MALÅ MIRA Controller

User Guide

Our Thanks...

Thank you for choosing Guideline Geo and MALÅ! The very core of our philosophy is to provide our users with great products, support, and services. Our team is committed to providing you with the most efficient and easy-to-use solutions with the capability to meet your needs for efficiency and productivity.

Whether this is your first MALÅ product, or addition to the MALÅ collection, we believe that small investment of your time to familiarize yourself with the product by reading this manual will be rewarded with a significant increase in productivity and satisfaction.

Please let us know about your use and experience of our products as well as the contents and usefulness of this manual. We're excited to be part of your journey!

Guideline Geo AB

http://www.guidelinegeo.com

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Preface

About this Manual

This manual is written for the end user of the product and explains how to set up and configure the product, as well as providing detailed instruction on its use.

Additional Resources

Training: www.guidelinegeo.com/training-gpr-resistivity-seismics-tem/

Downloads: https://www.guidelinegeo.com/support-service-advice-training/resource-center/

Applications: www.guidelinegeo.com/application-areas/

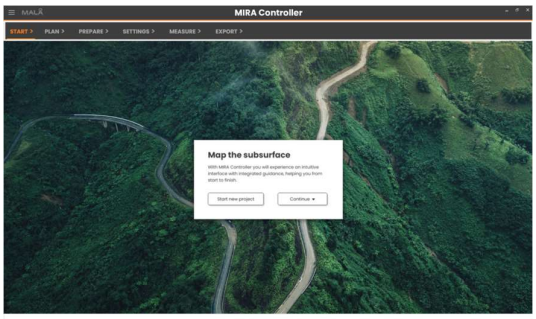
Feedback

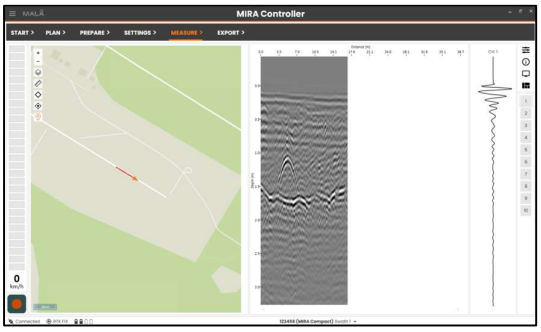
Feedback regarding the contents of this manual or the product may be sent using any of the contact details found at www.guidelinegeo.com

About MIRA Controller

MALÅ MIRA Controller is the data acquisition software dedicated to the MALÅ MIRA HDR and MIRA Compact systems from Guideline Geo.

The MIRA Controller software gives you an easy-to-use user interface, data collection guidance with several different positioning options and file management, together with other key features. Projects can be exported to MALÅ Vision Desktop for post-processing and interpretation (for further information see *MALÅ Vision Desktop User Guide*).





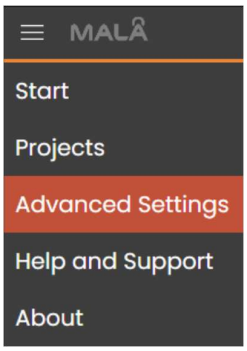
Installation

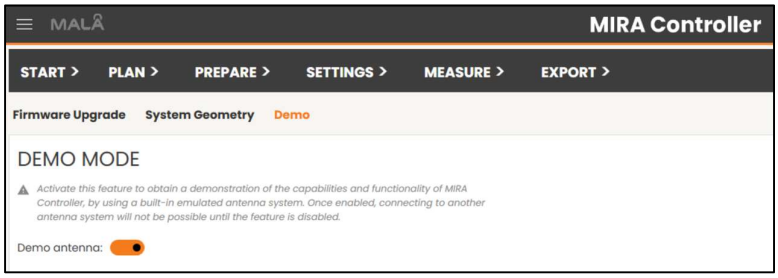
The MIRA Controller software is downloadable from the Guideline Geo´s homepage, (www.guidelinegeo.com) Always make sure to use the latest version.

When downloading a new version of the software, note that depending on browser used, different warnings may occur. For instance, for Microsoft Edge you need to press the *Keep* link, to be able to save and see the file in *My Downloads* folder.

When using Bluetooth devices (such as a Emlid GNSS) with a computer running Windows 11 you need to set the option Bluetooth devices discovery (in the Bluetooth & Devices menu) to *Advanced*.

Note: The software can be run in Demo mode. To change to Measurement mode, go to the main menu Advanced Settings and turn off Demo antenna to enable measurements.





The software runs on Windows 10 or 11, and it is recommended to have a modern processor, i5 or later and at least 8 GB RAM. Depending on the settings the MIRA HDR and MIRA Compact system collects approximately 550 kb data/m^2.

Overview MIRA Controller

This manual (together with the *MALÅ MIRA HDR User Guide* or *MALÅ MIRA Compact User Guide*) explains how to set up the measurements with the MIRA HDR and MIRA Compact antenna arrays, how to collect data and how to save and export this to a suitable format. During data collection it is also possible to view the collected radargrams and traces from all channels.

The user interface of MIRA Controller is developed to be easy to handle during field work and to work on a computer with or without a touch screen. The workflow is straightforward and consists of the following steps:

1. Make sure that the MIRA HDR or MIRA Compact antenna box is turned on and connected to the data acquisition platform.
2. Create a new project (with name and type) or open an existing project.
3. Check the measurement settings (different acquisition options, channel selection and trigger type).
4. Check the positioning (GNSS and Total Station parameters).
5. If needed check the Advanced settings (trace position, geometry settings, power settings)
6. Now you are ready to measure.

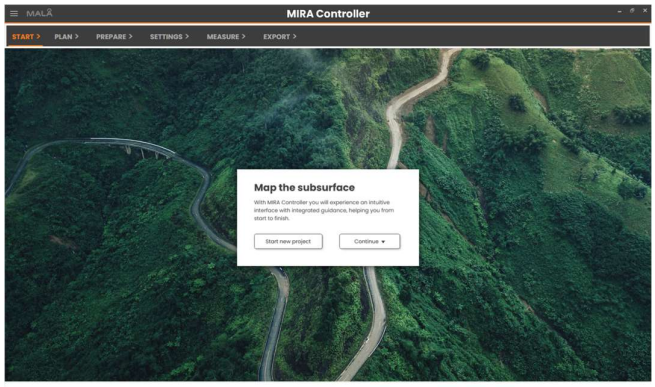
The following definitions are used in this User Guide:

Sample	Digital value of recorded radar signal at one specific time.
Trace	The recorded radar signal from one channel at one point, built up over a short time by a certain number of samples.
Point distance	Distance between each trace collected for all individual channels.
Stacks	Number of averages for each trace.
Swath	One complete profile line including all channels in the array. The coverage every swath depends on the individual channel spacing multiplied by the number of channels.
Tx	Abbreviation for a transmitter antenna.
Rx	Abbreviation for a receiver antenna.

Start the software

When you start MIRA Controller you are asked to *Start new project* or to *Continue* a project.

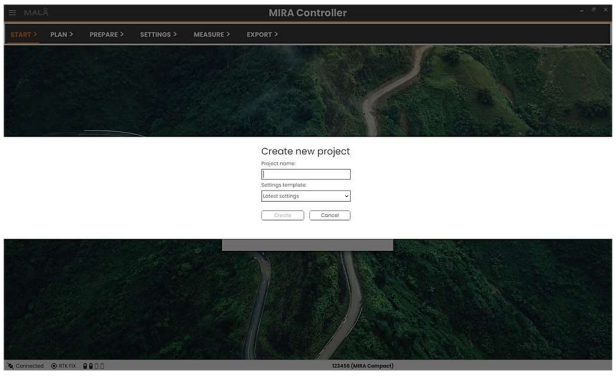
At any time, you can go back to the *Projects* menu (found in the Main menu) to change, create, or delete projects. See also the *Projects* section below.



Start new project

The *Start new project* option creates a new MIRA project, with your own defined project name and possibility to choose between different pre-defined settings or the last used setting. If you have saved a template, it can be found in the dropdown list as well (see section *Projects* below).

Make sure to choose a suitable antenna setting for the MIRA system you have, (MIRA HDR or MIRA Compact).



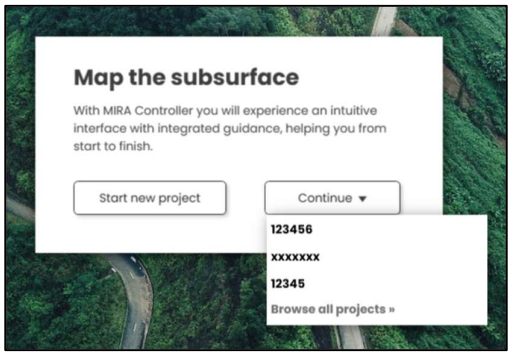
When you press create you will immediately reach the Prepare tab. See section *Prepare* below.

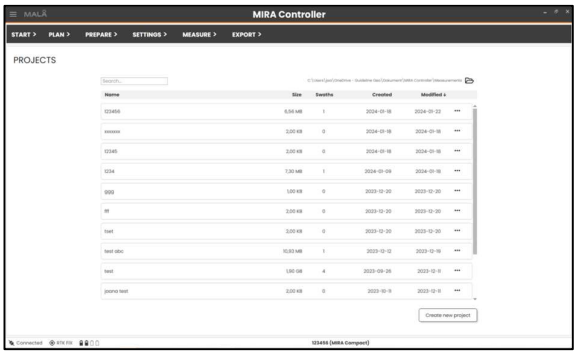
Note: If the project name already exists, the *Create* option is greyed out.

Note: The project name is also used for the separate, single swaths in a project, but with an extension: 1, 2 and so on.

Continue

When choosing the option *Continue* project, you can choose to open an existing project. The latest three are visible in the drop-down menu, otherwise use the option *Browse all projects* to open the Projects tab. This is also found in the Main menu ☰.





Click on the correct row, and the project will immediately open where you last left off.

Main Screen

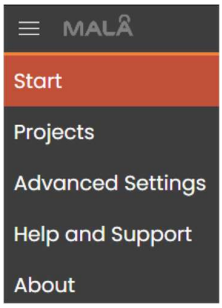
Workflow tabs

It is recommended to follow the workflow in the upper row of the MIRA Controller software, from left to right through out any of your MIRA projects:

See sections *Plan*, *Prepare*, *Settings*, *Measure* and *Export* for more information.

Main menu

The main menu is located in the left upper corner, from where you can reach e.g., Help and Support:



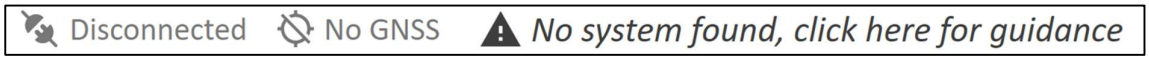
Status bar

At the bottom of the main screen, in the status bar, system information is displayed.

From left-to-right the following information is displayed:

- Connection to MIRA system, active or not
- GNSS or Total Station connection and status
- Power and charging information
- Guidance (if applicable)
- Project name and template
- Selected swath number

Example when no antenna or positioning system connected:



Example with antenna and RTK GNSS connected:

In the centre of the status bar the project name and selected swath number are displayed. By pressing the arrow, you can switch between swaths.

MIRA Controller Function keys

- F1 - opens About page
- F2 - toggles to Main menu
- F3 - starts measurement
- F5 - stops measurement
- ALT+arrows up/down - switches between channels
- F9 – F11 toggles the different views in the measurement tab.

File Directory

MIRA Controller creates a file directory in the Documents folder called MIRA Controller. This file directory contains a folder called Measurements where all the projects created can be found.

The location of this folder can be changed. You can also open data from other locations, by changing the file directory route in the Project window, see section *Projects*.

In detail, the following file folders and files are created by MIRA Controller:

1. Measurement folder

2. For each project, a project folder is created. In that folder a <project_name>.yml file and a <project_name_backup>.yml file are created that contain all information related to the project (channel selection, channel settings and everything else). These files can be opened in a simple text editor such as Notepad.

3. For each measurement, the following files are created per swath:

- < project_name >_<swath>.YML (snapshot of system settings when measurement was done)
- < project_name >_<swath>.mpos (if positioning is available, it will contain raw GNSS positions for the measurement stored in GeoJSON format)
- < project_name >_<swath>.mcor (if positioning is available it will contain the interpolated GNSS positions in GeoJSON format)
- < project_name >_<swath>.mtts (if positioning is available it will contain the timestamps for all traces)

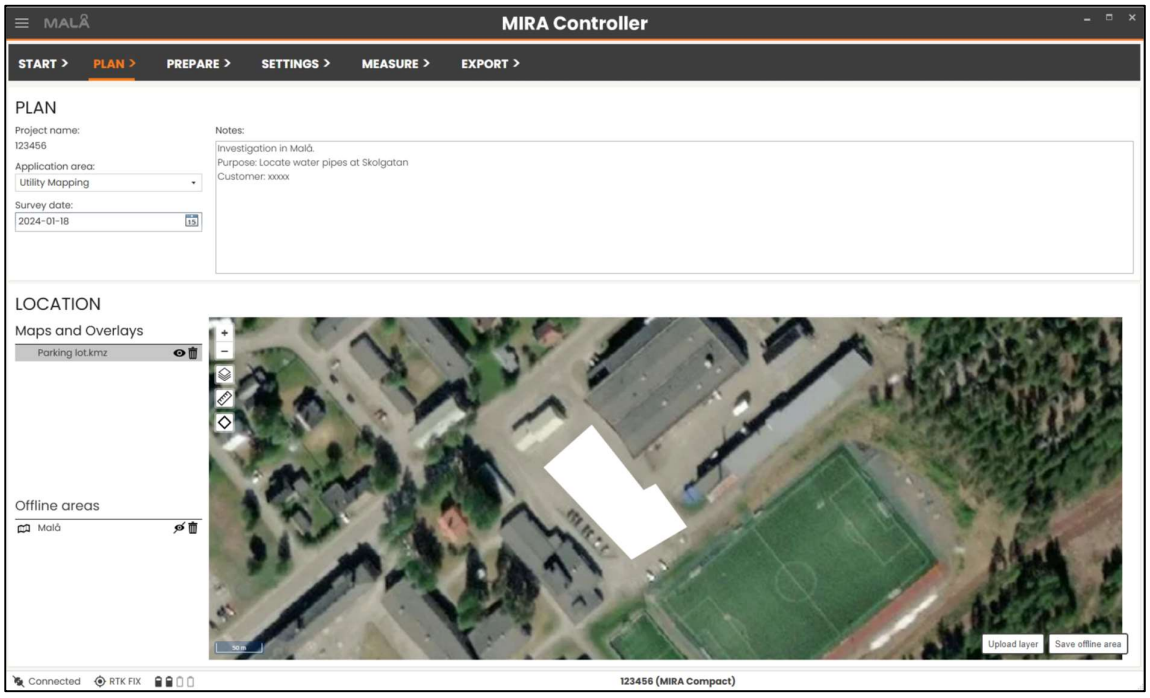
And the following files are created per channel:

- < project_name >_<swath>_<channel>.rd7 (32 bit GPR raw data)
- < project_name >_<swath>_<channel>.rad (information on channel settings)

4. If data are exported (e.g., to rSlicer format) a folder is created to store all files in that export. If export is made to rSlicer format, the folder is called rSlicer as well.

Plan

The Plan tab is used for planning the project beforehand. You can put in notes on the projects, set the application and date. You can also save maps to be used in offline mode, or upload kmz/kml-files.



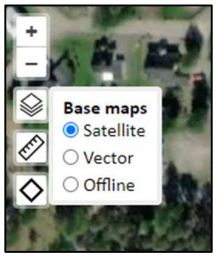
Press *Upload layer* (in the right lower corner of the map) to upload a kmz/kml-file to be shown on the map. This could be the limitations of the investigation area or other features good to have marked during field work. Use ◇ to turn off and on uploaded layers.

You can also use the option *Save offline area* to save the map at the zoom level seen. This map can be named freely and is saved to be used when you are working in off-line mode.

Note: If the *Save offline area* button is greyed out the area is too large to be saved. Zoom in until the button becomes active to save.

The layer switcher (in the *Plan* or *Measure* tab) allows for selection between displaying the offline or the online base map.

The ruler can be used to both measure length and areas.



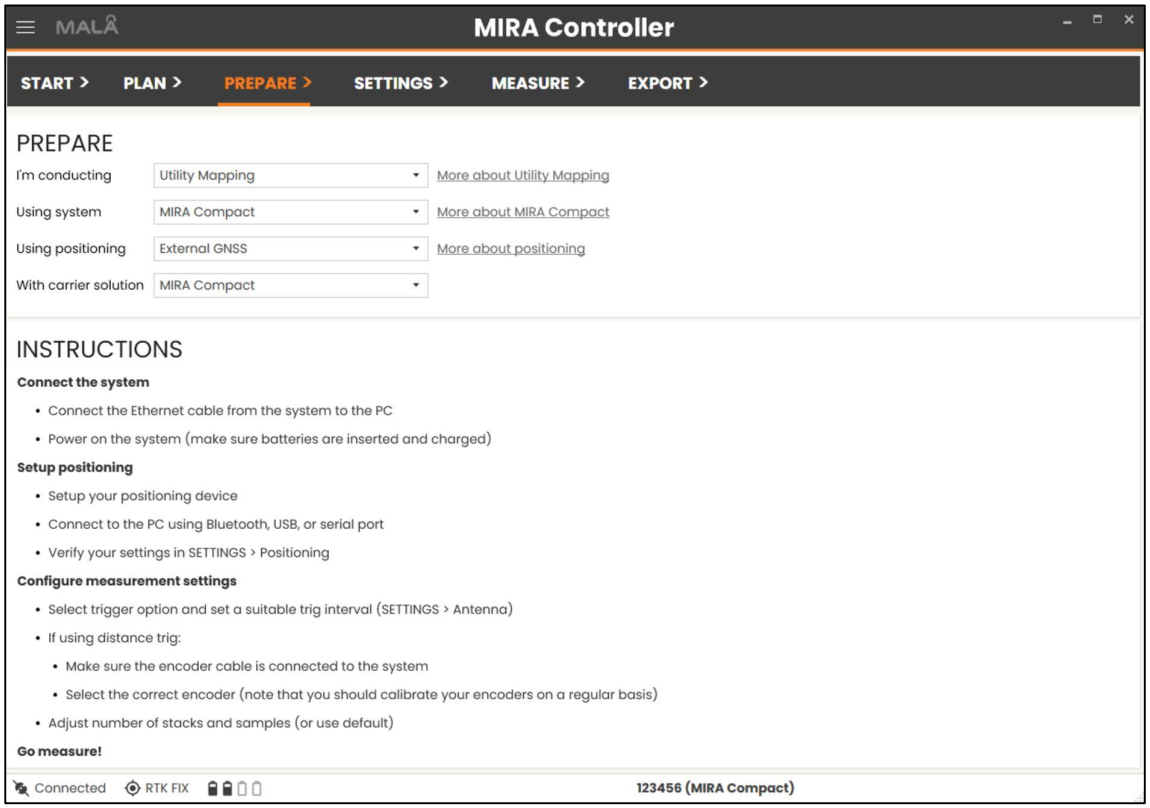
The map has the following features:

- Zoom 
- Change between offline or online base maps 
- Measure Line strings or Polygons 
- Turn kmz/kml-files on and off 

Prepare

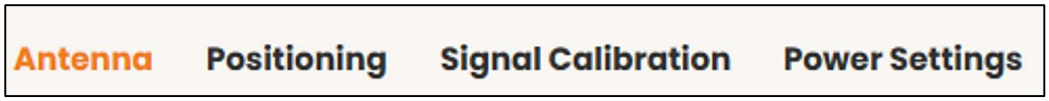
In the Prepare tab you can define what type of project you are doing and by that get guidance on suitable measurement settings.

Instructions of the setup is based on the selected system also available to easy and helps make sure all necessary steps are carried out for successful investigations.



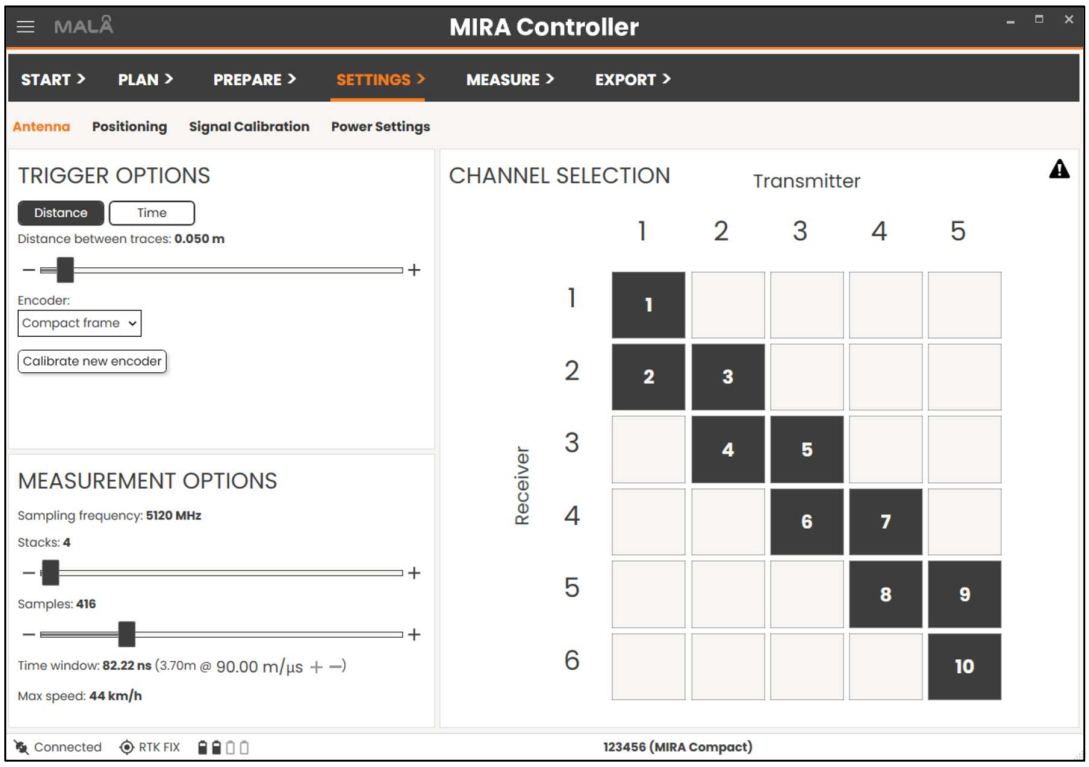
Settings

In the Settings menu you can adjust measurement settings for the MIRA system as well as the external positioning device.



Antenna

In the Antenna tab you find measurement options for traces, trigger, measurement wheel and channel selection.



Note: You can have different settings for different swaths measured within the same project. However, mixing different settings while measuring might impact the post processing capabilities.

The warning triangle (upper right corner) is shown if the settings have changed since the last made measurements in the open active project. This means that the signal position needs to be calibrated (see section *Signal Calibration*).

Measurement Options

- Sampling Frequency: A fixed value, optimized for the antenna frequency used.
- Stacks: How many times each trace is to be stacked; higher numbers give better data quality but will lower the maximum acquisition speed.
- Samples: How many samples are collected for each trace.
- Time window: Time window for current settings, adjust the velocity (with the + and – signs) to get the estimated depth value.

Note: The maximum measurement speed is shown for the current settings when using distance triggering.

Depending on the number of Tx units used in the array the number of available samples will change, as below:

- 1-4 Tx: 1984 samples
- 5-8 Tx: 1728 samples
- 9-16 Tx: 672 samples

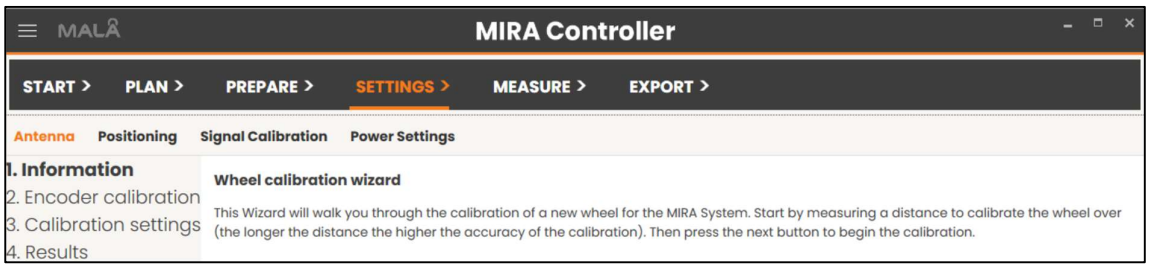
Trigger Options

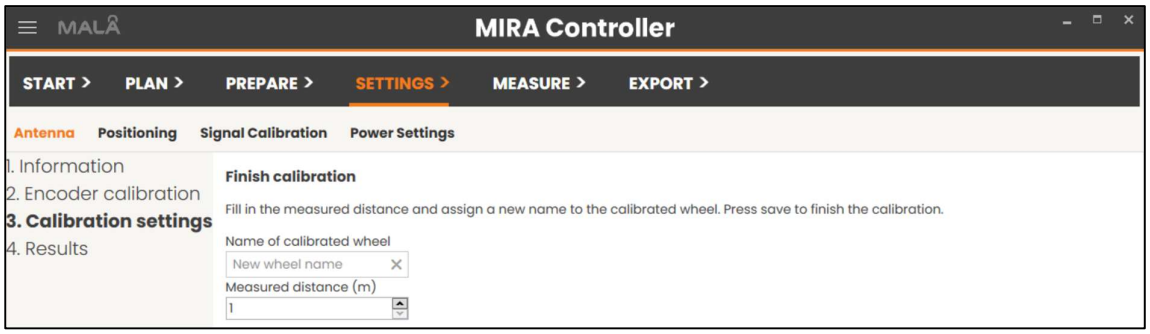
The MIRA HDR and the MIRA Compact can be trigged with *Distance* or *Time*.

For *Distance*, choose the *Distance between traces* and the correct encoder in the drop-down-menu. If a new encoder is needed, or a re-calibration must be carried out, use the option *Calibrate encoder* which will guide you through some easy steps to calibrate and save a new measurement wheel.

For the *Time* triggering option set the *Time between traces*.

The steps to calibrate or add a new encoder are as follows:





Note: While carrying out an encoder calibration, you need to be connected to the MIRA antenna box.

Channel Selection

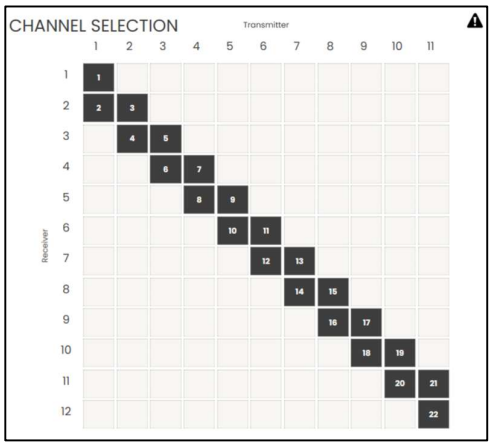
In the channel selection matrix, the operator selects how the radar antenna array should be set up to collect data. The user defines a firing sequence by clicking in the squares of the matrix; this will turn them grey and display the channel number assigned to that combination of Tx (columns) and Rx (rows). This sequence of Tx-Rx combinations is repeated every time a measurement is triggered.

Note: If the selection turns red, it indicates that an antenna used in that combination is not working properly.

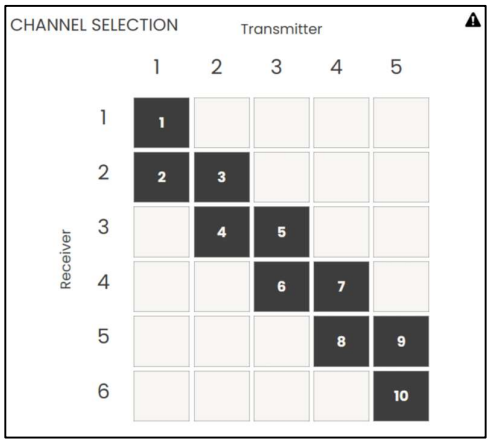
It is possible to add up to 132 channels, in any combination with the MIRA HDR system and 30 channels, in any combination with the MIRA Compact system.

The default channel configuration for a MIRA HDR and MIRA Compact antennas are shown in the pictures below. These are also provided within the software at purchase.

Default MIRA HDR set-up: 22 channels with 11 Transmitters and 12 Receivers antennas.

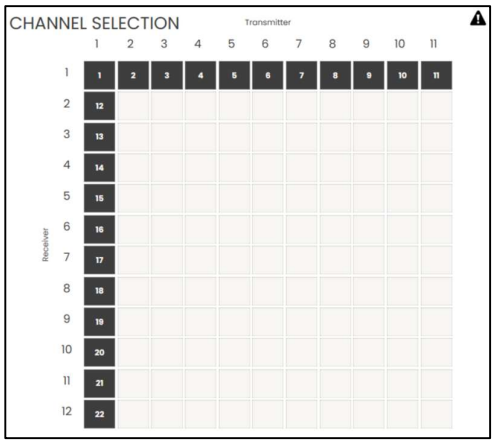


Default MIRA Compact set-up: 10 channels with 5 Transmitters and 6 Receivers antennas.



On the right hand-side an example of a user-defined channel set-up is shown. This layout is automatically saved and connected to the project.

Click on the grey box to either choose or remove an antenna combination.



Positioning Menu

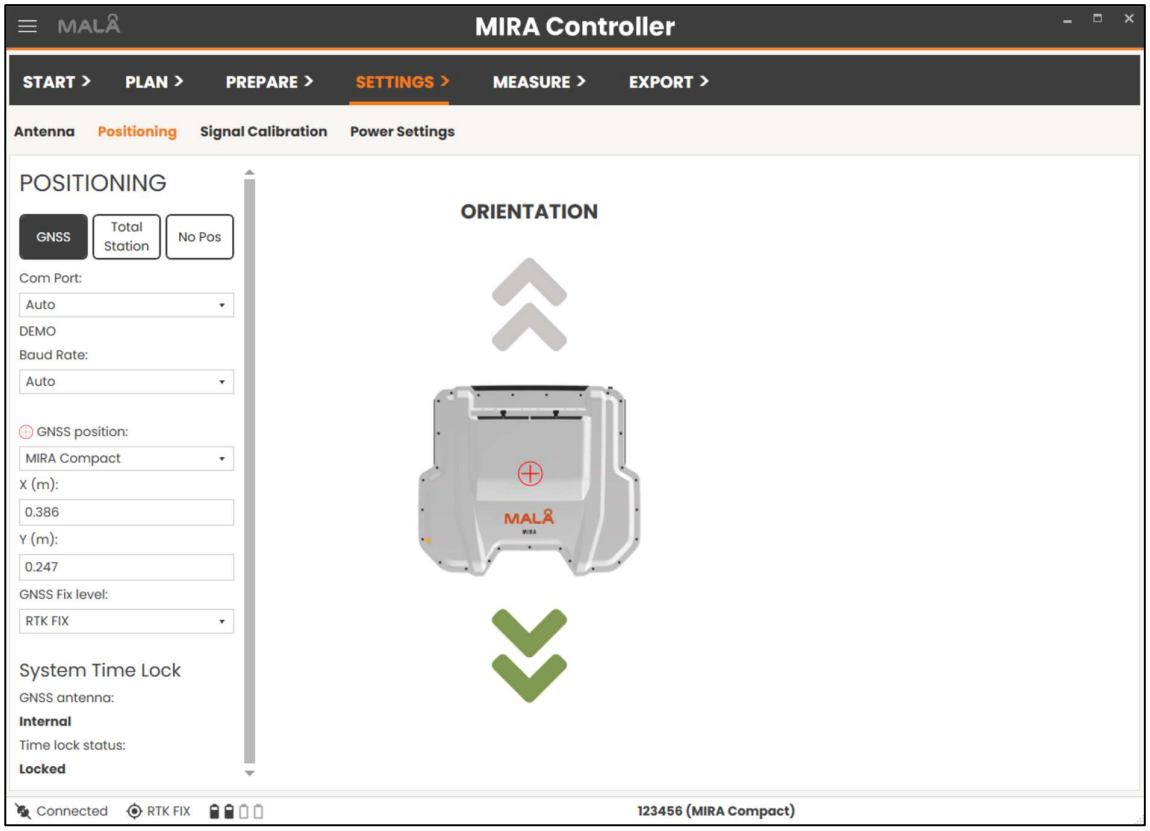
Positioning of the MIRA antenna boxes is done with an external GNSS system such as an RTK-GNSS or a Total Station.

It is highly recommended to use an accurate GNSS solution or a Total Station to position the MIRA measurements as this will increase the quality of the resulting time slice images. The GNSS is connected to the computer used for data collection.

MIRA Controller reads standard NMEA data, specifically G*GGA messages, from the connected GNSS. It will by default discover the *COM port* settings automatically, to enable communication between the GNSS and the MIRA Controller software. If you wish to set the *COM port* and *Baud Rate* manually simply use the drop-down menus to change from Auto to your preferred setting.

INGGA messages are also supported.

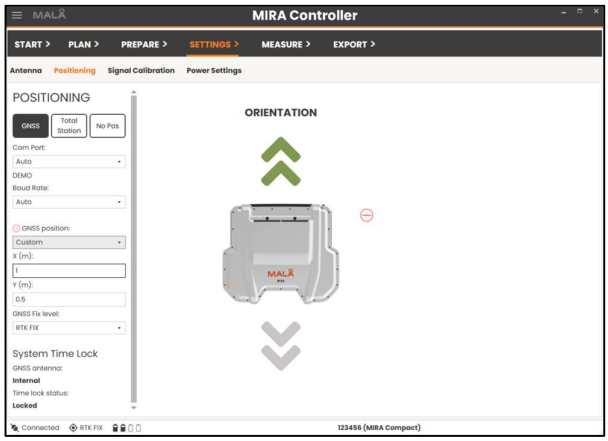
More information on the positioning files is found in Appendix 1 Positioning.



Acceptable *GNSS Fix levels* can be set as:

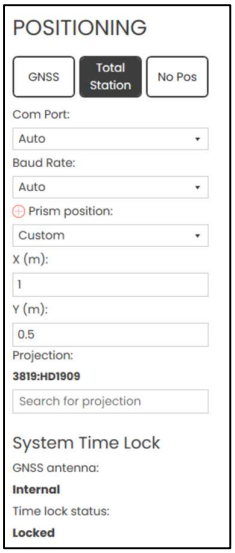
- *RTK FIX,* best quality, should be used during measurement
- *RTK Float,* positioning is of ok quality
- *GPS,* positioning is of poor quality

The *GNSS offset* has several pre-sets, for the MIRA Compact, the MIRA HDR Field Trailer, the MIRA HDR front carrier and the MIRA HDR Road Trailer. If you use any other GNSS position, choose Custom and add the correct values. The red cross on the antenna box picture, in the Positioning tab, will show the location of the set offset.



Example with a custom GNSS position

The *GNSS offset* measurements are defined as the distance from the GNSS antenna's reference position (usually marked on the GNSS antenna itself but check the supporting documentation for your system) and the positioning reference point on the MIRA system. More information on positioning reference point is found in Appendix 2 Reference point and in the systems hardware user guide.



For the *Total Station*, as well as for the GNSS, the system automatically recognizes the com port and baud rate for communications or can be selected from the drop-down menus.

The *Prism position* is defined in the same way as for the GNSS offset, see above.

To be able to fully utilise the positioning support in MIRA Controller a total station establishment must be done.

Once this is done the projection for the used coordinate system can be selected in MIRA Controller. This can be done by searching for the projection in the smart search box that allow searching by EPSG code or projection identifier.

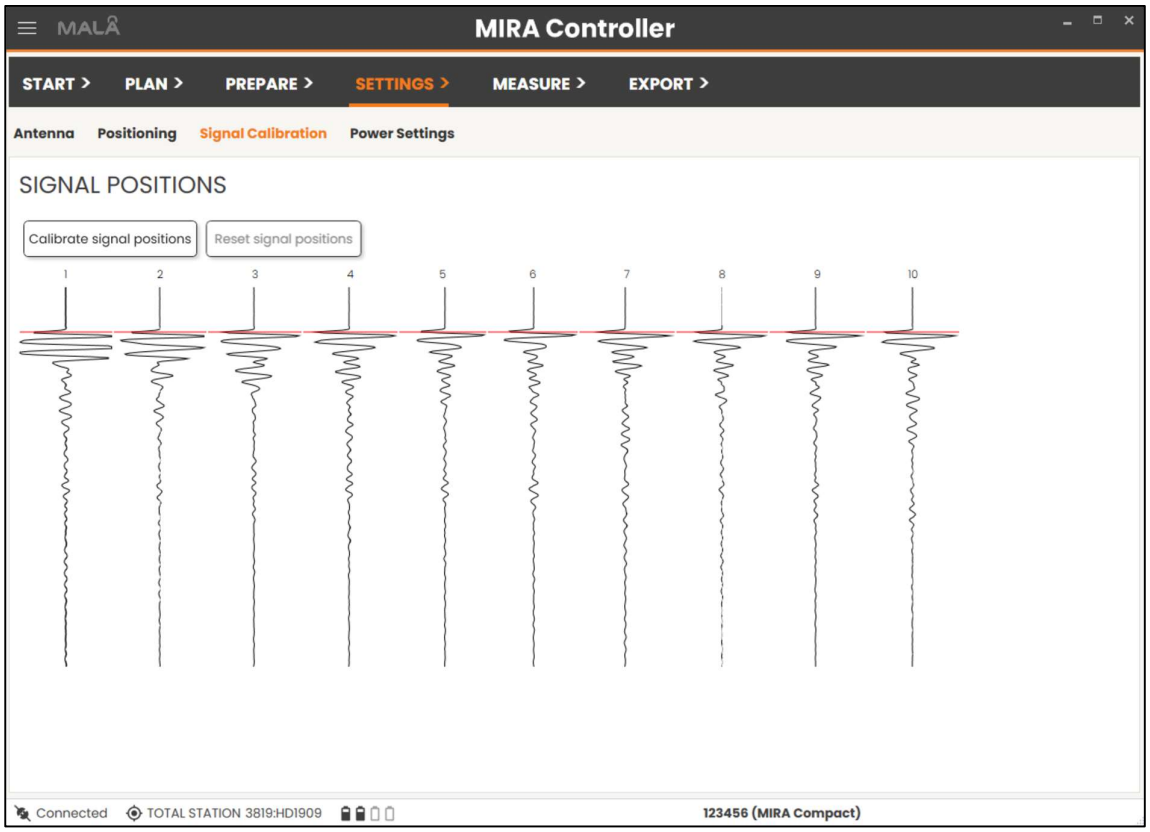
The option *No Pos* (No positioning) should only be used for testing.

Note: The measurement orientation is set here as well, forward or backward (i.e., push or tow) by choosing the correct arrow in the picture (green indicates the chosen direction). This needs to be set correctly, to get a correct positioning of the full swath.

Signal Calibration

In the *Signal Calibration* tab, you can calibrate the signal position or reset the same.

Note: We recommend that you carry out a signal calibration before measurement is started.



It is important to set the correct time zero (first arrival) for all active channels in your system.

To help the operator in aligning the trace position a set of commands/buttons are provided to accomplish this task:

- *Calibrate signal positions*. MIRA Controller automatically calibrates the channels activated in the Channel selection (see section *Antenna*), to locate the zero level on the same position.
- *Reset signal positions*. The signal positions are reset back to the last stored/saved values.

Power Settings

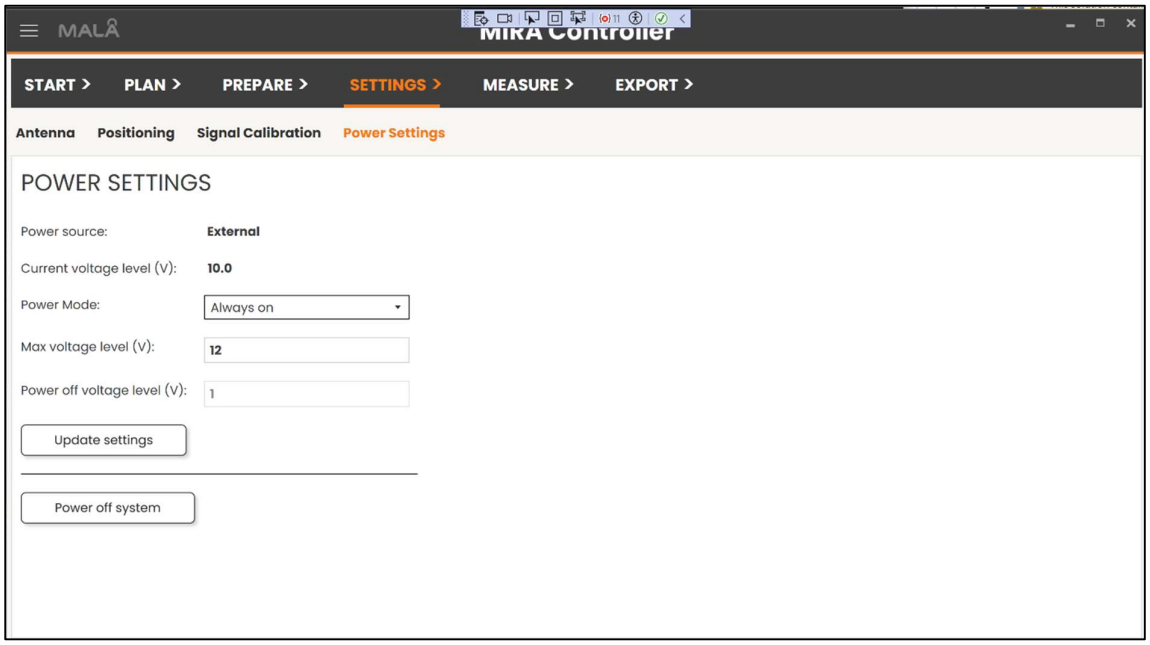
If using a system with external power source the power settings are important to set to get accurate power status information and warnings.

In this tab you can also power off the system remotely.

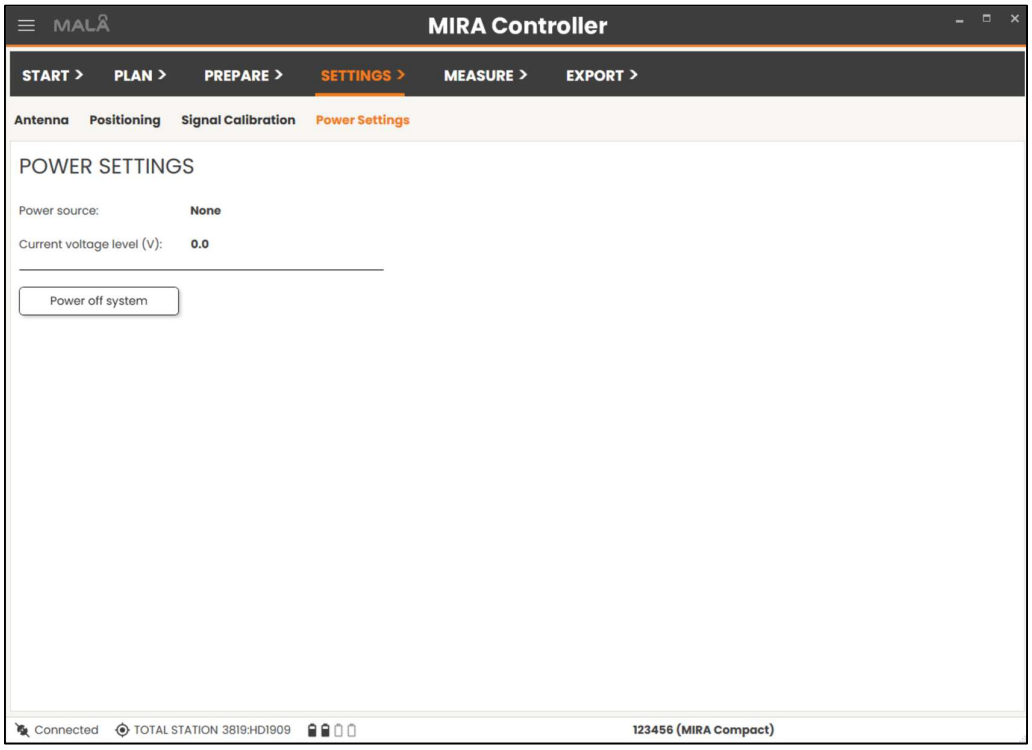
MIRA HDR

- *Power Mode*: Choose between *Always On* or *Power off at voltage level*.
- *Max voltage level*: Enter the maximum voltage level in volts for the power source used. This affects the battery level displayed in the status bar.
- *Power off voltage level*: decide at which battery level (mV) the system should be turned off. This setting can be used to prevent draining especially car batteries to too low voltage levels.

When changes are made, press *Update settings*, to send the new information to the MIRA system.

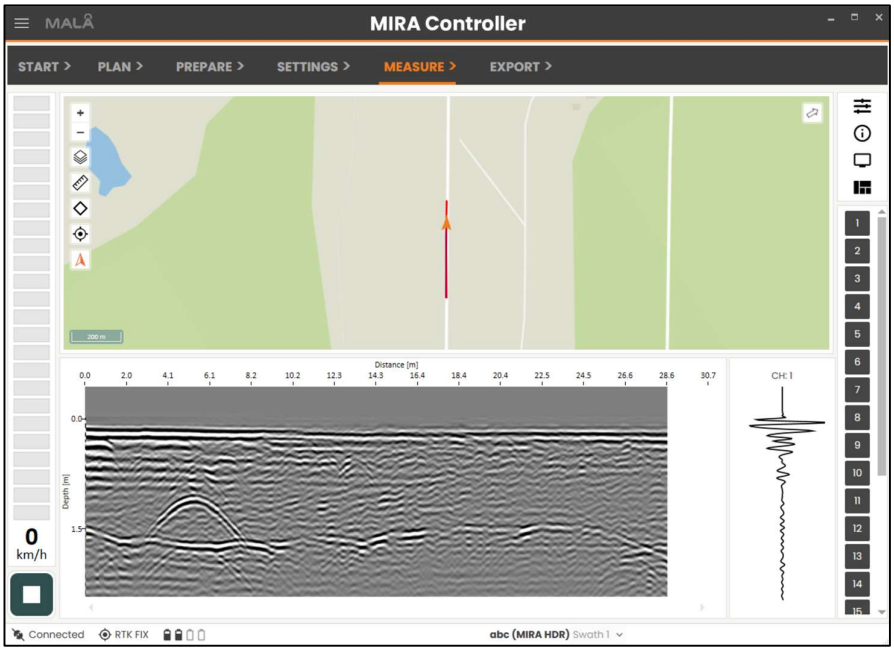


MIRA Compact



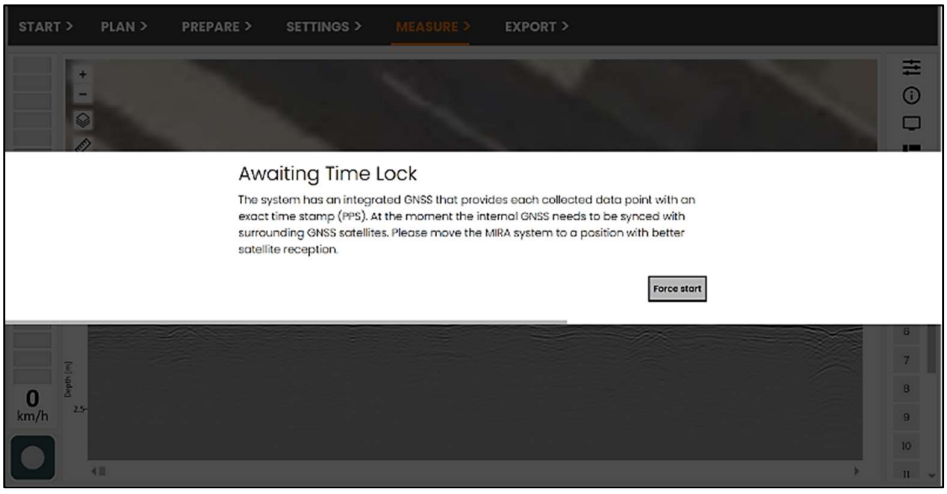
Measure

When all settings are done, choose the *Measure* tab. In the *Measure* tab you can choose to display the GPR data, the map, and a trace or just one of these (more information on how to adjust this is available below).



Press  to start the measurement of a swath.

The system waits for a good and accurate GPS position before it starts (or ends) a measurement.



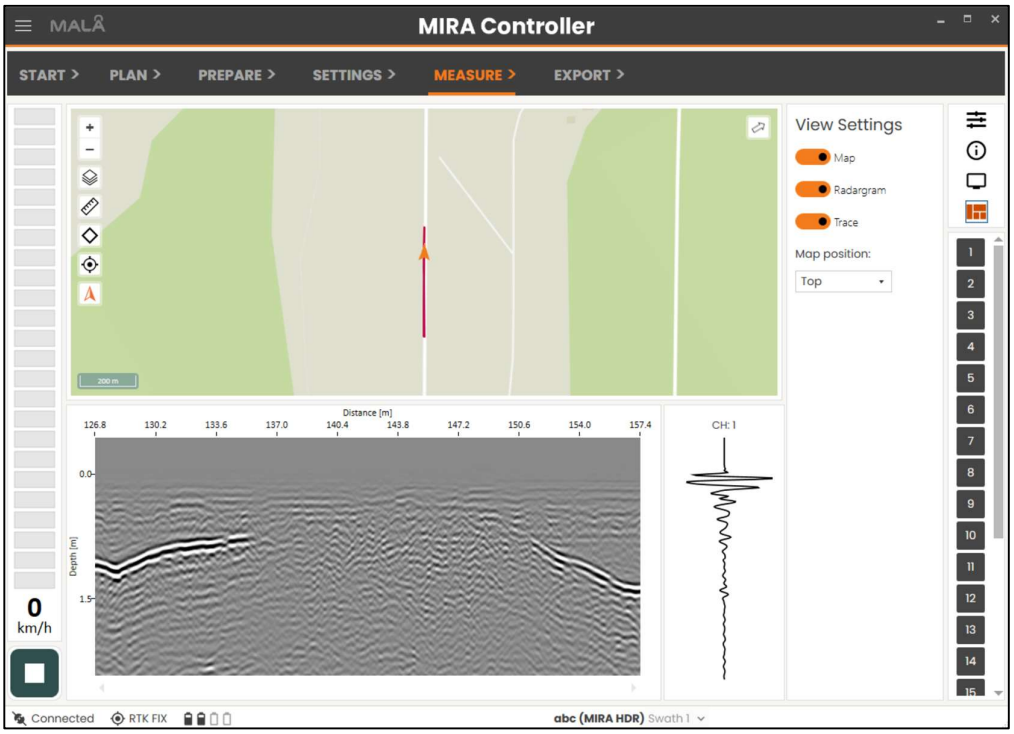
Note: Make sure you have RTK FIX. However, sometimes, if GPS conditions are bad, you may need to move your starting position, e.g., if you are too close to a building or underneath tree cover, or adjust the accuracy settings of your GNSS device to float in the GNSS settings tab.

When a swath is complete, press  to stop the measurement.

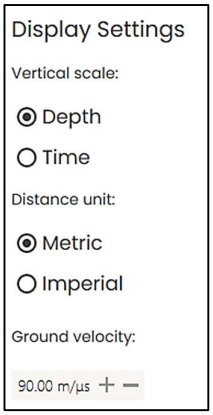
To view data from previous swaths either select it in the map view or use the swath selector at the bottom of the screen 

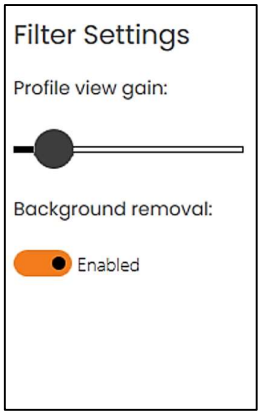
When pressing  data are automatically saved by MIRA Controller.

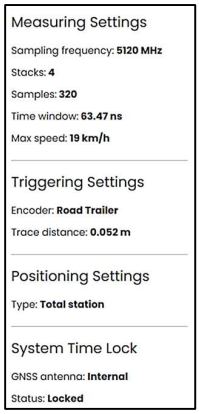
During measurements, the data and positioning can be viewed in different ways. Press the Toggle view settings button  , on the right-hand side of the screen and choose among the view options. Close the window by pressing  again.



You can also change the display settings, distance unit and change the radar wave velocity with the Display button and add filters with the Filter button on the right-hand side of the measurement window. Information about project settings is also available .







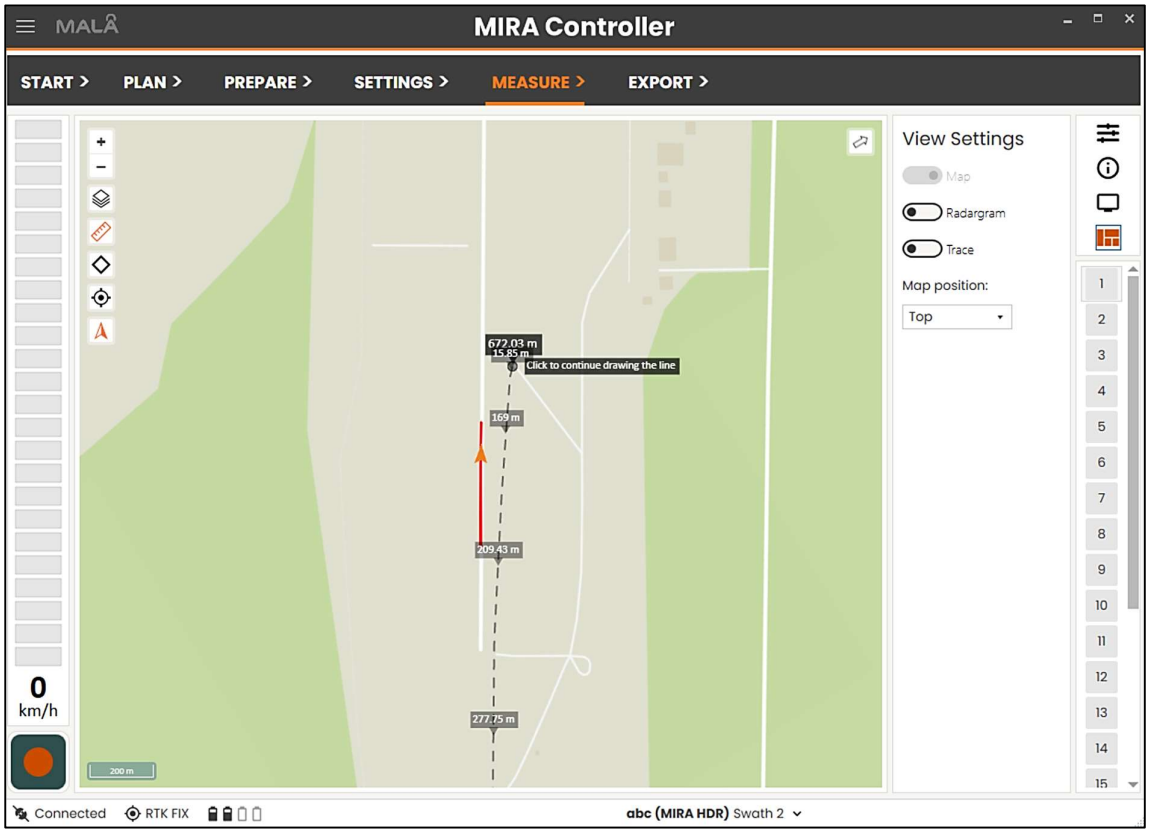
Note: Any gain or background removal applied to the data are only for display, and do not affect the recorded data which are saved in a raw state.

Note: The colour bar at the left shows the measurement speed, it should not be red, as this may cause loss of traces. A loss of trace will show up as a grey vertical line in the radargram.

Note: On the right-hand side, you can toggle between the different measured channels, and by that decide which is displayed in the radargram window.

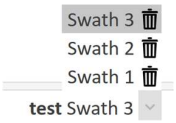
Note: If several swaths have been collected, you can choose which to display by clicking in the map view. Alternatively, you can choose the swath to be displayed in the swath-selector in the status bar.

In the map view you can zoom in and zoom out, decide to use an online or offline base map (see section *Plan*), center the map, or orientate it to North or measure distances or areas. Choose Length (Line string) or Area (Polygon) to take measurements in the map. Just click with your mouse on the map and double-click to end the line or polygon.


MALÅ
MIRA Controller
START >
PLAN >
PREPARE >
SETTINGS >
MEASURE >
EXPORT >
View Settings
Map
Radargram
Trace
Map position:
Top
672.03 m
15.85 m
Click to continue drawing the line
169 m
209.43 m
277.75 m
0
km/h
200 m
Connected
RTK FIX
abc (MIRA HDR) Swath 2

Tips and tricks during measurement

- Prior to GPR data acquisition, thorough planning of the survey should be done. It is advisable to conduct the data acquisition in straight lines, whenever possible. Although the MIRA HDR and MIRA Compact systems does not require straight swaths, positioning errors will be reduced, and achieving full coverage of the survey area will be easier to manage if the geometry is kept simple.
- The MIRA Controller application has a moving map navigation aid, showing swath coverage, which can be used to ensure total coverage of the investigation area. It is wise to have a visual reference point far away for each swath, to keep the measurements straight, and then use the map to see that data is collected side by side, without gaps. Swaths shown on the map are partially transparent and will darken where they overlap; try to maintain a small overlap for best results.
- For every swath, each channel will be precisely positioned. To avoid gaps in data, it is recommended to collect data with one channel overlap. Uncovered areas will produce artefacts in the resulting images. The processing software has been designed to minimize these effects but nevertheless, a careful data collection procedure is essential for the resulting image quality.
- The MIRA system should be kept on the ground, or as close to the ground as possible, for best possible data quality and depth penetration.
- Be aware of all system warning messages from MIRA Controller, such as exceeding maximum measurement speed or lack of positioning etc.
- It is ok to stop the movement of the antenna array and take a rest within a traverse. If the duration of the break is long, make sure to stop the measurement and turn off the antenna array, as it will otherwise continue to use power; however, traces are only collected when the encoder wheel is moving.
- If you wish to delete a swath, you can stop it, and delete it, in the swath selector. Then start a new line. Even if a bad line has been collected and saved, you can also remove these from the project folder.



- Swaths can also be remeasured later and included in earlier projects; double-check that the measurement settings of the new swaths match the old ones if you intend to process the whole project as one.
- The MIRA systems are capable of collecting data at high speeds but depending on the carrier solution and the site conditions this speed is often limited.. Surface roughness, obstacles preventing data collection in straight lines, crossing traffic and other details often limit the average speed to below 20 km/h.

Measurements in any direction

Measurements with the MIRA HDR and MIRA Compact system can be carried out in any direction.

Note: Measurements made with straight lines will create a better end result than very curved lines.

Measurement with a highly elevated GNSS position or remote GNSS position (i.e., on survey vehicle)

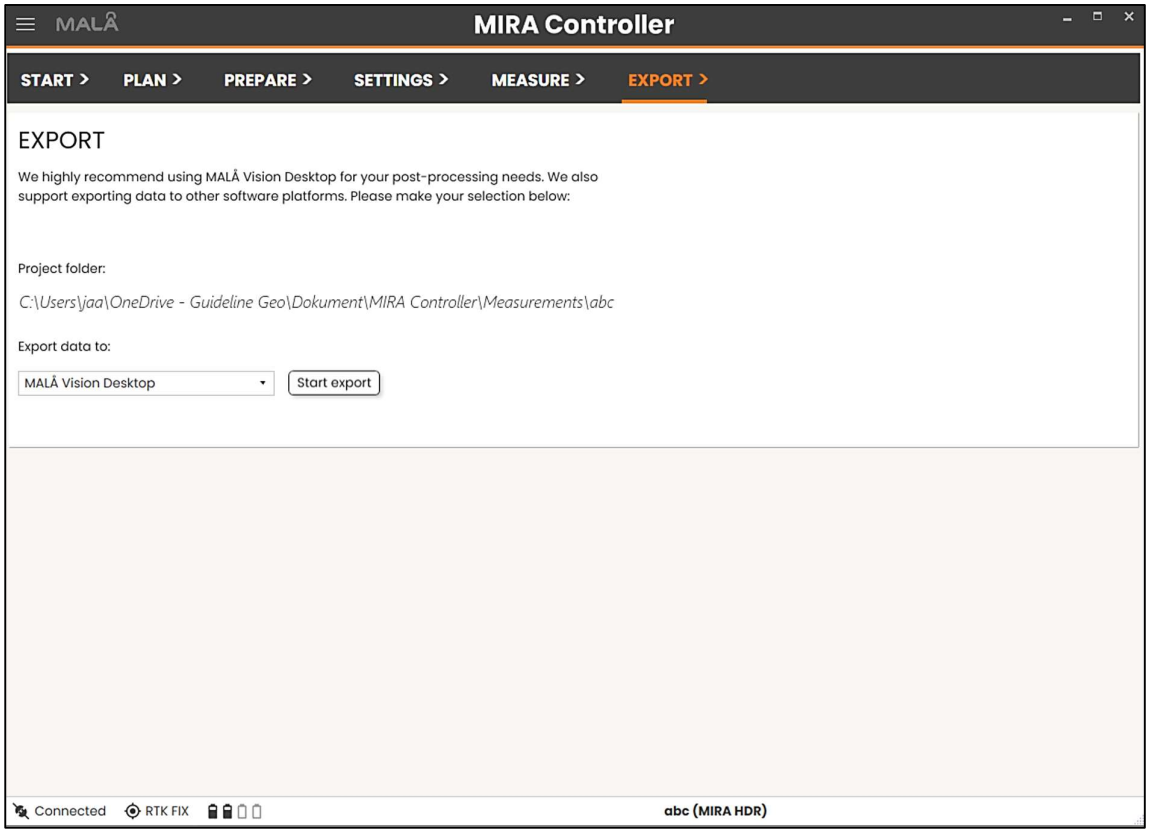
The advantage of placing your GNSS device at a high position is to get a clear view to the sky, thus a larger number of satellite signals can be detected which results in a more stable fix and improved accuracy. The disadvantage is that real-world positional accuracy decreases when the GNSS device or prism is tilting because of uneven ground or steep slopes.

If the GNSS antenna is placed further away from the antenna box (distances exceeding approximately 2 meters), it should be noted that there might be a changeable element to the offset (compared to the Geometry Settings entered under the Advanced menu), especially in curves, resulting in positioning discrepancies in the end result.

Remember to update your GNSS settings if you move or change the location of your GNSS system or prism (Settings-Positioning).

Export

In the *Export* tab you can export your data to the project folder as well as decide in which format data should be exported in. Choose between MALÅ Vision Desktop, GPR-SLICE, rSlicer, rSlicer without positioning or SEG-Y and press *Start export*.



Note: If measurements have been done with different settings for different swaths, the rSlicer export will be divided into several projects, grouping together swaths with the same settings.

When exporting to rSlicer the coordinates will be exported as UTM.

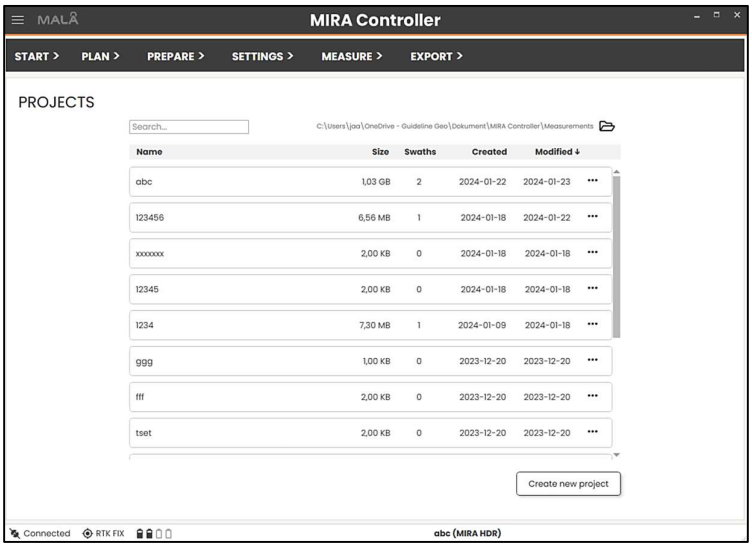
When exporting to rSlicer without positioning, each of the collected swaths are lined up next to each other based on the width of the channel selection. The swaths are assumed to be collected in the same direction.

When exporting data to SEG-Y format an additional positioning file (.txt) is generated for each swath.

```
#Index  DateTime        Latitude        Longitude       Elevation       Velocity        Heading HeadingRate
#FormatVersion=1.0
#Culture=ja-JP
0       2019-11-11T01:32:30.4480Z       33.805986565    132.79415733866668      41.000999450683594      0       357.201233      0
1       2019-11-11T01:32:31.9400Z       33.80598754527707       132.7941572975775       40.995021820068359      0.0205356982    357.1706        -0.0421775021
2       2019-11-11T01:32:32.2230Z       33.805988250996847      132.79415718497987      41.017658233642578      0.0296556782    357.104156      -0.0116234021
3       2019-11-11T01:32:32.4320Z       33.80598894273097       132.79415712690329      41.028999328613281      0.0372865424    357.139862      0.0169308763
```

Projects

The *Projects* menu can be accessed from the MIRA Controller Main menu ☰. It shows all existing projects and gives the option to delete old ones or select projects to view after a measurement is finished.

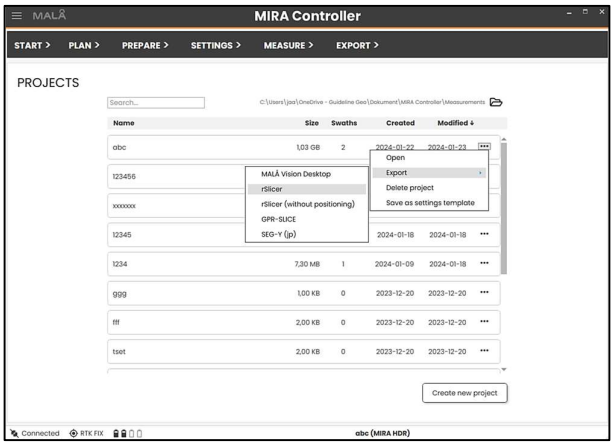


The project is opened with a single click on the chosen project row.

When an existing project is opened, it can be:

- Supplemented with new swaths -> check measurement settings first in the *Settings* menu.
- Viewed, by choosing the *Measure* tab.

In the *Projects* menu you can also export your data. Click ••• to export data. For more information see section *Export.*



Save settings

The option *Save as settings template* found in a project's options menu:  . This gives the possibility to save settings used for a project so that you can reuse them in new projects. A template is saved with a user-defined name and will show in the list of templates that you can choose from when creating new projects; see section *Create new projects*.

Saved templates can be deleted in the drop-down menu when you create a new project. See section *Create new projects*.

Advanced settings

In the Advanced menu you find options for Firmware Upgrade, System Geometry and Demo.

Firmware upgrade

The *Firmware Upgrade* tab displays information on the current firmware (of the MIRA system), firmware versions downloaded and how to upgrade.

Download the installation package to the computer where MIRA Controller is installed (from www.guidelinegeo.com) or use the button *Here*, if you are online. The *Here* option will open the Guideline Geo resource center directly, filtered on relevant resources for MALÅ MIRA systems.

The installation package is in a special format with *.GGM extension. Only files with this format are compatible and can be chosen.

Note: The file downloaded from the resource center is a zip file that needs to be extracted to get hold of the actual firmware file that is used to upgrade the antenna system.

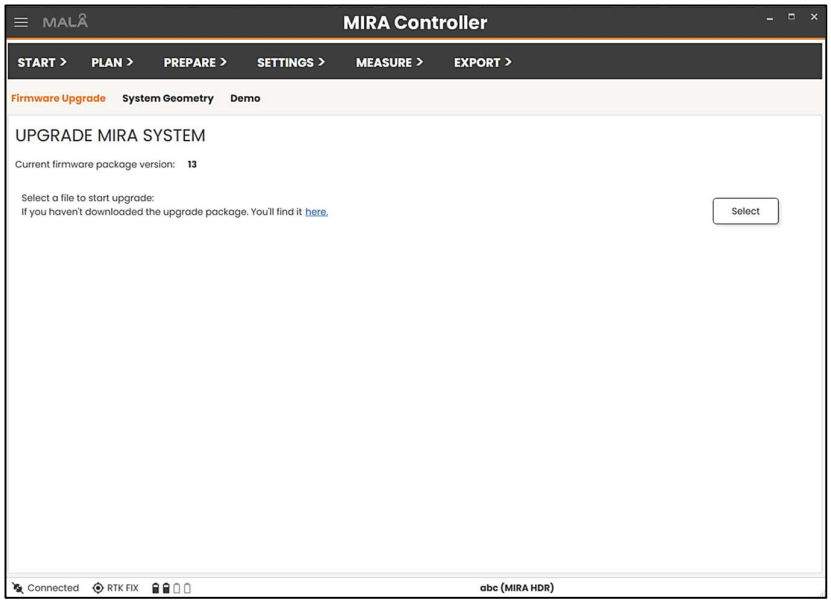
MIRA Controller determines, based on the current system status and the chosen firmware package, which components will need to be upgraded. It will display the time required for the upgrade.

Note: If running the system on battery power, make sure that you have enough battery before starting a system upgrade. Do NOT disconnect the system during the upgrade procedure.

WARNING: If you get a message, stating that the firmware upgrade failed, you MUST try again until the message saying: “Current firmware package version: xxx”.

WARNING: If you get a message, stating firmware package mismatch, you MUST try to again until the message saying: “Current firmware package version: xxx”.

After the upgrade is completed, please restart the MIRA system and restart MIRA Controller.

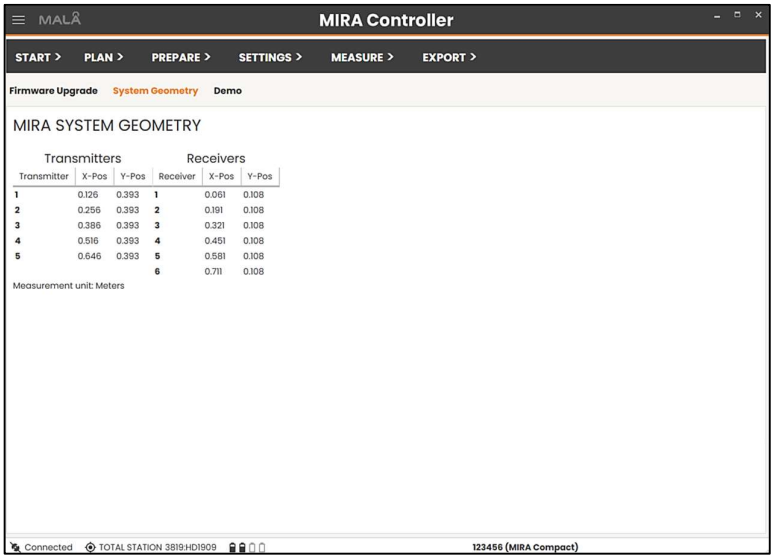


System Geometry

In the *System Geometry* tab you define the location of each antenna element (Tx and Rx), related to the 0,0-position of the enclosing array box. These distances are needed to be able to assign and sort the location of all individual channels in the chosen post-processing software.

If choosing the MIRA HDR or MIRA Compact template when creating a project, these numbers are added automatically and are correct (please note that these numbers shouldn't be changed). The measurements are made from the 0-point of the individual Tx/Rx antennas to the 0,0-point of the array box.

The geometry settings for a MIRA Compact system are shown below:



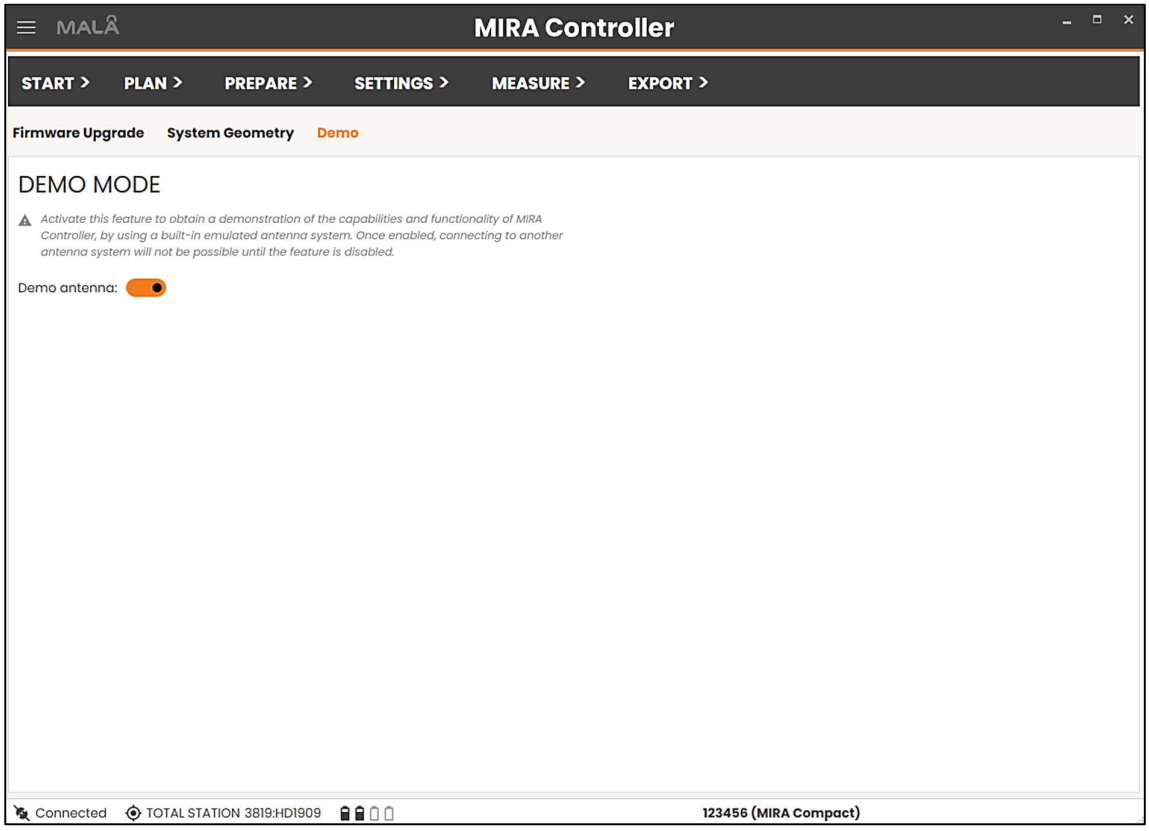
The MIRA HDR system has the following geometry:

Transmitters			Receivers		
Transmitter	X-Pos	Y-Pos	Receiver	X-Pos	Y-Pos
1	0.126	0.393	**1**	0.061	0.108
2	0.256	0.393	**2**	0.191	0.108
3	0.386	0.393	**3**	0.321	0.108
4	0.516	0.393	**4**	0.451	0.108
5	0.646	0.393	**5**	0.581	0.108
6	0.776	0.393	**6**	0.711	0.108
7	0.906	0.393	**7**	0.841	0.108
8	1.036	0.393	**8**	0.971	0.108
9	1.166	0.393	**9**	1.101	0.108
10	1.296	0.393	**10**	1.231	0.108
11	1.426	0.393	**11**	1.361	0.108
			12	1.491	0.108

Measurement unit: Meters

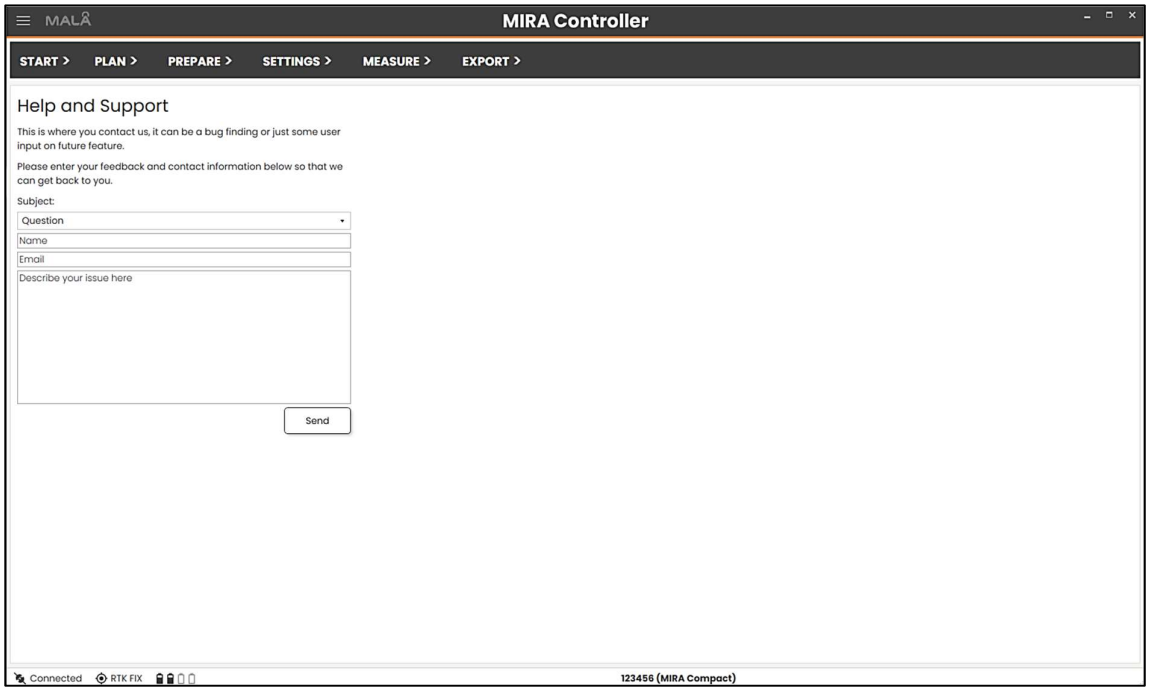
Demo

In the *Demo* tab, you can set MIRA Controller to Demo mode. The demo mode provides an opportunity to run MIRA Controller without a connected MIRA system, still being able to start and stop measurements and display emulated data.



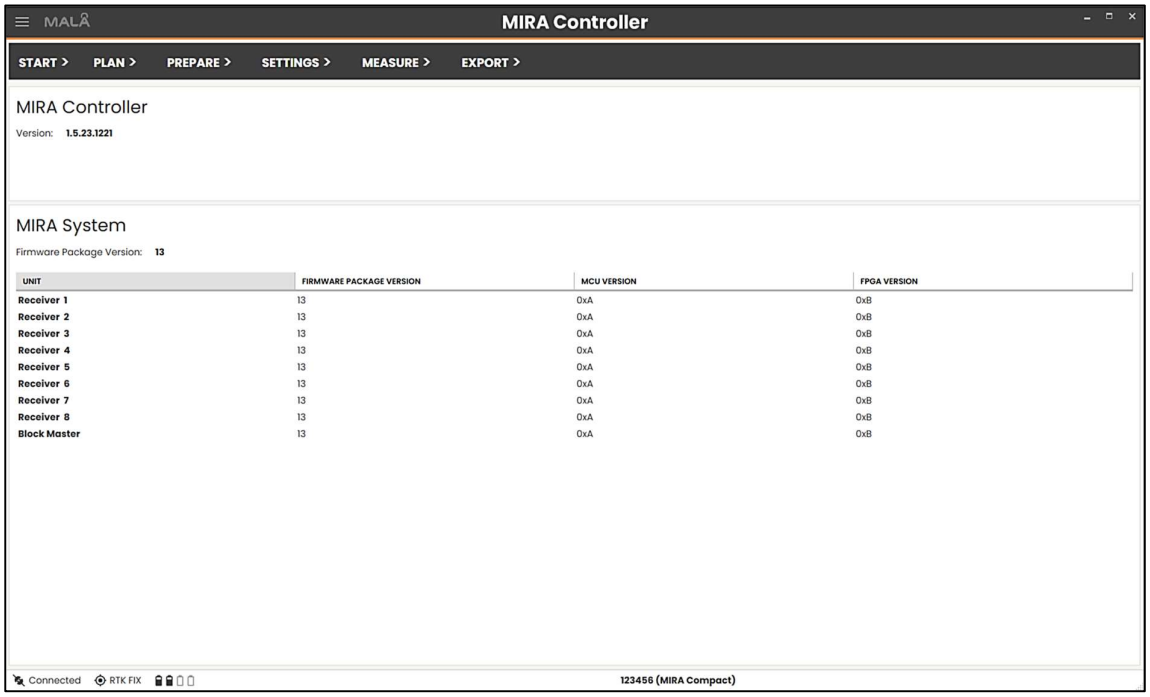
Help and Support

If you are online with your measurement computer, you can reach out to our Help and Support team directly from MIRA Controller. Enter your name and email address and describe your problem.



About

In the *About* menu, you find information on the current MIRA Controller software version and firmware versions installed on the connected MIRA system.



Appendix 1 Positioning

The positioning data is written in a so called *.mpos file that will contain the raw positioning data received from the used positioning device and is in GeoJSON format. A *.mcor file is also created and contain interpolated positions for all traces collected during the measurement. The *.mcor file is also in GeoJSON format and differs from the *.mpos file in that it contains a reference to the associated trace. The *.mcor file is structured as follow:


```
{
    "type": "FeatureCollection",
    "features": [
        {
            "type": "Feature",
            "geometry": {
                "type": "Point",
                "coordinates": [
                    20.2338662818,
                    63.842677564,
                    10.989915602840484
                ]
            },
            "properties": {
                "PositionTime": "2020-10-16T14:19:31.5341705+02:00",
                "TraceNumber": 1
            }
        },
        .
        .
        .
        {
            "type": "Feature",
            "geometry": {
                "type": "Point",
                "coordinates": [
                    20.2352142097,
                    63.8433977665,
                    12.089915601536632
                ]
            },
            "properties": {
                "PositionTime": "2020-10-16T14:19:59.5988422+02:00",
                "TraceNumber": 1635
            }
        }
    ]
}
```

Appendix 2 Reference point

If the GNSS antenna is attached elsewhere than the pre-sets, on the measurement set-up, as on top of the carrier vehicle when using the MIRA HDR, the position needs to be adjusted accordingly. The reference point is marked in orange in the picture below, where green represent the location of connectors and red the positioning zero point.

The 0,0-point, the positioning reference point, of the MIRA HDR system is located in the back-left corner of the array box: