GL-Connect

User Guide

General Laser GmbH

June 3, 2025

https://glrm.general-laser.at

Contents

1 Introduction

This user guide is useful for anyone who is interested in using the GLRM receiver with the GL-Connect application available for Android and IOs. This documentation explains all the necessary steps to have the GLRM receiver running, connected to your GL-Connect application and fully operational with its services. A summary of the main keywords and technologies used throughout the document can be found in this section.

GNSS (Global Navigation Satellite System) is a term used to describe a system that encompasses multiple satellite constellations, including GPS (Global Positioning System), GLONASS, Galileo, BeiDou, and others. GNSS receivers can receive signals from multiple satellite constellations to determine a position on Earth with accuracy. RTK (Real-Time Kinematic) is a technique used to enhance the precision of position data derived from GNSS. Using GPS delivers to you 3-5 m accuracy, which is not sufficient for high-precision applications and industries, while RTK enables below a cm precision.

RTK uses a base station and a rover to provide real-time, centimeter-level accuracy for surveying, mapping, and construction applications. The base station calculates its position accurately using GNSS signals and transmits correction data to the rover, which utilizes this correction data to calculate its precise position in real time.

GLRM makes use of Bluetooth Low Energy (BLE) to communicate with GL-Connect. Bluetooth Low Energy uses a different modulation scheme from standard Bluetooth. Due to the low power consumption of BLE, the GLRM is able to operate for longer periods of time. GLRM utilizes proprietary communication protocol that uses compression of JSON objects for the serial communication. Please refer to the GLRM Integration Manual for the specifics.

The Network Transport of RTCM via Internet Protocol (NTRIP) is a protocol for streaming differential corrections over the Internet for RTK systems. The GL-Connect application utilizes an NTRIP client to retrieve the correction data from an NTRIP caster, then forwarding this data through a dedicated BLE service to the GLRM.

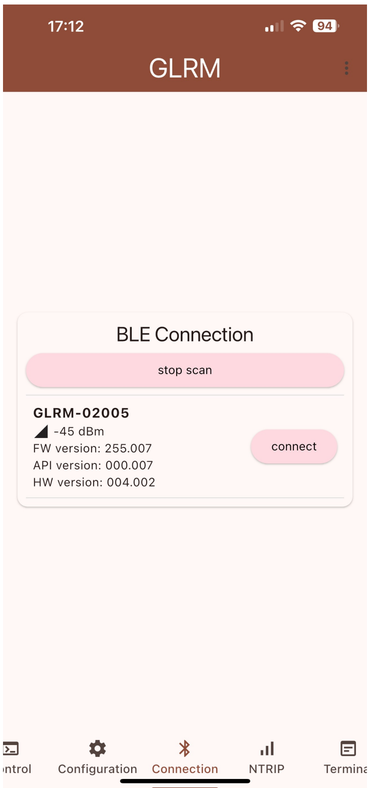
The GL-Connect application can be downloaded from google play store (for Android) and app store (for IOs).

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.

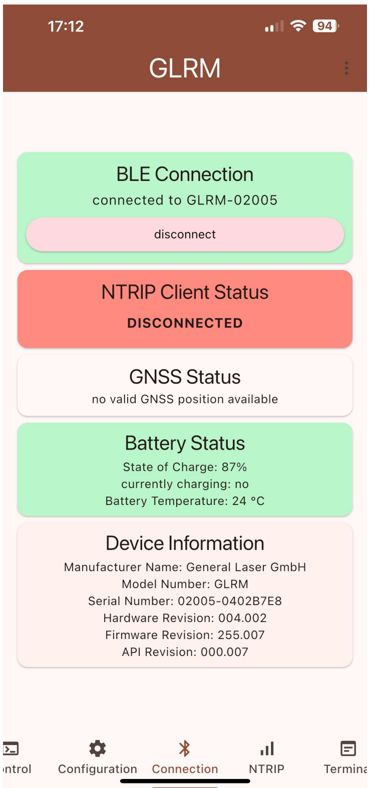
Clicking on the start scan button, scans all potential GLRM devices in the vicinity. Each GLRM device has its own name identifier. For example a device name be as shown in the picture below "GLRM-02005". Upon choosing which GLRM device to connect to, the outer LED on the GLRM stops blinking and holds 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 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.

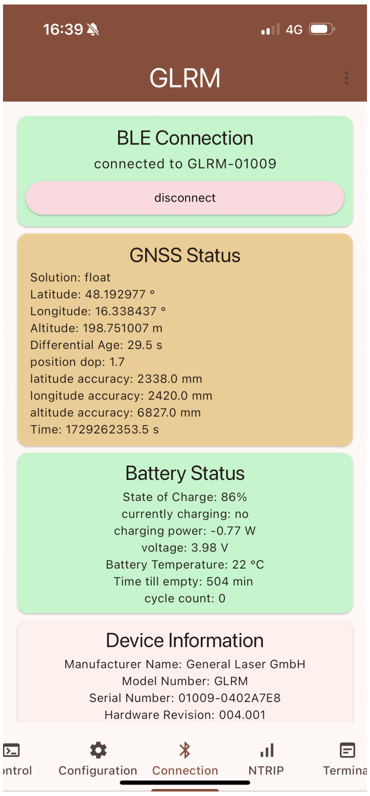


3.1 NTRIP client status

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, (chapter 6 contains more information regarding the NTRIP connection).

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.



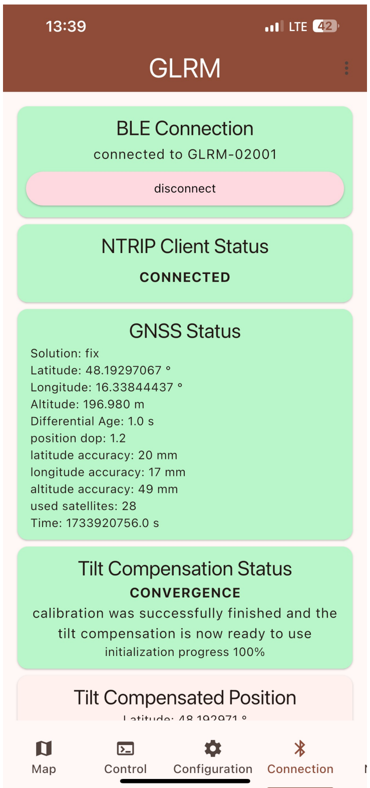
3.3 Tilt compensation status

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 section 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:

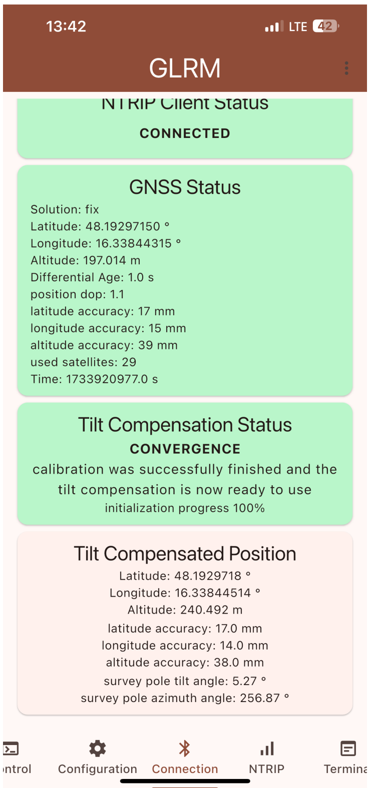
- **static**: Keep the survey pole static and as vertical to the ground as possible.
- **waiting**: Waiting for the RTK-fix solution. Check your NTIRP-Client connection.
- **calibration**: Move the survey pole in a big circular motion to calibrate the tilt-compensation algorithm.

- **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.



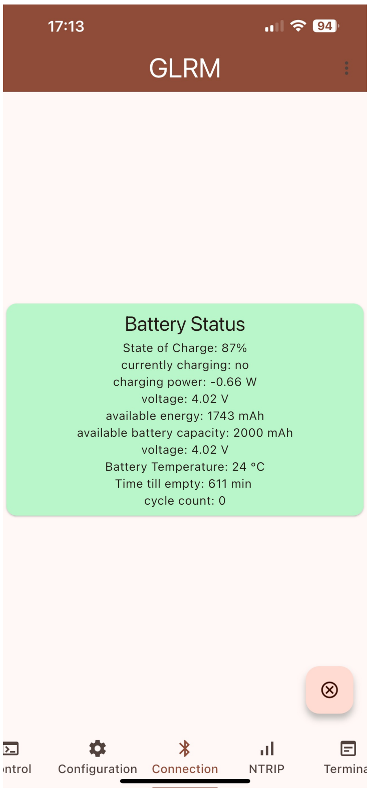
3.4 Tilt compensatied position

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.



3.5 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.



3.6 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.

4 Configuration screen

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:

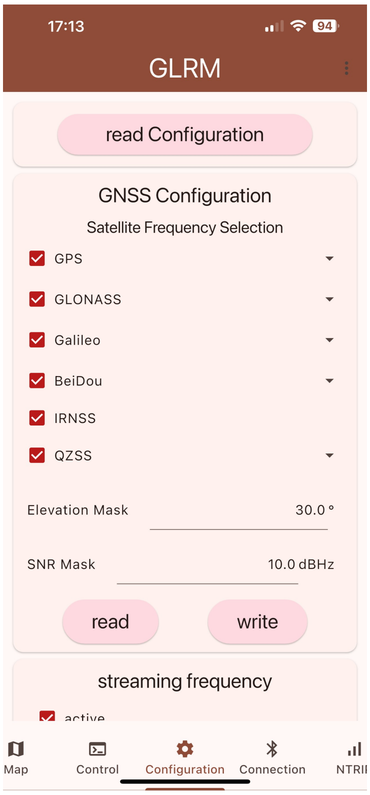
- L1 Band (1575.42 MHz): Used by most GNSS constellations for basic positioning.
- L2 Band (1227.60 MHz): Provides higher accuracy and is often used for correction data, such as in RTK (Real-Time Kinematic) systems.
- L5 Band (1176.45 MHz): Designed for safety-critical applications like aviation, with 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.



4.2 Streaming frequency

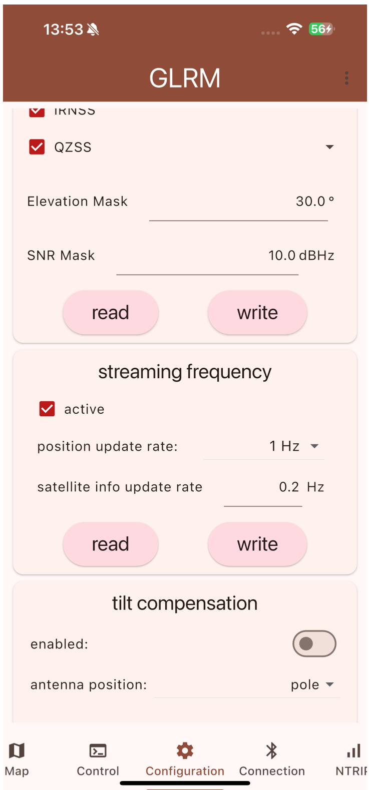
Configure the output of the GLRM. The BLE output can turned on or off with the active button.

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.

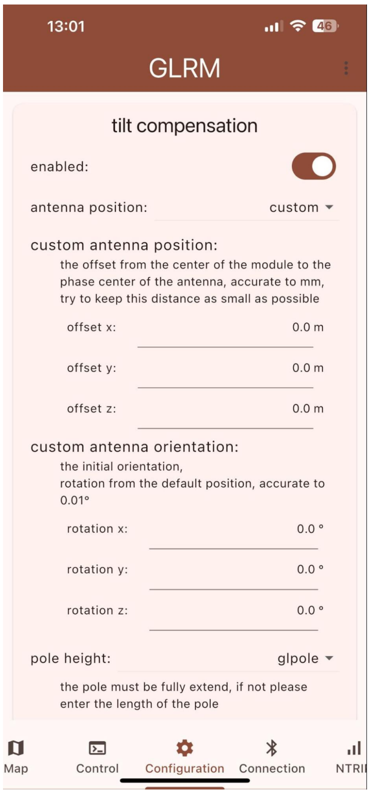


4.3 Tilt compensation

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.

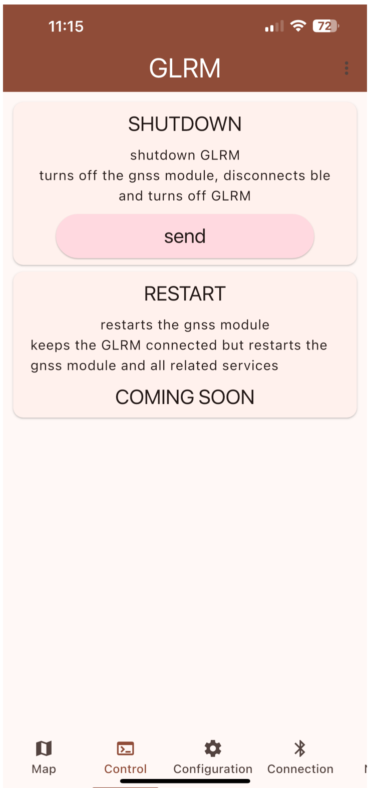
Antenna height: The height of the used surveying pole. Using the predefined GL pole mount, the pole length is measured from the bottom pole mount thread. If a custom antenna position is specified the pole length is measured from the antenna phase center. The GL-pole is predefined and has a fully extended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



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.

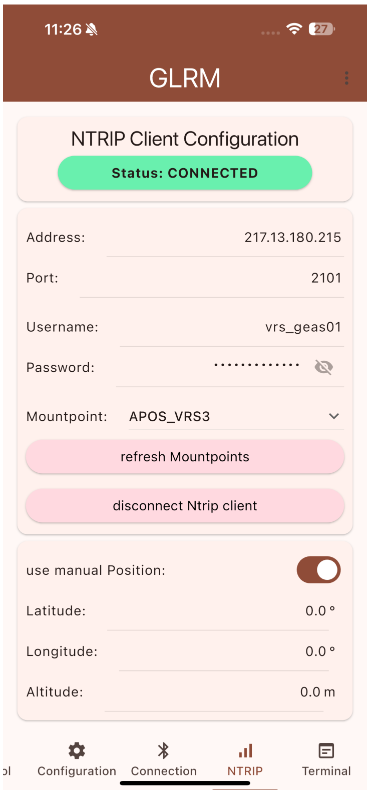
5 Control screen



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.

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.

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).