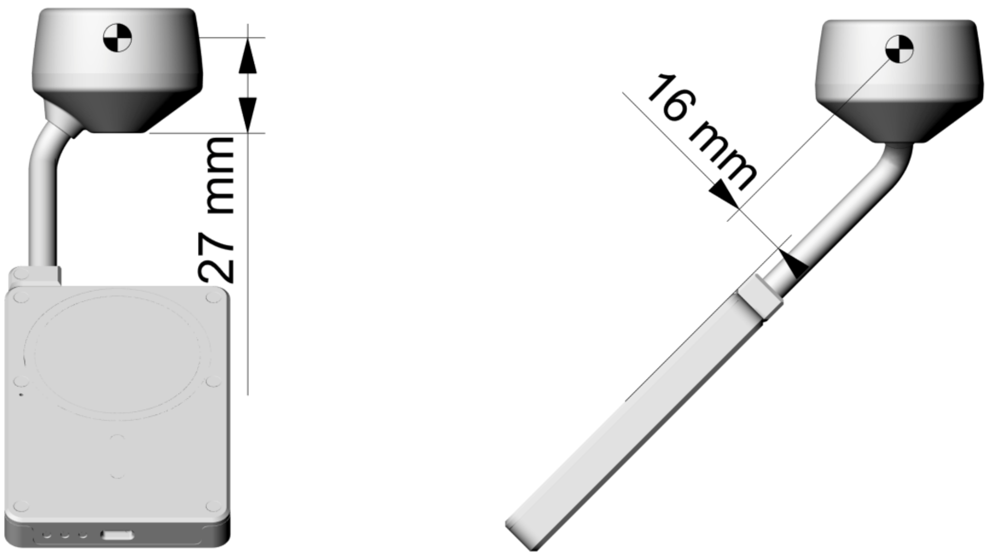


Figure 2.4: GLRM phone antenna offsets

2.6.3 Minipole

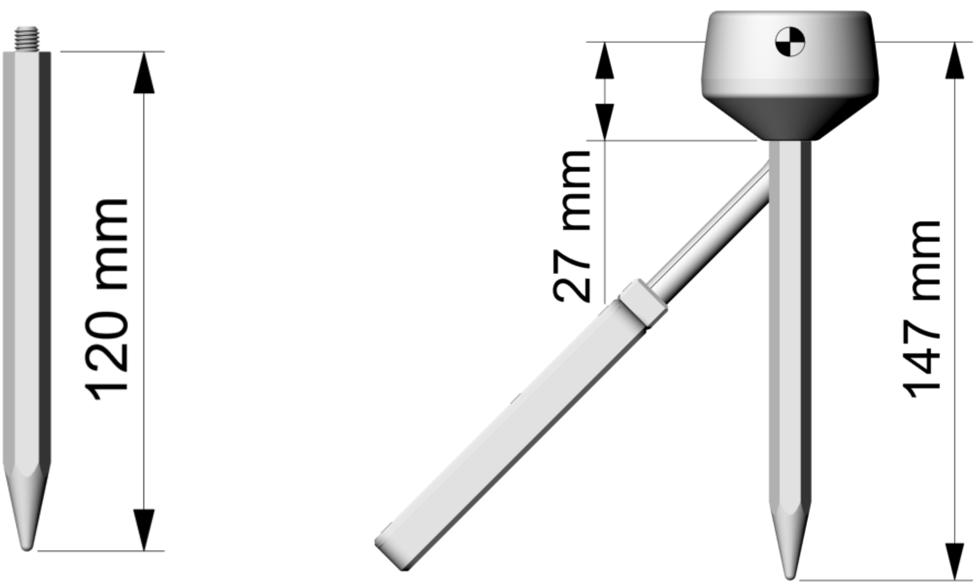


Figure 2.5: GLRM minipole offsets

add GLRP hardware offsetes

2.7 Reset GLRM

If something went wrong and GLRM ends in an error state (LED1 is fast orange blinking) or GLRM just doesn't respond anymore, there is a hardware reset button.

To reset the GLRM, there is button hidden behind a small hole, see Figure 2.6. Press and hold this button for about 1 second to reset the GLRM. In order to reach the button use a paperclip or sim card ejection clip from your phone.

Figure 2.6: GLRM reset button location

3 GL-Connect App

3.1 Intro

This section describes the official companion app of GLRM, GL-Connect.

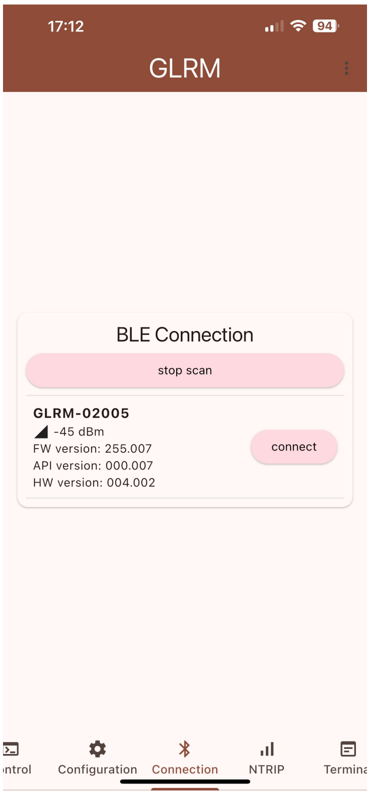
The GL-Connect application can be downloaded from google play store (for Android) and app store (for IOs).

3.2 Connection screen

The connection screen shows all the GLRM devices which are readily available to connect. The GLRM needs to be turned on to connect to the GL-Connect.

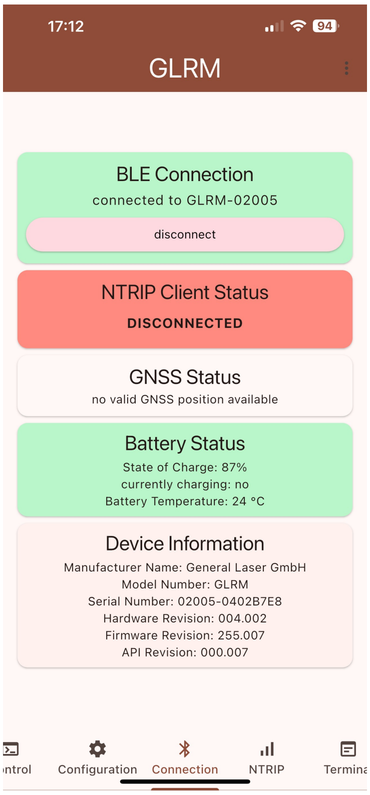
Clicking on the start scan button, scans all potential GLRM devices in the vicinity. Each GLRM device has its own name identifier. For example a device name be as shown in the picture below "GLRM-02005". Upon choosing which GLRM device to connect to, the outer LED on the GLRM stops blinking and holds the blue state. This process allows your mobile phone to act as a GLRM controller or data receiver.

On Android background, execution of GL-Connect can be enabled for the NTRIP-Client. This allows GL-Connect to continue forwarding correction data to the connected GLRM even if the app is closed.
Furthermore, mock location can be enabled. This allows GL-Connect to override the phones location with the location received from your GLRM. In order for this feature to work GL-Connect must be selected as mock location provider in the developer settings.



3.3 Status screen

Once connected to the device, another screen is presented with the status information, such as current GNSS solution, if enabled tilt compensation status, battery status information and device information.

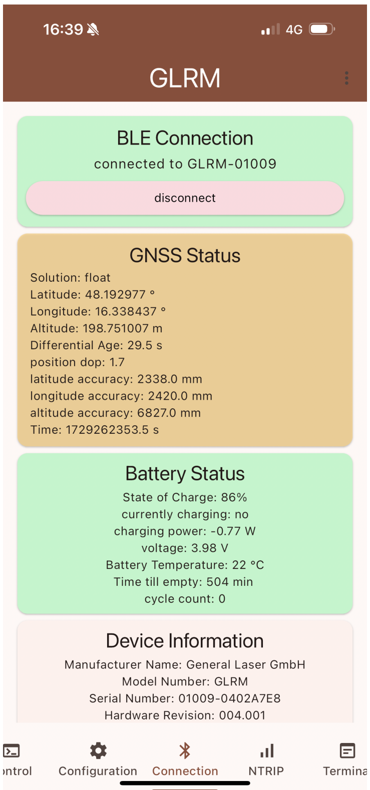


3.3.1 NTRIP client status

NTRIP Client status is either in a not connected(red color) or connected(green color), representing the current state of the application in regards to the NTRIP connection tab. To confirm successful correction data transmission the NTRIP Client status blinks blue every time data is received and GLRM indicates received correction data by blinking the stats LED in turquoise. The NTRIP connection profile can be modified in the NTRIP menu, (section 3.6 contains more information regarding the NTRIP connection).

3.3.2 GNSS status

GNSS status card shows information about current GNSS solution. This includes position information and accuracies, number of used satellites and position dop. When this status card turns green it means that a RTK-fixed solution has been obtained. At this point, the middle LED in the GLRM receiver will be in a solid orange state.

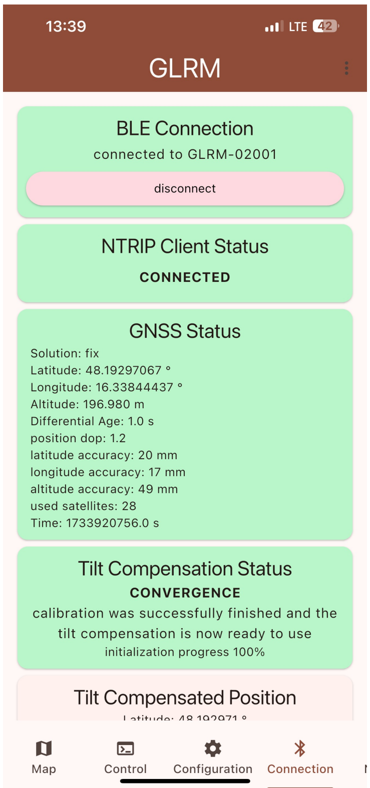


3.3.3 Tilt compensation status

Tilt compensation is only available since firmware version 1.7 and hardware version 4.2. It can be enabled by going in the configuration tab in the GL-Connect application. Refer to subsection 3.4.3 for more information.

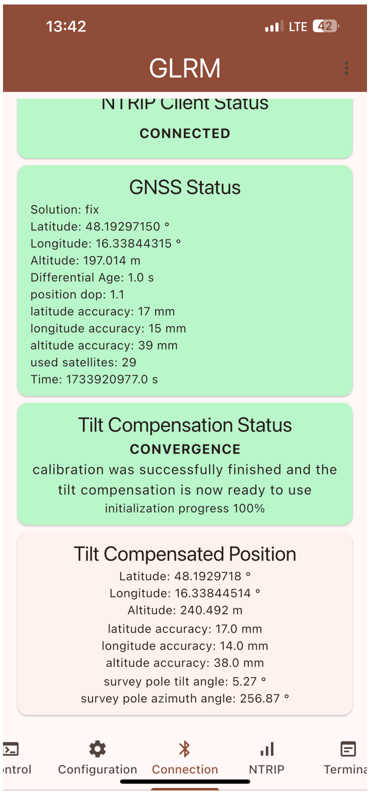
This status card is only visible when tilt compensation is enabled. It provides the following information about the tilt compensation calibration states:

- **static**: Keep the survey pole static and as vertical to the ground as possible.
- **waiting**: Waiting for the RTK-fix solution. Check your NTIRP-Client connection.
- **calibration**: Move the survey pole in a big circular motion to calibrate the tilt-compensation algorithm.
- **recalibration**: Move the survey pole in a big circular motion to recalibrate the tilt-compensation algorithm.
- **convergence**: Calibration was successfully finished and tilt-compensation is now ready to use.
- **satnotenough**: There are not enough satellites in view, waiting for at least 20 satellites.



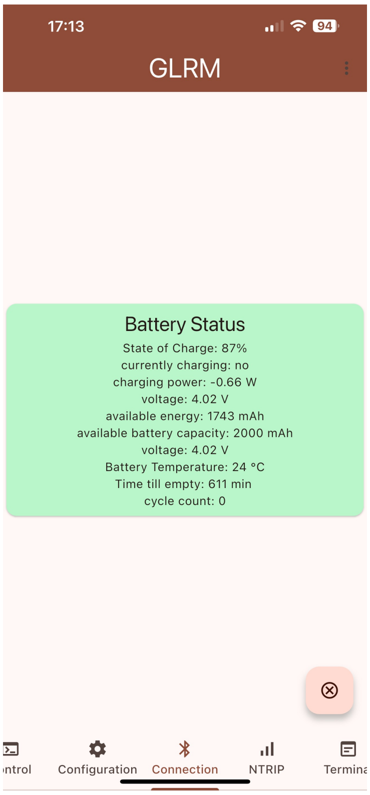
3.3.4 Tilt compensated position

Tilt Compensated Position shows the current tilt compensated positions, accuracies, tilt angle and azimuth angle.
The tilt compensated position is the position of the tip of the surveying pole.



3.3.5 Battery status

Battery status informs the user know about the current state of charge of the GLRM receiver. Tapping the battery card 5 times opens another window that provides additional information about the battery.



3.3.6 Device information

Device information gives information about the connected GLRM model. This information includes serial number, model number, hardware revision, firmware revision and API revision numbers.

ota udpate description

3.4 Configuration screen

3.4.1 GNSS configuration

The user can select which satellites are used to obtain a GNSS solution. This is important because each satellite in a GNSS constellation broadcasts its signals on specific radio frequency band. These frequencies carry the satellite's information, including time, orbit, and correction data, which the receiver uses to calculate an accurate position.

Examples of frequency bands used by GNSS satellites:

- L1 Band (1575.42 MHz): Used by most GNSS constellations for basic positioning.

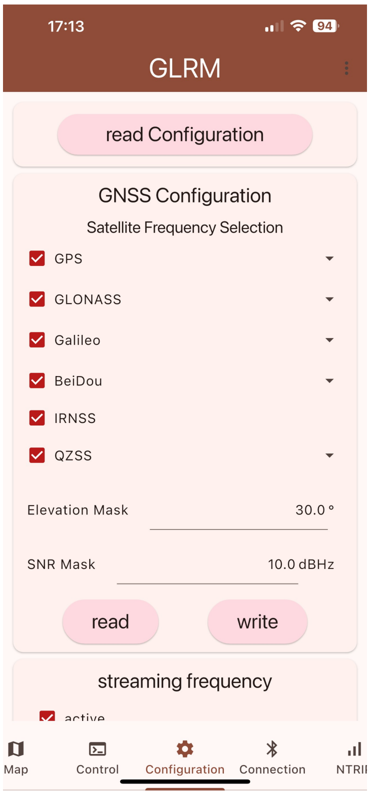
- L2 Band (1227.60 MHz): Provides higher accuracy and is often used for correction data, such as in RTK (Real-Time Kinematic) systems.
- L5 Band (1176.45 MHz): Designed for safety-critical applications like aviation, with improved resistance to interference.

The satellites which can be used in the application to get our location are as stated below:

- **GPS** is maintained by the United States of America
- **GLONASS** is maintained by Russia
- **Galileo** is maintained the European Union.
- **BeiDou** is maintained by China
- **IRNSS** is maintained by India
- **QZSS** is maintained by Japan

Elevation Mask: Any satellite below the specified angle will not be tracked and dropped for the measurements.

SNR Mask: (Signal-to-Noise ratio) Excludes satellites with lower SNR from the computation. The lower the SNR, the less accurate our data will be.



3.4.2 Streaming frequency

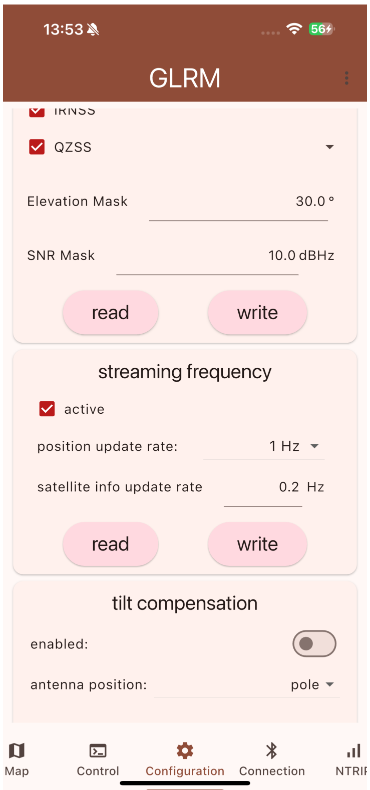
Configure the output of the GLRM. The BLE output can turned on or off with the active button.

Position update rate:

- 1 Hz or 2Hz represents the frequency we want our position to be updated. This refers to how often the GNSS receiver calculates and provides an updated position (latitude, longitude, and altitude).
- A higher position update rate (e.g., 2 Hz) is useful in dynamic scenarios like vehicle navigation or emergency response, where rapid position changes occur.
- For static applications (e.g., surveying or monitoring stationary objects), a lower update rate (e.g., 1 Hz) is often sufficient.

Satellite info update rate:

- This is how often the GLRM receiver publisher satellite information (such as satellite orbital data, health status, and timing signals).
- The satellite info update rate must be at most 1Hz and is calculated to be a fraction of the position update rate.

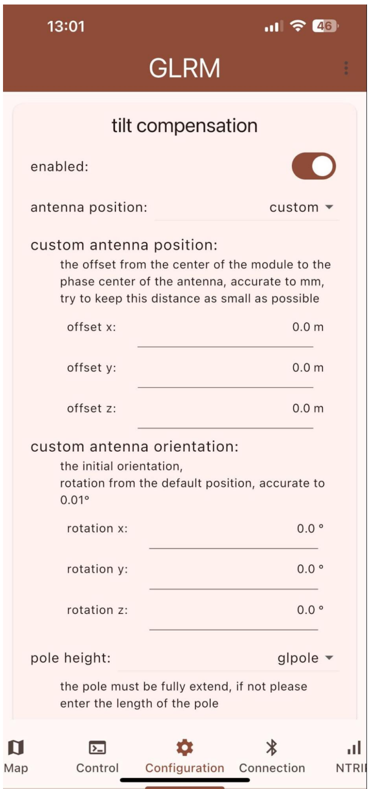


3.4.3 Tilt compensation

Configure and enable tilt-compensation. This widget is only present if the connected hardware supports tilt-compensation.

Antenna position: The position of the antenna phase center relative to the GLRM module. The offsets for the GLRM pole adapter are predefined and can be selected easily. To use a custom antenna, the offsets and rotations must be specified manually. It is recommended to keep the module to antenna offset small for better results.

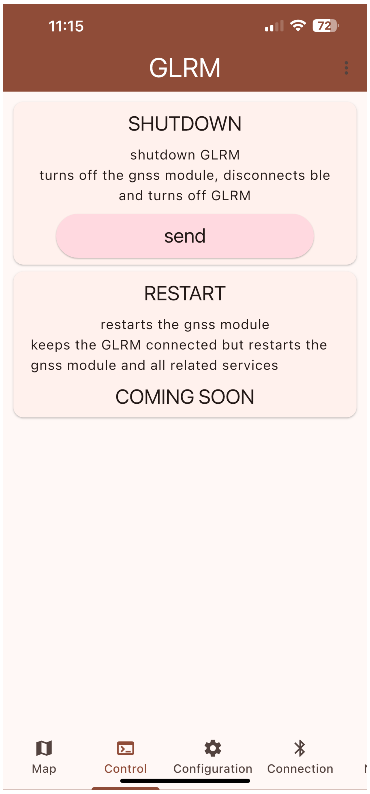
Antenna height: The height of the used surveying pole. Using the predefined GL pole mount, the pole length is measured from the bottom pole mount thread. If a custom antenna position is specified the pole length is measured from the antenna phase center. The GL-pole is predefined and has a fully extended length of 1.8 m.



3.4.4 Device name

Every GLRM device is shipped with its default name as GLRM-xxxxx, xxxxx representing the first 5 characters of the devices serial number. User can change the name of the GLRM device by changing the variable part of the name noted with “xxxxx” then tapping on the button write. Next time the user scans for GLRM devices, this device will show up with the user defined name.

3.5 Control screen



In this screen there is the choice of controlling the GLRM device. For now this includes only the following functionality:

- **Shutdown**: disconnects the GLRM and directly turns it off.

3.6 NTRIP screen

NTRIP screen is where users can configure the NTRIP client within the GL-Connect application. This configuration includes the following:

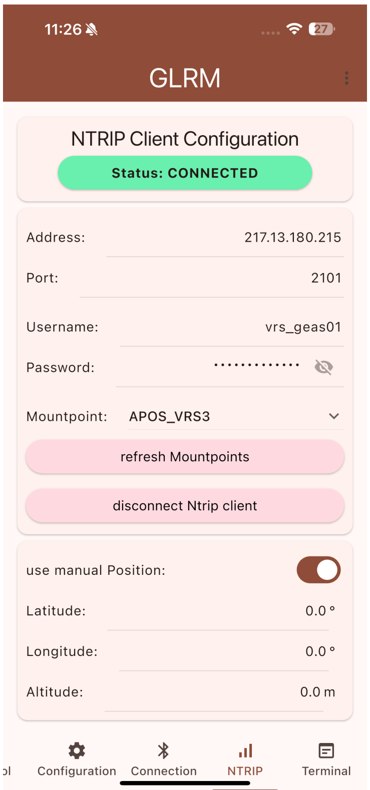
Address: The hostname or IP address of the NTRIP caster.

Port: The port number the NTIP caster is using, default port is 2101.

Username: The username used to authenticate on NTRIP caster.

Password: The password used to authenticate on NTRIP caster.

Mountpoint: Select a mountpoint to use out of list of available mountpoints. Different mountpoints usually provide a different level of correction data or use different satellite systems for their correction data.



Unless manual position is selected the GLRM will automatically send it's current position to the NTRIP caster. Otherwise, users can manually enter the coordinate in the latitude, longitude and altitude placeholders.

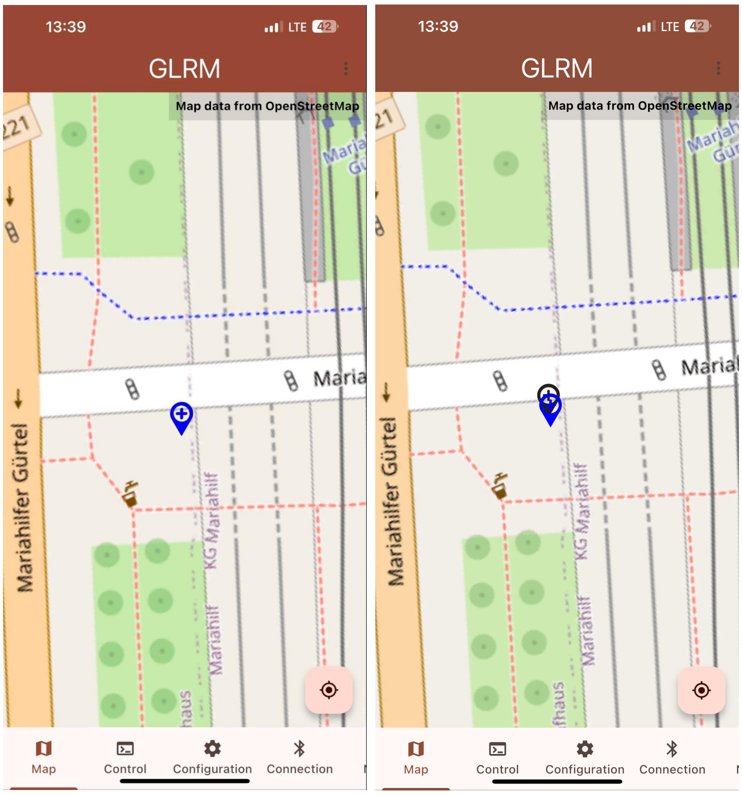
On clicking connect NTRIP client, the NTRIP status will turn from red to green. The blue blinking on top of the green status indicates that data has been received. To validate that GLRM is also receiving the correction data, check the outer status LED of the GLRM, it should now show turquoise impulses.

3.7 Map screen

Here, the user can view their current position received from the GLRM on a map provided. The map is provided by OpenStreetMap.

When tilt compensation has converged and the status in the connection screen turns green for tilt compensation, we can view the tilt compensated position as well.

- The black marker shows the position of the antenna.
- The blue marker shows the tilt compensated position (if enabled).


13:39
LTE
GLRM
Map data from OpenStreetMap
Mariahilfer Gürtel
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Mariahilf
Map
Control
Configuration
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Map data from OpenStreetMap
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