



SibER

MULTI-ELECTRODE RESISTIVITY & INDUCED POLARIZATION IMAGING INSTRUMENT

— USER'S GUIDE —

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— 1. INSTRUMENT PURPOSE —

“SibER”, the multi-electrode instrument, is intended for running geo-electrical surveys by resistivity method and induced polarization method using electrical imaging technique (EI), vertical electrical sounding technique (VES) and electrical tomography technique (ET).

It is supposed that user who reads this guide knows electrical survey basics of resistivity and induced polarization methods.

— 2. COMPLETE SET —

Element	Quantity
“SibER” instrument	1
Safety fuses ^[1]	2
Charger ^[2]	1
USB wire	1
Compact disc ^[3]	1
Multi-node cables for 48 electrodes ^[4]	2
Wires for connecting external battery	2
User’s guide ^[5]	1
Electrodes	50
Electrode connectors	50

[1] Rated current operation 20 A, L = 30 mm, \varnothing = 6 mm.

[2] Device specification: 230 V AC, 50 Hz / 13.8 V, 600 mA DC.

[3] See “Compact disc”.

[4] The default spacing between adjacent nodes on the cable is 5 meters. However, the spacing may be changed if necessary. There are two variants of cables: "Standard" and "Economy".

[5] This very document.

[6] The tables contain information about measurement durations in various modes and depths of investigation for different measuring array types.



"SibER" instrument



Safety fuse



Charger



USB wire



Compact disc



Multi-node cable "Standard"



Multi-node cable "Economy"



Wires for connecting external battery



User's guide



Electrodes



Electrode connector

— 3. COMPACT DISC —

Path	Object
/software/geotomo	Data inversion and modeling software by Geotomo Software
/software/siber.tools	SibER TOOLS ^[1] software distribution
/software/acrobat.reader	Adobe Acrobat Reader 9.3 software distribution for reading documents in PDF format
/doc	User's guide (copy of this very document) and reference tables
/backup	Backup of folders and system files of "SibER" instrument ^[2]

[1] See "Description of SibER TOOLS software".

[2] In order to restore the system files, copy the contents of the directory /backup (folders /dat, /etc, /seq) to the file system root of "SibER" instrument. In case of compact disc loss contact with technical support via E-Mail (see "Feedback").

— 4. TECHNICAL SPECIFICATIONS —

General	
Number of electrodes	up to 50 ^[1]
Dimensions (W x H x D)	42 x 34 x 23 cm
Weight	11 kg
Internal memory	up to 2 Gb ^[2]
Internal battery	12 V, 7 Ah
External supply	12 V
Display	5", 240 x 128
PC communication	USB
Protection rating	IP 67 ^[3]
Operation temperature	-20 ÷ +40 C

Transmitter	
Output current	1 ÷ 2000 mA
Maximum voltage	500 V
Maximum power	200 W
Current measurement accuracy	1 %
Short circuit protection	yes

Receiver	
Impedance	10 MOhm
Input voltage	0.1 mV ÷ 250 V
ADC	24 bit
Voltage measurement accuracy	1 %
Number of measuring channels	1
Surge protection	up to 1 kV

[1] In case of using two multi-node cables (included in complete set) with 24 nodes in each. It is possible to use 1 or 2 remote electrodes for Pole-Dipole and Pole-Pole arrays respectively. Cables for remote electrodes are sold separately.

[2] Depends on installed memory card of the instrument. One measurement takes up to 30 bytes.

[3] With the lid closed and latched.

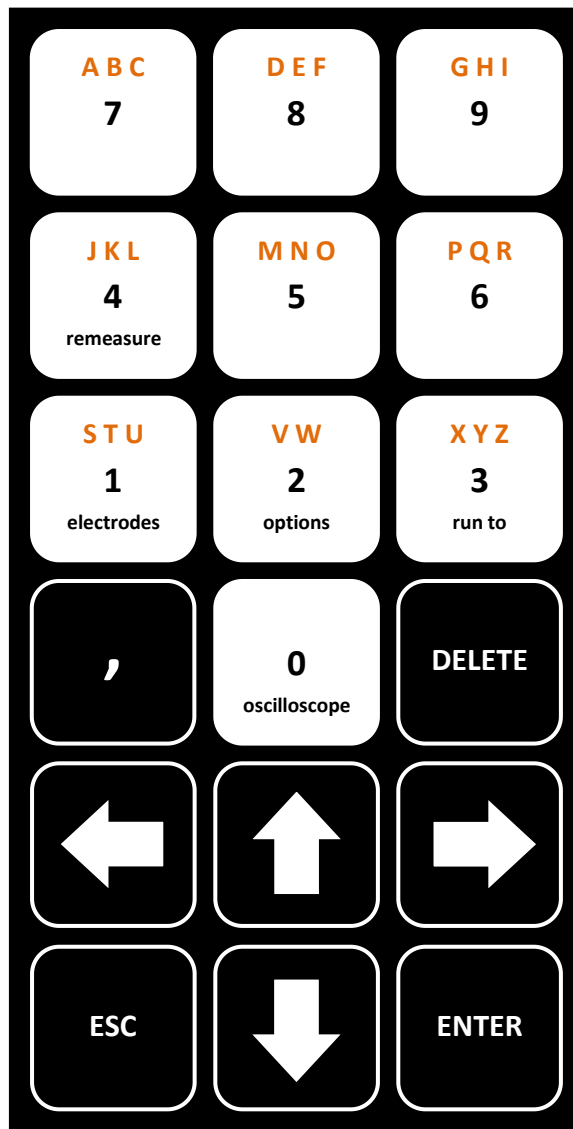
— 5. FRONT PANEL —



- [1] Indicator lights during transmitter operation.
- [2] Carries on and off the power from the internal battery.
- [3] Under no circumstances do not touch these terminals regardless of the instrument measurement mode because of electric shock danger.
- [4] External switching units are not included in complete set.

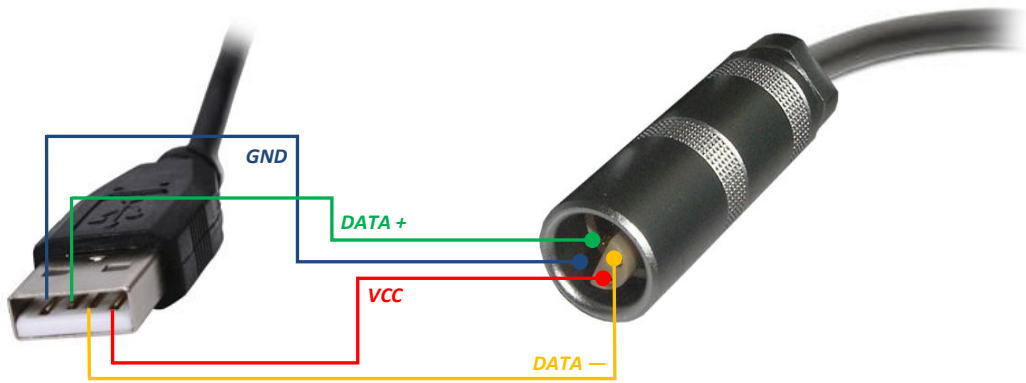
— 6. KEYBOARD —

The appearance of the keyboard may differ from the below image for different instances of the instrument, but its function keys correspond to this example.

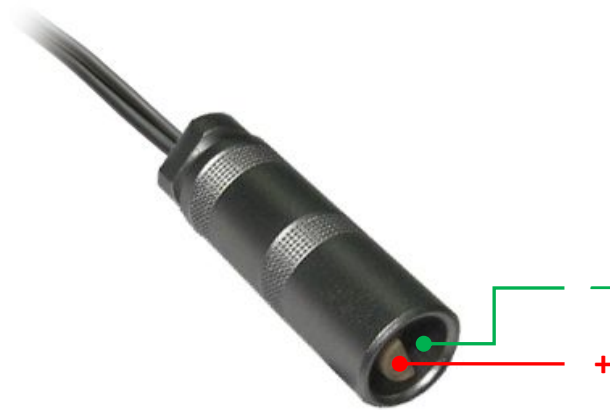


— 7. CONNECTORS —

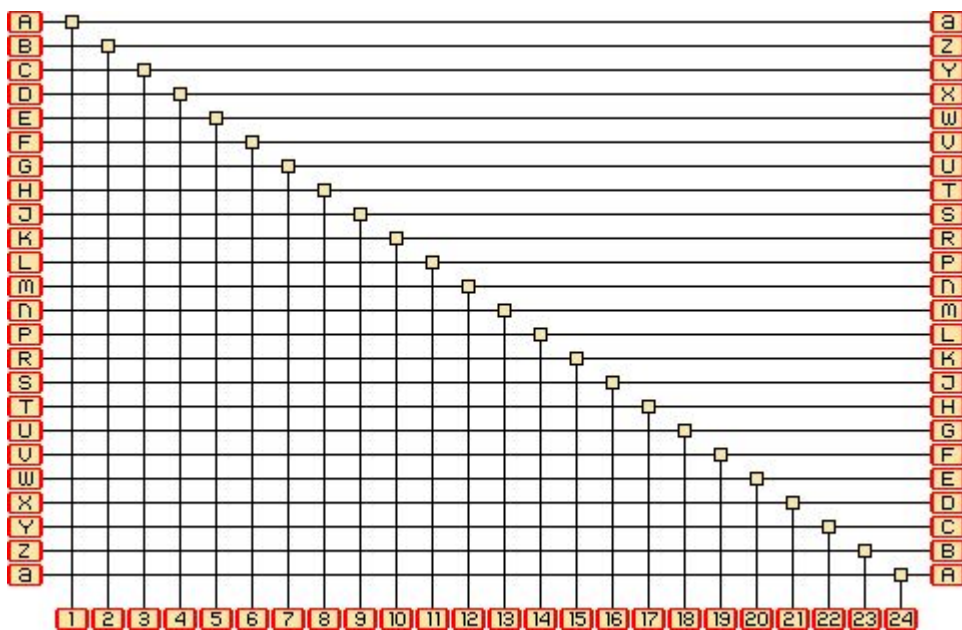
USB wire



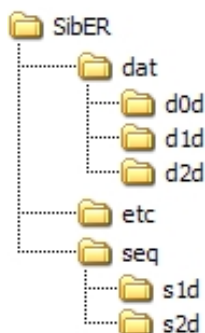
Charger



Multi-node cable



— 8. "SIBER" DIRECTORY STRUCTURE —



There are data files D0D, D1D and D2D in folders /dat/d0d, /dat/d1d, /dat/d2d respectively. Files D0D are used in operation mode "Instant", D1D are used in operation mode "Manual", D2D are used in operation mode "Automatic" (see "Operation modes").

Folder /etc is system. To avoid problems with the use of instrument it is imperatively advised not to delete or modify files in this directory. If this happens, it is possible to restore the contents from the attached backup on a compact disc included to complete set (see "Compact disc").

Folders /seq/s1d and /seq/s2d contain templates for work in "Manual" and "Automatic" modes, respectively. In order to use pre-created template, it must be written to the appropriate directory of the instrument memory.

File names without an extension should not exceed 8 characters. Valid characters are the 26 letters of the Roman alphabet (in any case), the underscore character "_" and the numbers 0...9. Other characters, including space, are not permitted.

When "SibER" is connected to a PC, internal memory of the instrument is recognized as an external storage drive. There is no need to install any special drivers. Internal memory can be up to 4 GB depending on installed memory card of the instrument. Try not use the instrument internal memory for storage of extraneous information and not to store large number of files due to the fact that their search can be time-consuming.

Despite the fact that the instrument has a modern system of data storage and protection against data loss when power cliffs, it is recommended to backup your data as soon as possible and to complete the measurement process correctly, i.e. turn off the instrument after exiting to main menu only (see "Description of user interface").

— 9. TRANSMITTER AND RECEIVER OPTIONS—

Configurable parameters of the instrument's transmitter and receiver are described below. Further in this document when referring to these parameters it refers to the following characteristics:

Title	Units	Description	Values
Standard deviation	%	relative standard deviation ^[1]	1 ÷ 50
Minimum stacking	—	minimum number of measurement repeats ^[2]	1 ÷ 30 ^[3]
Maximum stacking	—	maximum number of measurement repeats ^[2]	1 ÷ 30 ^[3]
Induced polarization	ms	inducted polarization mode (IP)	disabled, 60 ÷ 320 ^[4]
Transmitter power	%	power of transmitter	1 ÷ 100 ^[5]

[1] Computed using the following formula:

$$\frac{\sqrt{\frac{1}{N-1} \sum_{i=1}^N (R_i - \bar{R})^2}}{\bar{R}} \times 100\%,$$

where N – number of measurement repeat, R_i – selective value of electrical resistivity, \bar{R} - selective average value of electrical resistivity. This value is one of the criteria for the measurement end. If $N = 1$, this value equals zero.

- [2]** The system performs at least “Minimum stacking” and not more than “Maximum stacking” measurements. After each measurement the current value of the relative standard deviation is calculated, which is then compared with the required. If the current value is not more than desired, the measurement ends.
- [3]** If “Minimum stacking” = 1 and “Maximum stacking” > 1, then “Minimum stacking” = 2 automatically. Exact number of repeats can be achieved by equating the values of “Minimum stacking” and “Maximum stacking”.
- [4]** A set of fixed values “T”. Supply pulse duration is 500 ms in IP mode. After switching off the current the system makes a pause of 20 ms, which is then followed by a recording the integral value under the IP curve during period “T”. Status “disabled” means that this mode is turned off. Enabling of induced polarization mode greatly increases the measurement time.
- [5]** A set of fixed values.

— 10. USAGE OF “SIBER” —

10.1 Operation modes

Instant

This mode is designed for EI and other works. In “Instant” mode the internal switching unit is not used. It means that the current electrodes should be connected to the red terminals of transmitter line C (A, B/ ∞) on the front panel; the potential electrodes should be connected to the black terminals of receiver line P (M, N/ ∞). Multi-node cables connecting to the sockets “Cable 1 - 24” and “Cable 25 - 48” will not work.

The geometry of the measuring array is not defined for the device, i.e. the system will not record any information about the relative positions of current and potential electrodes and will not calculate the apparent resistivity. Number of measurements recorded in one data file also remains undetermined. So, in this mode the sequence of measurements and their meaning is defined completely by the user.

In “Instant” mode it is needed to start every measurement manually, since the working process involves manual transposition of current and potential electrodes.

Manual

Operation mode “Manual” is designed for VES. A switching unit is not used, as well as in “Instant” mode.

This operation mode requires S1D template which contains information about the measuring array type and the geometry of measuring arrays used for VES, composing this measurement set (a measurement set refers to data from one point of sounding recordings). Thus, the number of measurements is determined by the number of entries in the template, and the calculation of the apparent resistivity value is based on the geometry of the used measuring array.

S1D template can be created with SibER TOOLS software or by the instrument. However it is recommended to give preference to SibER TOOLS due to its convenience.

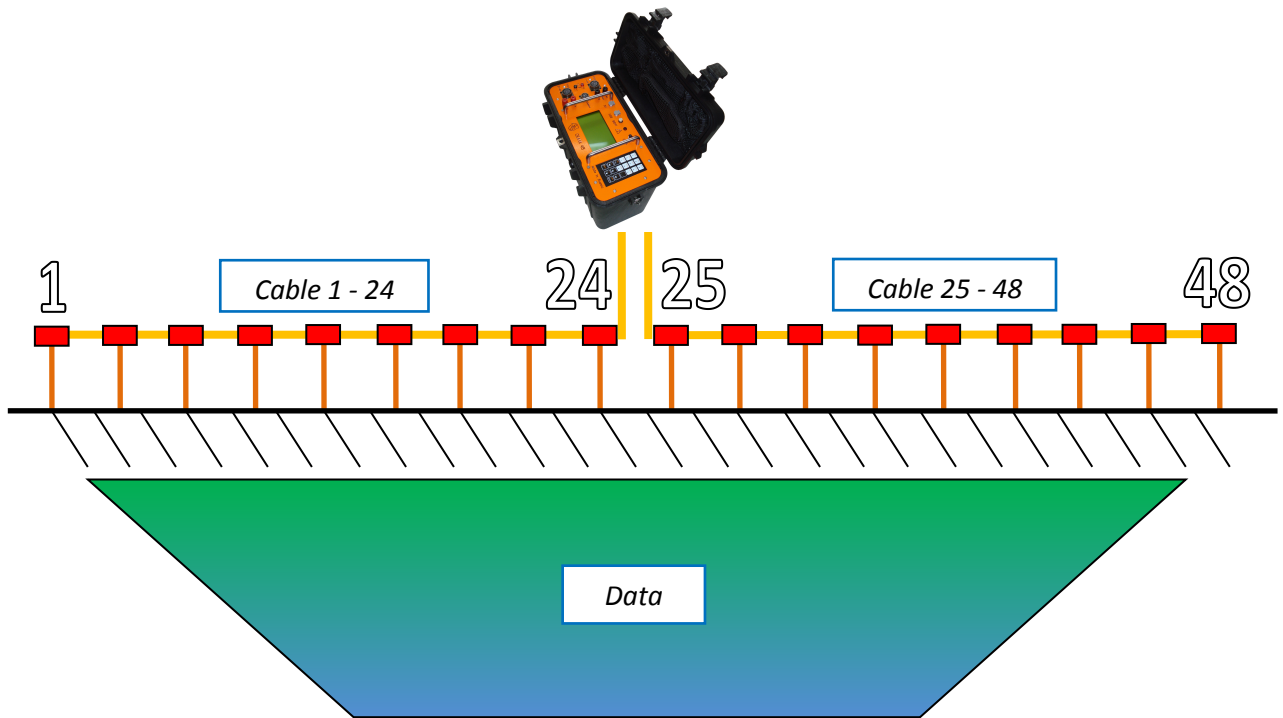
In “Manual” mode it is needed to start every measurement manually, since the working process involves manual transposition of current and potential electrodes.

Automatic

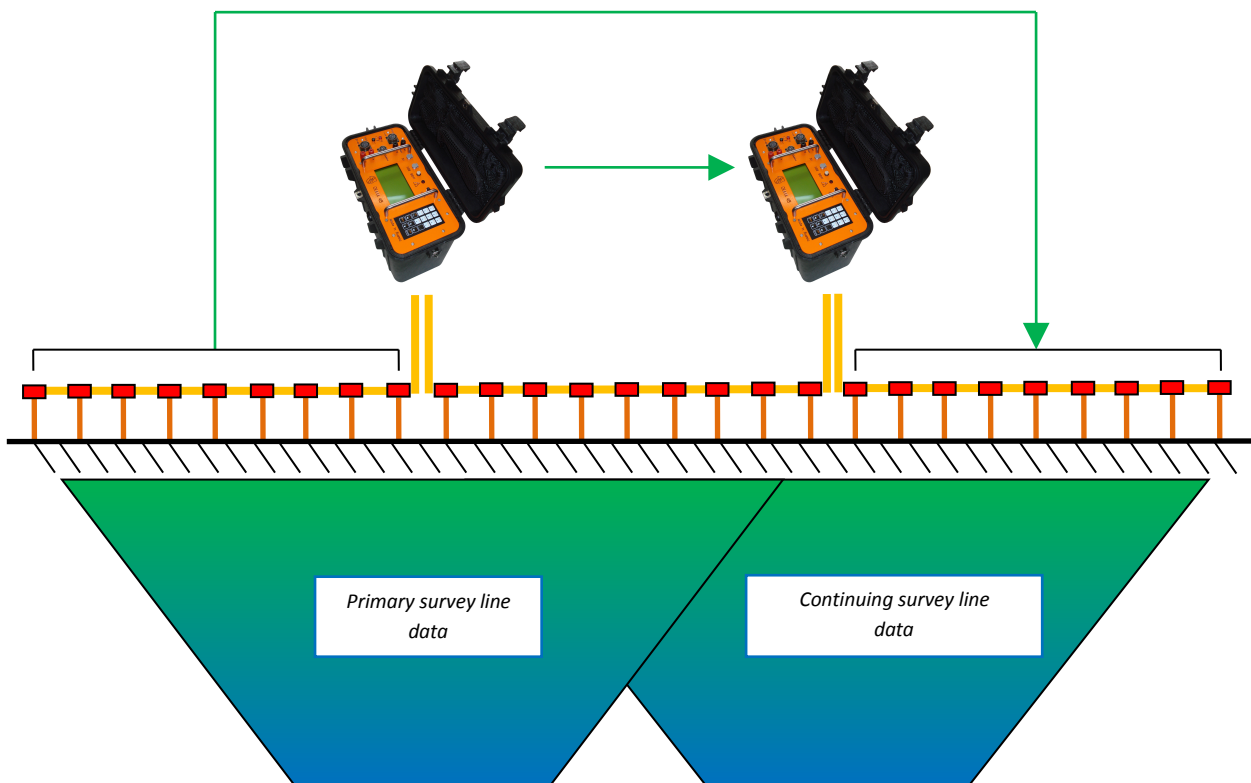
Operation mode “Automatic” is designed for ET. This operation mode uses internal switching unit in contrast to the operation modes “Instant” and “Manual”. It means that measurement requires multi-node cables, that are connecting to the sockets “Cable 1 – 24” and “Cable 25 – 48”. However terminals (A, B/ ∞) and (M, N/ ∞) and external switching unit socket are also used in parallel with current and potential electrodes of multi-node cables. Under no circumstances do not touch these terminals during instrument operating because of electric shock danger.

Electrodes numeration starts from distant electrode of “Cable 1 – 24” and ends with distant electrode of “Cable 25 – 48”. It is important to ensure that cables alignment is correct because of possible mistake in data processing.

Standard work plan involves the use of one or two multi-node cables, which connect the electrodes putted in a line with equal spacing between adjacent electrodes. This spacing must be known for data processing and accurately declared in the used template S2D (see “Description of ET schemes”).



In case of using two cables besides standard measuring scheme it's possible to apply continuing survey line scheme ("roll along") moving first cable of previous arrangement to the place of second cable in next one. This feature is available due to connectors on both ends of cables. Every further arrangement captures following segment of survey section. Data obtained this way can be processed as one long survey line. It is important to ensure that alignment of continuing cable is correct: 25th electrode of previous arrangement must be first in next one.



Operation mode “Automatic” requires S2D template, which contains information about the type of measuring array, the number of electrodes, the spacing between adjacent electrodes and the geometry of the measuring arrays composing measurement set. Thus, the number of measurements is determined by the number of entries in the template, the computation of the apparent resistivity is based on the geometry of the measuring array and information about the placement of electrodes used in this measurement set.

Template for standard measuring scheme has parameter “Sequence Type = Single” and called primary. Template for continuing measurement has parameter “Sequence Type = Roll Along”. Continuing survey measurement scheme requires both of them: the primary template (used only in the beginning of the survey line) and the corresponding continuing template (used repeatedly after the primary one). Correspondence is the identity of all parameters, except for the parameter “Sequence Type”.

S2D template can be created with SibER TOOLS software or by the instrument. However it is recommended to give preference to SibER TOOLS due to its convenience.

In “Automatic” mode measurements run automatically, since the working process does not imply manual transposition of current and potential electrodes.

10.2 Description of VES schemes

Introductory remarks

This document will refer to the terms “length of measuring line” and “measuring array span”. The first term means distance between grounded potential electrodes M and N, the second one means defined for each measuring array distance between the specific points of its geometry, which size determines the sounding depth.

Measuring scheme for VES is composed of measuring arrays of a certain type. Thus, first of all, the type of measuring array should be determined (parameter “Array Type”). Parameter “Increment Type”, which is common for measuring scheme, characterizes the change in measuring array span and can take one of two values: “Linear” (linear increase) or “Geometric” (geometric increase).

All measuring arrays included in the scheme are divided into several groups (their number is defined by parameter “MN count”, 4 groups are maximum). The difference between groups is in the length of receiver lines. Each group of arrays is built according to certain rules based on several individual for it parameters:

- “Spacing”. This parameter is used to scale the geometry of the measuring array. Unit: meter.
- “Spacing Count”. The parameter specifies the number of measuring arrays in this group, including first one.
- “Increment / Factor”. This parameter characterizes the value growth of measuring array span. Linear increase in the span uses the name “Increment” (unit: meter), geometric increase uses the name “Factor” (dimensionless unit).

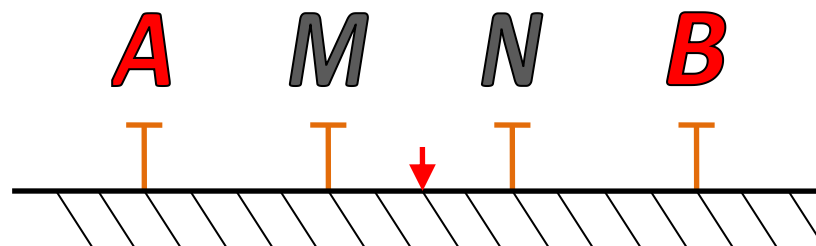
- “**Overlap Count**”. Setting “Overlap Count” value equal to, for example, N, we make the last N spans of the previous group to become the first N for the next. It means first N (nonzero) arrays are built “without rules” and (N+1)-th and subsequent arrays are built as expected. Obviously, N can not be greater than the number of arrays in the previous group. The meaning of this parameter is to provide “overlap” measurements with arrays with the same span, but with the different length of receiver lines.

It should be noted that for the Wenner and Pole-Pole arrays only one group in the scheme of observations allowed. It is caused by their geometry, which allows building a set with any span, using only one group parameters.

A set of arrays of a given type can be described by listing the values of two parameters named “P.1” and “P.2”. Each array in the set corresponds to one pair of its values.

Further on the schemes red arrow shows the record point of array, also called the sounding center. “SibER” instrument locates in this point during measurement. If the distance from the record point to the right and left is counted, the values of the parameters of P.1 and P.2 help to determine at what distance electrodes should be grounded.

Wenner Alpha array

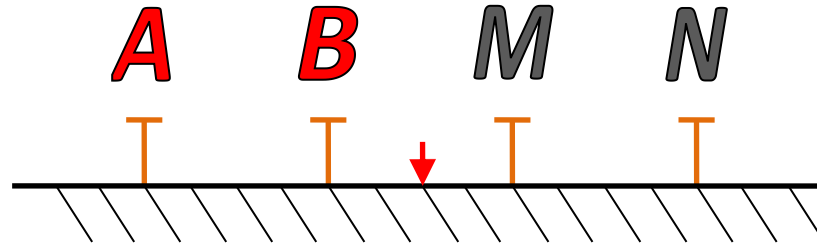


P.1	P.2	Span	Record point	Specifications
AB/2	MN/2	AB	MN center	AM = MN = NB = Q

$$AB_j = \begin{cases} 3 \times Spacing + (j - 1) \times Increment \\ 3 \times Spacing \times Factor^j \end{cases}, j \in [1, Spacing.Count]$$

$$Q_j = \frac{1}{3} \times AB_j$$

Wenner Beta array

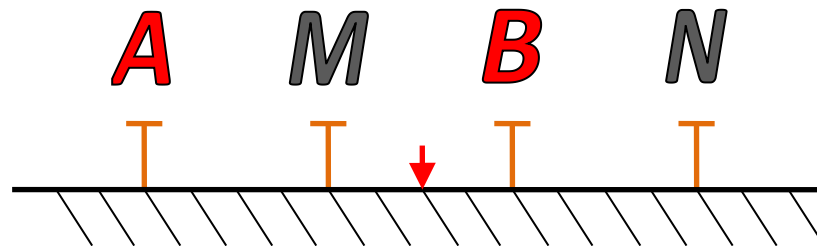


P.1	P.2	Span	Record point	Specifications
AN/2	BM/2	AN	BM center	AB = BM = MN = Q

$$AN_j = \begin{cases} 3 \times \text{Spacing} + (j - 1) \times \text{Increment} \\ 3 \times \text{Spacing} \times \text{Factor}^j \end{cases}, j \in [1, \text{Spacing.Count}]$$

$$Q_j = \frac{1}{3} \times AN_j$$

Wenner Gamma array

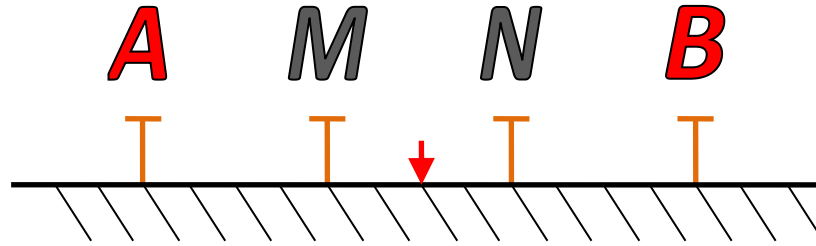


P.1	P.2	Span	Record point	Specifications
AN/2	MB/2	AN	MB center	AM = MB = BN = Q

$$AN_j = \begin{cases} 3 \times \text{Spacing} + (j - 1) \times \text{Increment} \\ 3 \times \text{Spacing} \times \text{Factor}^j \end{cases}, j \in [1, \text{Spacing.Count}]$$

$$Q_j = \frac{1}{3} \times AN_j$$

Schlumberger array



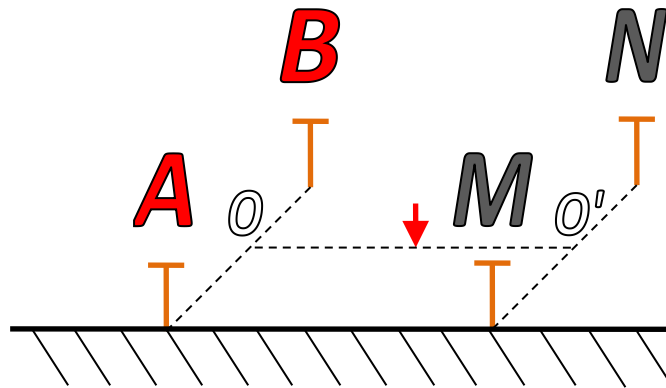
P.1	P.2	Span	Record point	Specifications
AB/2	MN/2	AB	MN center	AM = NB = Q, Q ≥ MN

$$AB_j = \begin{cases} 3 \times Spacing + (j - 1) \times Increment \\ 3 \times Spacing \times Factor^j \end{cases}, j \in [1, Spacing.Count]$$

$$MN_j = Spacing$$

Equatorial Dipole-Dipole array

Segment OO' connects centers of current dipole (AB) and potential dipole (MN).



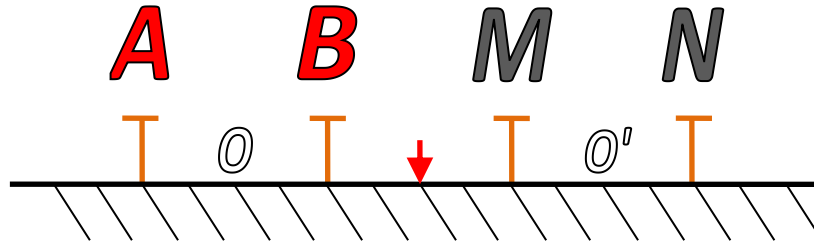
P.1	P.2	Span	Record point	Specifications
OO'/2	MN/2	OO'	OO' center	AB = MN = Q, OO' ≥ Q

$$OO'_j = \begin{cases} Spacing + (j - 1) \times Increment \\ Spacing \times Factor^j \end{cases}, j \in [1, Spacing.Count]$$

$$Q_j = Spacing$$

Inline Dipole-Dipole array

Segment OO' connects centers of current dipole (AB) and potential dipole (MN).



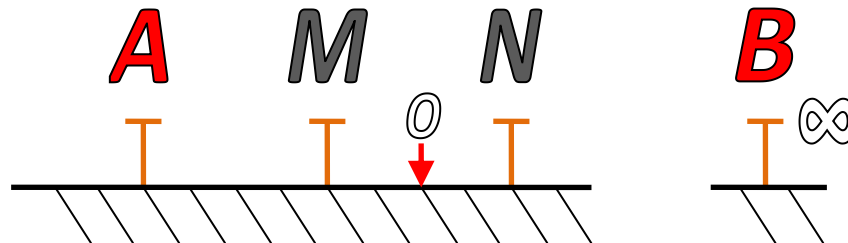
P.1	P.2	Span	Record point	Specifications
AN/2	BM/2	OO'	центр OO'	AB = MN = Q, OO' ≥ 2Q

$$OO_j = \begin{cases} 2 \times Spacing + (j - 1) \times Increment \\ 2 \times Spacing \times Factor^j \end{cases}, j \in [1, Spacing.Count]$$

$$Q_j = Spacing$$

Pole-Dipole array

O is a center of potential (MN) dipole. Current electrode B is placed in infinity.



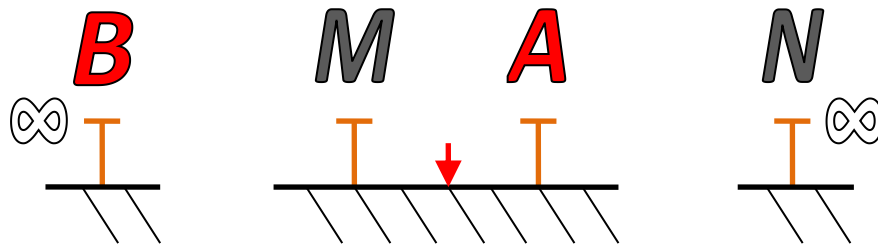
P.1	P.2	Span	Record point	Specifications
AO	MN/2	AO	MN center	AO ≥ 1.5 MN

$$AO_j = \begin{cases} \frac{3}{2} \times Spacing + (j - 1) \times Increment \\ \frac{3}{2} \times Spacing \times Factor^j \end{cases}, j \in [1, Spacing.Count]$$

$$MN_j = Spacing$$

Pole-Pole array

Current electrode B and potential electrode N are placed in infinity.



P.1	P.2	Span	Record point	Specifications
MA	—	MA	MA center	—

$$MA_j = \begin{cases} Spacing + (j - 1) \times Increment \\ Spacing \times Factor^j \end{cases}, j \in [1, Spacing.Count]$$

10.3 Description of ET schemes

Introductory remarks

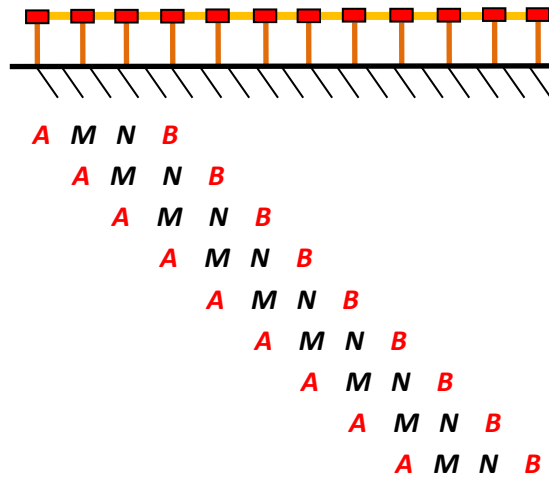
A feature of the ET method is a reuse of the same electrodes with fixed positions as current and potential. It means that the observation scheme for ET, in contrast to the VES, is a set of measuring arrays of a certain type, built on a set of fixed electrodes. Thus, first of all, we must determine the type of measuring array (parameter “**Array Type**”) and the spacing between adjacent electrodes (parameter “**Spacing (A)**”, unit: meter).

All measuring arrays included in the scheme are divided into several groups (their number is defined by parameter “**MN count**”, 4 groups are maximum). The difference between groups is in the length of receiver lines. Each group of arrays is built according to certain rules based on several individual for it parameters:

- “**Spacing (D)**”. This parameter is used to scale the geometry of the measuring array. Unit is quantity of Spacing (A).
- “**Level Count**”. This parameter characterizes the number of different spans for group set.
- “**Start Level**”. This parameter defines the least span for group arrays. Unit is quantity of Spacing (A).
- “**Level Step**”. Every (Level Step)-th span is used.

It should be noted that for the Wenner and Pole-Pole arrays only one group in the scheme of observations allowed. It is caused by their geometry, which allows building a set with any span, using only one group parameters.

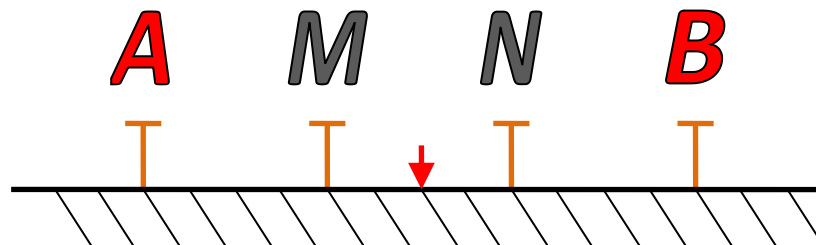
All measuring arrays corresponding to these parameters will be built using all involved electrodes, for example (Wenner Alpha array, Spacing (D) = 1 x A, Level = 1, 12 electrodes):



A set of arrays included in the scheme of observations can be described by listing the numbers of electrodes corresponding to current (A, B) and potential (M, N). Each array in the set has its own unique combination of A, B, M, N.

Next on the schemes record points are also designated by red arrows.

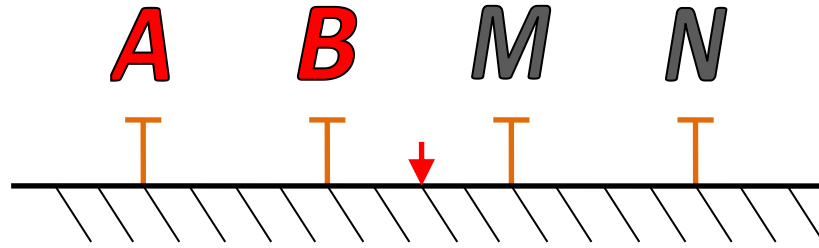
Wenner Alpha array



Span	Record point	Specifications
AB	MN center	AM = MN = NB = Q

$$Q_j = Spacing.(D) + j - 1, j \in [Start.level, Start.Level + Level.Count]$$

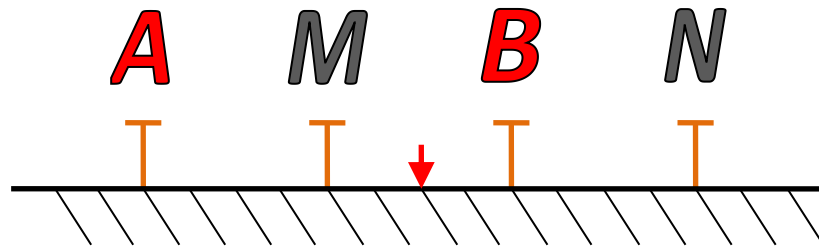
Wenner Beta array



Span	Record point	Specifications
AN	BM center	AB = BM = MN = Q

$$Q_j = \text{Spacing} \cdot (D) + j - 1, j \in [\text{Start.Level}, \text{Start.Level} + \text{Level.Count}]$$

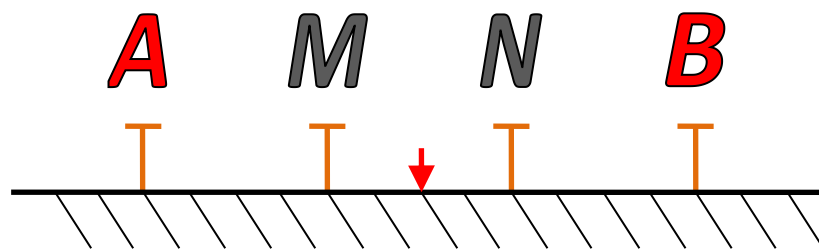
Wenner Gamma array



Span	Record point	Specifications
AN	MB center	AM = MB = BN = Q

$$Q_j = \text{Spacing} \cdot (D) + j - 1, j \in [\text{Start.Level}, \text{Start.Level} + \text{Level.Count}]$$

Schlumberger array



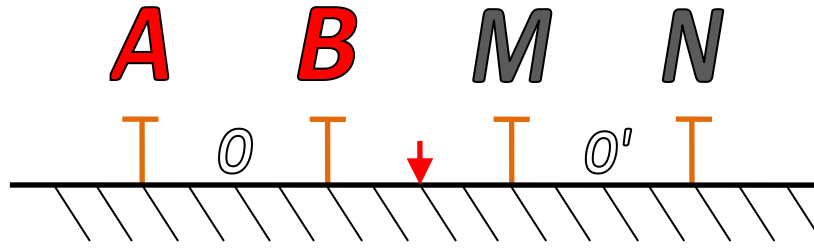
Span	Record point	Specifications
AB	MN center	AM = NB = Q, Q ≥ MN

$$AB_j = 3 \times \text{Spacing} \cdot (D) + 2 \times (j - 1), j \in [\text{Start.Level}, \text{Start.Level} + \text{Level.Count}]$$

$$MN_j = \text{Spacing} \cdot (D)$$

Inline Dipole-Dipole array

Segment OO' connects centers of current dipole (AB) and potential dipole (MN).



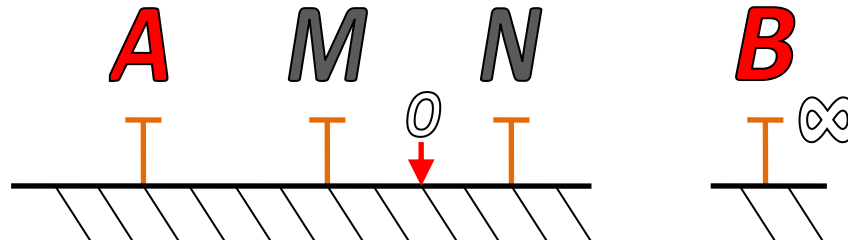
Span	Record point	Specifications
OO'	BM center	AB = MN = Q, BM ≥ Q

$$BM_j = Spacing.(D) + j - 1, j \in [Start.Level, Start.Level + Level.Count]$$

$$Q_j = Spacing.(D)$$

Forward Pole-Dipole array

O is a center of potential (MN) dipole. Current electrode B is placed in infinity (connected to terminal B_∞).



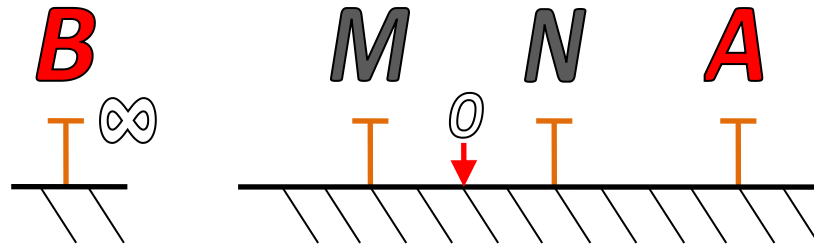
Span	Record point	Specifications
AO	MN center	AM ≥ MN

$$AM_j = Spacing.(D) + j - 1, j \in [Start.Level, Start.Level + Level.Count]$$

$$MN_j = Spacing.(D)$$

Reverse Pole-Dipole array

O is a center of potential (MN) dipole. Current electrode B is placed in infinity (connected to terminal $B_{/\infty}$).



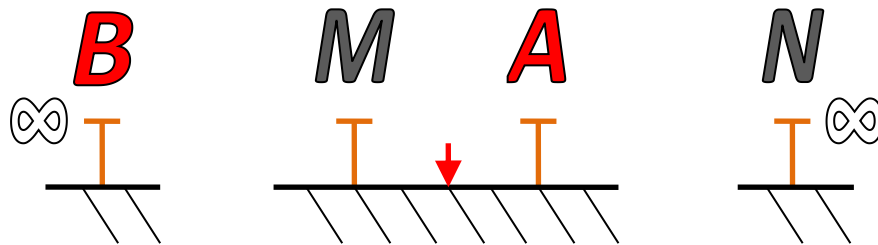
Span	Record point	Specifications
OA	MN center	$NA \geq MN$

$$NA_j = Spacing.(D) + j - 1, j \in [Start.Level, Start.Level + Level.Count]$$

$$MN_j = Spacing.(D)$$

Pole-Pole array

Current electrode B and potential electrode N are placed in the infinity (connected to terminals $B_{/\infty}$ and $N_{/\infty}$).



Span	Record point	Specifications
MA	MA center	—

$$MA_j = Spacing.(D) + j - 1, j \in [Start.Level, Start.Level + Level.Count]$$

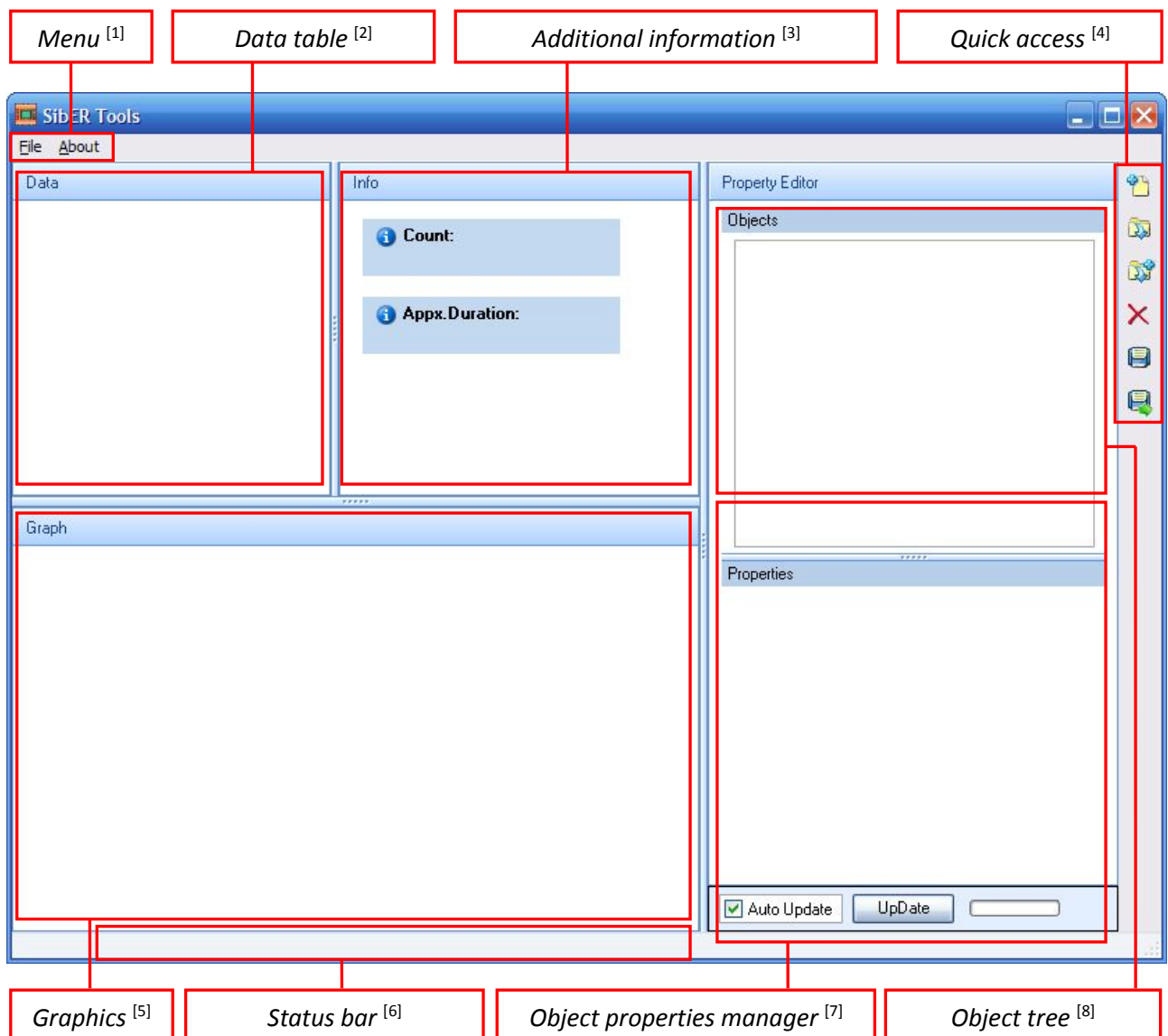
— 11. DESCRIPTION OF SIBER TOOLS SOFTWARE—

Introductory remarks

“Siber TOOLS” software is supplied with “Siber” instrument on compact disc (view “Compact disc”). This software allows you to:

- View, visualize and preprocess data of “Siber” instrument.
- Export data to other formats.
- Create and view templates:
 - S1D for “Manual” mode (VES).
 - S2D for “Automatic” mode (ET).

The software runs under OS Microsoft® Windows® 98/ME/2000/XP/Vista.



- [1] Primary software functions: loading, saving, exporting data, template creating, files concatenating.

- [2] Representing objects' data in tables. Table allows sorting of columns by dragging of its titles with mouse and sorting of rows (in ascending or descending powers of values) in any column by single mouse click on title of column.

- [3] This feature is used for "Sequence 1D" and "Sequence 2D" objects.

- [4] Reduplication of primary software functions and deleting objects from object tree.

- [5] Representing objects' data in graphic diagrams. This panel allows graphics zooming in by mouse moving with left mouse key pressed from top left corner to bottom right corner of interesting area. To zooming out, make this movement in reverse direction.

- [6] Representing features of some graphic objects, which are currently aimed by mouse cursor in graphic panel.

- [7] "Update" key refreshes data table and graphic panel in compliance with objects' properties changes. "Auto Update" checkbox forces refreshing automatically.

- [8] Objects are files D0D, D1D, D2D and templates S1D, S2D.

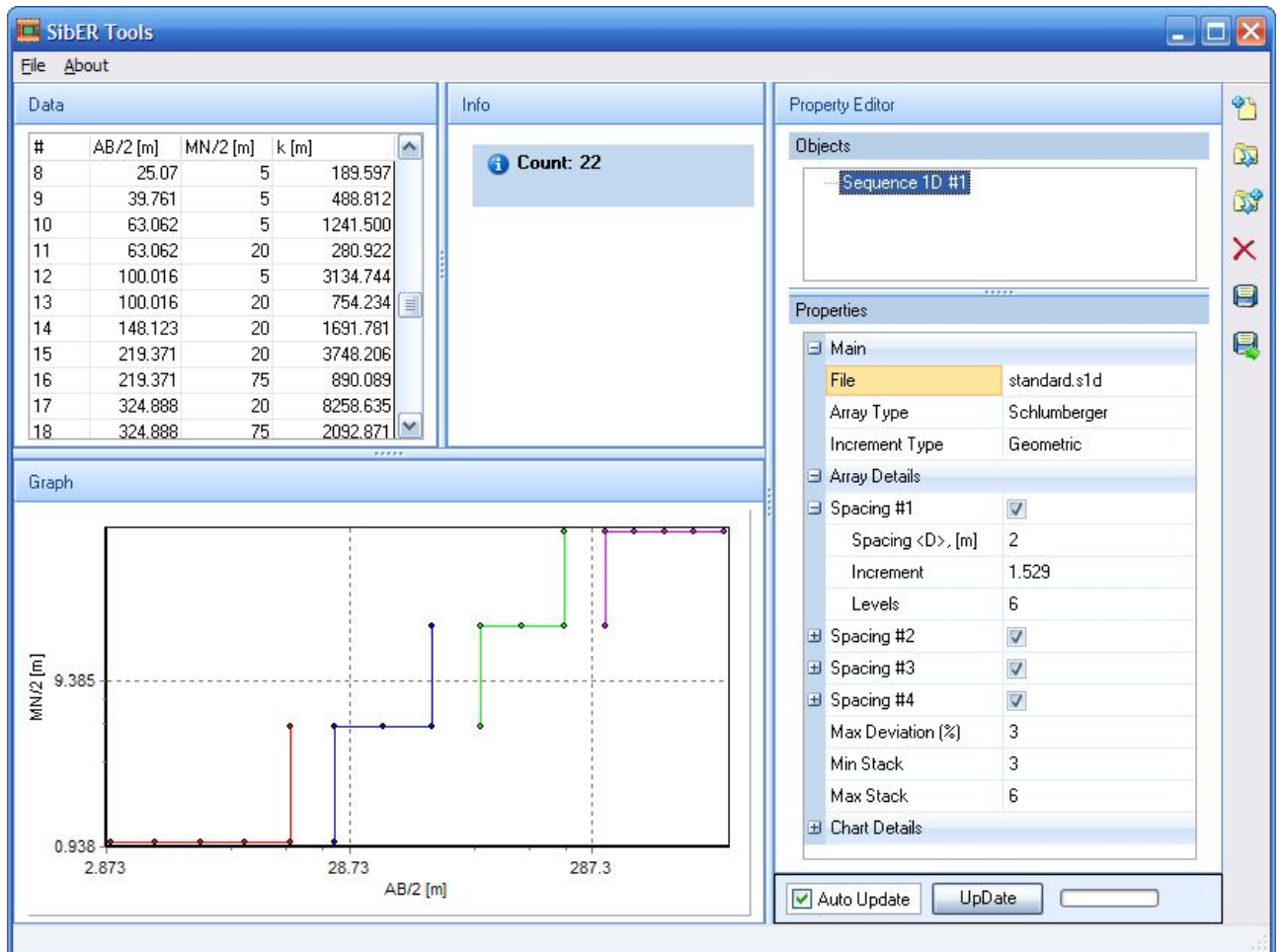
Шаблоны S1D

S1D templates are used by "Manual" mode (VES). To create a new template, click "File – New" then select "Blank 1D" entry in popped-up window. New "Sequence 1D" object appears in object tree.

Following information about template's measuring arrays will be shown in data table: measuring entry number (#), 2 columns of specific distances of array (P.1 and P.2) and geometric factor of measuring array (k, m). Panel of additional information shows number of entries in current S1D template with current settings.

There are parameters of S1D template (see "*Description of VES schemes*") available for editing in object properties manager. Options "X Log Scale" and "Y Log Scale" in "Chart Details" key allows making graphic axes logarithmic.

Diagram of P.1 and P.2 parameters is shown on graphic panel; every measuring array in template corresponds to one pair of P.1 and P.2, and these pairs correspond to marks on diagram. Sets of measuring arrays with different receiver lines (MN) are marked by different colors.



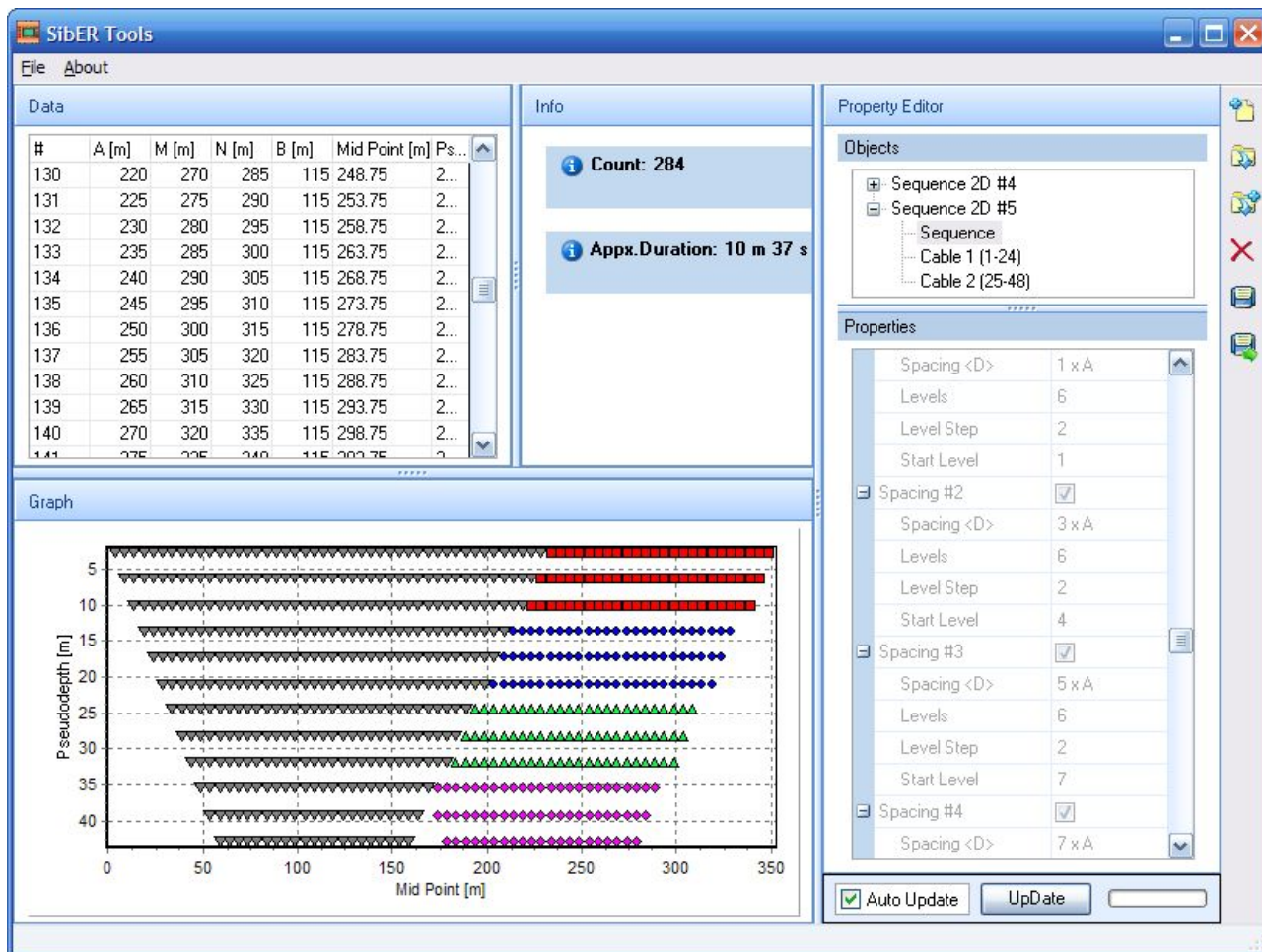
Saving / loading template is provided by menu item “File — Save” / “File — Load.” Make sure, that mask “1D Sequence Files (*.s1d)” is selected and choose name for creating / loading file.

S2D templates

S2D templates are used for “Automatic” mode (ET). To create a new template, click “File – New” then select “Blank 2D” entry in popped-up window. New “Sequence 2D” object appears in object tree. This object has 3 branches: “Sequence” (setting up measuring arrays parameters), “Cable 1 (1 - 24)” and “Cable 2 (25 - 48)” (editing available electrodes and whole multi-node cables).

Following information about template’s measuring arrays will be shown in data table: measuring entry number (#), 4 columns of current (A, B) and potential (M, N) electrodes, horizontal (Mid Point, m) and vertical (Pseudo-depth, m) position of measuring array record point. “Mid Point” is calculated relative to first electrode position.

Panel of additional information shows number of entries (Count) in current S2D template with current settings and approximate whole measurement duration (Appx. Duration, Minimum stacking = Maximum Stacking = 3, Induced polarization = disabled).



There are parameters of S2D template (see “Description of ET schemes”) available for editing in object properties manager. If you have a primary template (which has Sequence Type = “Single”) in object tree, you can create corresponding continuing template (which has Sequence Type = “Roll Along”) by assigning a new blank template value of cell “Single sequences” to the name of primary template. Options “X Log Scale” and “Y Log Scale” in “Chart Details” key allows making graphic axes logarithmic.

Diagram of Mid. Point and Pseudo-depth parameters is shown on graphic panel; every measuring array in template corresponds to one pair of Mid. Point and Pseudo-depth, and these pairs correspond to marks on diagram. Sets of measuring arrays with different receiver lines (MN) are marked by different colors.

As you choose branches “Cable 1 (1 - 24)” and “Cable 2 (25 - 48)” of object tree, it is possible to mark used electrodes (click checkbox) or whole multi-node cables (click on heading “Used”).

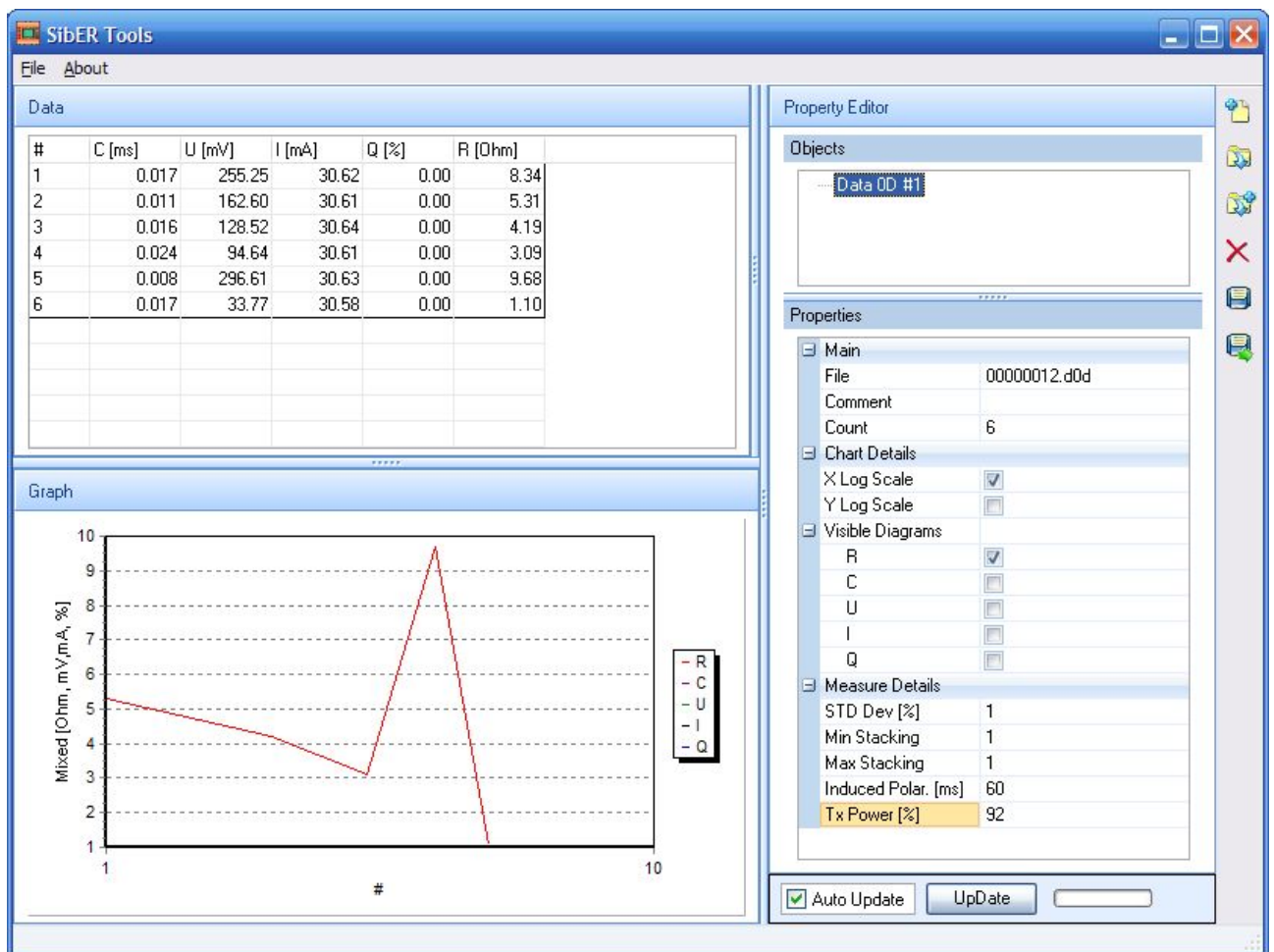
Saving / loading template is provided by menu item “File — Save” / “File — Load.” Make sure, that mask “2D Sequence Files (*.s2d)” is selected and choose name for creating / loading file.

DOD data files

Files DOD are created by “Instant” mode, which is designed for EI and other works. This mode does not use switching unit. Geometry of measuring array is not defined.

To load DOD file, click “File — Open”, then set file mask to “OD Data Files (*.d0d)” and choose the file. A new “Data OD” object appears in tree object.

Data table shows following things: entry number (#), apparent chargeability (C, ms), input voltage (V, mV), output current (I, mA), standard deviation (Q, %), electric resistance (R, Ohm).



There are following parameters in object properties manager: in “Main” key: file name, commentary, measurements number; in “Measurement Details”: options of performed measurements. Options “X Log Scale” and “Y Log Scale” in “Chart Details” key allows making graphic axes logarithmic.

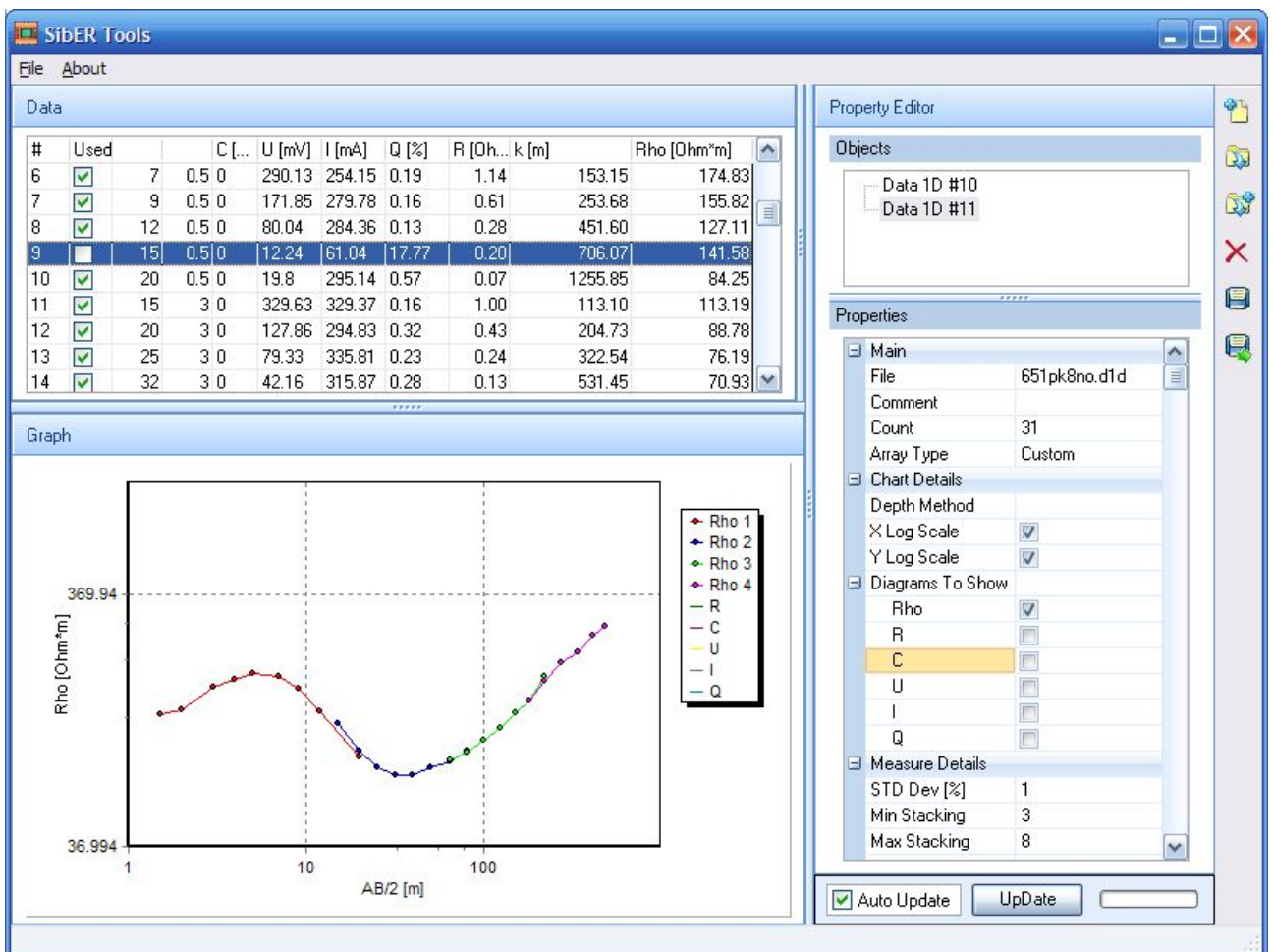
Graphic panel represents dependences of C, U, I, Q, R on measurement number. To pick out visible diagrams, click corresponding checkboxes in “Visible Diagrams” key of object property manager.

Click “File — Export” and enter file name to export data to CSV format.

D1D data files

Files D1D are created by “Manual” mode, which is designed for VES. This mode does not use switching unit, but it defines type of measuring array and specific distances of arrays, which are included to measurement set.

To load D1D file, click “File — Open”, then set file mask to “1D Data Files (*.d1d)” and choose the file. A new “Data 1D” object appears in tree object.



Data table shows following things: entry number (#), 2 columns of specific distances for used measuring arrays (P.1 and P.2), apparent chargeability (C, ms), input voltage (V, mV), output current (I, mA), standard deviation (Q, %), electric resistance (R, Ohm), geometric factor of measuring array (k, m), apparent resistivity (Rho, Ohm·m).

Clicking on checkboxes of certain entries, one can make data filtration. Lack of checkboxes means that these measurements are already filtered or have not been performed during work.

There are following parameters in object properties manager: in “Main” key: file name, commentary, measurements number, array type; in “Measurement Details”: options of performed measurements. Options “X Log Scale” and “Y Log Scale” in “Chart Details” key allows making graphic axes logarithmic.

Graphic panel represents dependences of C, U, I, Q, R on measurement number and sounding curve, i.e. relationship of Rho on measuring array span. Different colors correspond to measuring arrays with different receiver lines (MN). To pick out visible diagrams, click corresponding checkboxes in “Visible Diagrams” key of object property manager.

In order to save filtered data, click “File — Save”, choose file mask “1D Data Files, *.d1d” and enter file name. Filtered data also will be saved without checkboxes. Click “File — Export” and enter file name to export data to CSV format. Filtered data will be not exported.

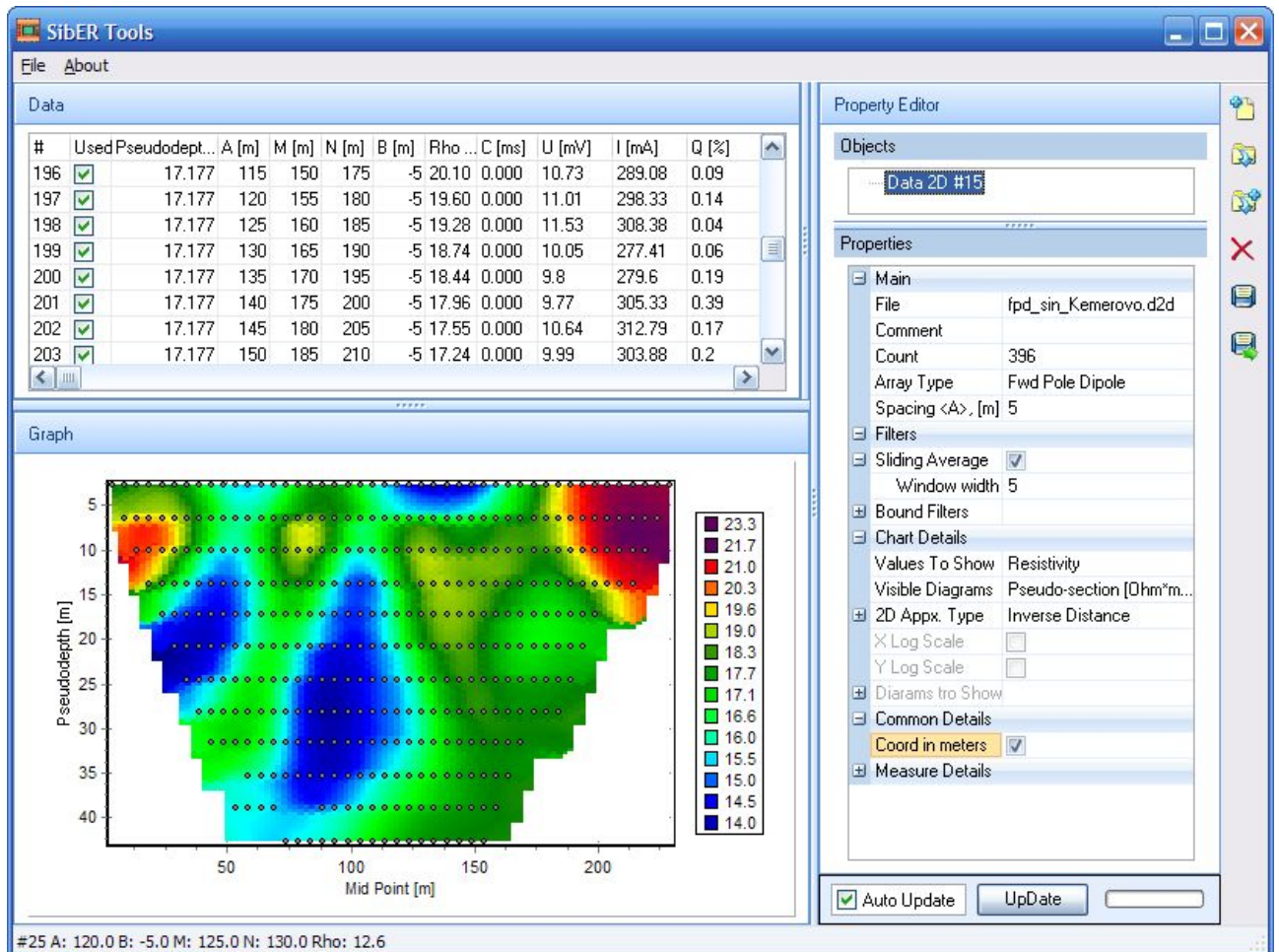
D2D data files

D2D files are created by “Automatic” mode, which is designed for ET. This mode uses switching unit, i.e. it is needed to plug in multi-node cables.

To load D2D file, click “File — Open”, then set file mask to “2D Data Files (*.d2d)” and choose the file. A new “Data 2D” object appears in tree object.

Data table shows following things: entry number (#), 4 columns of current (A, B, m) and potential (M, N, m) electrodes numbers or coordinates, apparent chargeability (C, ms), input voltage (V, mV), output current (I, mA), standard deviation (Q, %), apparent resistivity (Rho, Ohm·m). If the number of B or N electrodes is set to “∞”, it means they are connected to corresponding terminals on the front panel (B_∞ and N_∞). Clicking on checkboxes of certain entries, one can make data filtration. Lack of checkboxes means that these measurements are already filtered or have not been performed during work. To switch between electrode numbers and coordinates, use checkbox “Coord in meters” of “Common Details” key in object property manager.

There are following parameters in object properties manager: in “Main” key: file name, commentary, measurements number, array type, distance between adjacent electrodes (Spacing (A), m); in “Measurement Details”: options of performed measurements.



Moreover, object property manager supplies graphic panel controllers (Chart Details). Options “X Log Scale” and “Y Log Scale” in “Chart Details” key allows making graphic axes logarithmic. Switching value for “Visible Diagrams” between “Pseudo-section”, “All Sounding Curves”, “All Profile Curves” и “Signal Diagrams” allows to represent following things on graphic panel:

- Dependence of Rho values on “Mid Point” and “Pseudo-depth”.
- Dependence of Rho values on “Pseudo-depth”.
- Dependence of united Rho values on “Pseudo-depth” relatively to average value.
- Dependence of C, Rho, R, U, I, Q on measurement number, which may be switched on/off in “Diagrams to Show” below.

Status bar shows data point parameters, which is currently aimed by mouse cursor on graphic panel. Approximation type of Pseudo-section may be changed by “2D appx. Type” key in object property manager.

Filtration can be performed using graphic panel by single mouse clicks on separate points or pressing Ctrl + Shift on a keyboard and moving mouse cursor over points

Also object property manager supplies two filtration types: by boundary values for different magnitudes (min ... max) in “Bound Filter” key and profile curves smoothing by sliding average window in “Sliding average” key. The last one has window parameter to adjust smoothing degree.

Changing value of “Values To Show” from “Resistivity” to “Chargeability” allows switching to IP data visualization.

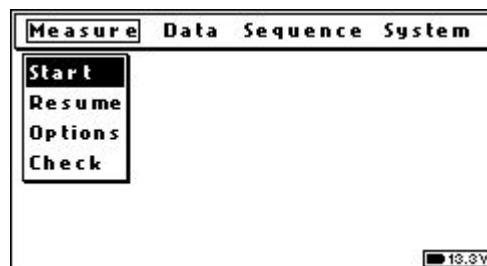
Menu item “File – Append” allows you to add contents of another file to contents of current. Make sure you have selected “2D Data Files (*.d2d)” file mask and choose file to add. This operation serves to concatenate data files by continuing measure scheme. It is important to concatenate files in a right order, corresponding to actual geometric positions of survey line sections. **You can also concatenate Forward Pole-Dipole and Reverse Pole-Dipole array files this way.**

In order to save filtered data, click “File — Save”, choose file mask “2D Data Files, *.d2d” and enter file name. Filtered data also will be saved without checkboxes. Click “File — Export” and enter file name to export data to CSV format. Filtered data will be not exported.

— 12. DESCRIPTION OF USER INTERFACE —

This section contains description of functions, which are provided by the instrument user interface. We recommend you to learn its abilities in full to work with instrument in most effective way. The data, which are shown on artwork below, are demonstrations only.

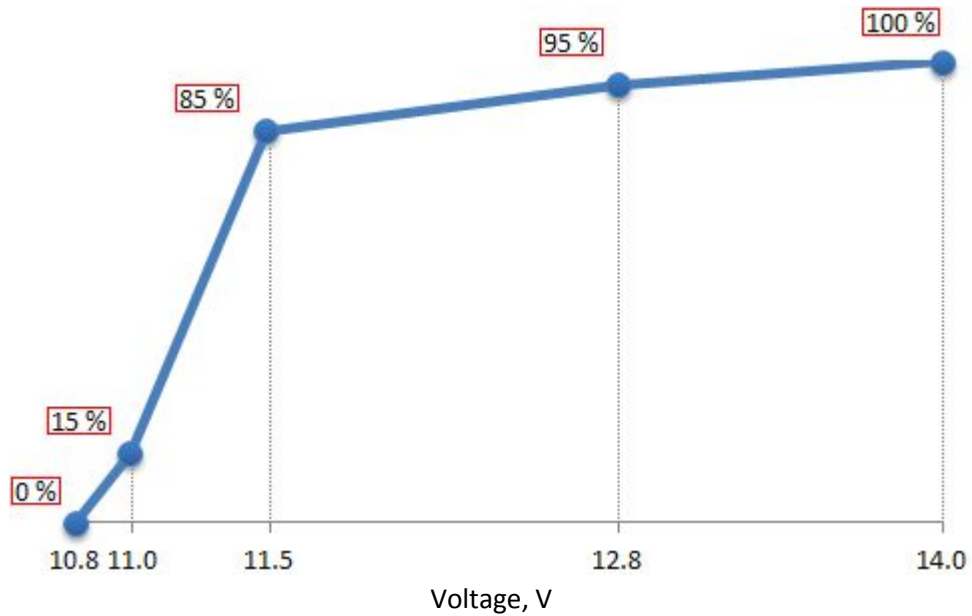
12.1 Main menu



The main menu contains the following sections:

- Measure (performing measurements, setting up, checking of ground connection and signal strength).
- Data (data files viewing).
- Sequence (templates creation and viewing).
- System (connecting to a computer).

The battery charge indicator is shown in the right bottom corner of the screen; it is also shown in all other menus. It is necessary to look after its state intently during work: the data derived during the battery is discharged may be much less precise. The state of the graphic indicator is computed according to following dependence:

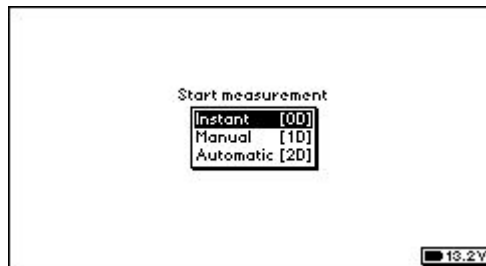


Controls

- ← / → pass to previous/next menu section
- ↑ / ↓ pass to previous/next menu item
- Enter choose current menu item

12.2 Menu section “Measure”

Measure — Start (Start measurement)



Before you start to work the system suggests you to set up the measurement options (see “Measure — Options”). Then you can choose one of the operation modes:

- Instant (EI and other works).
- Manual (VES).
- Automatic (ET).

Controls

- ↑ / ↓ pass to previous/next menu item
- Enter choose current menu item
- Esc exit to main menu

Measure — Start — Instant (Start measurement in “Instant” mode)

#	C [ms]	U [mV]	I [mA]	Q [%]	R [Ω]
1	13.11	278.9	33.61	0	8.296
2	378.3	36011	33.68	0	1069
3	7.993	101.7	33.69	0	3.020
4	176.5	36051	33.79	0	1066

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This kind of survey is designed for EI and other works. In this mode the geometry of measuring array is not defined and the switching unit is not used. At first, you are suggested to enter the file name (see “Enter file name”), which will keep obtained data. Table of “Instant” mode contains following columns: measurement number (#), apparent chargeability (C, ms), input voltage (U, mV), output current (I, mA), standard deviation (Q, %), electric resistance (R, Ohm). The current page of table is shown to the left of the battery charge indicator. It is necessary to confirm measurement completion on exit (see “Are you sure you want to exit?”).

Controls

- ↑ / ↓ pass to previous/next measurement number
- ← / → pass to previous/next page of measurements
- Enter make a single measurement
- Esc exit to main menu
- Delete delete current measurement results
- 0 start oscilloscope (see “Oscilloscope”)
- 2 set up transmitter and receiver (see “Measure – Options”)
- 3 set cursor to appointed number (see “Run to number”)

Measure — Start — Manual / Automatic (Choose a template for “Manual / Automatic” mode)

/seq/s1d:	Sequence info	/seq/s2d:	Sequence info
schlum.s1d	Measures 20	newform.s2d	Measures 210
wenner.s1d	Array type schlumberger	schlum.s2d	Array type schlumberger
mixed.s1d	Increment type linear	wenner.s2d	Sequence type roll along
		dipole.s2d	Spacing <A> 5.00 m
	Spacing <D> 1.00 2.00 3.00 4.00		Spacing <D> 1 x A 3 x A 5 x A 7 x A
	Increment Factor 2.00 2.00 2.00 2.00		Levels 6 6 6 6
	Levels 5 5 5 5		Level step 2 2 2 2
	Overlaps — 2 2 2		Start level 1 4 7 10
	Multi cables are not used		1 5 10 15 20 24
			25 29 34 39 44 48

13.3V 13.3V

The modes “Manual” and “Automatic” require templates (S1D and S2D accordingly), which contain an information about geometry of required measuring array. This menu lets you choose the required template. In case of file lack the caution “NO FILES” will be shown, then system passes to the previous menu.

Controls

- ↑ / ↓ pass to previous/next file
- ← / → pass to previous/next page of file list
- Enter chose current file
- Esc exit to previous menu

Measure — Start — Manual — <S1D template> (Start measurement in “Manual” mode)

#	AB/2	MN/2	C [ms]	U [mV]	I [mA]	Q [%]	P [Ω·m]
1	1.500	0.500	5.192	101.10	33.90	0	18.91
2	2.500	0.833	5.159	37.48	33.97	0	11.56
3	3.500	1.167	7.994	37.46	33.85	0	16.22
4	4.500	1.500					
5	5.500	1.833					

⏪ M N ⏩ B PAGE 1 OF 1 11.9V

This kind of survey is designed for VES. At first, you are suggested to enter the file name (see “Enter file name”) which will keep obtained data. The “Manual” mode table contains following columns: measurement number (#), 2 columns of specific distances for current measuring array (m), apparent chargeability (C, ms), input voltage (U, mV), output current (I, mA), standard deviation (Q, %), apparent resistivity (ρ, Ohm·m). The current page of table is shown to the left of the battery charge indicator. The graphic scheme of measuring array is shown in the left bottom corner of the screen. It is necessary to confirm measurement completion on exit (see “Are you sure you want to exit?”).

Controls

- ↑ / ↓ pass to previous/next measurement number
- ← / → pass to previous/next page of measurements
- Enter make a single measurement
- Esc exit to main menu
- Delete delete current measurement results
- 0 start oscilloscope (see “Oscilloscope”)
- 2 set up transmitter and receiver (see “Measure – Options”)
- 3 set cursor to appointed number (see “Run to number”)

Measure — Start — Automatic — <S2D template> (Start measurement in “Automatic” mode)

#	A	M	N	B	C [ms]	U [mV]	I [mA]	Q [%]	P [Ω·m]
1	1	2	3	4	7.964	37.27	33.83	0	34.61
2	2	3	4	5	7.968	37.33	33.79	0	34.71
3	3	4	5	6	7.956	37.31	33.97	0	34.51
4	4	5	6	7	7.934	37.27	33.74	0	34.71
5	5	6	7	8	7.929	37.30	33.90	0	34.56
6	6	7	8	9	7.954	37.30	33.75	0	34.72
7	7	8	9	10					
8	8	9	10	11					
9	9	10	11	12					
10	10	11	12	13					
11	11	12	13	14					
12	12	13	14	15					
13	13	14	15	16					

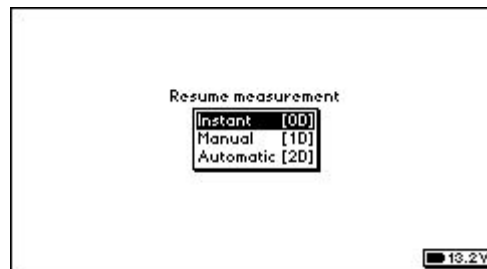
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This kind of survey is designed for ET. At first, you are suggested to enter the file name (see “Enter file name”), which will keep obtained data. The “Automatic” mode table contains following columns: measurement number (#), 4 columns of current (A, B) and potential (M, N) electrode numbers, apparent chargeability (C, ms), input voltage (U, mV), output current (I, mA), standard deviation (Q, %), apparent resistivity (ρ, Ohm·m). If the number of B or N electrodes is set to “∞”, it means they are connected to corresponding terminals on the front panel (B_{/∞} and N_{/∞}). While measuring, the estimated remaining time is shown in the left bottom corner of the screen. The current page of table is shown to the left of the battery charge indicator. It is necessary to confirm measurement completion on exit (see “Are you sure you want to exit?”).

Controls

↑ / ↓	pass to previous/next measurement number
← / →	pass to previous/next page of measurements
Enter	start/stop measurements (hold the key to stop)
Esc	exit to main menu
Delete	delete current measurement results
0	start oscilloscope (see “Oscilloscope”)
1	assign used/unused electrodes (see “Set available electrodes”)
2	set up transmitter and receiver (see “Measure – Options”)
3	set cursor to appointed number (see “Run to number”)
4	repeat measurements with appointed electrodes (see “Enter electrodes to remeasure”)

Measure – Resume (Resume measurement)

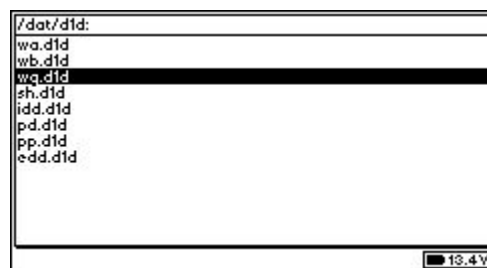


This mode serves to resume the unfinished works. At first, the system suggests you to set up transmitter and receiver (see “Measure – Options”) and then one can choose the survey type to resume.

Controls

↑ / ↓	pass to previous/next menu item
Enter	choose current menu item
Esc	exit to main menu

Measure – Resume – Instant / Manual / Automatic (Choose file to resume measurement)



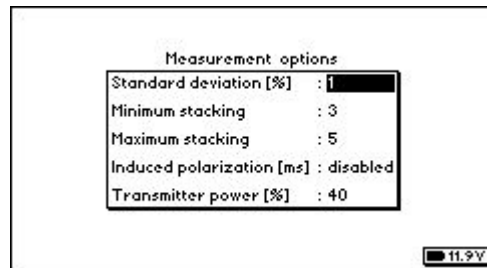
Here one can choose the file to continue to work with. After you made a choice, the following partial progress does not differ from “Measure – Start” branch. In modes “Manual” and “Automatic” the cursor will be moved to number of a first unfinished measurement. If there is no such number, the cursor will be moved to the first number. In case of file lack the caution “NO FILES” will be shown, then the system exits to previous menu.

Controls (see next page)

↑ / ↓	pass to previous/next file
← / →	pass to previous/next page of file list
Enter	choose file

Esc exit to previous menu

Measure — Options (Set up transmitter and receiver)

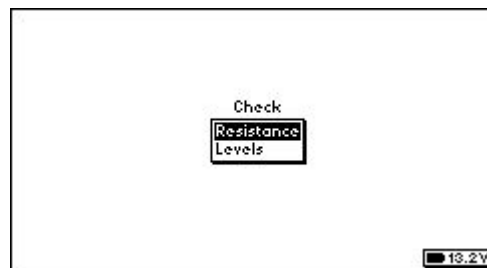


Here the options of transmitter and receiver are set up. The options are saved hereafter. In case of system files trouble (see “Cautions”) the default options will be loaded.

Controls

- ← / → choose value of current parameter
- ↑ / ↓ pass to previous/next menu item
- Enter save changes and pass to next menu or return to work
- Esc save changes and exit to main menu or return to work

Measure – Check (Check ground connection and signal strength)



This window allows you to choose what to check: ground connection or signal strength for measuring arrays.

Controls

- ↑ / ↓ move cursor upwards/downwards
- Enter choose current menu item
- Esc exit to main menu

Measure – Check – Resistance (Check ground connection)

The table contains columns of electrode numbers (#, #) and values of resistance between them (R, kOhm). Values less than 1 kOhm are considered as good, values below 2 kOhm are average, and values more than 2 kOhm are satisfactory. **Bad ground connections cause low data quality. One can check ground connection of remote electrode like this: disconnect the 24-th electrode (for example) from multi-node cable and connect the remote electrode instead of it. Then check pairs of electrodes 23-24 and 24-25.**

#	#	R [kΩ]	#	#	R [kΩ]	#	#	R [kΩ]	#	#	R [kΩ]
1	2	0.324	14	15		27	28		40	41	
2	3	0.325	15	16		28	29		41	42	
3	4	0.436	16	17		29	30		42	43	
4	5	0.337	17	18		30	31		43	44	
5	6	0.428	18	19		31	32		44	45	
6	7	0.329	19	20		32	33		45	46	
7	8	0.323	20	21		33	34		46	47	
8	9	0.223	21	22		34	35		47	48	
9	10	0.323	22	23		35	36				
10	11	0.243	23	24		36	37				
11	12	0.342	24	25		37	38				
12	13		25	26		38	39				
13	14		26	27		39	40				

13.2V

Controls

- ← / → move cursor to left/right
- ↑ / ↓ move cursor upwards/downwards
- Enter start/stop checking (hold the key to stop)
- Esc exit to main menu
- 0 start oscilloscope (see "Oscilloscope")

Measure – Check – Levels (Check signal strength)

The upper table suggests you to choose the array type, Spacing (D), Level, transmitter power, IP mode and a number of first electrode of measuring array (Offset). The lower table shows the numbers of used electrodes (A, B, M, N) for current configuration and measurement results: **simple average value of signal below IP curve (C, mV)**, input voltage (U, mV) and output current (I, mA). To make a measurement move the cursor to OK button and press Enter.

Array type	pole-dipole
Spacing <D>	3 x A
Level	5
Transmitter power [%]	50
Induced polarization [ms]	60
Offset	5
OK	

A	M	N	B	C [mV]	U [mV]	I [mA]
5	12	15	∞	5.120	38.41	34.67

11.9V

Controls

- ↑ / ↓ move cursor upwards/downwards
- Esc exit to previous menu
- 0 start oscilloscope (see" Oscilloscope")

12.3 Menu section "Data"

Data — *.D0D / *.D1D / *.D2D (View D0D / D1D / D2D data files)

/dat/d1d:
wa.d1d
wb.d1d
wc.d1d
sd.d1d
idd.d1d
pd.d1d
pp.d1d
edd.d1d

13.4V

D0D files are used for "Instant" mode, D1D are used for "Manual", and D2D are used for "Automatic" mode. In this menu the system suggests you to choose a file to view. The heading of table shows the path

to shown files. In case of files lack the caution “NO FILES” will be shown, then the system exits to previous menu.

Controls

↑ / ↓	move cursor upwards/downwards
← / →	pass to previous/next page of file list
Enter	choose current menu item
Esc	exit to main menu

*Data — *.D0D / *.D1D / *.D2D — <data file> (View contents of data file)*

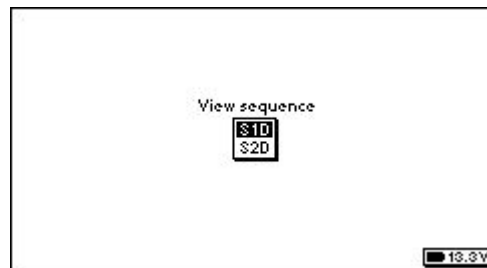
Here one can view the contents of selected file. The table structures are the same as in measure modes. For D1D files the schemes of used measuring arrays are shown in the left bottom corner. The current page of table is shown to the left of the battery charge indicator.

Controls

↑ / ↓	pass to previous/next page of data table
Esc	exit to previous menu

12.4 Menu section “Sequence” (Templates)

Sequence – View (View sequence)



Here you can choose the type of template to view. S1D is used for work in “Manual” mode, and S2D is used for “Automatic”. See “Operation modes” to find descriptions of modes.

Controls

↑ / ↓	move cursor upwards/downwards
Enter	choose current menu item
Esc	exit to main menu

Sequence – View – S1D / S2D (View S1D / S2D template)

The left window shows the available files, the heading shows the path to them. The right window (Sequence info) shows primary behavior of current file. In case of files lack the caution “NO FILES” will be shown, then the system passes to previous menu.

/seq/s2d:	Sequence info
newform.s2d	Measures :210
schlum.s2d	Array type :schlumberger
wenner.s2d	Sequence type :roll along
dipole.s2d	Spacing <A> :5.00 m
	Spacing <D> :1 x A :3 x A :5 x A :7 x A
	Levels :6 :6 :6 :6
	Level step :2 :2 :2 :2
	Start level :1 :4 :7 :10
	1 5 10 15 20 24
	25 29 34 39 44 48

Controls

- ↑ / ↓ move cursor upwards/downwards
- ← / → pass to previous/next page of file list
- Enter view current file
- Esc exit to previous menu

Sequence – View – S1D / S2D – <S1D / S2D template> (View S1D / S2D template)

#	AB/2	MN/2
1	1.500	0.500
2	2.500	0.833
3	3.500	1.167
4	4.500	1.500
5	5.500	1.833
6	6.500	2.167
7	7.500	2.500
8	8.500	2.833

▲ M N B PAGE 1 OF 1 13.4V

#	A	M	N	B
1	1	2	3	4
2	2	3	4	5
3	3	4	5	6
4	4	5	6	7
5	5	6	7	8
6	6	7	8	9
7	7	8	9	10
8	8	9	10	11
9	9	10	11	12
10	10	11	12	13
11	11	12	13	14
12	12	13	14	15
13	13	14	15	16

▲ M N B PAGE 1 OF 6 13.4V

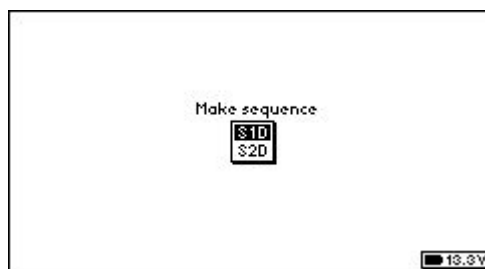
The table for S1D template (left) contains following columns: a number of measuring array in sequence (#), 2 columns of specific distances of measuring array (m). The scheme of array is shown in left bottom corner. The current page of table is shown to the left of the battery charge indicator.

The table for S2D template (right) contains following columns: a number of measuring array in sequence (#), 4 columns of current (A, B) and potential (M, N) electrodes. If the number of B or N electrodes is set to “∞”, it means they are connected to corresponding terminals on the front panel (B_∞ and N_∞). The current page of table is shown to the left of the battery charge indicator.

Controls

- ↑ / ↓ pass to previous/next page
- Esc exit to previous menu

Sequence – Make (Make sequence)

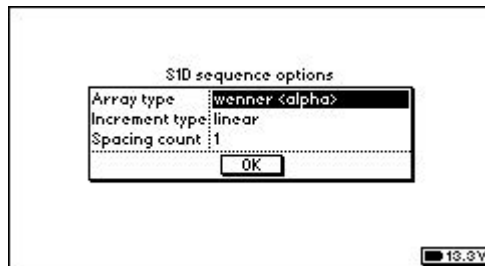


In this menu one can choose the type of template to create. S1D is used for work in “Manual” mode, and S2D is used for “Automatic”. See “*Operation modes*” to find descriptions of modes.

Controls

- ↑ / ↓ move cursor upwards/downwards
- Enter choose current menu item
- Esc exit to main menu

Sequence – Make – S1D (Make S1D template)

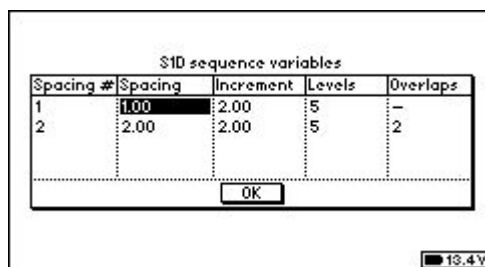


This is the first screen with preferences of creating S1D template. All preferences can be set by cycle switching. It’s necessary to move cursor to OK button and press Enter to pass to next menu.

Controls

- ↑ / ↓ move cursor upwards/downwards
- ← / → cycle switch of value
- Esc exit to previous menu

Sequence – Make – S1D – OK (Continue of making S1D template)

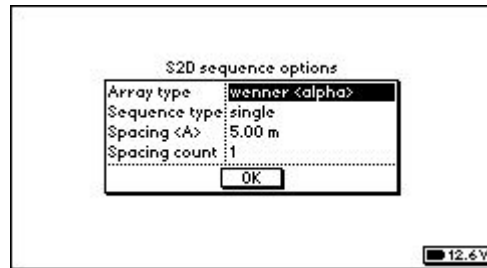


This is the second screen with preferences of creating S1D template. All preferences can be set by typing with number keys. Moving cursor to OK button and pressing Enter will cause creating file name request (see “*Enter file name*”) and leaving to main menu. The file will be saved in folder /seq/s1d. The created template is available for viewing in menu “*Sequence – View – S1D*”.

Controls

- ↑ / ↓ move cursor in vertical direction
- ← / → move cursor in horizontal direction / move type cursor
- Enter change value / save new value (does not work with inadmissible values)
- Esc exit to previous menu
- 0..9 type value

Sequence – Make – S2D (Make S2D template)

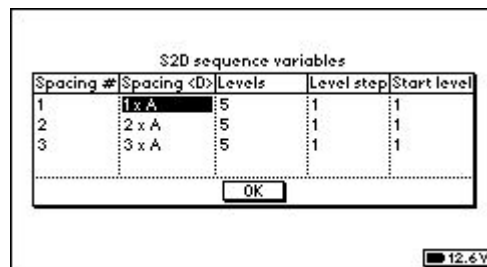


This is the first screen with preferences of creating S2D template. Some preferences (Array type, Sequence type, MN count) are changed by cycle switching and other ones (Spacing <a>, First electrode) require typing to be changed. Move cursor to OK button and press Enter to pass to next menu.

Controls

- ↑ / ↓ move cursor upwards/downwards
- ← / → cycle switch of value / move type cursor
- Enter change value / save new value (does not work with inadmissible values)
- Esc exit to previous menu
- 0..9 type value

Sequence – Make – S2D – OK (Continue of making S2D template)

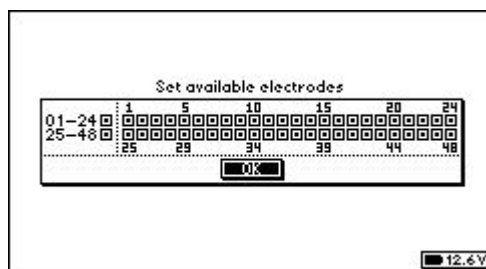


This is the second screen with preferences of creating S2D template. All preferences can be changed by typing in this screen. Move cursor to OK button and press Enter to pass to next menu.

Controls

- ↑ / ↓ move cursor in vertical direction
- ← / → move cursor in horizontal direction
- Enter change value / save new value (does not work with inadmissible values)
- Esc exit to previous menu
- 0..9 type value

Sequence – Make – S2D – OK – OK (Further making of S2D template)



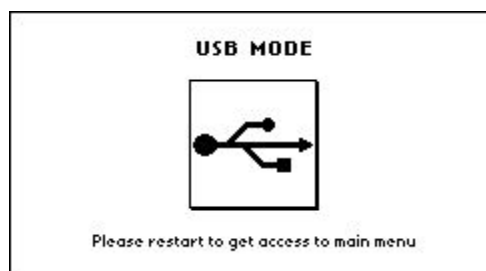
This menu suggests you to choose available electrodes for creating S2D template. The interface allows you to turn on and off either single electrodes or multi-node cables. Moving cursor to OK button and pressing Enter will cause file name requesting (see “*Enter file name*”) and leaving to main menu. The file will be saved in folder /seq/s2d. The created template is available for viewing in menu “*Sequence – View – S2D*”. If you see the caution “Empty sequence. Please check S2D parameters” instead of main menu, it means that no one measuring array comply with current template preferences.

Controls

- ↑ / ↓ move cursor in vertical direction
- ← / → move cursor in horizontal direction
- Enter turn on/off electrode or multi-node cable
- Esc exit to previous menu

12.5 Menu section “System”

System – USB (Synchronization with a computer over USB)

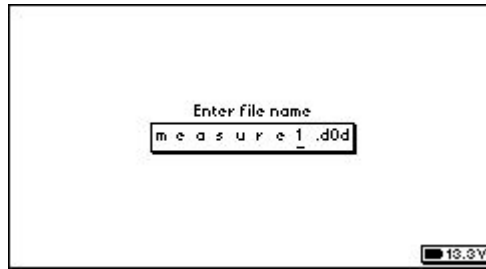


To synchronize the instrument with a computer, connect it with USB wire (it is included in complete set). The memory of the instrument is recognized as external storage drive. The structure of “SibER” folders is described in section “*SibER*” directory structure”. To restart the device, turn it off and then turn on again.

12.6 Service menus

Enter file name (Type the file name)

This menu serves to type the name of creating file. The acceptable characters are 26 letters of Roman alphabet in lower case and numbers 0...9. If the file with such name already exists, the system asks to rewrite it or enter another name.



Controls

- ← / → move cursor to left/right
- Enter confirm file name
- Esc return to previous menu
- Delete delete character (works at string end only)
- 0..9 cycle switch of characters on a pressed key

Are you sure you want to exit? (Exit confirmation)

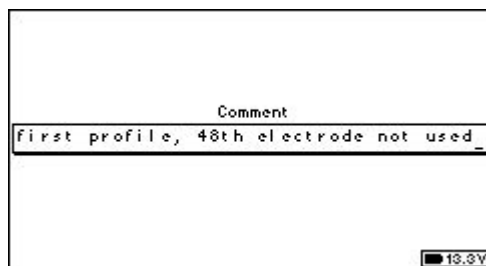


This menu is used to confirm the end of work. If negative, the system returns to work. If positive, the system suggests you to write a comment (see “*Comment*”) to completed file.

Controls

- ← / → move cursor to left/right
- Enter confirm choice

Comment



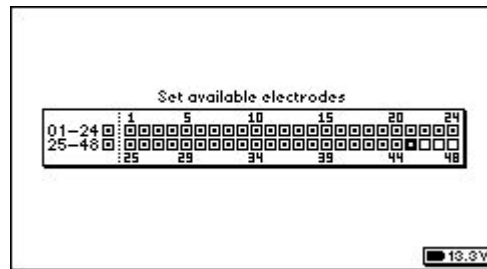
The menu is used to add a commentary to data files. The acceptable characters are 26 letters of Roman alphabet in lower case, space and numbers 0...9.

Controls (see next page)

- ← / → move cursor to left/right
- Enter save comment and leave to main menu
- Delete delete character
- 0..9 cycle switch of characters of a pressed key

, comma

Set available electrodes

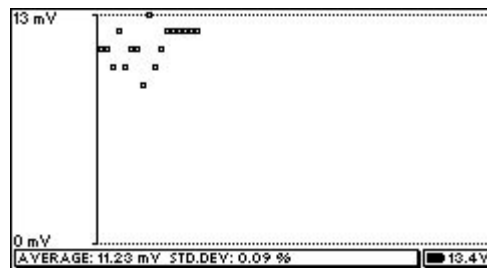


This menu is used in “Automatic” mode to turn on/off single electrodes or multi-node cables. The measuring arrays, that include unused electrodes, will be passed during work. Two multi-node cables with all electrodes are used by default. Changes are saved for current measurement session only; next time you work in “Automatic” mode, the default settings will be loaded, even if you work with the same file again.

Controls

- ↑ / ↓ move cursor in vertical direction
- ← / → move cursor in horizontal direction
- Enter turn on/off electrode or multi-node cable
- Esc save changes and return to work

Oscilloscope

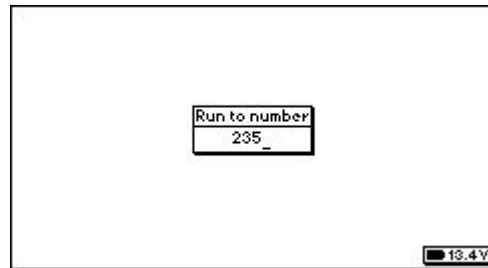


This tool serves to check receiver line noise. For modes “Instant” and “Manual” the receiver line is aggregate of M and N terminals on front panel, and for “Automatic” mode and resistance check receiver line includes furthermore appropriate channels of switching unit. For example, if cursor is set to number with electrodes 5 and 6 in resistance check mode, then receiver line is terminals M, N on front panel and electrodes 5 and 6 of multi-node cable. There are some statistics in left bottom corner: average value (mV) and standard deviation (%). The result of first measurement is assumed as zero level.

Controls

- Enter return to work (hold the key)

Run to number

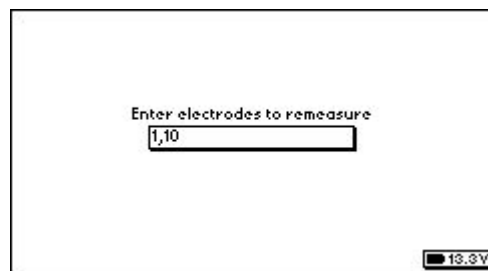


In order to move a cursor to certain position quickly during work, it is possible to enter its number in this window. The values, which overstep the limits, will be set to limits.

Controls

Enter	confirm number
Esc	cancel
Delete	delete last character
0...9	type number

Enter electrodes to remeasure



Here you are allowed to remake measurements with individual electrodes, numbers of which are listed through a comma. After all, cursor of current measurement moves to first number and then measurement series begin. The measurements, which do not contain selected electrodes, will be passed. When measurement ends, the caution "Re-measurement is completed" appears. You may suspend measurement the same way you do it in usual measurement mode, but you must do the following to return to usual state:

- Start measurement and wait till it ends.
- Enter to "Enter electrodes to remeasure" again, delete all numbers and confirm operation.

Controls

Enter	confirm numbers
Esc	cancel
Delete	delete last character
0...9	type number
,	comma

12.7 Cautions

In order to avoid problems with the use of instrument it is imperatively advised:

- Not to delete or modify files in /etc directory. If this happens, it is possible to restore the contents from the attached backup on a compact disc from supplied equipment (see “Compact disc”).
- Use only 26 letters of the Roman alphabet (in any case), the underscore character “_” and the numbers from 0 to 9 inclusive for file names. Other characters, including space, are not permitted. File names without an extension should not exceed 8 characters.

— 13. THINGS YOU HAVE TO PAY ATTENTION TO —

Checking ground connection of electrodes is required procedure to be made before you start measuring. It is required to achieve smooth changes of resistance values from one electrode to another. For example, if you have resistances 0.254, 0.342, 0.988, 0.879, 0.396 kOhm, you have to try to decrease values 0.988 and 0.879 although such values are marked as good in this manual.

Pay a special attention if your measurement arrays use remote electrodes (forward or backward pole-dipole, pole-pole arrays). For example, disconnect 24th electrode from multi-electrode cable, connect remote electrode wire instead it and check pair of electrodes 23-24 or 24-25 (if they are grounded). The criteria of good grounding is the same as for multi-electrode cable electrodes. If Pole-Pole array is used, then check transmitter remote electrode, and then receiver remote electrode.

While measuring, please observe derived data. If current values I [mA] are less than 1.0 mA, it means that there's no transmitter current in circuit. It may be an open circuit. Analogically, values of voltage U [mV] less than 1.0 mV mean that there's no input voltage. Current value I [mA] must be at least 20 mA, and voltage U [mV] must be at least 10 mV to ensure your data quality.

Low values (less than 1.0 %) of standard deviation Q [%] are typical feature of quality data. Values less than 5.0 % are also allowable. If the values of Q [%] exceed 10.0 % systematically, you have to check U [mV] and I [mA] values and stop measuring and then figure out how measurement options (transmitter power, minimum stacking, maximum stacking) affect resulting data. Keep in mind that standard deviation can't be evaluated for one stacking, so Q [%] value will be equal to 0.

Also don't forget about battery. Discharged battery causes not only defective data, but can bring a damage to equipment. Don't use battery if it's charge is lower than 11.5 V. To provide a long time of measurements, use an accumulator with high capacity (60 A·hour and more). It's not recommended to work with internal battery only due to it's low capacity (7 A·hour).

Remember: the higher transmitter power you use from device menu, the faster a battery discharges. Values of current I [mA] more than 700 mA or values of voltage more than 5000 mV are good reason to decrease transmitter power.

— 14. FEEDBACK —

If you have noted any errors or discrepancies in user's guide, "SibER" instrument and SibER TOOLS software or if you have any questions, suggestions, comments, please contact us:

SKALA.SUPPORT @ GMAIL.COM

"SibER" developers team

— 15. INSTRUMENT CERTIFICATE —

“SibER” instrument is developed by TROFIMUK INSTITUTE OF PETROLEUM GEOLOGY AND GEOPHYSICS / RUSSIAN ACADEMY OF SCIENCES / SIBERIAN BRANCH (Novosibirsk, Russia). The instance of “SibER” instrument is manufactured by KB Electrometry Ltd. The instrument does not contain precious metals. The instrument meets the specifications and found fit for service.

Serial number _____

Release date _____

KB Electrometry Ltd. representative:

First / last name _____

Date _____

L. S.

Signature _____

Dealer representative:

First / last name _____

Date _____

L. S.

Signature _____