"KB ELECTROMETRY" &

Multi-Frequency Electromagnetic Profiler "Geovizer"

USER MANUAL
THEORY

Before using the device read the instructions

KBE Electrometry OOO – Novosibirsk, Russia 2019 – ***R&D and manufacture***

Landviser LLC – Houston, TX, USA 2019-2021 **– *Sales and Support***
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WARNING:

- The GEOVIZER geophysical electromagnetic scanner is internally powered equipment (1x12V)
- The equipment type is continuous operation.
- If the equipment is receiving or causing interference, the equipment should be relocated away from the other equipment.
- There is no preventive inspection or maintenance required on the system or parts of the system.
- Remove the battery if the equipment will not be used for an extended period of time.
- Environmental requirements for storage and transport:
  Ambient temperature: -40C to +70C
  Relative humidity: 10% to 100%
  Atmospheric pressure: 500hPa to 1060hPa


Follow local governing requirements when disposing of equipment or batteries


CAUTION: General Warning – refer to accompanying documents

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GENERAL DESCRIPTION OF GEOVIZER

Electromagnetic multi-frequency sounding device GEOVIZER is developed with specialists from Laboratory of EM fields of Institute of Geophysics, Russian Academy of Sciences, Siberian Branch.

PHYSICAL BASIS OF ELECTROMAGNETIC SOUNDING

Electromagnetic sounding is well known as a powerful tool for the study of the Earth's crust at various depths – from few centimeters up to the deep mantle. The technology of this study is based on the detection the spatial distribution of electromagnetic fields induced in the electrically inhomogeneous media by different sources. The task of the electromagnetic sounding depends on the problem investigated. So, for deep crust sounding a natural powerful source – ionospheric current system – is used. For other tasks – extraction of earthquake or volcano eruption electromagnetic precursors – the weak electromagnetic signals caused by the dynamic changes in the crust internal structure at various depths have to be extracted and the ionospheric source is a powerful interference for this. And for the study of the upper part of the crust, the active electromagnetic sounding with artificial sources is widespread. The adequate interpretation of the field observation data gives a possibility to get quantitative information about the geometric dimensions (size, depth) and electric parameters of inhomogeneity and also their dynamics.

In any case, an electromagnetic sounding process must have a variable parameter, that allows it to propagate to the various depths. Such a parameter can be time of measurement (Time Domain EM methods) or frequency (Frequency Domain methods).

Frequency domain electromagnetic induction sounding is the full title of the method, hardwired in the GEOVIZER device.

The procedure of such sounding consists of the following phases:

1. A transmitter transmits the primary EM field of the first frequency.
2. The primary field acts upon the media.
3. The secondary EM field induces in the media on the first depth.
4. Receiver receipts in the secondary field.
5. A transmitter transmits the primary EM field of the second frequency….

The number of such steps depends on the number of frequencies. Geovizer device operates at three set frequencies to provide scanned maps at three depths.

PURPOSE AND APPLICATIONS OF SHALLOW DEPTH ELECTROMAGNETIC SOUNDING

GEOVIZER was designed to study the first three meters of the Earth's crust. The real depth of measurement depends on the resistivity of the ground, however, can't exceed 3 m in standard soil because of the limited sensibility of receivers. Meanwhile, we can expect that in some special kinds of soil conditions such as dry sands or ice the propagation depth can reach and even exceed 3 m.

Due to this propagation limit, the purpose of the unit is limited by a study of geoelectric situation on the depth up to 3 m. The device can operate on 3 frequencies. It means that the data acquired can describe the geoelectric situation at 3 levels of depth. In the horizontal plane, the responding media is the ellipse with one constant axis length (0.7 m) and second axis length depending on the frequency 0.5 – 3 m. Having such a resolution we can basically state that the unit is intended for 3D specification of geoelectrical parameters of the media at a depth up to 3 meters with heterogeneous inclusions dimensions 0.5 x 0.5 x 1 m or more. Meanwhile, the very contrast targets such as metal objects can be even smaller.

The applications of the device are:

- Archaeological survey;
- UXO determination;
- Subsurface tunnels and empties investigations;
- Quantitative assessment of water saturation of the ground;
- Assessment of HC waste in the ground;
- Searching both fresh and salty water sources;
- Subsurface buildings condition control;
- Searching and localization of burial place of industrial waste;
- Source and volumes of water leakage in water supply and heating systems;
- Source and volumes of fuel/oil leakage in subsurface fuel tanks/pipelines;
- Definition of places of a lining of metal pipes and cables;
- A detailed exploration of ore bodies;
- Environmental monitoring of dumping liquid mineralized waste.

PHYSICAL MODEL OF GEOVIZER

The Trofimuk Institute of Petroleum Geology and Geophysics SB RAS, about 15 years ago, has developed equipment for frequency sounding and profiling - Nemfis (sounding parameter frequency). Its main feature is the incorporation of two receiver coils with opposite momenta. Moments are selected so that the summation signal of both coils, the direct field generator in the air, exceeding the medium response at zero-order becoming. This technique increases the quality of information, but there is a need for strict adherence to the geometry of the device.

An alternative method of suppression direct field was developed to solve this problem. As a result of studies, it was found the presence of a surface on which the vertical component of the magnetic field from the source passes through zero. The equation of this surface is easily obtained from the expression for the calculation of the magnetic field in a homogeneous space:

$$H_z^t = -\frac{I_t M_t}{4\pi R^3}\left(\frac{3r^2}{R^2} + \frac{3kr^2}{R} + k^2 r^2 - 2 - 2kR\right)e^{-kR},$$

where $k^2 = i\omega\mu_0\sigma$, r and R – cylindrical, and spherical radii, I_t and M_t – current and moment of the generator coils, □ - electrical conductivity of the medium. Where, for small kr, direct compensation condition fields:

$$r \approx \sqrt{2}z$$

This gave the basis to create the device, in which a set of receiving coils is located on this surface and at different distances from the generator. The described method of compensating direct sensing field and was patented [Patent number 2502092]. In this case, the sounding parameter is affected not only by the frequency but also the distance between the source and receives coils.

The emergence of a new device resulted in a need to modify the existing algorithms for the calculation of the direct problem and the creation of software for the transformation of data to assess the applicability of the equipment.

Solution of the problem

Expression to calculate the vertical component of the magnetic field is as follows [Balkov et al., 2004]:

$$H_z = \frac{M_t}{2\pi}\int_0^\infty \lambda^3 J_0(\lambda r) X d\lambda \text{, where}$$

$$X = \frac{p_1 \cdot ch(p_1 \cdot h) + p_2 \cdot sh(p_1 \cdot h)}{(p_0 \cdot p_1 + p_1 \cdot p_2)\cdot ch(p_1 \cdot h) + (p_1^2 + p_0 \cdot p_2)\cdot sh(p_1 \cdot h)}\text{, and}$$

$$p_j^2 = \lambda^2 + k_j^2,\ k_j^2 = i\omega\mu_0\sigma_j,\ j = 0..2.$$

This integral is calculated numerically and by using a large amount of data at many coils this process is excessively long. To avoid this integration parameters were studied. For example, such as the upper bound of the integration interval after which the contribution to the total amount will not be significant. As well as the sampling step and the use of various methods of integration. The optimum parameters for the conservation acceptable margin of error at maximum speed were obtained.

GEOVIZER hardware

The device set includes:

1. GEOVIZER tool
2. Charging unit
3. PDA (optional)
4. Software (optional)

GEOVIZER technical characteristics

Working frequencies: 12 kHz, 40 kHz, 104 kHz;

Measurement time: 0.3-0,9 sec;

Generator power: maximum 60 W;

Receiver sensitivity: 1 mV;

Dimensions: 90x75x25 cm;

Working time: about 6 hours;

Weight: 6 kg;

Software compatibility: Android, Windows.

- could be changed by manufacture without notice, actual specification always confirms before order.

SAFETY PRECAUTIONS

The device can't operate in a conductive environment. Keep the working GEOVIZER away from big metal objects. If during operation a metal plate 30 x 20 cm is situated at less than 10 cm from the "head", the phase of the primary field could not be measured and operation must be terminated by pressing Reset Button.

Keep the device dry.

All the components used in the device have a working temperature range of –20 ÷ +60 ºC.

Turn off the device before changing the environmental air temperature. After changing the environment air from negative to room temperature remove all the covers and let the device warm up for at least 1 hour. The current circuit during warming can damage the multilayer board.

DATA ACQUISITION PROCEDURE

Preparation of the device for field work

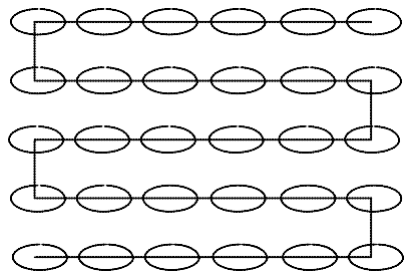
Be sure that the battery is full. We recommend measuring the voltage on the charging plug. The fully charged battery must show at least 12-13 V.

Assemble the tool.

Assemble GPS and Android control unit. Make sure that the Bluetooth connection on control unit is turned on and GEOVIZER/GPS is paired with it. If you received an Android control unit with the device, the QZond software and all necessary drivers specific to your GEOVIZER unit were already loaded on that Android device. You can also load QZond control software to your own Android phone or tablet follow directions in next section FAQ.

Preparation of work site

The device is ready for field work now. It's time to prepare your work site. If you need to explore a linear object, it's just a matter to put measurement marks on your profile. We use 50-m measurement tapes.



If you need to explore an area, the exploration area is supposed to be divided into squares depending on the task (usually 1x1 m). We use 3 measurement tapes: 2 as directors on parallel borders of the area and one as moving profile tape. This tape is used to move each time when a profile is done. GEOVIZER software is arranged to work with area data made by snake line as shown in Figure on the right.

Figure presents an example of area sounding layout. The process is going picket by picket and profile by profile. The area is divided into M equal parallel profiles. Each profile has N pickets.

Data acquisition process

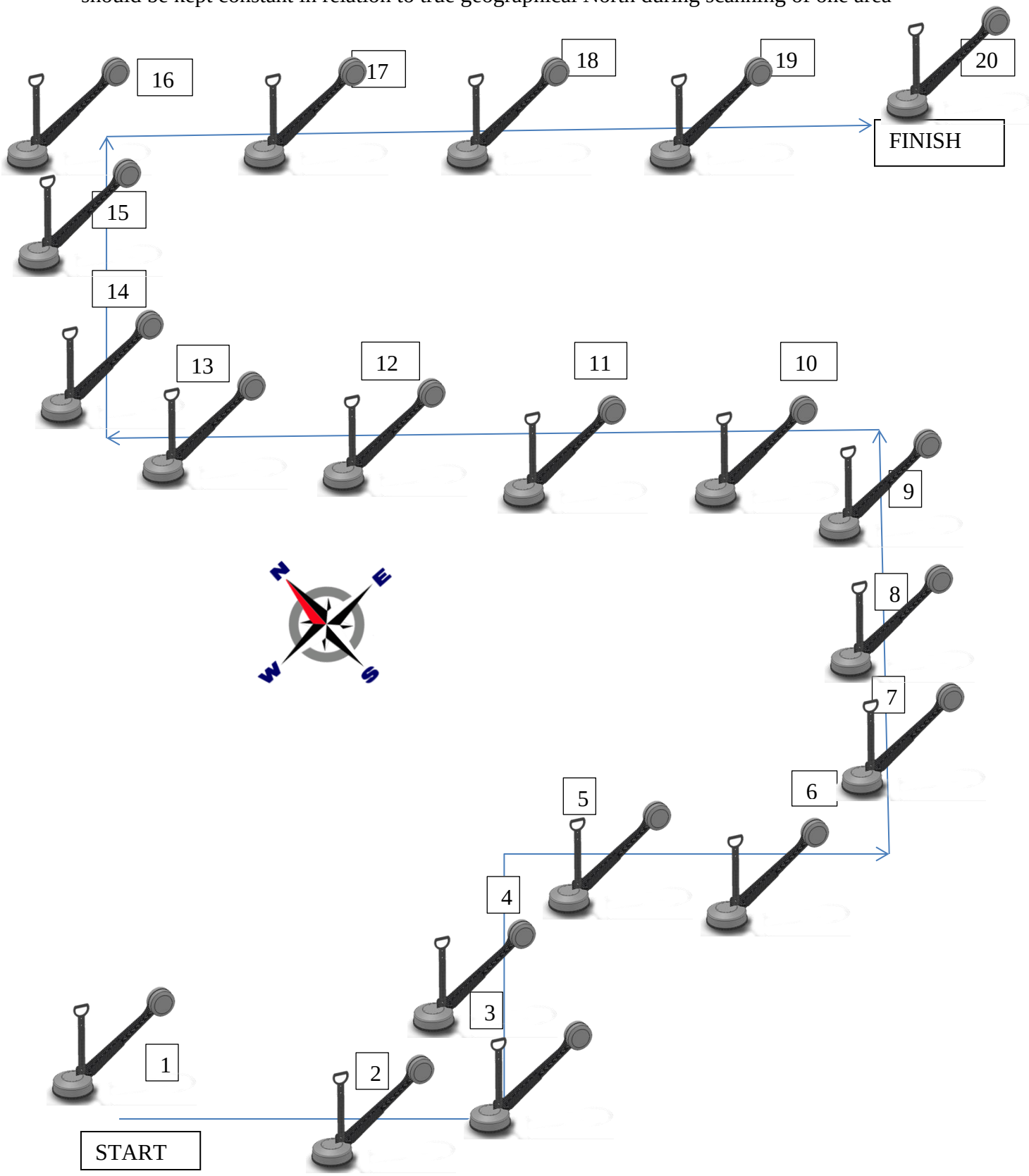
Turn the power switch on. Connect Geovizer with Android device via Bluetooth. Run QZond and connect with Geovizer. Make warming procedure (Qzond -> Equipment -> System -> Warm-up) immediately after that - make air calibration before scanning on a new place. Air calibration procedure must be done by keeping the device above the head while automatically measuring after pressing the specifical button (Qzond - > Equipment -> System -> Air). Use actual air calibration *.ini file only for the specified area (where and when air calibration was done).

While taking measurements, ALWAYS keep GEOVIZER oriented the same way in relation to the geographical position – i.e. when making turns at the end of the profile, do not turn the unit itself! See diagram on the next page.

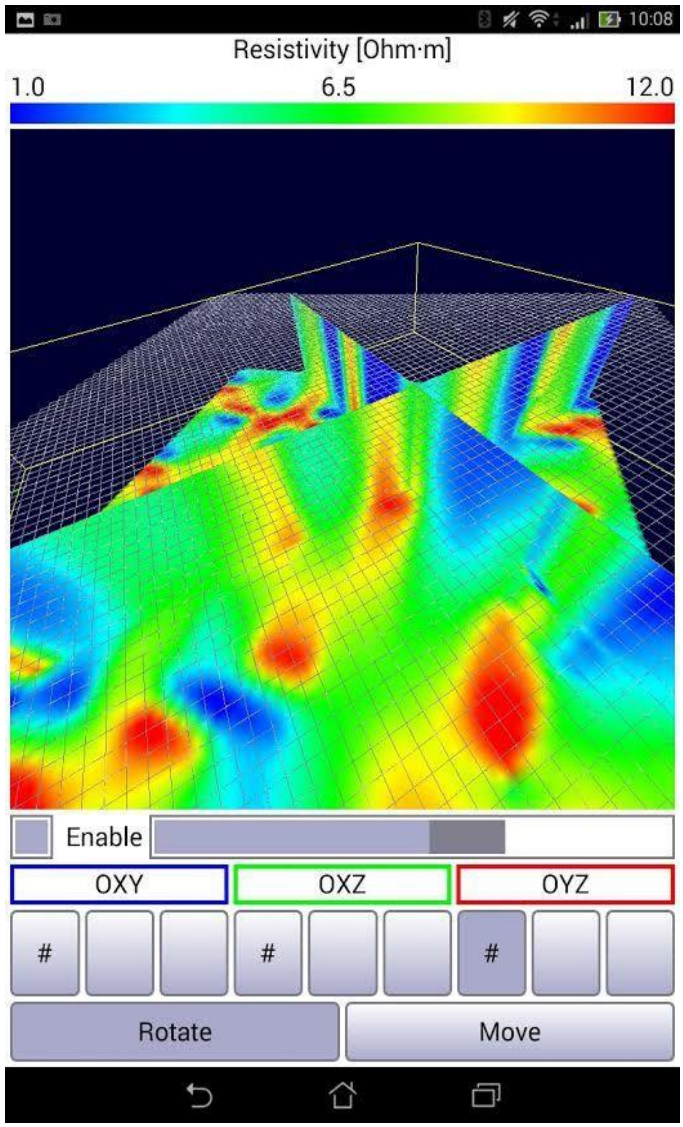
Do not take measurements while GEOVIZER is resting on the ground – galvanically connected with conductive media. All the measurements should be taken at least 20 cm above the ground. If it is tiring to hold the equipment, you can rest it on the ground from time to time, just do not collect measurements in that position.

Orientation of Geovizer

should be kept constant in relation to true geographical North during scanning of one area



QZOND SOFTWARE FOR GEOVIZER CONTROL



FREQUENTLY ASKED QUESTIONS ABOUT QZond

How to install QZond to my Android device?

Download QZond APK file to your Android device from the Internet or upload it via USB cable from your PC. Install QZond_X.apk on an Android device. Go to the Android Applications Setting menu and select the flag for folder access. Restart Android device – then you could copy calibration file into /QZond folder by any File Manager app for Android.

How can I get QZond APK file?

Please visit our repository at “http://nemfis.ru/geovizer/”.

How can I use my equipment with QZond?

Turn on Bluetooth adapter of your Android device, search for Bluetooth devices and add your equipment (probes and external GPS receivers) to Bluetooth paired devices.

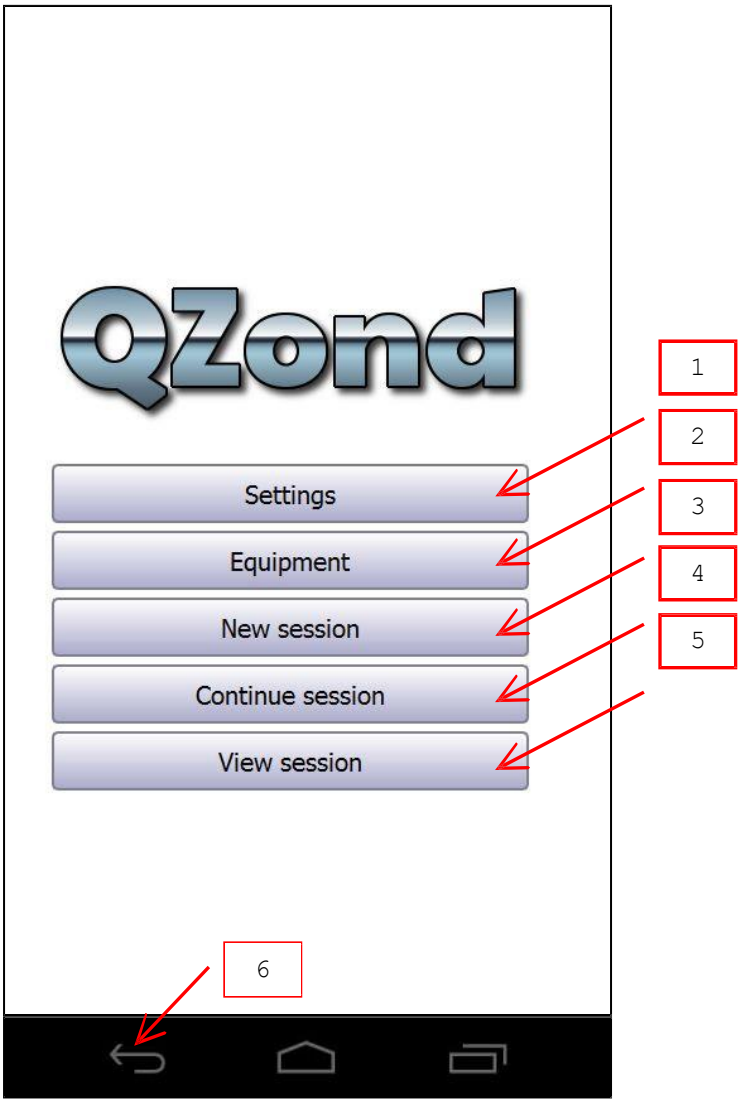
Where can I find my data files?

The path is “/sdcard/QZond”.

How can I use my Geovizer probe with QZond?

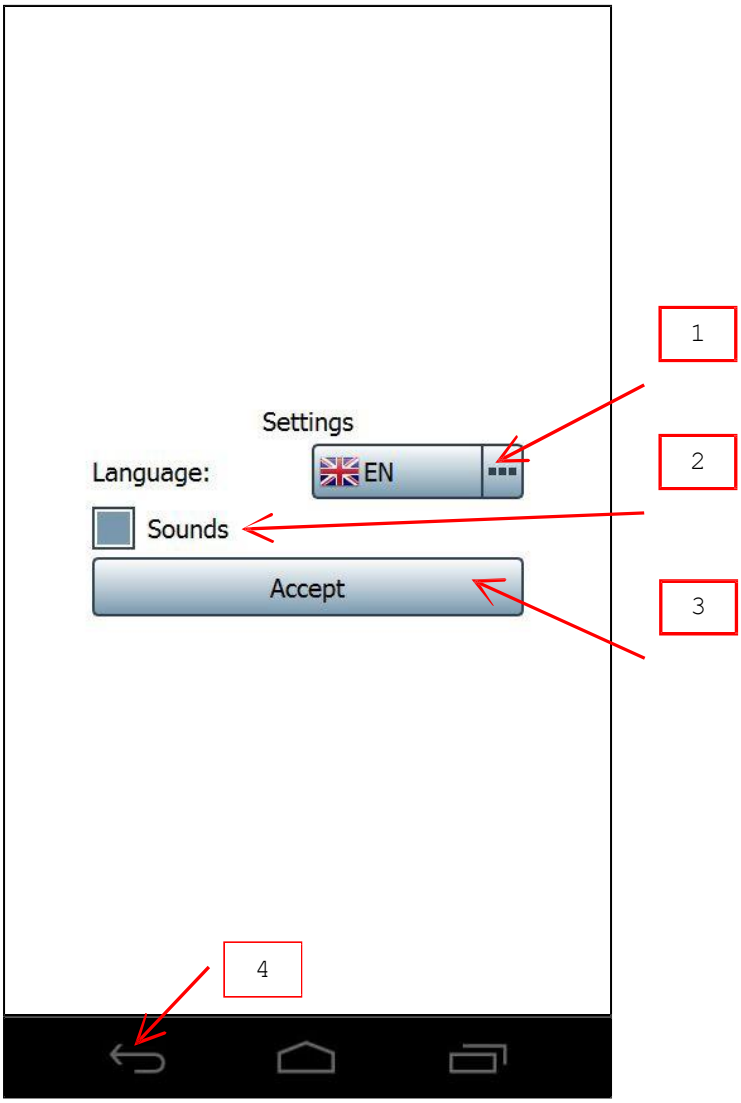
Put your Geovizer -specific INI-file to “/sdcard/QZond” folder.

MAIN MENU



1. Press to change general settings.
2. Press to choose equipment.
3. Press to begin a new session.
4. Press to continue saved session.
5. Press to view saved session.
6. Press to close QZond.

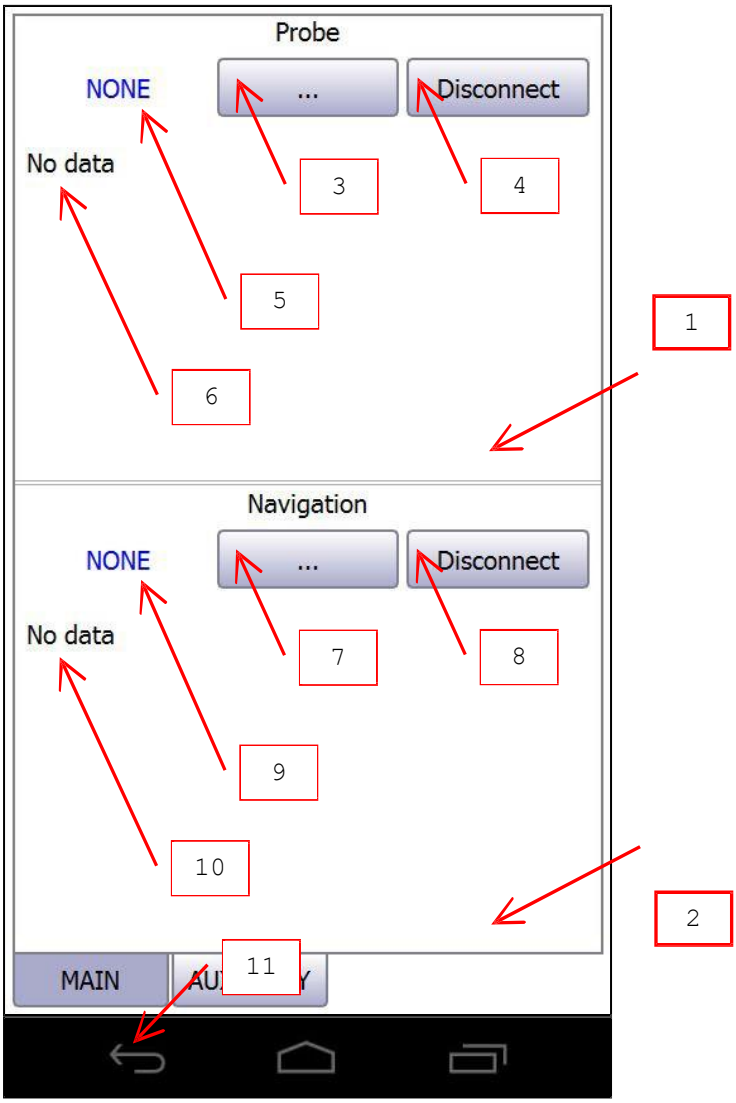
SETTINGS



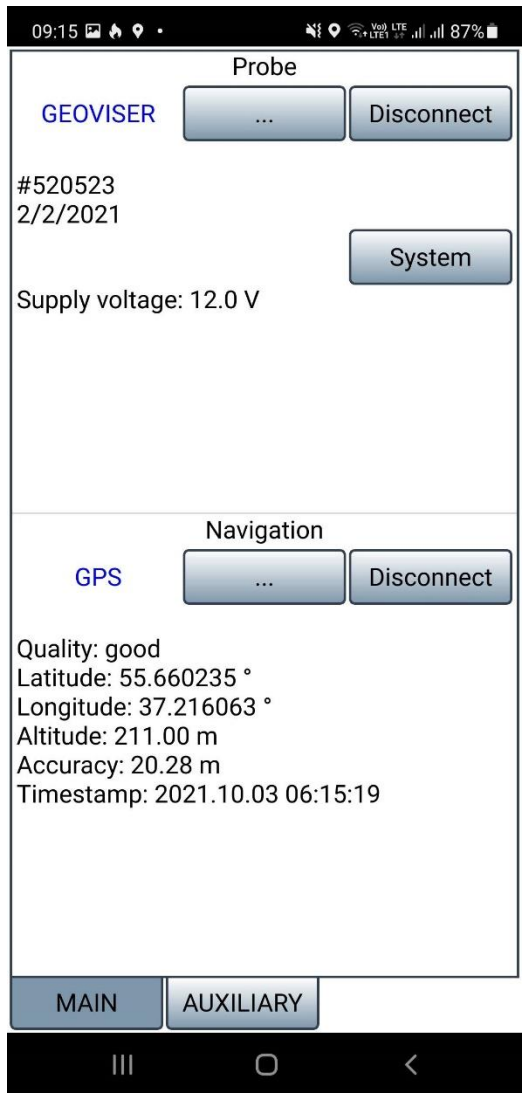
1. Choose QZond interface language [1].
2. Check to play sounds (recommended to hear that GEOVIZER is operating)
3. Press to accept changes.
4. Press to cancel.

[1] Accept changes and restart QZond to apply the new interface language.

EQUIPMENT



Typical View at the start



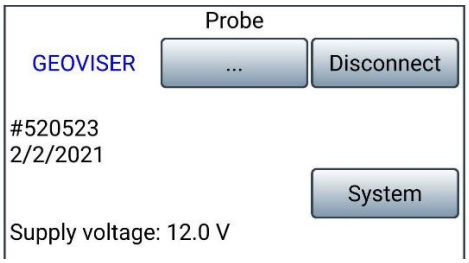
View after connecting to Geoviser and Phone GPS

1. Probe panel.
2. Navigation panel.
3. Press to choose probe.
4. Press to disconnect the current probe.
5. Current probe.
6. Current probe info.
7. Press to choose navigation.
8. Press to disconnect current navigation.
9. Current navigation.
10. Current navigation info.
11. Press to return to the main menu.

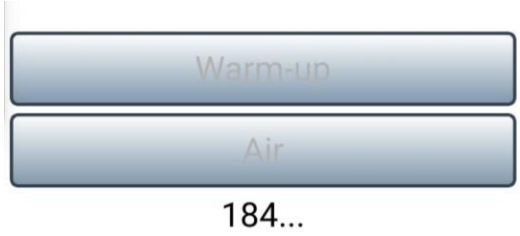
GEOVISER SITE CALIBRATION

*Follow those steps at **each new site/day** for the most precise data collection!*

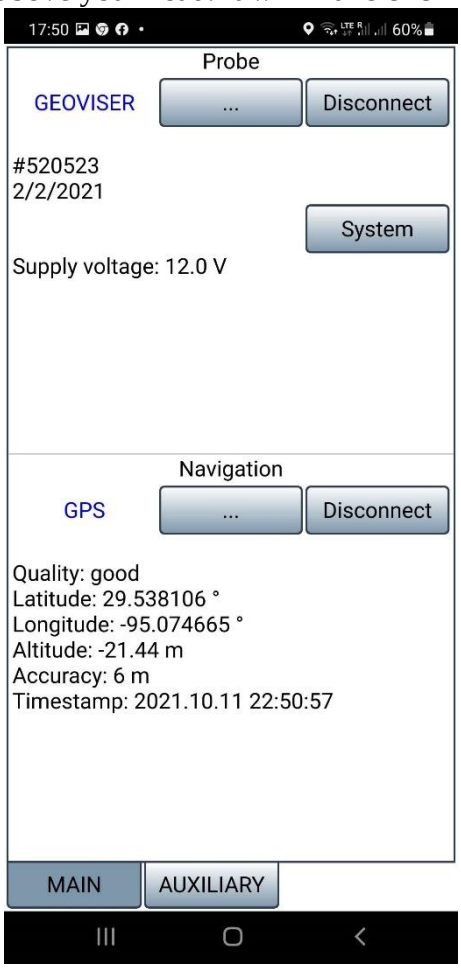
1. After connecting to Geoviser with the manufacturer .ini, on the EQUIPMENT page click SYSTEM



2. On the next screen click WARM-UP while holding Geoviser in a normal position just above the ground. Device would count down from 200 and make noise.

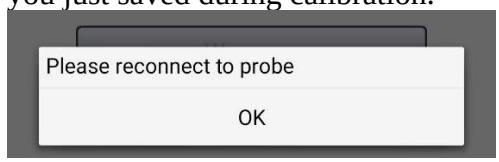


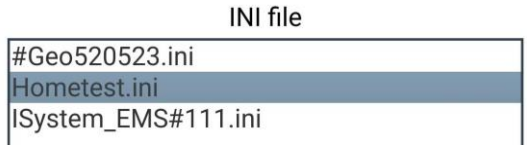
3. Next, press AIR and turn Geoviser upside-down facing antenna toward sky and raise it above your head. It will make clicking sound and then noise when finished calibration.

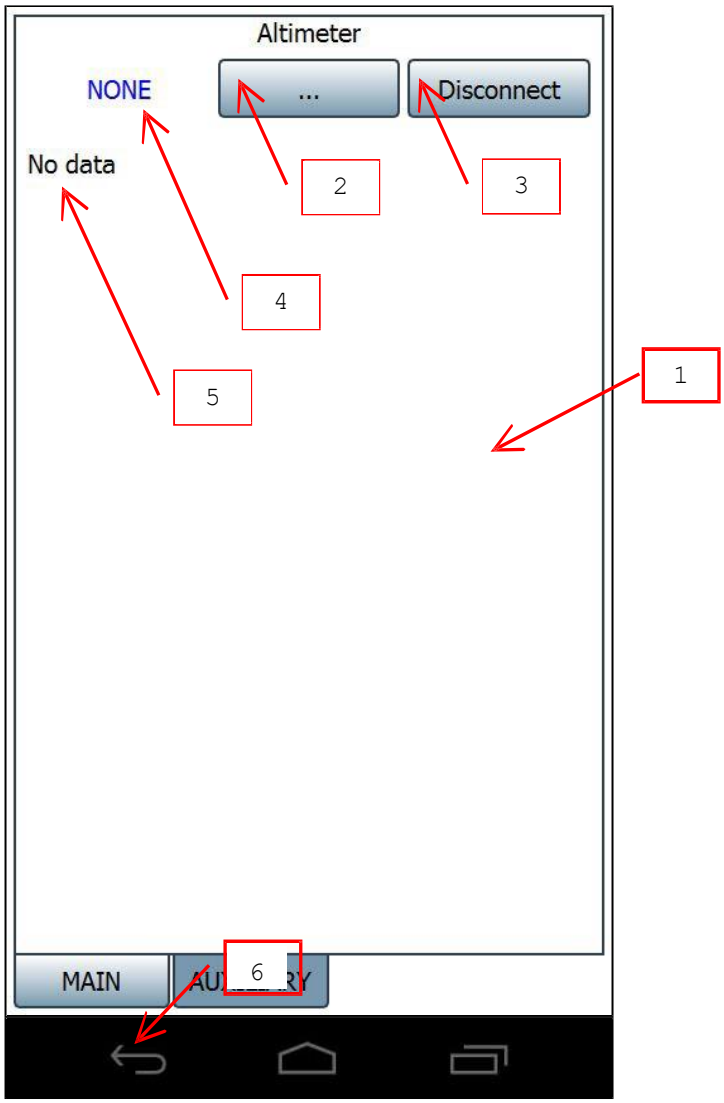


4. Save the air-calibration .ini file (name it with site/date info)

5. Device will disconnect and then ask you to re-connect to Geovizer, then you would select .ini file you just saved during calibration.

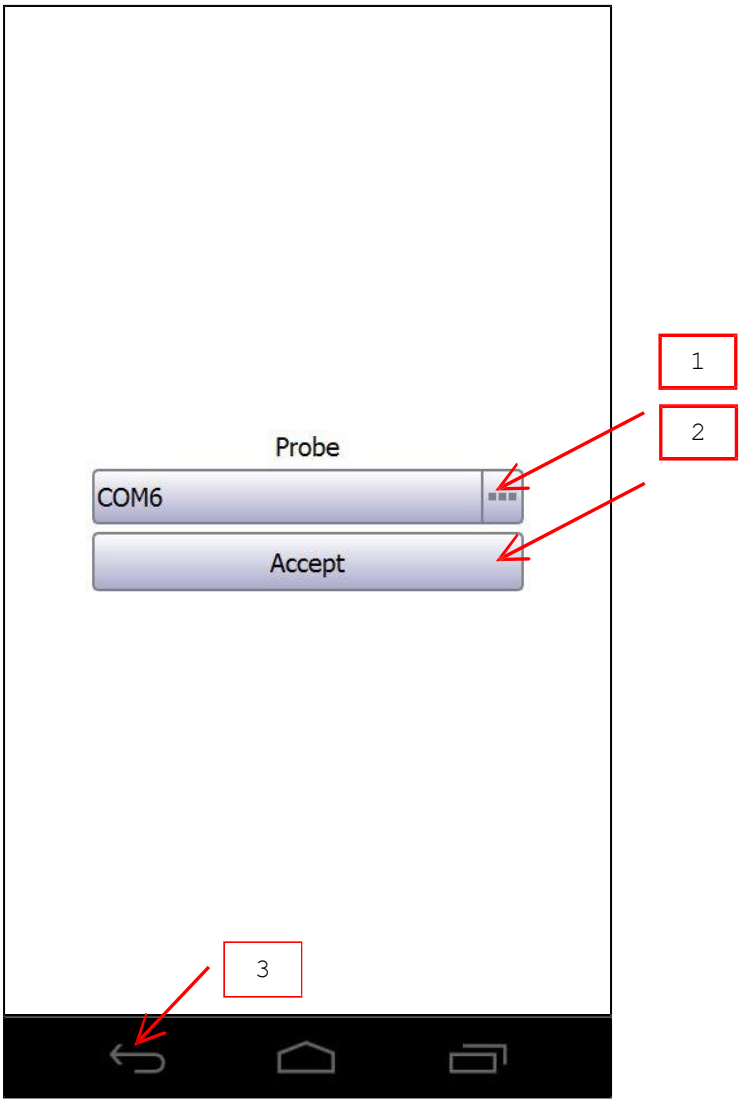






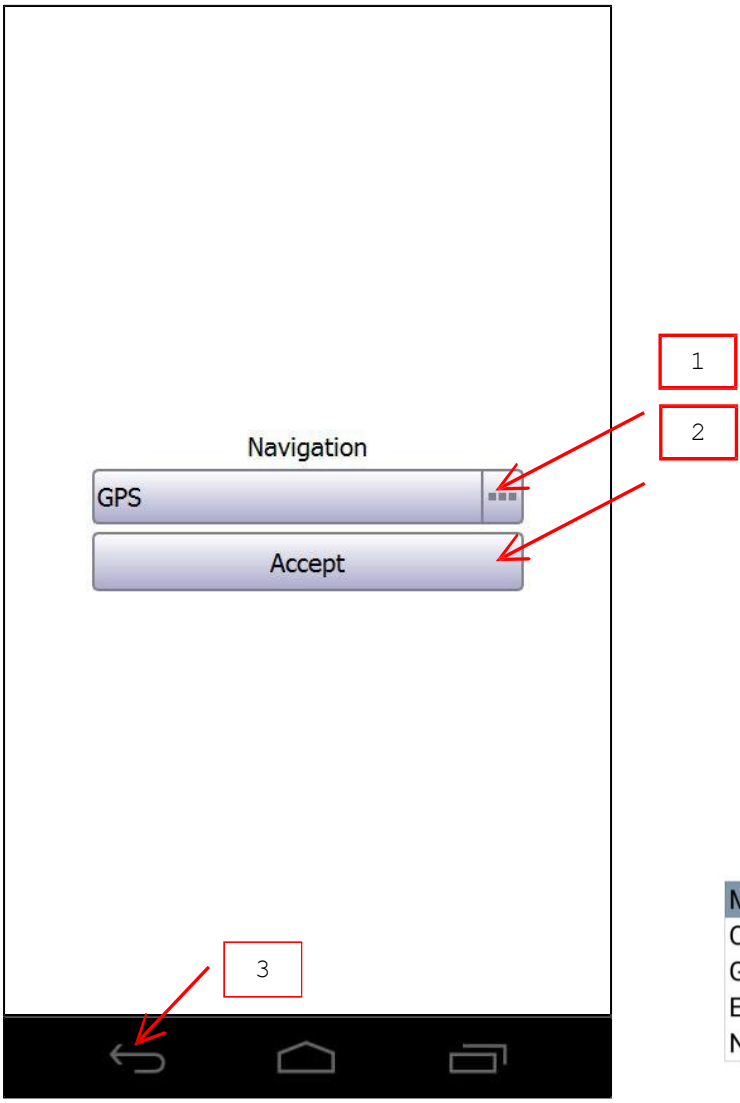
1. Altimeter panel.
2. Press to choose altimeter.
3. Press to disconnect the current altimeter.
4. Current altimeter.
5. Current altimeter info.
6. Press to return to the main menu.

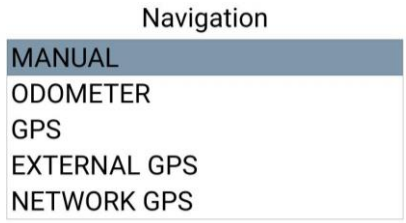
PROBE



1. Choose probe to connect.
2. Press to open connection.
3. Press to cancel.

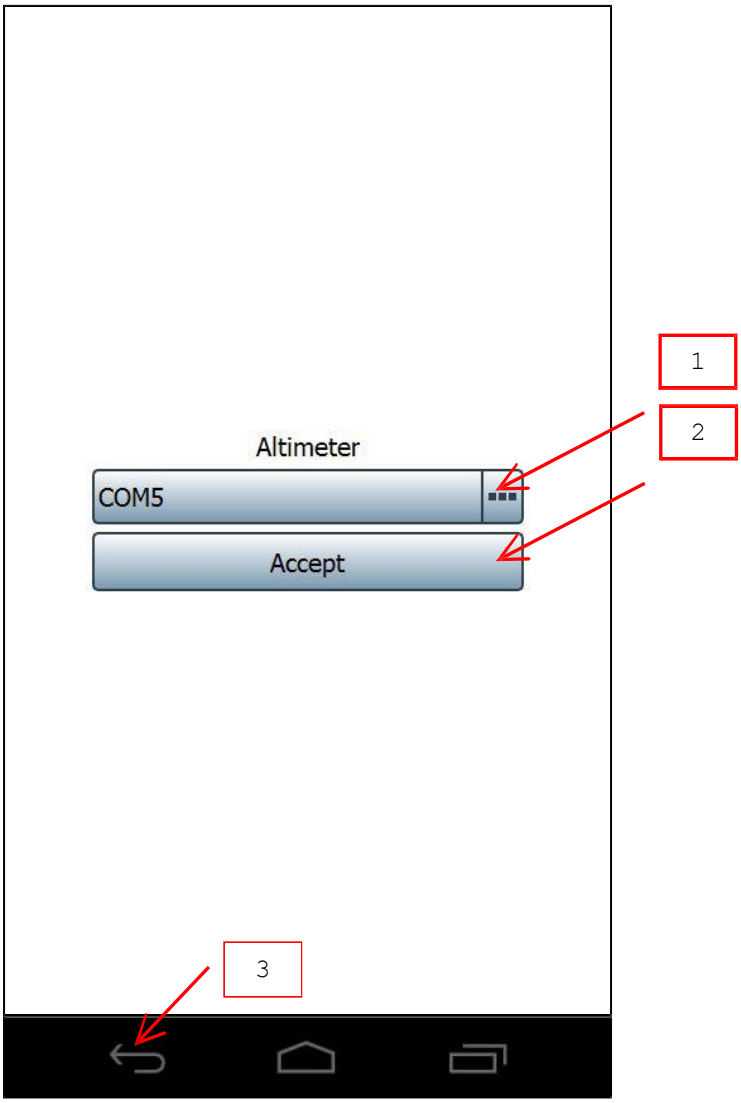
NAVIGATION





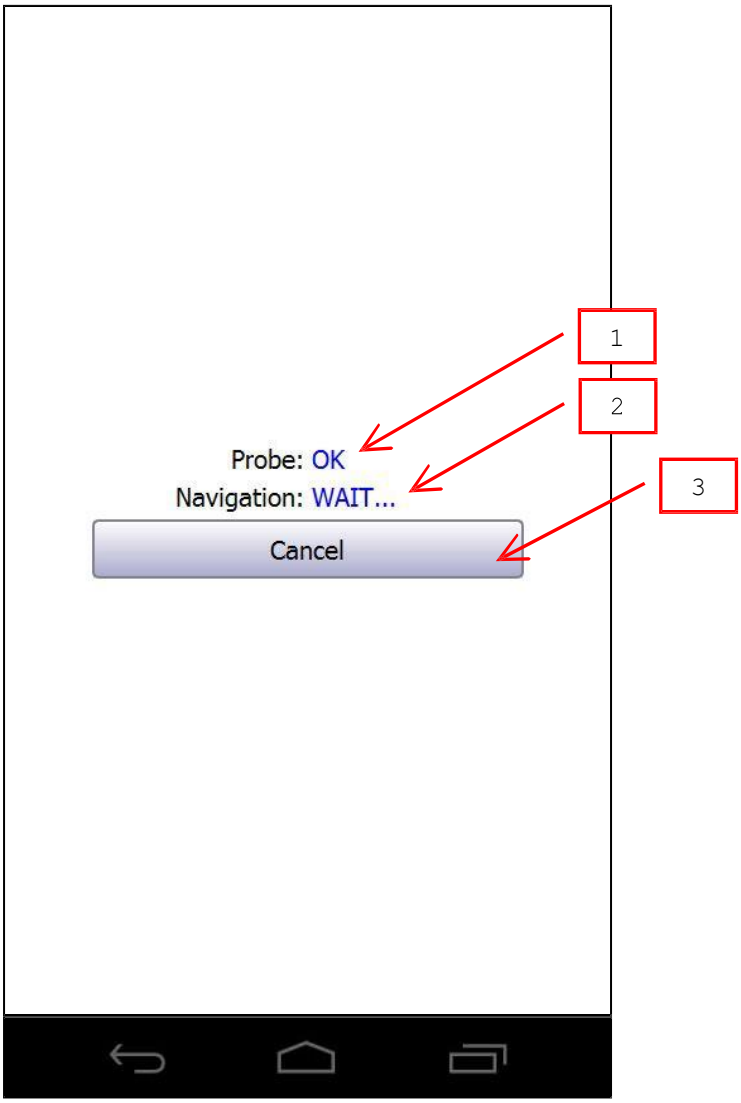
1. Choose navigation:
    - MANUAL – measuring tape, etc.;
    - ODOMETER – connected odometer (if available);
    - GPS – internal Android device GPS;
    - EXTERNAL GPS – usually Bluetooth protocol DGPS;
    - NETWORK GPS – RTK GPS connected through WiFi (Landviser offer excellent RTK GPS units and helps with setup for EM scanners)
2. Press to start navigation.
3. Press to cancel.

ALTIMETER



1. Choose altimeter to connect.
2. Press to open connection.
3. Press to cancel.

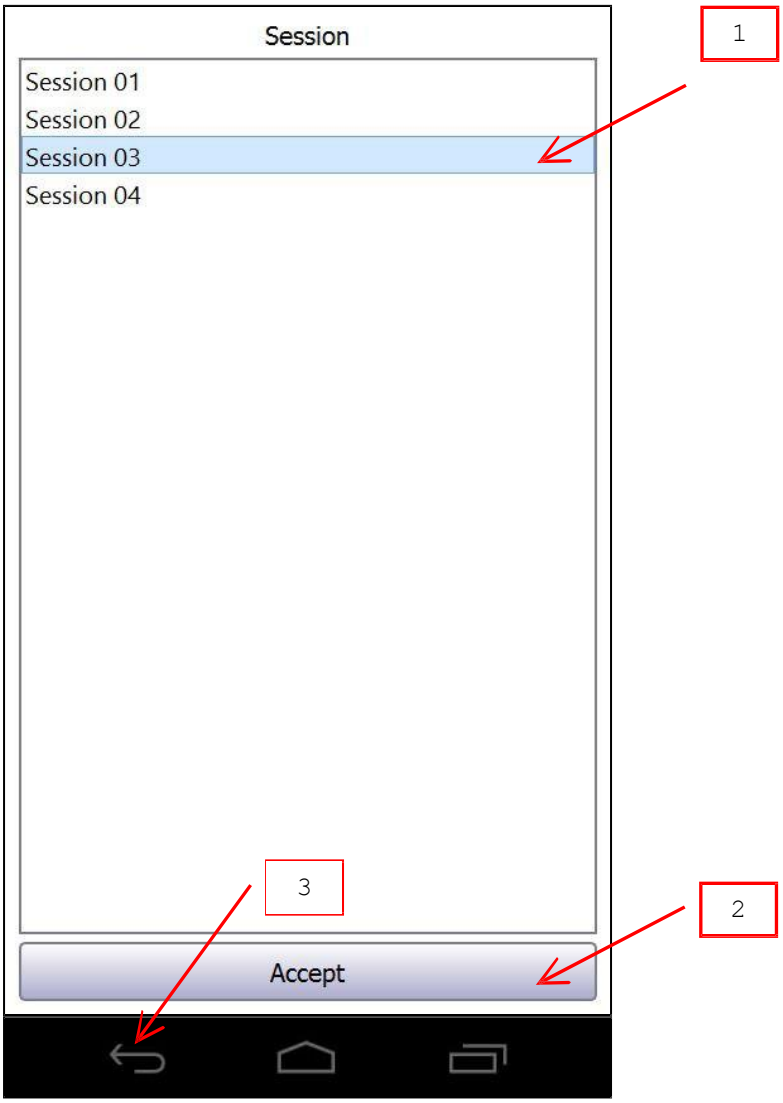
NEW SESSION



1. Probe state[1].
2. Navigation state[1].
3. Press to cancel.

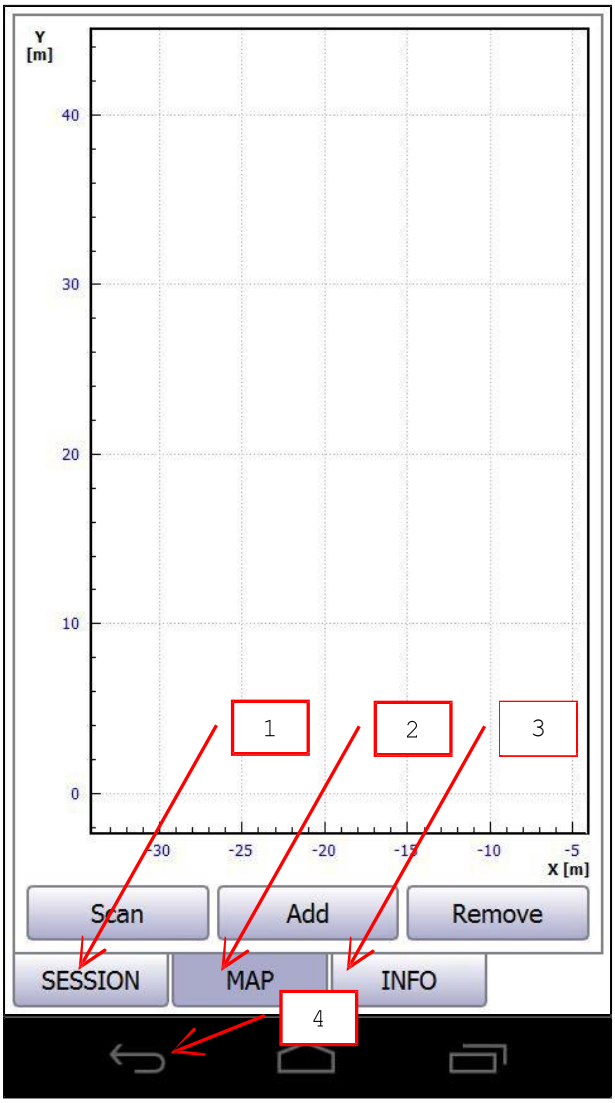
[1] WAIT... = not ready, OK = ready, NONE = nothing selected.

CONTINUE SESSION / VIEW SESSION



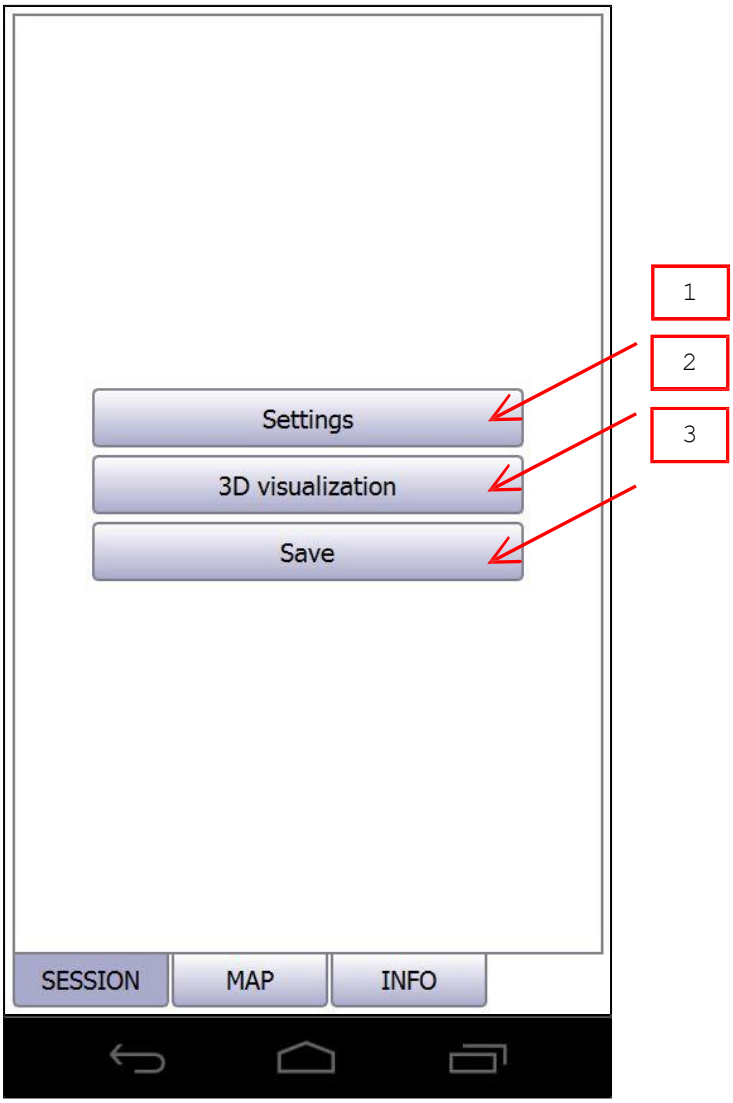
1. Choose a session to continue or view.
2. Press to continue or view the session.
3. Press to cancel.

SESSION MENU



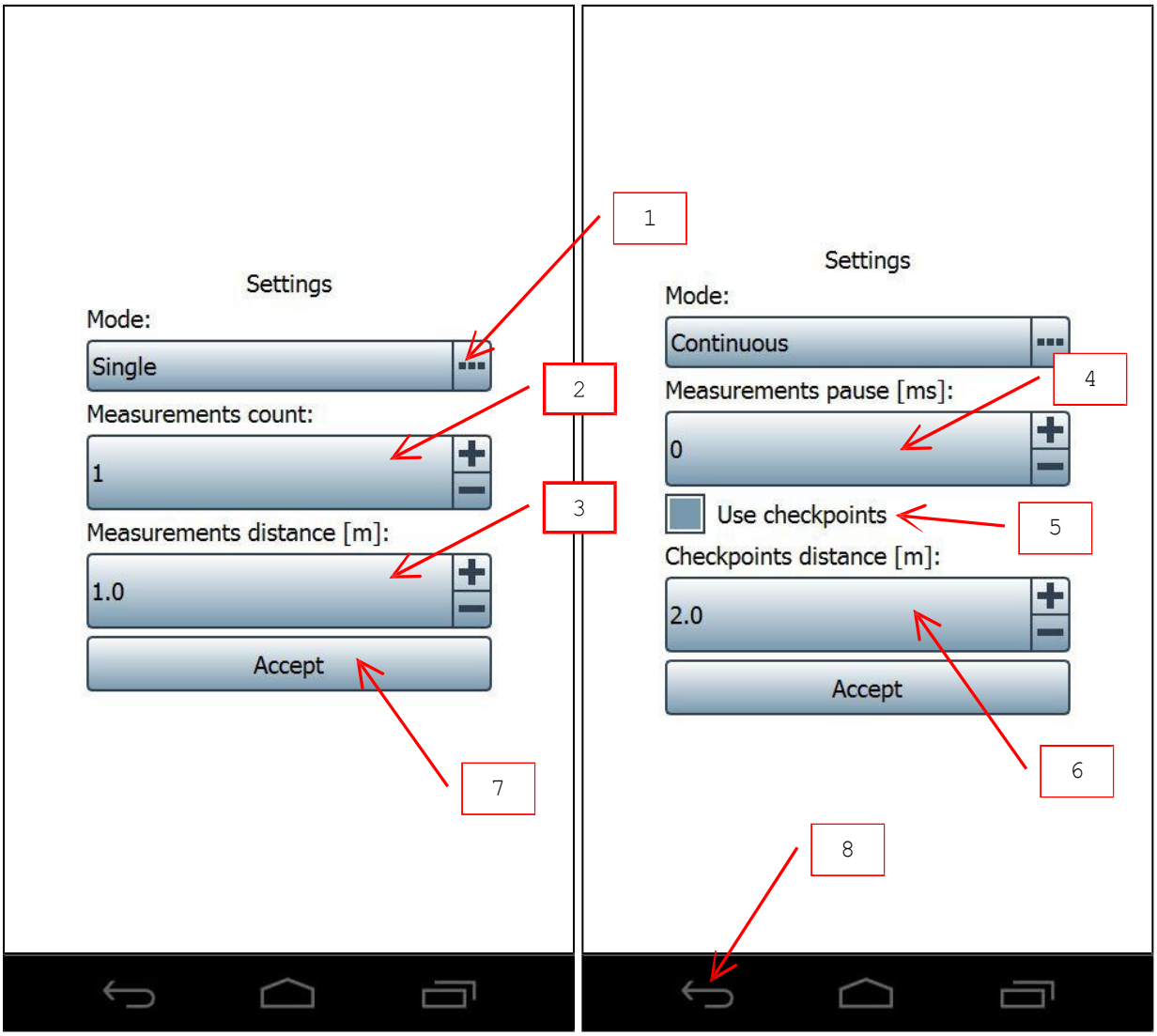
1. Session page.
2. Map page.
3. Info page.
4. Press to close the session.

SESSION PAGE



1. Press to change session settings.
2. Press to view data in 3D.
3. Press to save the current session.

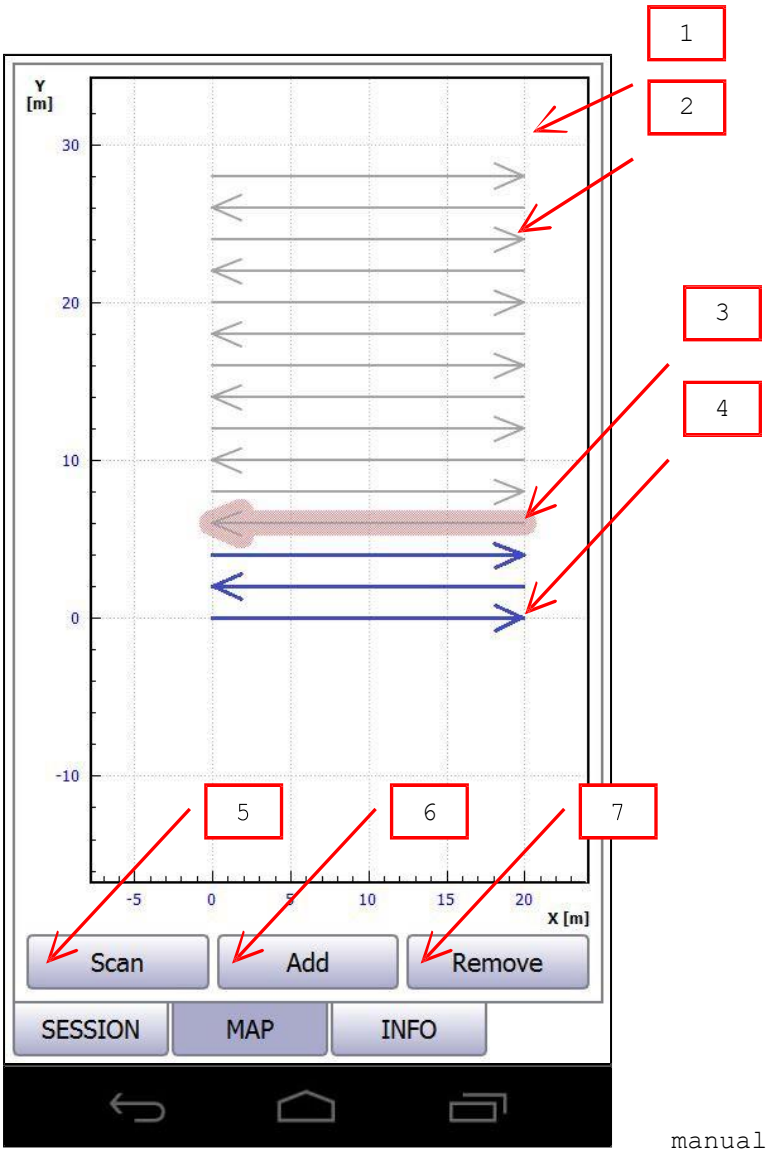
SESSION SETTINGS



1. Choose a single or continuous mode.
2. Choose measurements count in single mode.
3. Choose measurements distance in single mode[1].
4. Choose measurements pause in continuous mode.
5. Check to enable checkpoints in continuous mode[1].
6. Choose checkpoints distance in continuous mode[1].
7. Press to accept changes.
8. Press to cancel.

[1] This setting is available for MANUAL navigation only.

MAP PAGE

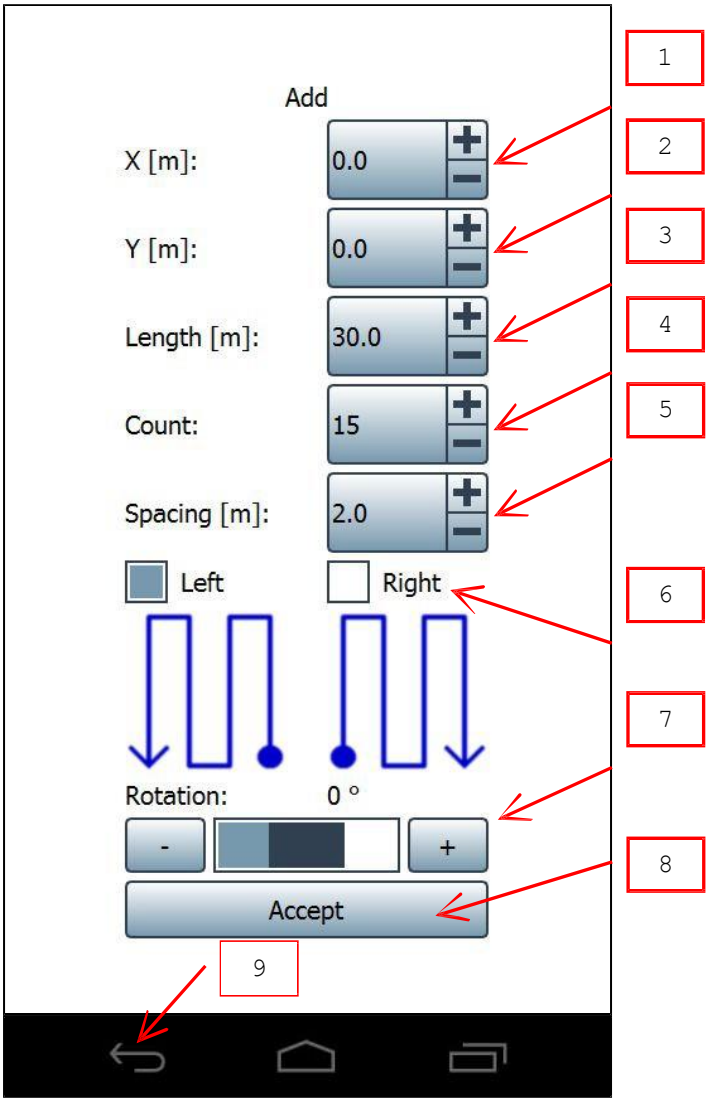


manual

1. Map plot. Use pan[1] and pinch[2] gestures to navigate and zoom.
2. Gray tracks are not scanned (empty).
3. Current track. Press track to select.
4. Blue tracks are already scanned.
5. Press to scan the current track.
6. Press to add new tracks.
7. Press to remove the current track. [1]

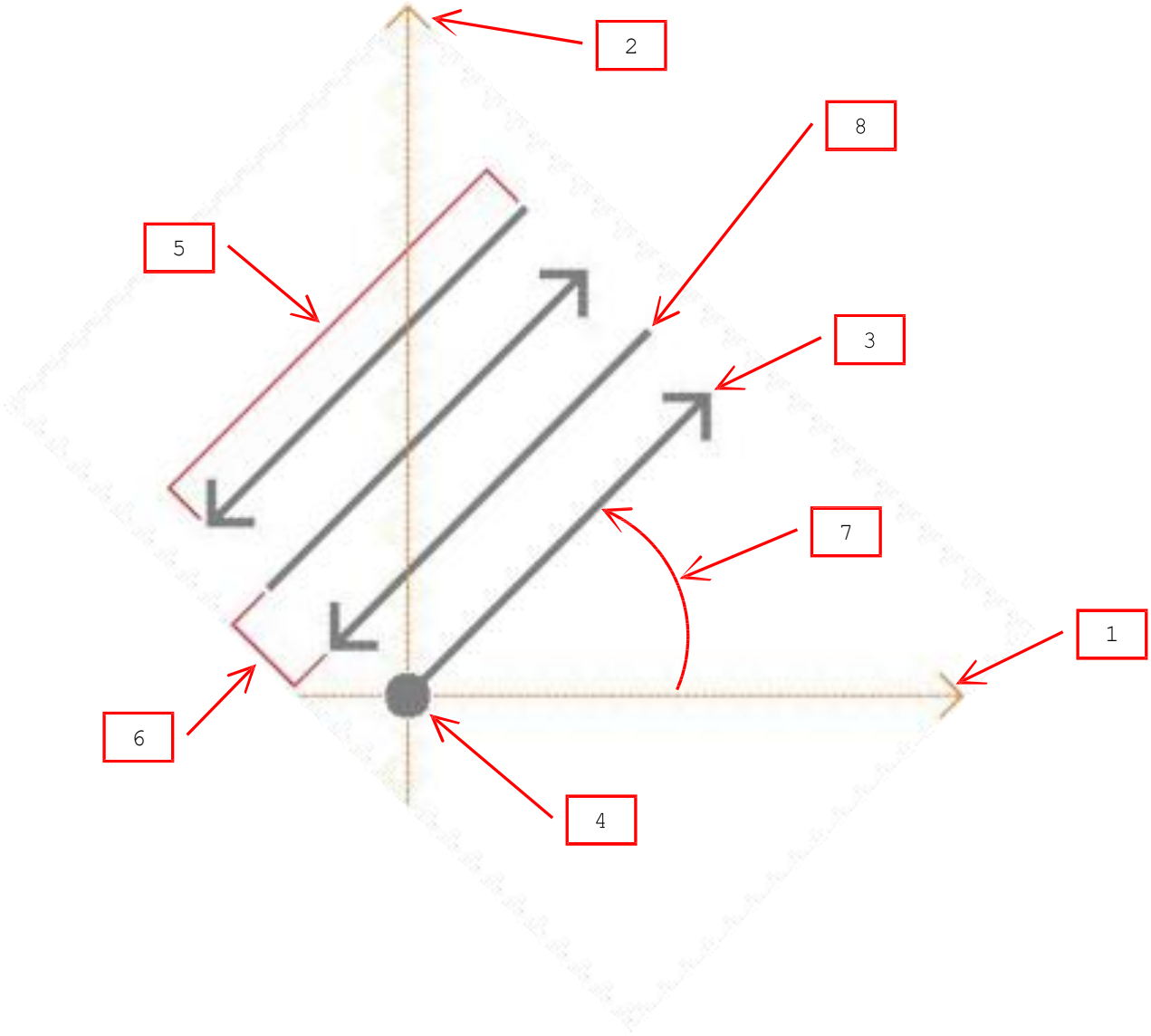
[2] 

ADD TRACKS[1]



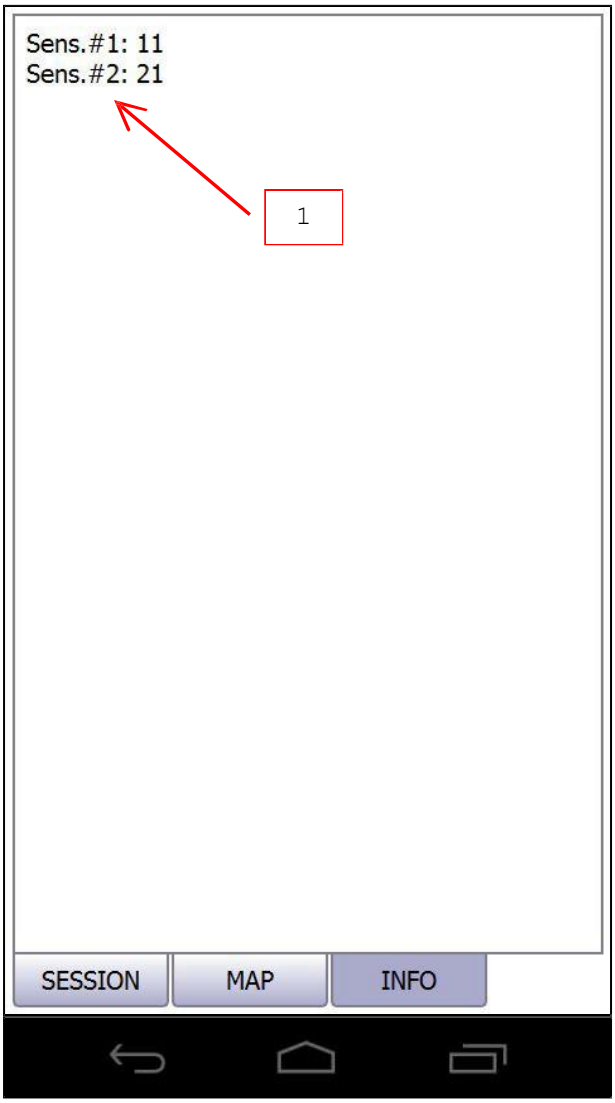
1. X position of first track beginning.
2. Y position of first track beginning.
3. Length of tracks.
4. Tracks count.
5. Distance between neighbor tracks.
6. Tracks orientation relative to the first track direction.
7. Tracks rotation around first track beginning.
8. Press to add tracks to the map.
9. Press to cancel.

[1] This setting is available for MANUAL and ODOMETER navigations only.



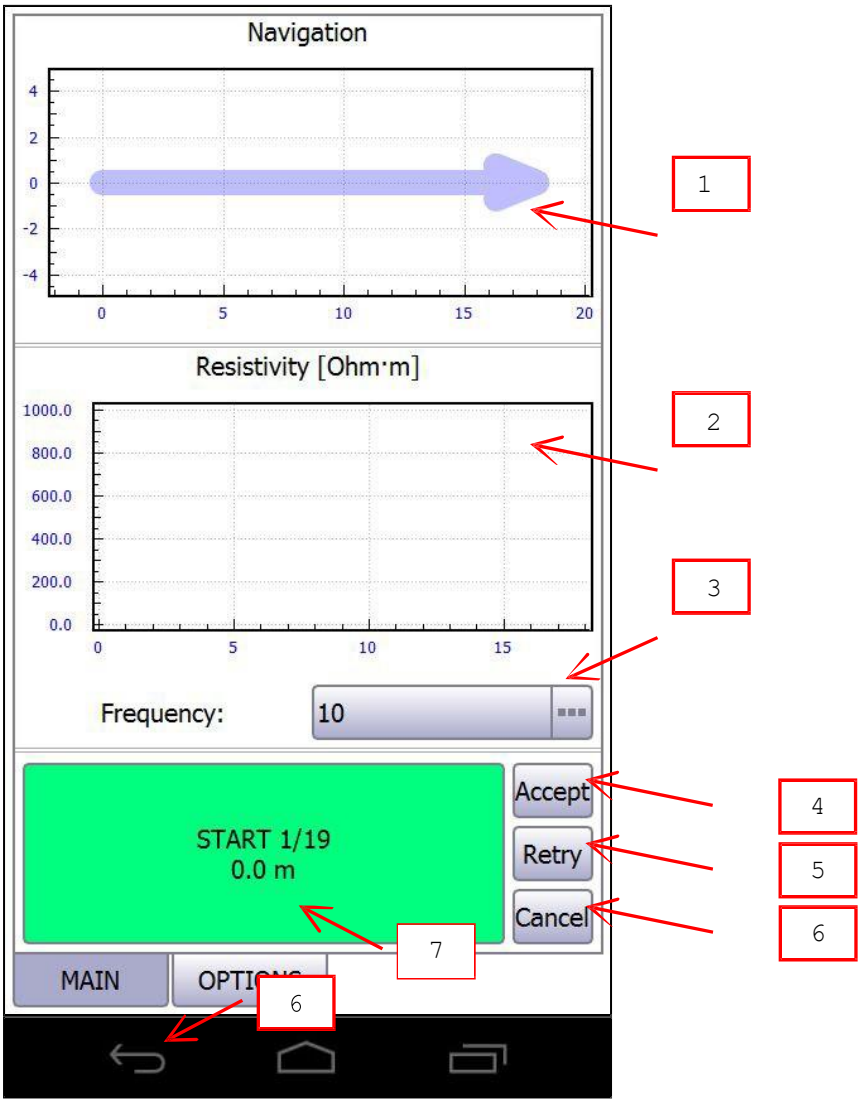
1. X-axis.
2. Y-axis.
3. First track.
4. X = 0.0 m, Y = 0.0 m.
5. Length = 10 m.
6. Spacing = 2.0 m.
7. Rotation = 45 °.
8. Count = 4, orientation = left.

INFO PAGE



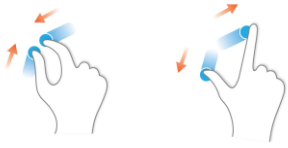
1. Equipment-specific info.

TRACK SCANNING

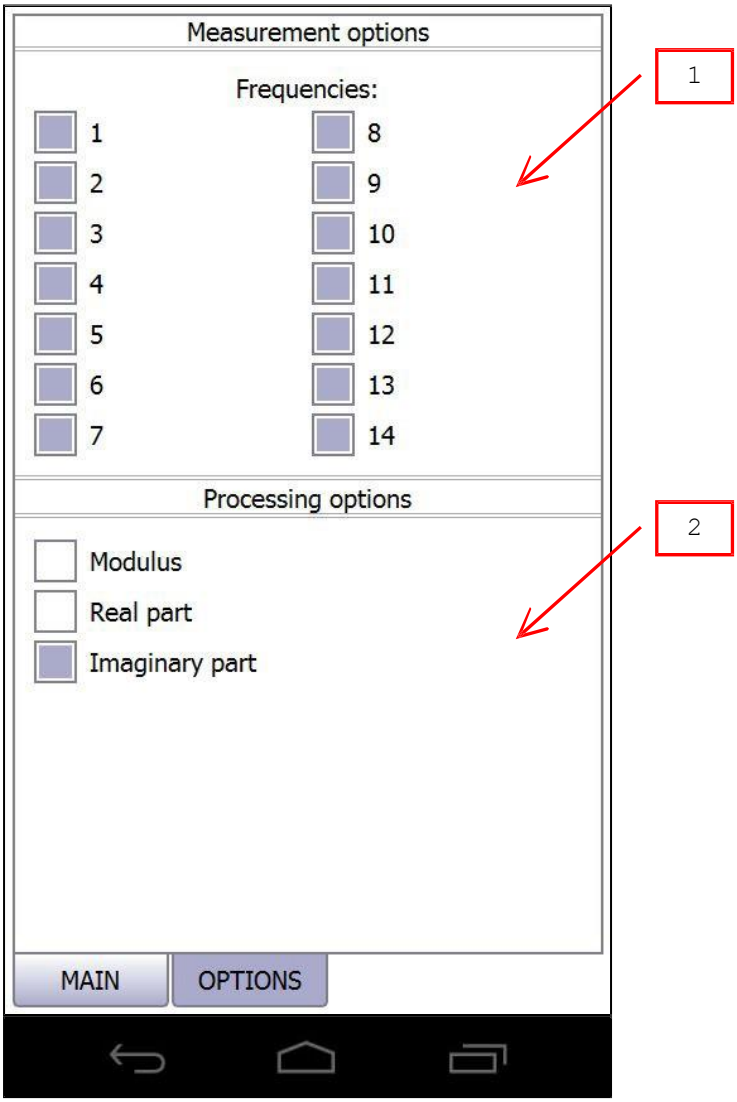


1. Track sketch.
2. Resistivity profile curve. Use pan[1] and pinch[2] gestures to navigate and zoom.
3. Probe-specific data view settings.
4. Press to accept track scanning.
5. Press to retry track scanning.
6. Press to cancel.
7. ACTION button.

[1]



[2]

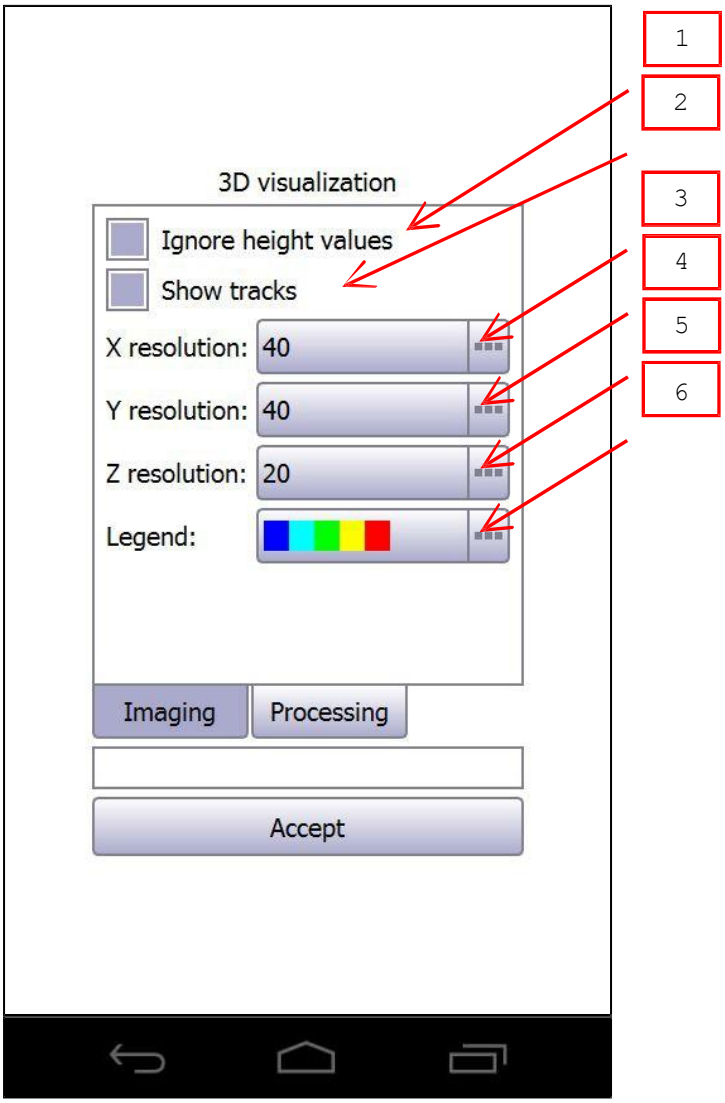


1. Probe-specific measurement options.
2. Probe-specific data processing options.

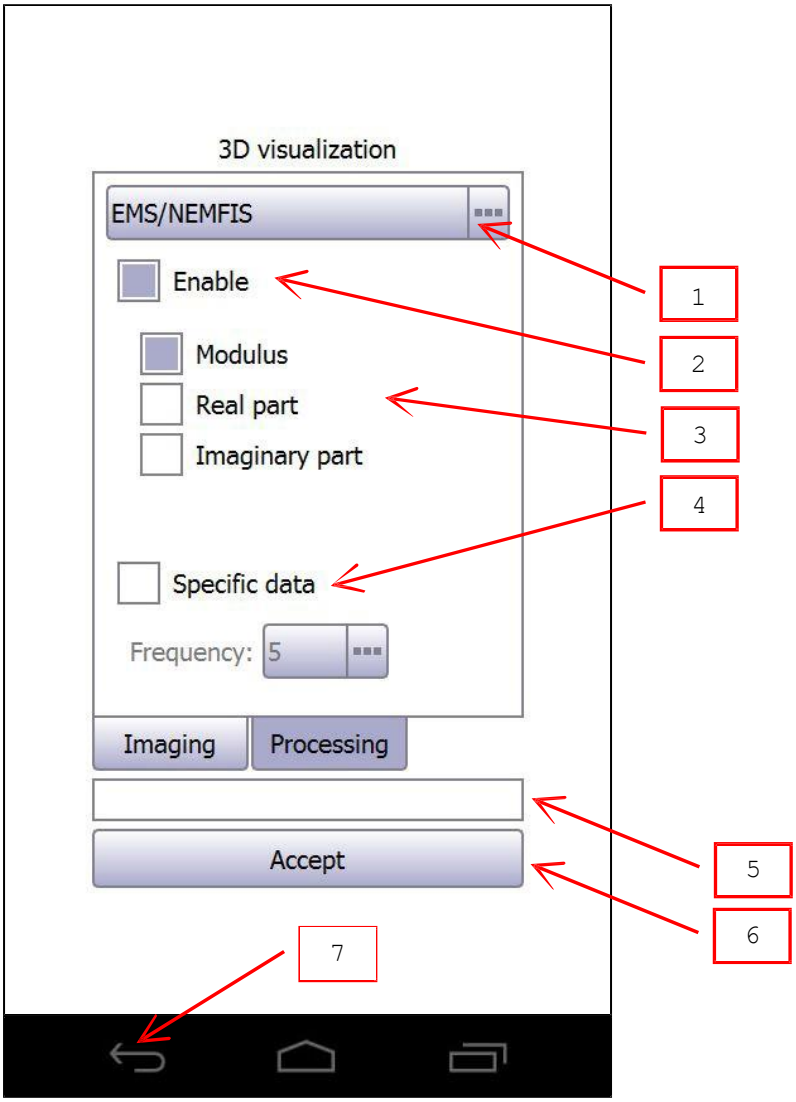
Measured signal component: the module (**Module**), real or quadrature a component (**Quadrature**), imaginary or inphase a signal component (**Inphase**).

*__Note__: 14 frequencies is for AEMP-14 EM instrument, Geovizer only has three frequencies here

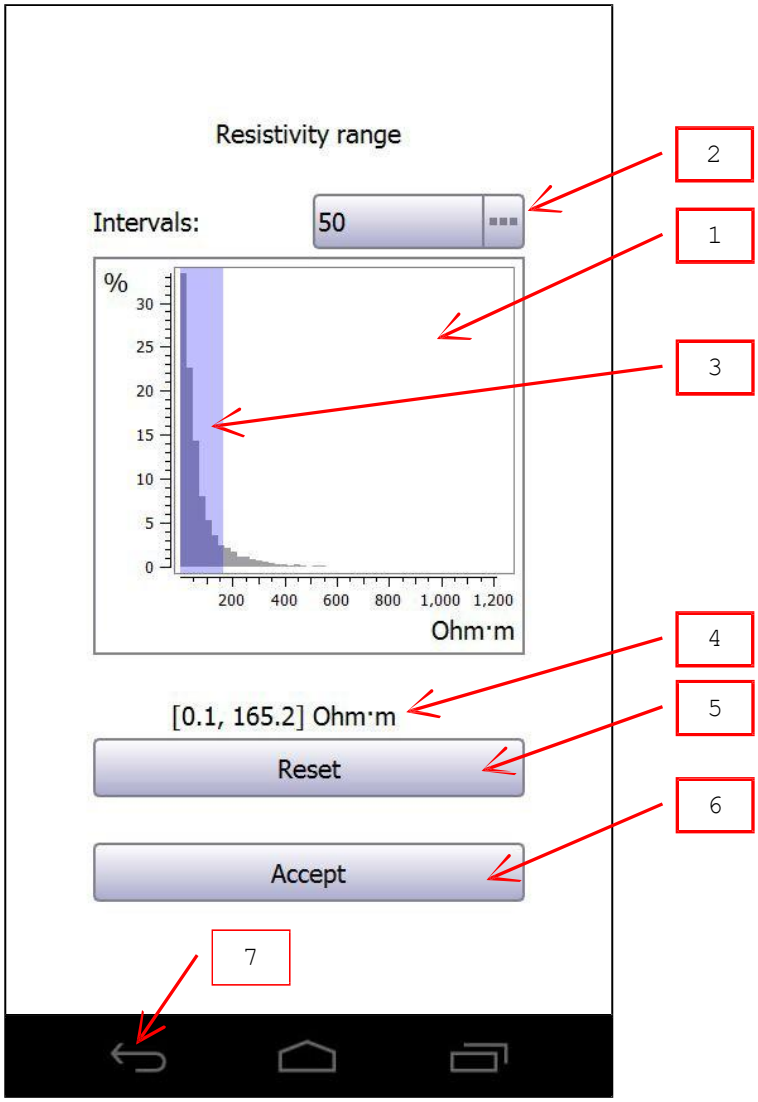
3D VISUALIZATION



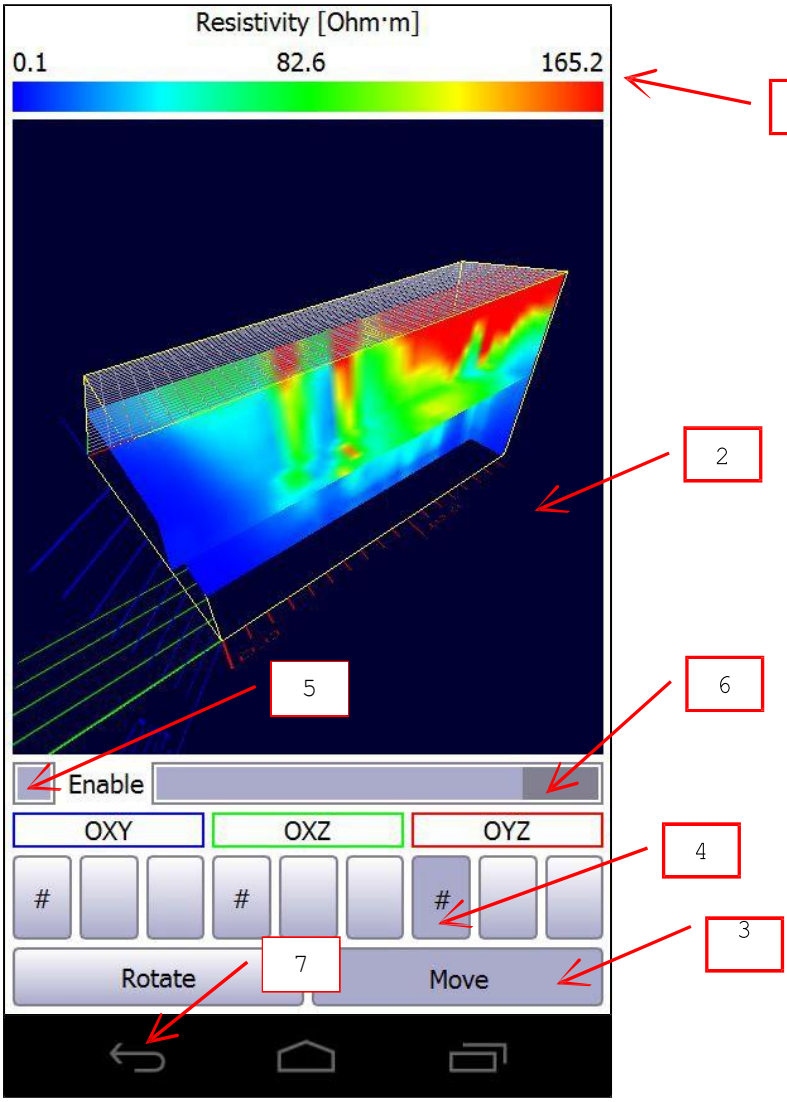
1. Check to assume that surface is flat.
2. Check to show tracks on the surface.
3. X pixels image resolution.
4. Y pixels image resolution.
5. Z pixels image resolution.
6. Choose color legend.



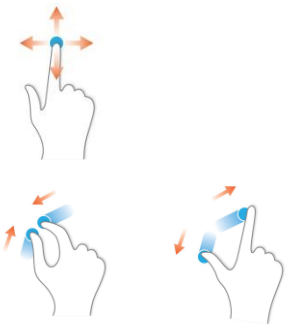
1. Choose probe to set up probe-specific data processing settings.
2. Check to enable probe data.
3. Probe-specific data processing settings.
4. Check to enable specific data only.
5. Progress indicator.
6. Press to accept image settings and build a 3D image.
7. Press to cancel.



1. Resistivity bar chart.
2. Resistivity bar chart bars count.
3. Use pan[1] gesture to choose resistivity range.
4. Current resistivity range.
5. Press to reset the current resistivity range.
6. Press to accept resistivity range.
7. Press to cancel. [1]



1. Resistivity color legend.
2. 3D image. Use pan[1] and pinch[2] gestures to move (rotate) and zoom image.
3. Choose pan gesture mode.
4. Choose a 3D image slice to set up[3].
5. Check to show the current slice.
6. Choose current slice position.
7. Press to exit. [1]

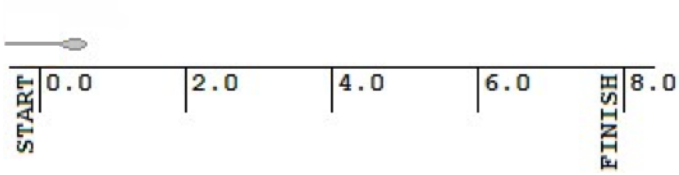
[2] 

[3] Enabled slices are marked with the "#" symbol.

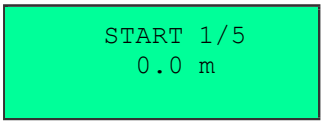
MANUAL NAVIGATION IN SINGLE MEASUREMENT MODE

Track length = 8.0 m Measurements
distance = 2.0 m

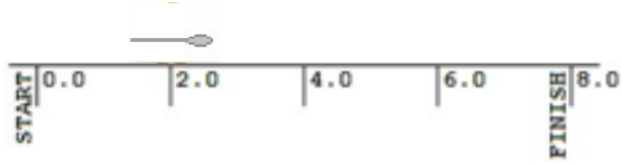
1. Go to track beginning (0.0 m position).



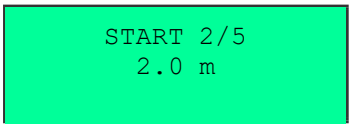
2. Press the ACTION button to make a measurement (first of five at 0.0 m position).



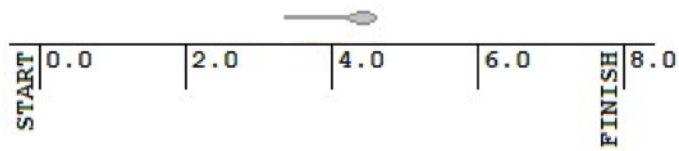
3. Go to the next position (2.0 m position).



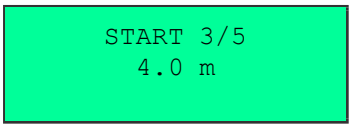
4. Press the ACTION button to make a measurement (second of five at 2.0 m position).



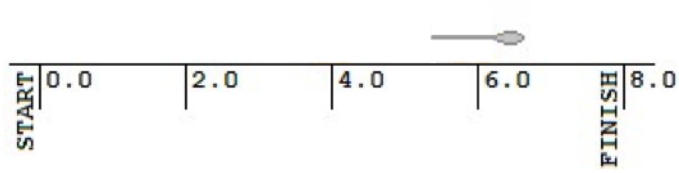
5. Go to the next position (4.0 m position).



6. Press the ACTION button to make a measurement (third of five at 4.0 m position).



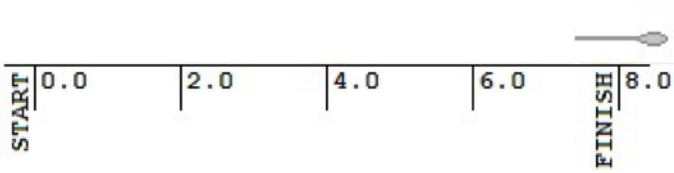
7. Go to the next position (6.0 m position).



8. Press the ACTION button to make a measurement (fourth of five at 6.0 m position).

START 4/5
6.0 m

9. Go to the next position (8.0 m position).



10. Press the ACTION button to make a measurement (fifth of five at 8.0 m position).

START 5/5
8.0 m

11. Completed. Accept, retry or cancel track scanning.

COMPLETED

MANUAL NAVIGATION IN CONTINUOUS MEASUREMENT MODE WITHOUT CHECKPOINTS

Track length = 8.0 m

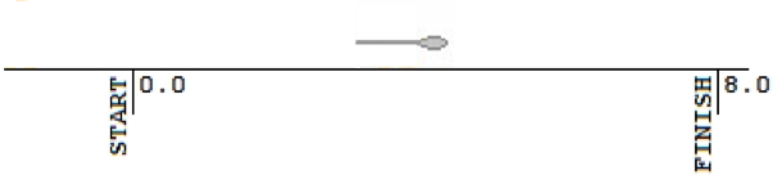
1. Stay behind track beginning (-2.0 m position).

2. Start going towards the end of the track evenly.

3. Keep going to the end of the track. Press the ACTION button at the track beginning (0.0 m position) to start continuous measurement.

START

4. Keep going to the end of the track.



5. Press the ACTION button at the end of the track (8.0 m position) to finish the continuous measurement.

FINISH
8.0 m

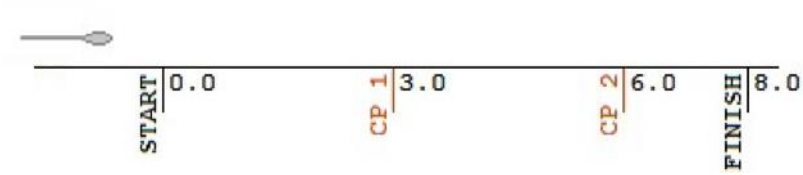
6. Completed. Accept, retry or cancel track scanning.

COMPLETED

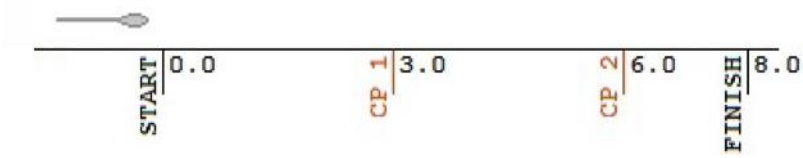
MANUAL NAVIGATION IN CONTINUOUS MEASUREMENT MODE WITH CHECKPOINTS

Track length = 8.0 m Checkpoints
distance = 3.0 m

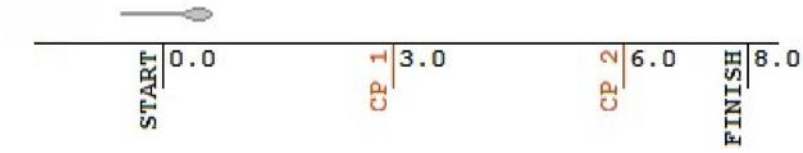
1. Stay behind track beginning (-2.0 m position).

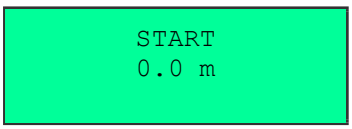


2. Start going towards the end of the track evenly.

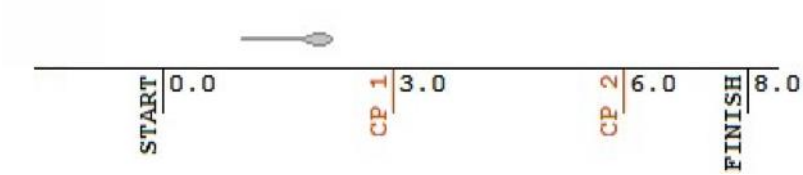


3. Keep going to the end of the track. Press the ACTION button at the track beginning (0.0 m position) to start continuous measurement.

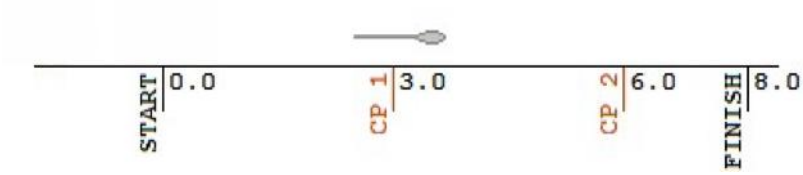


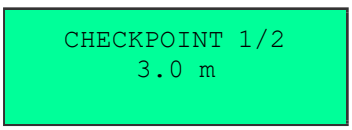


4. Keep going to the end of the track.

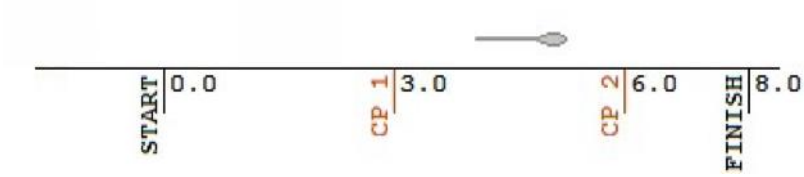


5. Keep going to the end of the track. Press the ACTION button to mark the checkpoint (first of two at 3.0 m position).

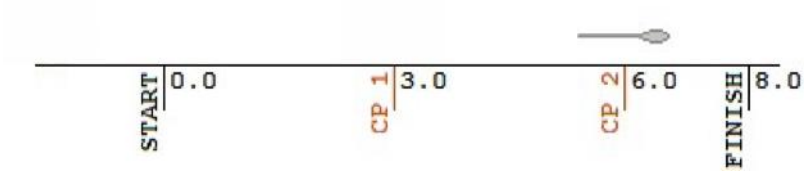




6. Keep going to the end of the track.

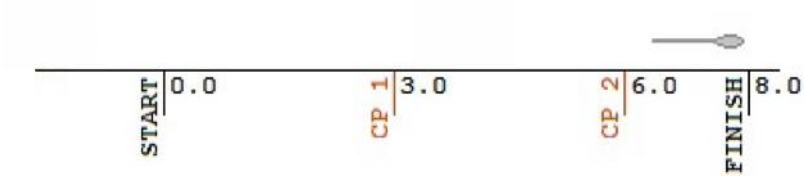


7. Keep going to the end of the track. Press ACTION button to mark checkpoint (second of two at 6.0 m position).

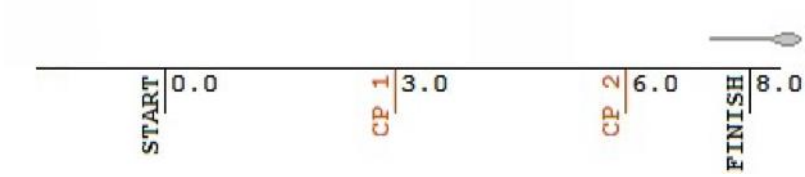


CHECKPOINT 2/2
6.0 m

8. Keep going to the end of the track.



9. Press the ACTION button at the end of the track (8.0 m position) to finish the continuous measurement.



FINISH
8.0 m

10. Completed. Accept, retry or cancel track scanning.

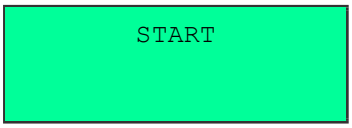
COMPLETED

ODOMETER NAVIGATION IN SINGLE MEASUREMENT MODE

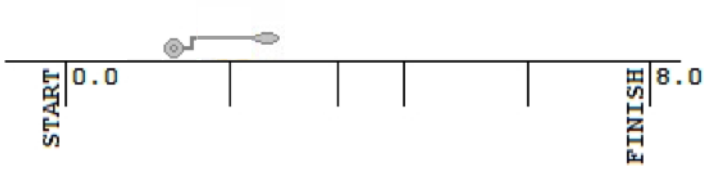
Track length = 8.0 m

1. Go to track beginning (0.0 m position).

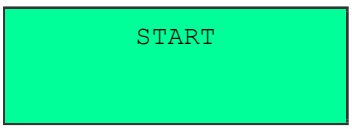
2. Press the ACTION button to make a measurement.



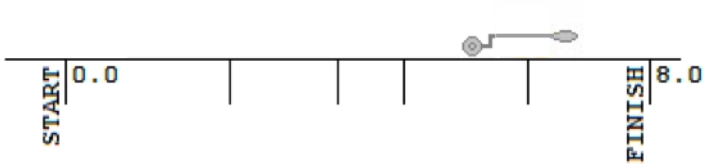
3. Go to the next position (any position you like).



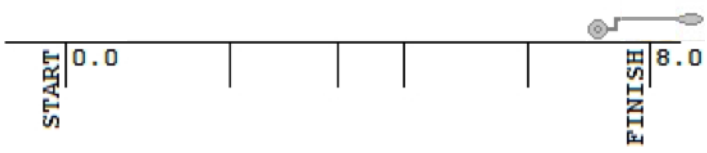
4. Press the ACTION button to make a measurement.



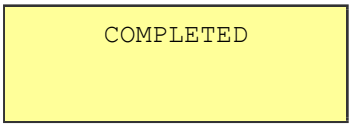
5. Repeat items 3 and 4 as many times as you like.



6. Cross-track ending (8.0 m position) to complete automatically.



7. Completed. Accept, retry or cancel track scanning.

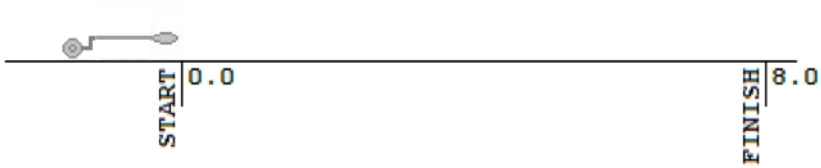


ODOMETER NAVIGATION IN CONTINUOUS MEASUREMENT MODE

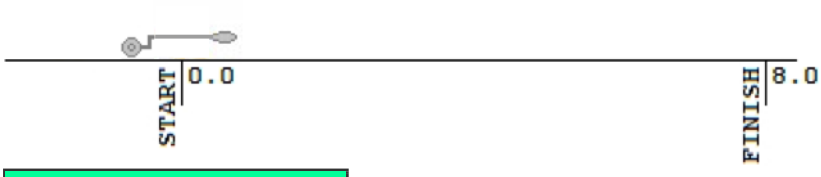
Track length = 8.0 m

1. Stay behind track beginning (-2.0 m position).

2. Start going towards the end of the track.

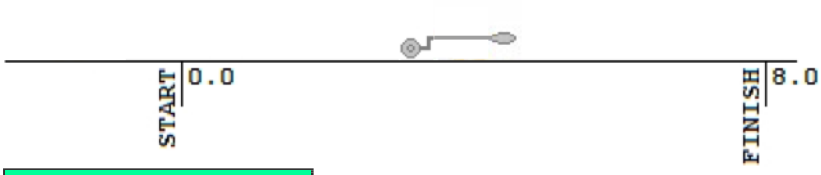


3. Keep going to the end of the track. Press the ACTION button at the track beginning (0.0 m position) to start continuous measurement.



START

4. Keep going to the end of the track. You may press the ACTION button to complete it immediately.



EARLY FINISH

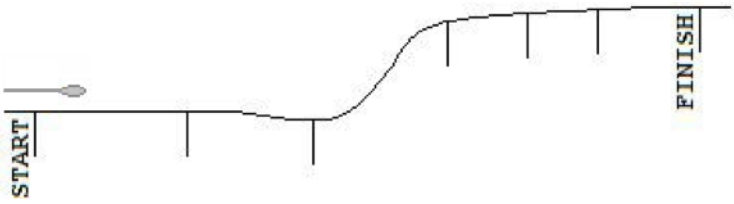
5. Cross-track ending (8.0 m position) to complete automatically.

6. Completed. Accept, retry or cancel track scanning.

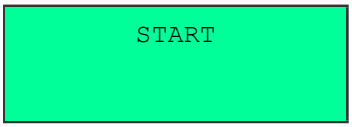
COMPLETED

GPS / EXTERNAL GPS NAVIGATION IN SINGLE MEASUREMENT MODE

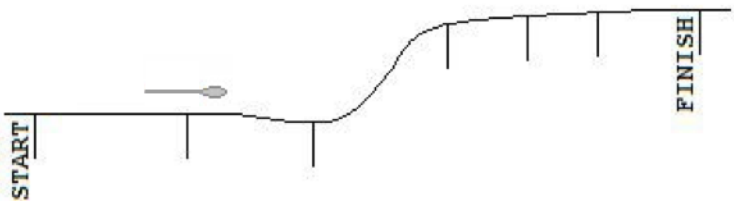
1. Go to track beginning (any position you like).



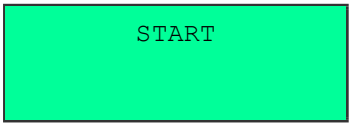
2. Press the ACTION button to make a measurement.



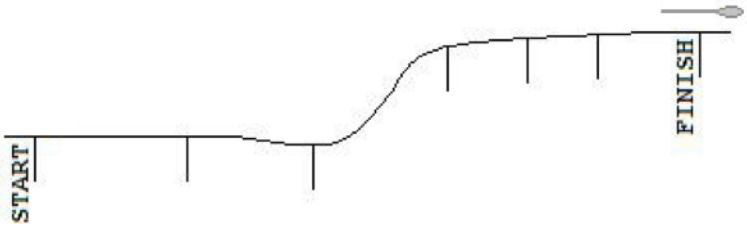
3. Go to the next position (any position you like).

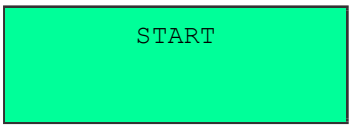


4. Press the ACTION button to make a measurement.



5. Repeat items 3 and 4 as many times as you like.

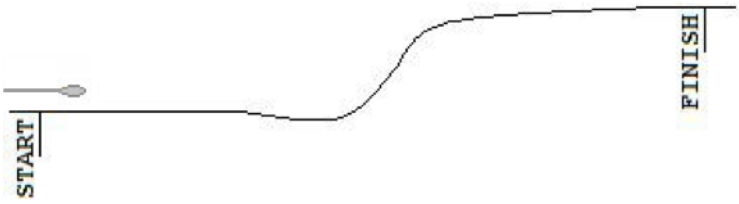




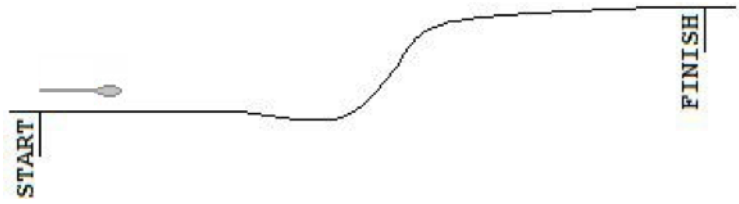
6. Completed. Accept, retry or cancel track scanning.

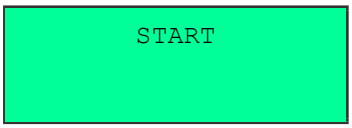
GPS / EXTERNAL GPS NAVIGATION IN CONTINUOUS MEASUREMENT MODE

1. Go to track beginning (any position you like).

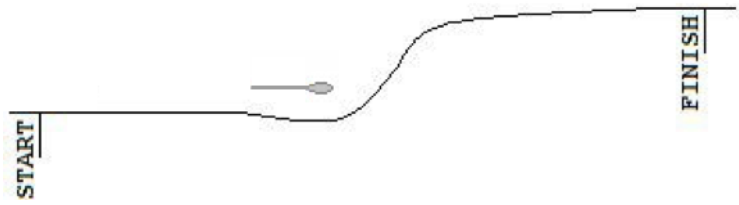


2. Press the ACTION button to start continuous measurement.

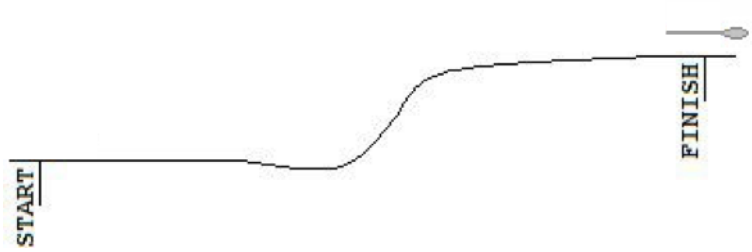


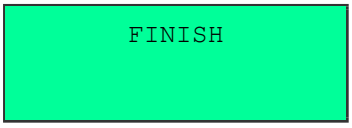


3. Keep going along the track.

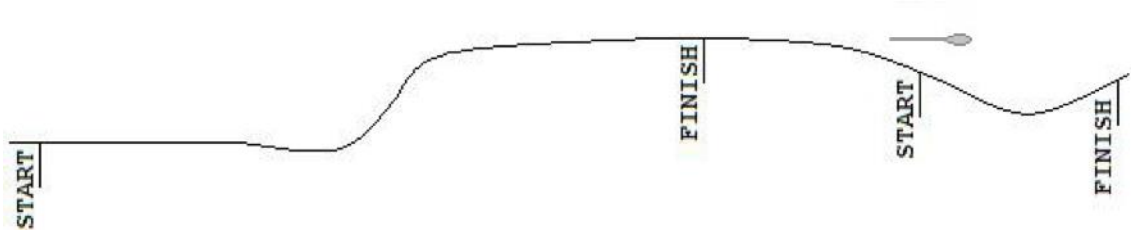


4. Press the ACTION button at the end of the track (any position you like) to finish continuous measurement.





5. Press the ACTION button to resume continuous measurement at any position you like.



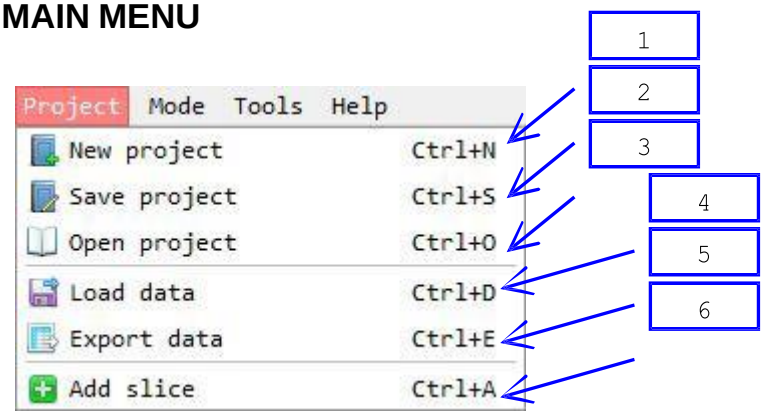
6. Completed. Accept, retry or cancel track scanning.

PC SOFTWARE

iiSystem

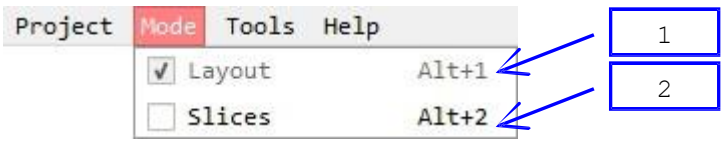
for preview and export QZond measurement data

MAIN MENU

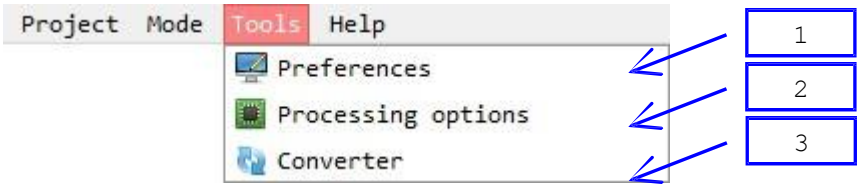


1. Create a new project.
2. Save current project.
3. Open a saved project.
4. Add data from the QZS file to the current project[1].
5. Export current project data to other formats.
6. Add data slice[2].

[1] This option is available in LAYOUT mode. [2] This option is available in SLICES mode.

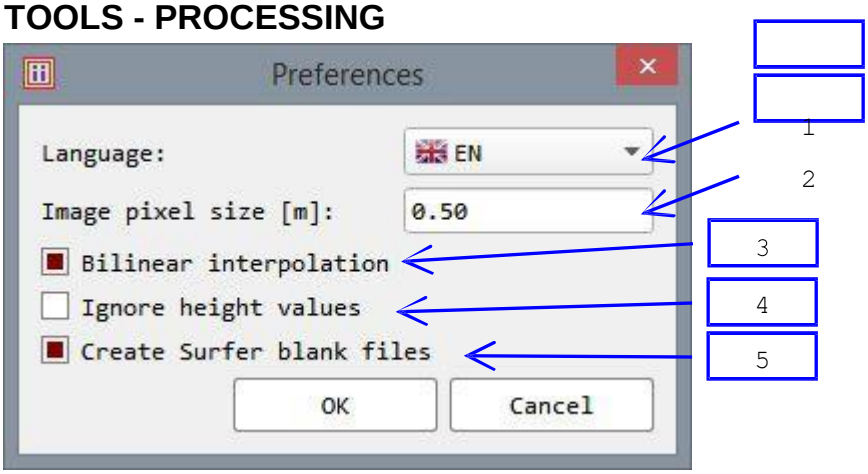


1. Use LAYOUT mode to add, remove, enable, disable and arrange tracks.
2. Use SLICES mode to view data as horizontal and vertical slices.

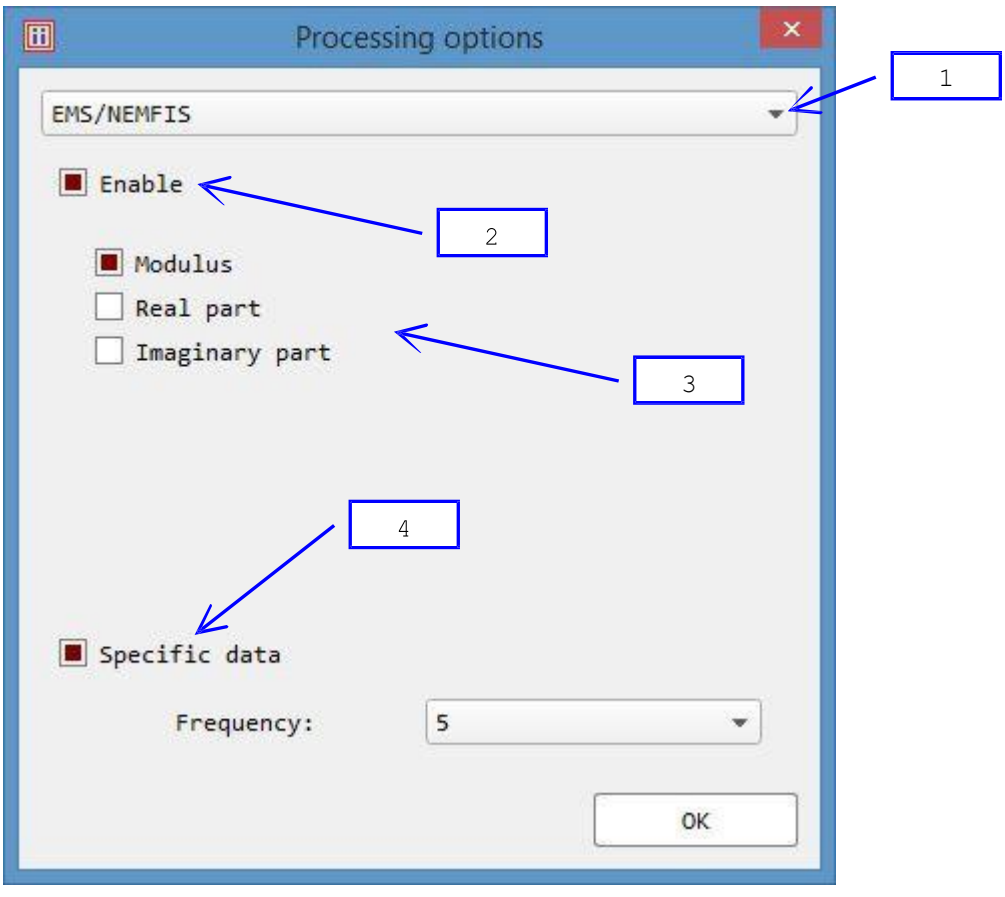


1. General preferences[1].
2. Probe-specific data processing options[1].
3. *.QZS to *.EMS converter. Choose a file to convert. [1] This option is available in LAYOUT mode only for AEMP-14 devices.

TOOLS - PROCESSING

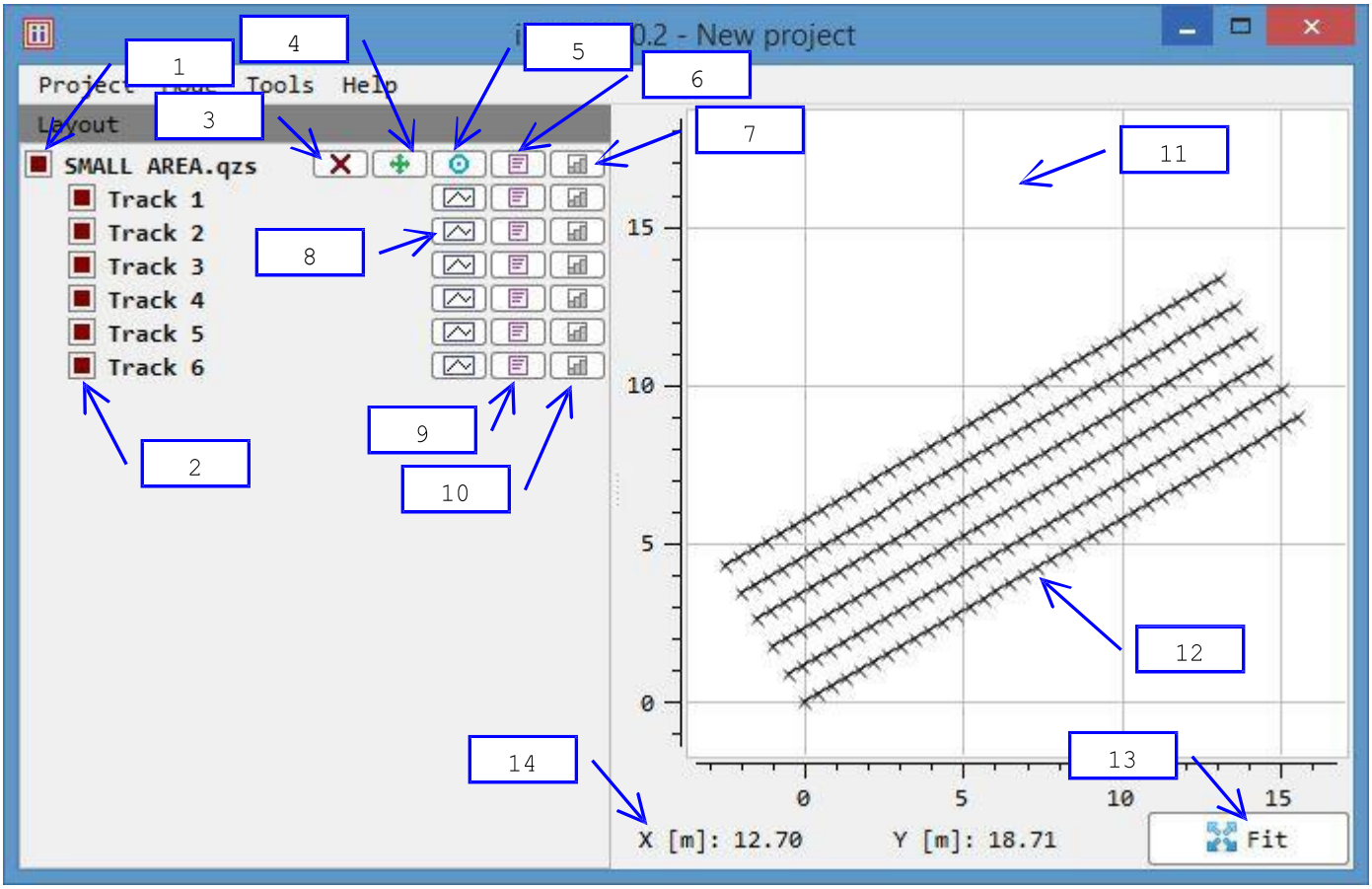


1. User interface language[1].
2. Smaller values cause higher slices resolution and longer computation.
3. Bilinear interpolation causes higher image quality.
4. Assume that surface is flat.
5. Create BLN files when exporting to Surfer format. [1] Restart iiSystem to apply.



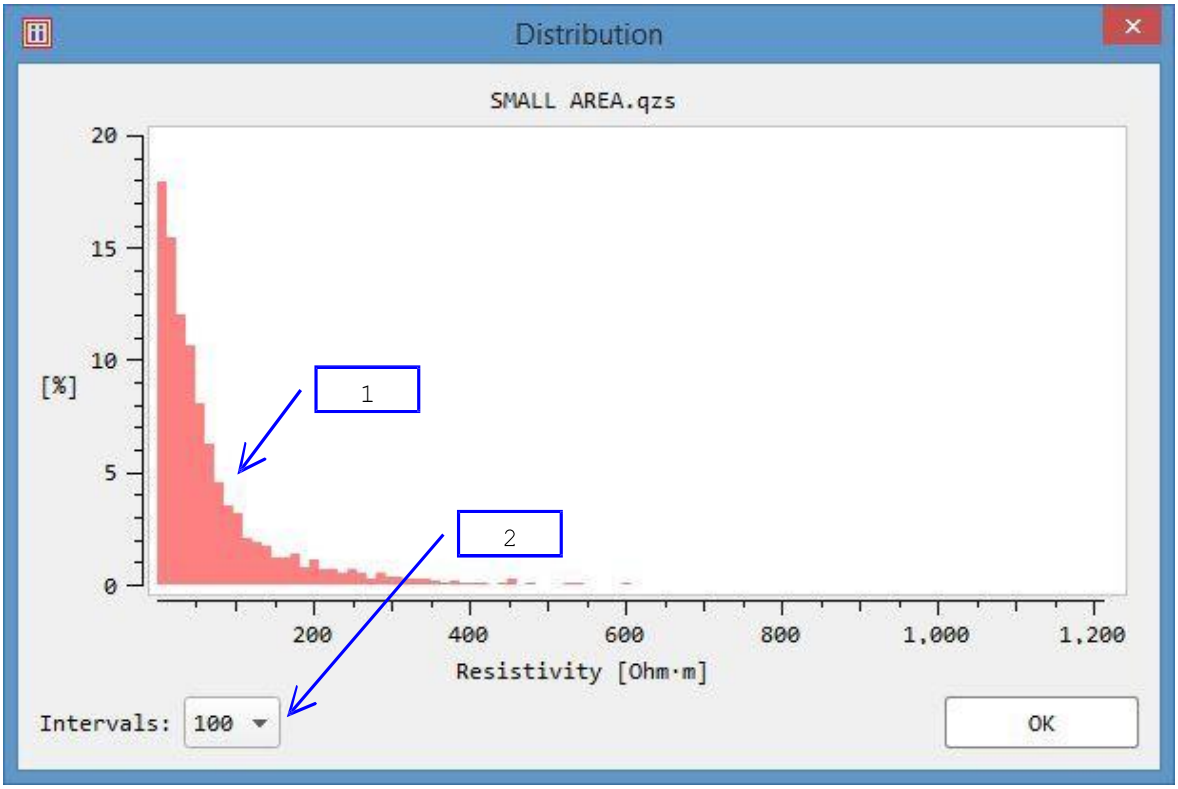
1. Choose probe.
2. Check to enable probe data.
3. Probe-specific data processing options.
4. Check to enable specific data only.

LAYOUT

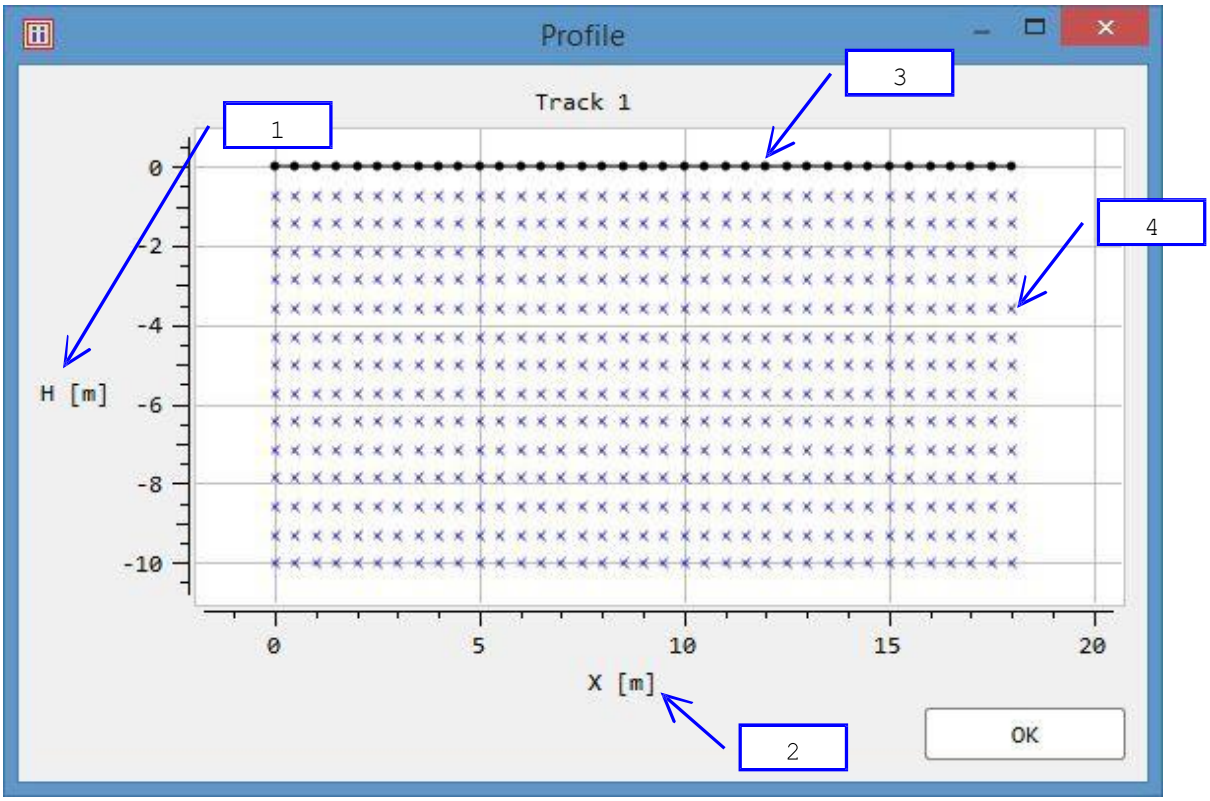


1. QZS file “SMALL AREA” is enabled.
2. QZS file “SMALL AREA” contains 6 tracks. All tracks are enabled.
3. Remove file.
4. Move all file tracks.
5. Rotate all file tracks around its first track beginning.
6. View file info.
7. View file resistivity bar chart.
8. View track profile.
9. View track info.
10. View track resistivity bar chart.
11. Map plot. Use the left mouse button to pan and mouse wheel to zoom.
12. Tracks. Every measurement position is marked with the “x” symbol.
13. Fit all tracks in map plot.
14. Current mouse pointer coordinates.

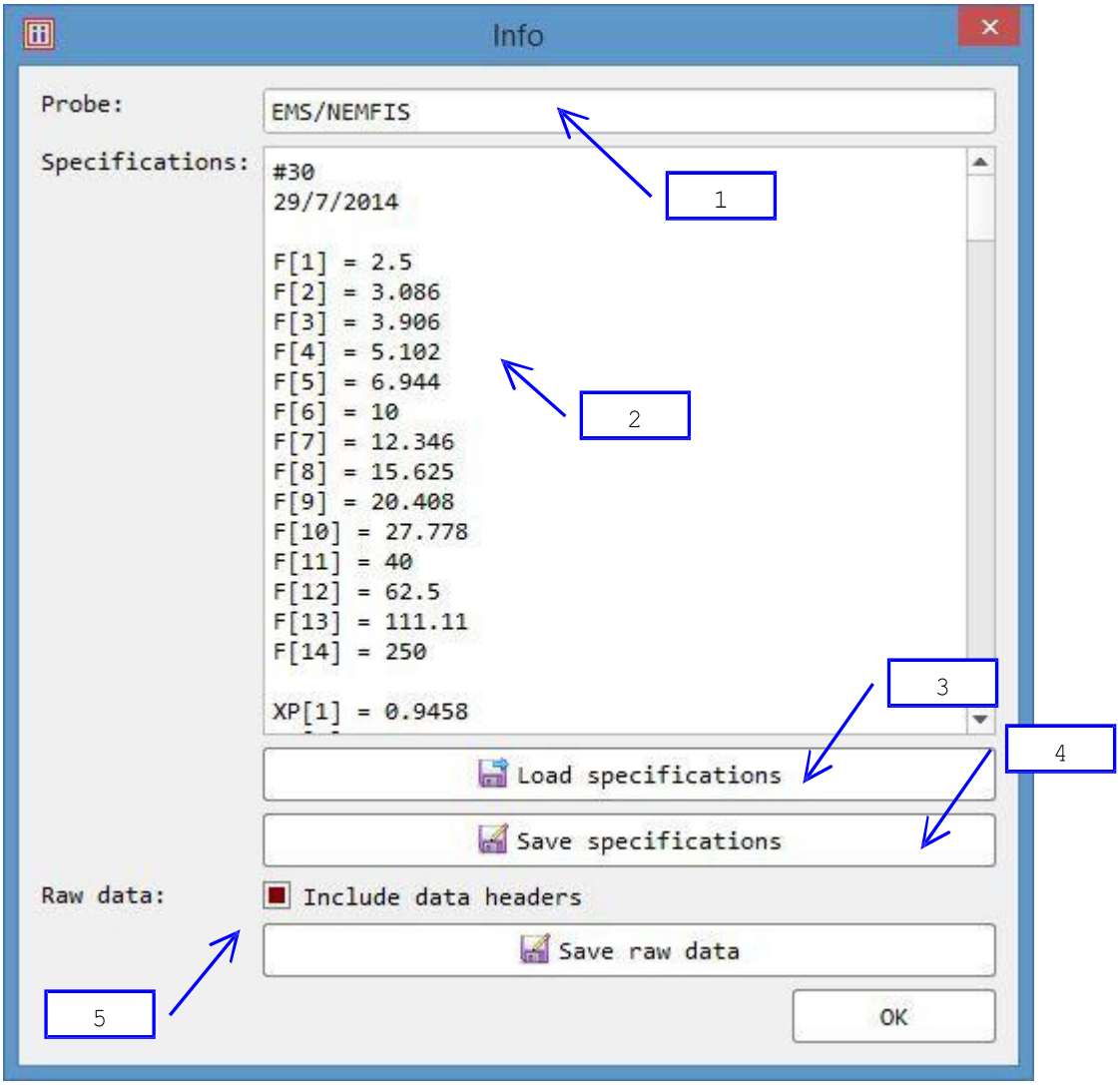
TRACK



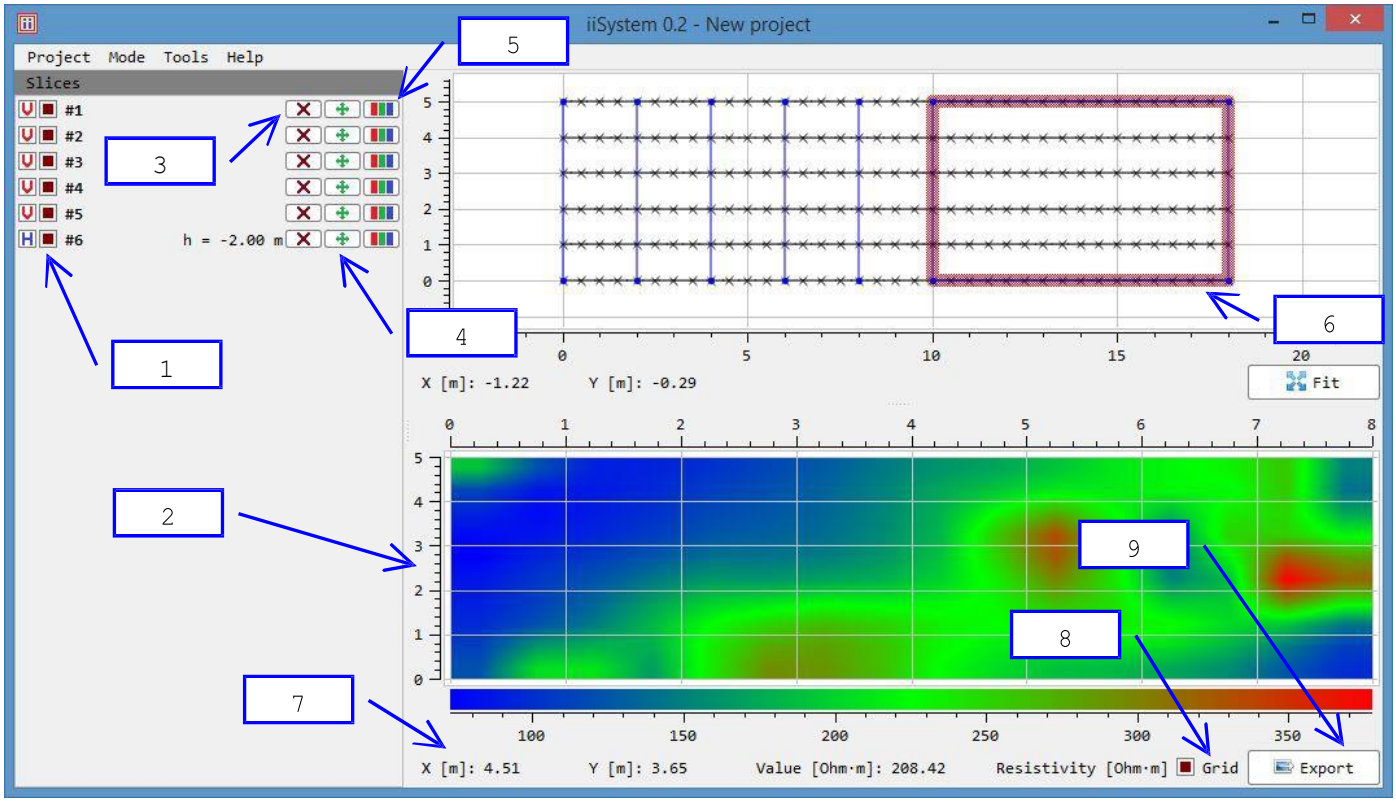
1. Bar chart.
2. Chart bars count.



1. Height.
2. Horizontal position.
3. Every measurement position is marked with the “o” symbol.
4. Every measurement is marked with an “x” symbol.



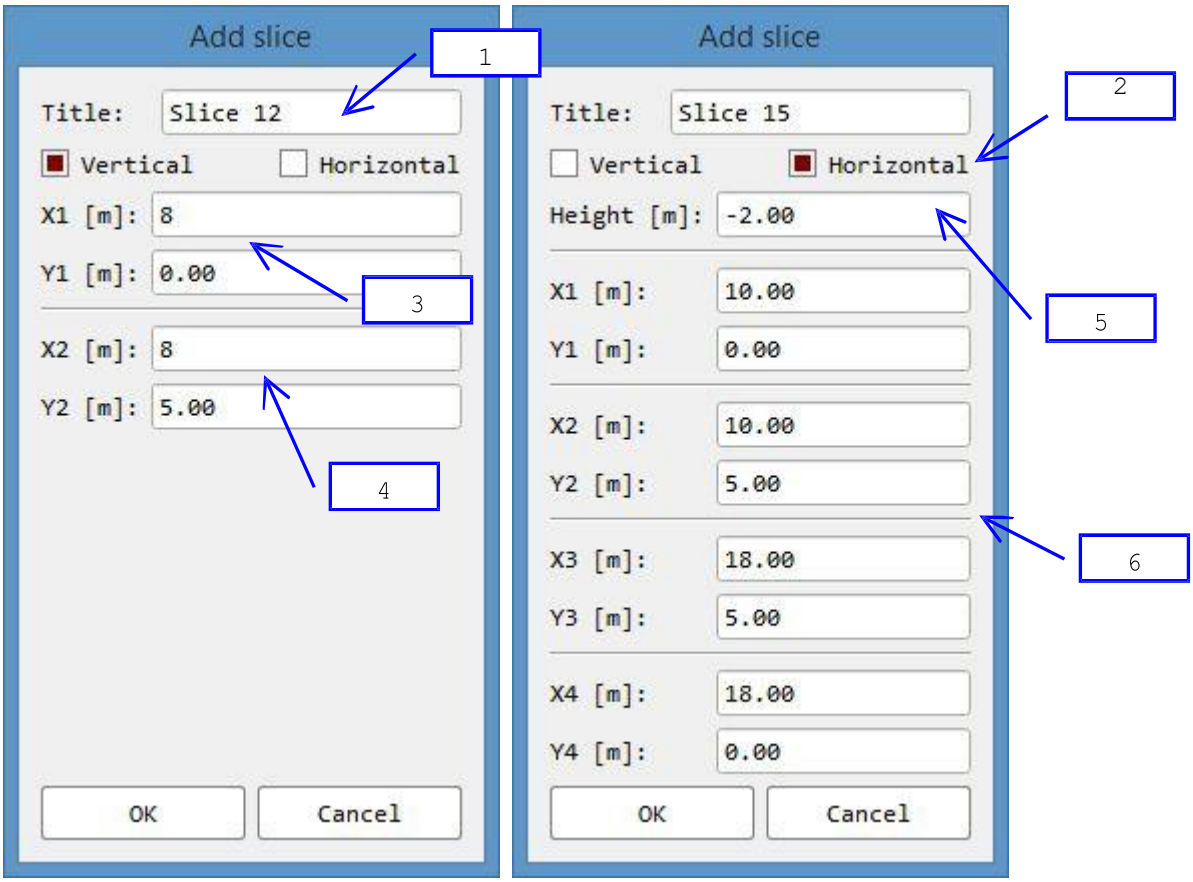
1. The probe used to scan track.
2. Probe specifications.
3. Replace current probe specifications with other ones.
4. Save current probe specifications.
5. Save probe raw data to the table.



1. Project contains 6 slices. Slices #1 ... #5 are vertical[1], slice #6 is horizontal[1] at height -2.0[2] m. All slices are shown as blue figures.
2. Slice view plot.
3. Remove slice.
4. Move slice.
5. View slice.
6. Horizontal slice #6 is currently shown.
7. Current mouse pointer coordinates and resistivity value.
8. Show grid.
9. Export current image to other formats.

[1] V = vertical, H = horizontal.

[2] In this project, all tracks do not contain height data, so the surface is located at the height 0.0 m.



1. Slice title.
2. Slice orientation.
3. Vertical slice beginning coordinates.
4. Vertical slice ending coordinates.
5. Horizontal slice height.
6. Horizontal slice corner coordinates.