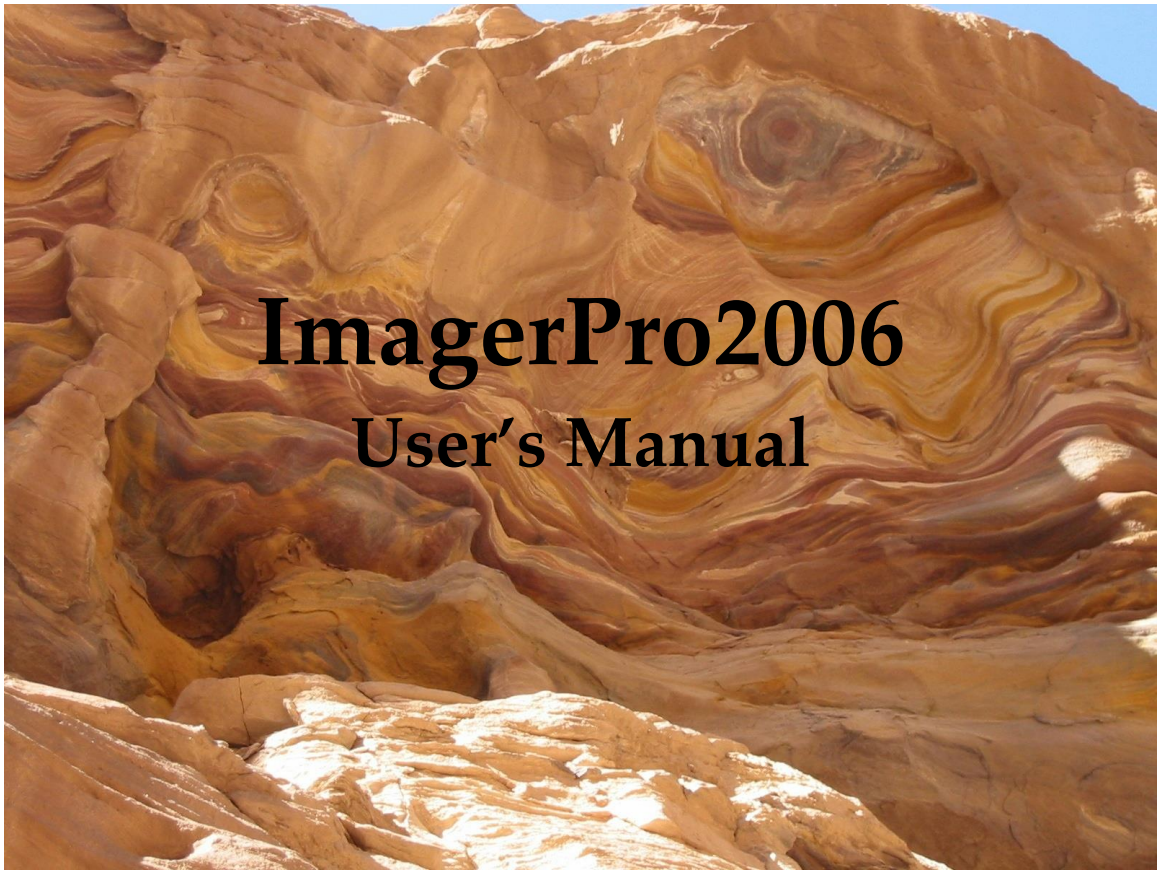


ImagerPro2006
User's Manual

2D Resistivity Imaging Control Software
for the Tigre 64 - 128 Channel Imaging System
(Version 1.16)

Allied Associates Geophysical Ltd
http://www.allied-associates.co.uk/

CONTENTS

1 Introduction

ImagerPro2006 represents a complete redesign of the original ImagerPro2000 software program for the Campus & Allied Tigre-64 and Tigre-128 resistivity imaging systems. ImagerPro2006 supports all the most commonly used array geometries including; Wenner α, Wenner β, Dipole-Dipole, Wenner Schlumberger and Pole-Dipole.

User-friendliness, speed of data access and powerful visualisation are the key features. It takes just seconds to setup surveys, view data, and change survey parameters on the fly.

1.1 Limitations of liability

Campus International Products Ltd will not in any event be liable for any loss, including consequential loss, caused by any error, defect or failure of the Programme, or howsoever arising, including but not limited to loss of use, loss of stored data, loss of profits or loss of contracts.

NOTE!! MAKE FREQUENT BACKUPS OF YOUR DATA. User error, Programme problems and other factors can cause data loss. To minimise problems, back up your data frequently. You are responsible for the safety of your own data.

1.2 Minimum System Requirements

Minimum recommended hardware requirements for running **ImagerPro2006** are:

Operating System	Windows 2000 or XP
CPU	Pentium 4 recommended
Memory RAM	512Mb recommended
Disk Space	A basic installation consumes approx. 2MB. To retain optimum computer performance, the hard drive should have at least 10MB free space after installation
Printer	Any Windows supported colour or black and white printer
Serial Port	16550 UART with FIFO Buffering*

***Note:** The stability of data acquisition when using USB Serial Port Adaptors cannot be guaranteed.

1.3 Technical support

When you have a question about ImagerPro2006, first look in this manual. If you cannot find the answer, contact Allied Associates Geophysical Ltd.

Technical support questions should be sent to: info@allied-associates.co.uk with "ImagerPro2006 Support" in the title or can be mailed to:

Allied Associates Geophysical Ltd
Concept House
8 The Townsend Centre
Blackburn Road
Dunstable
LU5 5BQ
United Kingdom

Tel: 44-(0) 1582 606999
Fax: 44-(0) 1582 606991

1.4 Installation

- Close all unnecessary programmes – particularly virus checkers - by pressing <CTRL + ALT + Delete> and choosing the tasks to end.
- Place the ImagerPro2006 CD in your CD-ROM/DVD drive
- Open Windows Explorer and locate the Setup executable file on the CD.
- Follow the on-screen instructions.
- The default path for data has been set to \Program files\ImagerPro2006.

1.5 Starting ImagerPro2006

To start ImagerPro2006 click <Start> on the Windows start bar, then navigate to *All Programs/ImagerPro2006*. Highlight the "*ImagerPro2006*" icon and press <Return> or click on the icon.

2 The Survey Window

All the various survey design, acquisition and utilities windows used in ImagerPro2006 are contained within the Survey Window (Figure 1). The window has eight components:

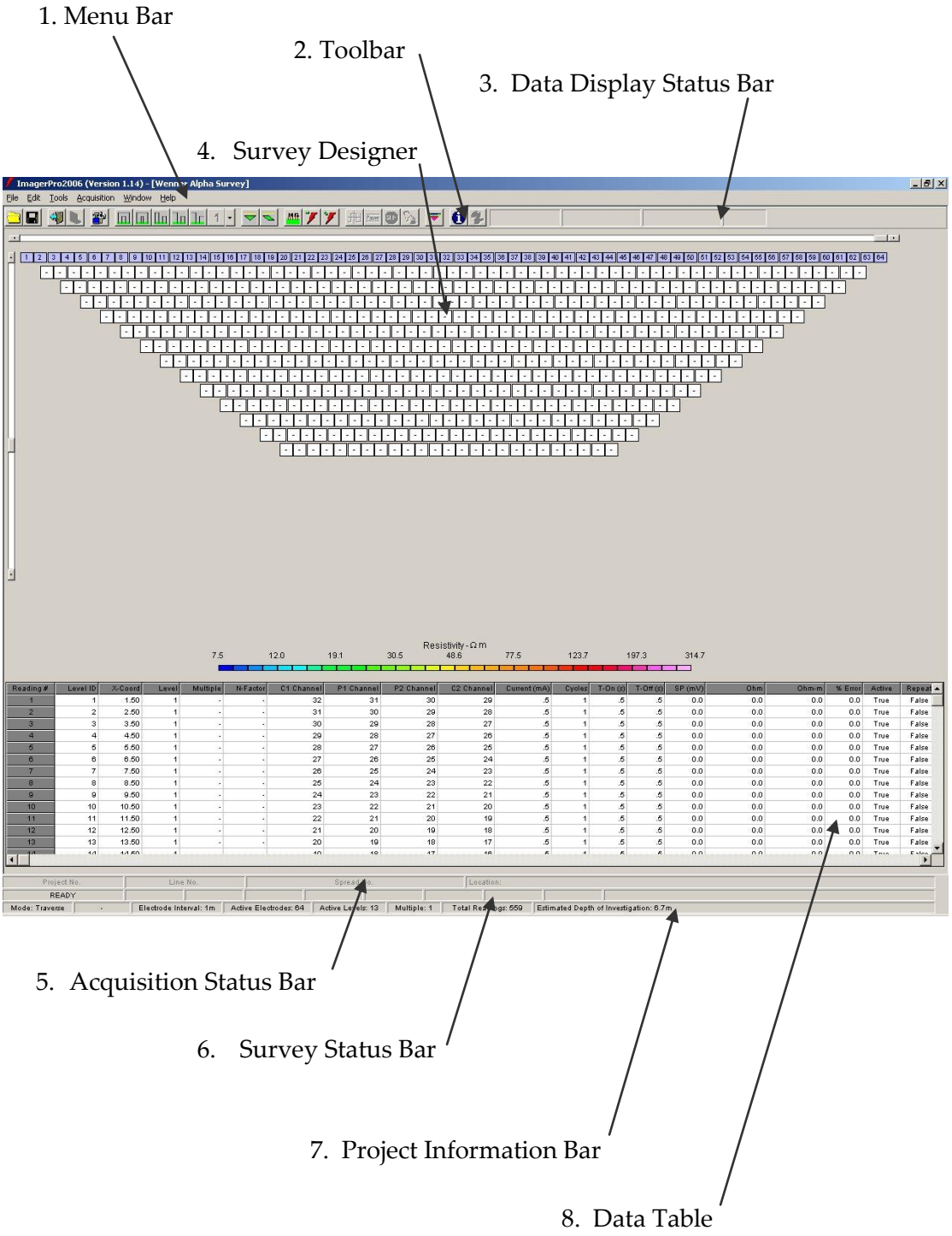


Figure 1: The ImagerPro2006 Survey Window

1. Menu Bar: Used to access the various program functions.

2. Toolbar: Quick access toolbar buttons for the most commonly used program functions.

3. Data Display Status Bar: Used to display resistivity readings and percentage errors for each cycle during acquisition. Also used to display meter & reading errors and list of electrode contact resistances.

4. Survey Designer: Used to select active electrodes and measurement levels. Displays array of cells (pseudo-section) representing available reading positions.

5. Acquisition Status Bar: Displays information on the status of the meter, the positions of the currently active electrodes and the various meter parameters (current, cycles, time on and time off) during acquisition.

6. Survey Status Bar: Provides information on current survey settings including survey type, a-spacing, number of active levels, number of active electrodes and estimated median depth of investigation.

7. Project Information Bar: Displays information on the current survey line including Project Number, Line Number and Location. This information is set using the Project Tab in the Survey Options dialog box.

8. Data Table: Table displaying information relating to each measurement of the currently selected survey array. This table is updated during data acquisition.

3 Setting up a Survey

3.1 Introduction

Survey design and configuration is carried out using the Survey Designer and the SURVEY OPTIONS tab.

The Survey Designer is the default window when ImagerPro2006 is first started and cannot be minimised or closed. If further windows are opened (e.g. the Data Display window) the Survey Designer can be reaccessed either by minimising or closing that window or using the Window menu on the Menu Bar.

The Survey Designer has two parts:

1. **Electrode array:** This is indicated by a row of numbered boxes along the top of the window. Electrodes that are to be used during the survey are indicated in blue whilst inactive electrodes are greyed-out or white. The maximum number of electrodes that can be used will be dependent on the number of channels available on the TIGRE system being used.

2. **Pseudo-section display:** The pseudo-section is represented by an array of boxes (cells) beneath the electrodes and comprises all of the available measurement positions for the currently selected array configuration. During survey design, active readings (i.e. those available with the current electrode / level settings) are displayed as white boxes. These boxes are coloured in during data acquisition. Hovering the cursor over a cell will display information relating to its location (in the array), its associated electrodes (C1, C2, P1 & P2) and its status.

3.2 Selecting the Survey Type

Common to other resistivity imaging systems ImagerPro2006 provides two survey types; roll-along and traverse.

The Roll-Along survey type is used to collect data along survey lines longer than the maximum available survey array length (the survey array length is equal to the number of active channels multiplied by the electrode spacing).

The Traverse survey type is used where the required survey line length can be achieved with the available maximum survey array length and to complete longer survey lines.

Selection of the Survey Type is made using either the

Traverse

and

 Roll-Along

buttons on the Toolbar, or via the Array Parameters tab on the SURVEY OPTIONS dialog box (see Section 3.8.2).

3.3 Selecting the Array Geometry

This can be done using either the buttons on the toolbar or via the Array Parameters tab on the SURVEY OPTIONS dialog box (see Section 3.8.2).

ImagerPro2006 supports the following popular array geometries:

 Wenner α (Wenner β is only available via the Survey Options dialog box)

 Wenner Schlumberger (with selectable Dipole Multiple of 1 to 4)

 Dipole-dipole (with selectable Dipole Multiple of 1 to 4)

 Pole-dipole (with selectable Dipole Multiple of 1 to 4)

 Pole-pole

For the Wenner Schlumberger, dipole-dipole and pole-dipole arrays, the software gives the option of selecting a Dipole Multiple up to a maximum value of 4. This can either be done using the Dipole Multiple button on the toolbar or via the Array Parameters tab on the SURVEY OPTIONS dialog box (see Section 3.8.2).

When using the pole-dipole and pole-pole geometries, the remote electrode(s) should be connected to the takeouts for Electrodes 1 and 2 (located on Channel 1 – 32 cable) using separate cables.

During acquisition these electrodes are identified by a raised C and P (pole-pole geometry) on the electrode array.

3.4 Setting the Number of Active Electrodes

To select the number of active electrodes in the current array (64, 96 or 128 channels) use the horizontal scroll bar located above the electrodes. Inactive electrodes are coloured white whilst active electrodes are blue.

The positions of measurements that are available with the current combination of active electrodes and levels are identified by white boxes in the pseudo-section.

To toggle individual active electrodes on and off, click on the required electrode using the left mouse button. The deselected electrodes are greyed-out in the electrode array along with all associated measurement positions (Figure 2). Measurements associated with these electrodes will be skipped during acquisition.

Figure 2: Deselected electrodes and their associated measurement positions are greyed out in the Survey Designer window. Individual measurements can also be toggled on / off (see Section 3.6)

Note: Do not deselect unwanted electrodes located at the end of the array using the toggle on/off option as measurements associated with these electrodes will still appear in the output file (DAT or RES). Always use the horizontal scroll bar.

3.5 Setting the Number of Active Levels

To select the required number of measurement levels, use the vertical scroll bar located to the left of the pseudo-section.

The maximum number of levels available is dependent on the number of active electrodes (**including those toggled off**). If the current number of levels exceeds this maximum the number of active levels is automatically reduced. Note that the position of the vertical scroll bar slider will remain unchanged.

3.6 Selecting & Deselecting Measurements

Individual measurement positions can be toggled on or off by pressing the CTRL key whilst clicking on the required position using the left mouse button. The inactive measurement position is greyed-out.

To toggle an entire level of measurements on or off, hold down the CTRL and ALT keys whilst clicking on the first measurement on that level using the left mouse button. The inactive measurement positions are greyed-out.

A group of measurements located on multiple levels can be selected by right-clicking on the first and last measurements in the required group. The cell of the first measurement turns red until the last position is selected. All measurement positions outside of the group are greyed out.

The status of each of the measurement positions in the current array is indicated in the Data Table under the column marked 'Active'.

3.7 Depth of Investigation

The estimated depth of investigation is indicated on the right hand side of the Survey Status Bar.

Depths are determined using the 'median depth of investigation' method. This is based on the array sensitivity function (or depth investigation characteristic) - the median depth representing the depth at which the layer of earth above has the same influence on the measured potential as the material below.

It is important to note that the indicated depth is only strictly valid for a homogeneous earth model and that if there are large resistivity contrasts in the near-surface the actual depth of investigation may be significantly different.

The user is referred to Section 2.5.2 of 'Tutorial: 2D and 3D electrical imaging surveys' by Dr. M.H. Loke (2003) for further details (available at www.geotomo.com).

3.8 Configuring Survey Options

Menu: EDIT > OPTIONS
Toolbar: 

Shortcut: CTRL+O

Once the survey design has been completed the various survey acquisition parameters are configured using the SURVEY OPTIONS dialog box.

The survey options are divided into five groups under separate tabs on the dialog box. To apply options once changes have been made either use the APPLY button or use the OK button to exit the dialog box. If the dialog box is exited using the CANCEL button any changes made will be lost.

3.8.1 Meter Settings Tab

This is used to set default or user-definable TIGRE settings for each active level: meter current, measurement cycles, waveform TIME ON and waveform TIME OFF together with the required computer serial port.

Three modes are available:

1. **Default:** The meter settings for each active level are fixed. The settings are based on the recommended minimum power settings for the currently selected Unit Electrode Spacing (see Tigre manual for details).

2. **Reconnaissance:** This mode provide rapid data acquisition. As in Default mode the meter settings for each active level are fixed. The *current* setting is incrementally increased as the level number increases, whilst the number of measurement *cycles*, waveform *on time* and *off time* are each set to the minimum values for each level.

3. **Custom:** All settings are user-definable for each level.

In modes 1 and 2 the Meter Settings options are unavailable.

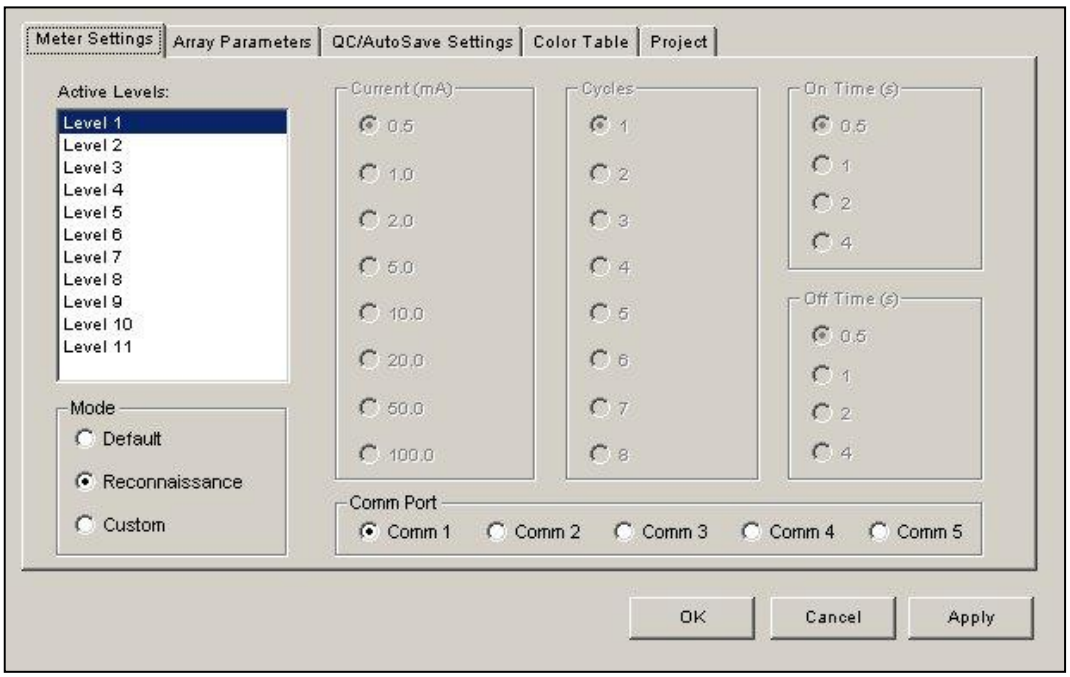


Figure 3: The Meter Settings tab

The list of active levels is displayed in the box on the left of the window (see Figure 3 above).

In order to select the settings for each level **(custom mode only)**, highlight the required level and then select the settings using the various option buttons. The same group of settings (e.g. *current, cycles, on time and off time*) can be applied for multiple levels by selecting groups of levels as required.

Note that the Custom settings will be lost when switching from Custom to either Default or Reconnaissance mode. If you wish to retain Custom settings it is recommended that you first save the Survey Design (see Section 3.8).

3.8.2 Array Parameters Tab

The Array Parameters tab is used to select a range of parameters associated with the survey array (Figure 4):

Array Type: Used to select the geometry. ImagerPro2006 currently supports six of the most popular geometries.

Array Size: The maximum array size is dependent on the number of channels available on the Tigre meter being used. The size of the Survey Designer display is automatically adjusted to take account of the Array Size and the screen resolution.

Survey Type: Refer to Section 3.2 for details.

Pole-Dipole Direction: Used to select the orientation of the electrodes in the pole-dipole array when using this geometry. The acquisition of data in both the forward and reverse orientations allows the effects of the inherent asymmetry of this geometry to be negated during data modelling (see p.35 of Loke, 2003 for further details). This option is inactive for all geometries other than Pole-Dipole.

Acquisition Mode: Select either All/Selected Readings or Single Readings mode. See Section 5 for details.

Unit Electrode Spacing: This corresponds to the physical distance between electrodes in the electrode array and defines the array's **minimum** *a-spacing*. With the 'Divide by 10' check box unchecked the selection range is set to 0.50m to 10.00m, in 0.5m increments. With the box

checked the range is 0.05m to 1.00m, in 0.05m increments.

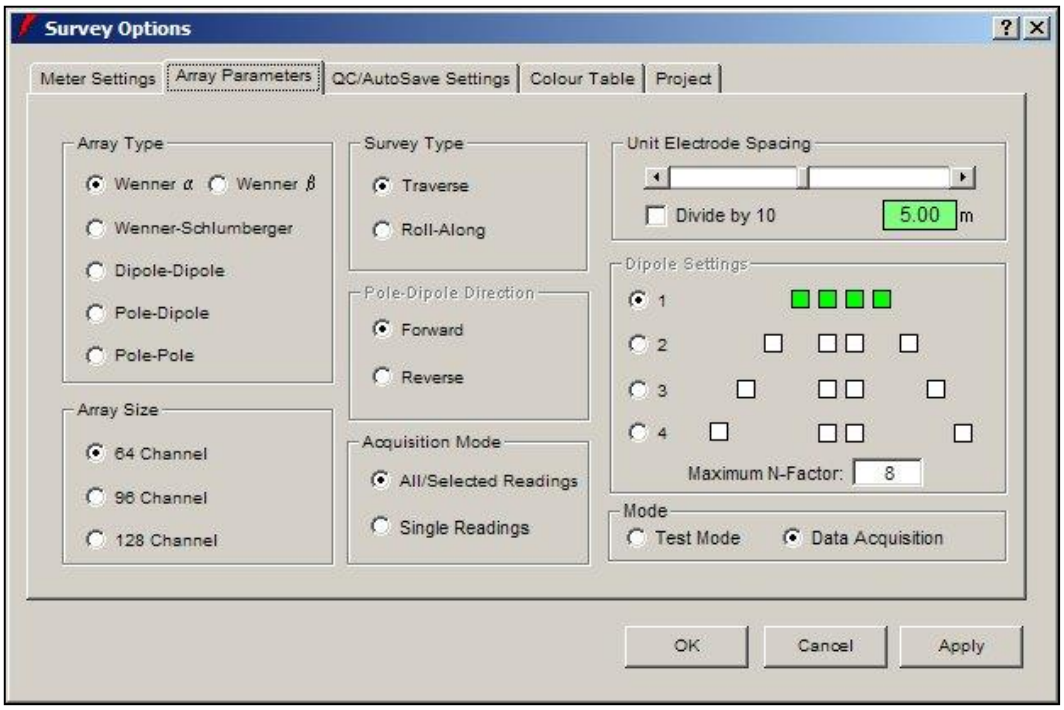


Figure 4: The Array Parameters tab

Dipole Settings:

Used to select the *dipole multiple* used during Dipole-Dipole, Wenner Schlumberger and Pole-Dipole surveys. The *dipole multiple* represents the ratio of the distance between the dipole(s) (C1-C2 or P1-P2) and the unit electrode spacing. This determines the *n-factor* (the ratio of the distance between the C1 and P1 electrodes and the C1-C2 or P1-P2 dipole length) for each measurement level. It is normally recommended that the *n-factor* be kept below 6 to prevent acquisition of noisy data, although the program will allow higher values to be set. Setting the maximum *n-factor* determines the maximum number of measurement levels (and hence depth of investigation) available to the user when using dipole array geometries.

Mode:

The software can either be set to run in Test Mode or normal Data Acquisition mode. Test Mode allows the user to test the accuracy of the resistance measurements by connecting a resistor across Pins A and B on the Channel 1–32 connector, located on the front panel of the Tigre.

3.8.3 QC / Autosave Settings Tab

This is used select how the program responds to poor data or a meter error during a measurement (Figure 5).

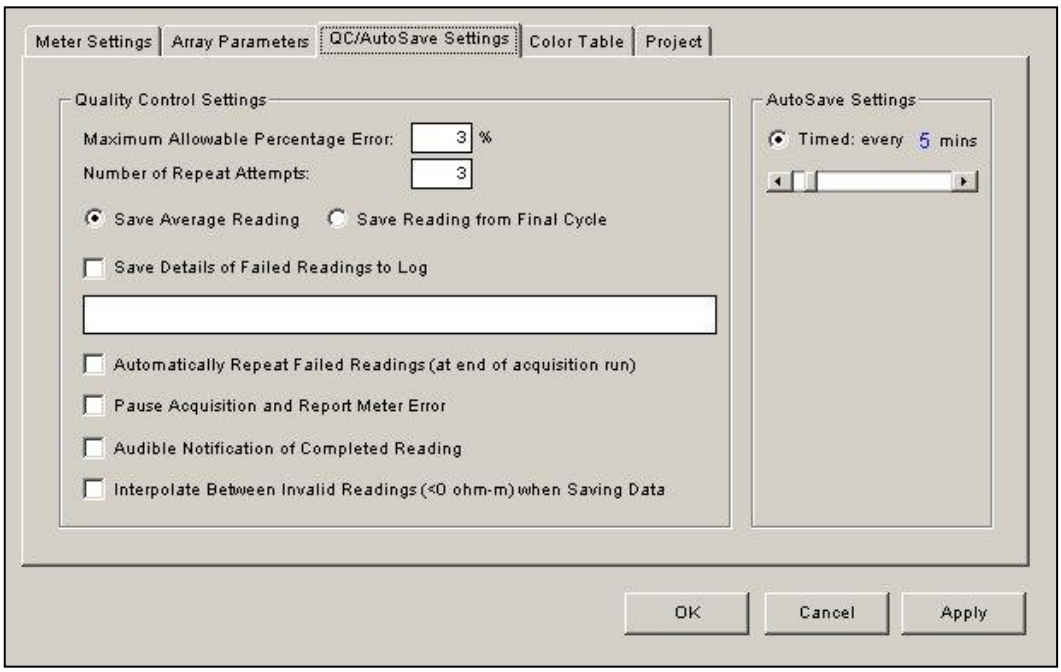


Figure 5: The QC/Autosave tab

Maximum Allowable Percentage Error: Used to set the maximum allowable percentage error for each measurement (averaged over the number of cycles at that level).

Number of Repeat Attempts: Used to set how many times a measurement (with a percentage error exceeding the maximum) is attempted before it is skipped.

Save Average Reading... Select the 'Save Average Reading' option to save the average reading from all cycles to the Data Table. Select 'Save Reading from Final Cycle' to save the result of the last cycle. The latter option is often preferable in 'noisy' ground conditions.

Save Details of Failed Readings to Log: Check this option to save details of each failed measurement to a text file. A 'Save As' dialog

box is automatically displayed to allow the user to select the filename and destination. The log file has an ERR extension.

Automatically Repeat Failed Readings...

If this option is checked the software will automatically repeat all measurements that failed after completing all measurements in the current array. Failed measurements are identified in the Data Table by a 'True' tag in the 'Repeat' column. If this option is not checked the user will be prompted to repeat any failed measurements at the end of the measurement sequence.

Pause Acquisition & Report Meter Error:

If checked the program will report individual meter errors or failed readings in a message box. Data acquisition will be halted until the user responds to the message box.

If unchecked, meter errors will be reported in the Acquisition Status Bar at the bottom of the Survey Window. The last measurement will be flagged as failed and the program will attempt to continue the data acquisition sequence: Select this option for unattended data acquisition.

Audible Notification of Completed Reading:

If checked the computer will emit a beep following the completion of each reading.

Interpolate Between Invalid Readings when Saving Data:

If this option is checked the program will attempt to replace invalid measurements with an interpolated value when the data is saved. Invalid measurements can alternatively be replaced using the 'Interpolate' function in the Data Display window.

AutoSave Settings:

Set the time interval between automatic data saves. It is recommended that data is saved regularly during data acquisition to help prevent data loss. The program saves the data in a RES format file in the application

directory. The filename is automatically generated using the current date and time in the form: Autosave_[yymmdd]_[hhmmss].res

3.8.4 Colour Table Tab

This dialog tab (Figure 6) allows selection of the required colour table and colour transform type used to plot the data during data acquisition and when viewing existing data sets. The .TBL colour table files are held in the Colour Tables folder in the Application directory.

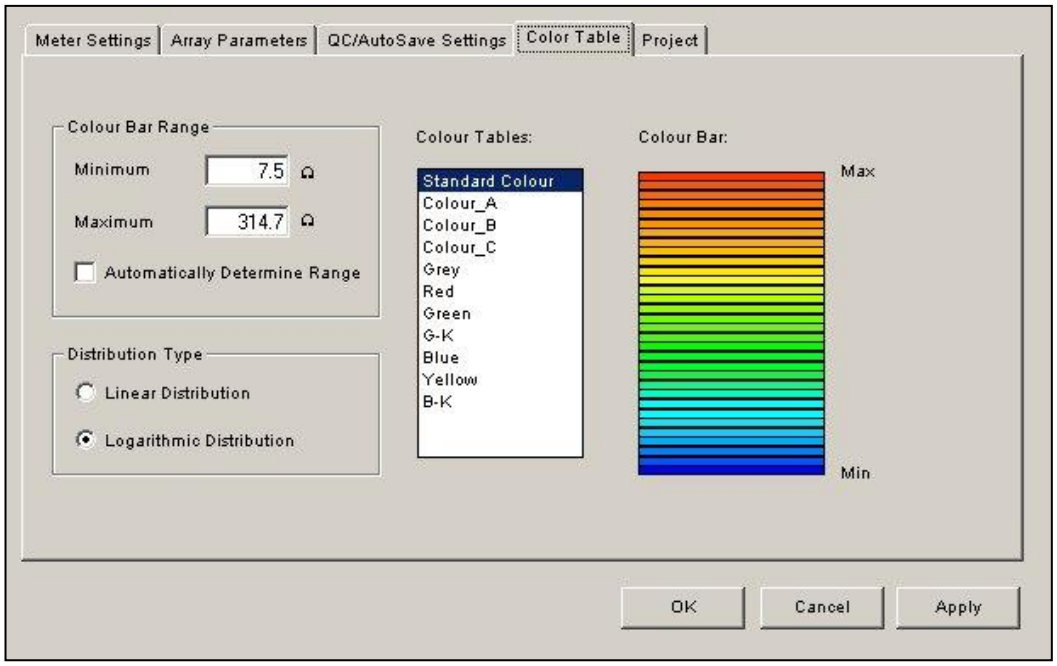


Figure 6: The Colour Table Tab

If the selected table is unavailable the default table ('Standard Colour') will be loaded. If the user attempts to select a missing colour table the data will be incorrectly displayed.

Colour Table Range:

To manually select the colour table range deselect the 'Automatically Determine Range' checkbox and then enter the required values into the Minimum and Maximum text boxes.

Note that when viewing an existing data set the manually entered range for a particular data type (e.g. Error, SP or RES) will be reset to the automatically determined range when the user navigates away from that data type.

If AUTO DETECT RANGE is selected the program will automatically scale the colour bar to fit the data set. This option will override the manual entry DATA RANGE settings.

In order to set the correct apparent resistivity range for the current survey, first acquire a series of measurements at various levels using SINGLE READING mode, set the DATA RANGE accordingly and then run ALL READINGS.

Colour Table Distribution Type:

The Distribution Type radio buttons enable selection of either a linear or logorithmic colour transform. The most appropriate transform will depend on the dynamic range of the data.

3.8.5 Project Tab

Use this tab (Figure 7) to enter details about the current project. These are saved in the header of the output file (RES or DAT format).

If the 'Save Survey Design Parameters on Exiting Program' checkbox is ticked the program will remember key survey parameters and automatically reinstate them the next time it is restarted.

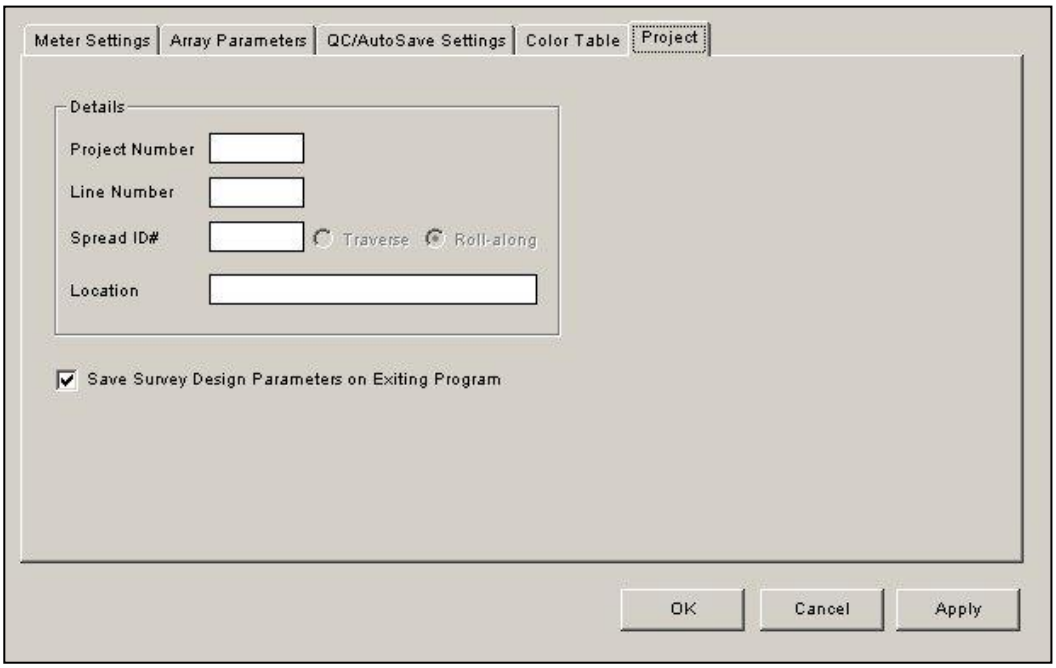


Figure 7: The QC/Autosave tab

3.9 Saving & Importing Existing Survey Designs

3.9.1 Saving

Menu: FILE > SAVE SURVEY DEFINITION
Toolbar: 
Shortcut: CTRL+S

Once a survey design has been configured it can be saved for future use. The design is saved to a .csv file that contains information on the number of active electrodes, active levels, survey type and meter settings for each active level. An example of the file format is provided below.

3.9.2 Importing

Menu: FILE > LOAD SURVEY DEFINITION
Toolbar: 
Shortcut: CTRL+L

Existing survey designs can be loaded using the FILE>LOAD SURVEY DEFINITION menu option or the LOAD SURVEY DEFINITION button on the toolbar. The meter parameters for each level will be automatically set using the details contained in the file.

4 Measuring Electrode Contact Resistances

Menu: ACQUISTION > MEASURE CONTACT RESISTANCES
Toolbar: 

Shortcut: CTRL+M

The electrode contact resistances are measured relative to three reference electrodes selected from the active electrode array.

To select a reference electrode position the cursor over the required electrode and click the right-hand mouse button. To deselect an electrode repeat this process.

The three electrodes need to be adjacent to one another in the array and should be positioned in good ground. It is recommended that the user selects three electrodes close to the centre of the array so that if they need treatment they are easily accessible.

Once the third electrode has been selected the software asks if you wish to run the contact resistance routine. If you do click YES otherwise click NO. If you select NO, you can activate the routine at any time using one of the three options listed above (provided the three electrodes are still selected).

The software starts by determining the contact resistances for each of the reference electrodes and will then run through the list of active electrodes.

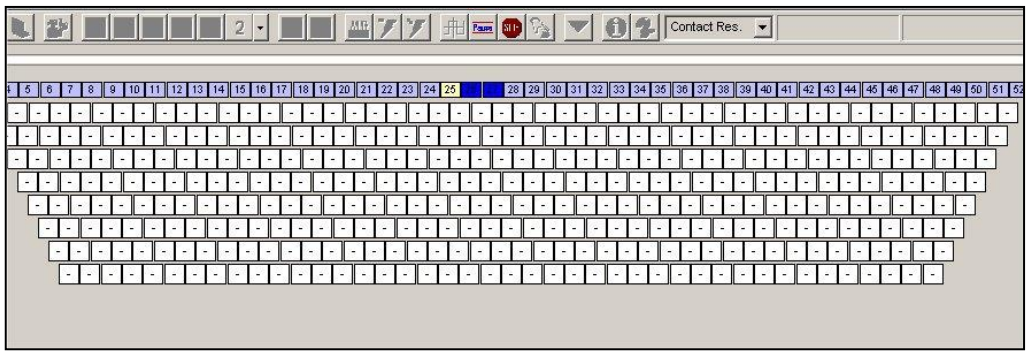


Figure 8: Display during contact resistance checks.

If an error is reported for any one of the reference electrodes, or the contact resistance is too high, the software will ask whether to continue with acquisition of the remaining readings or abort. If all three report an error the measurement sequence is automatically aborted.

The completed measurements are listed in a drop-down list box (labeled 'Contact Res.') located to the right of the Toolbar on the Data Display Status Bar (Figure 8). The result for a particular electrode will also be displayed when the cursor is hovered over the electrode.

The measurement sequence can be paused or aborted at any time by using the relevant buttons on the Toolbar. All other toolbar buttons are inactive.

On completion of each measurement the electrode is coloured red, orange or green depending on the result:

Red: Indicates a failed reading due to an open circuit. This can occur if the contact resistance is extremely high (preventing sufficient current getting into the ground) or if there is a fault with the meter or cables.

Orange: Indicates the contact resistance is above 2000Ω.

Green: Indicates the contact resistance is within recommended limits

Following completion the contact resistance measurements are automatically saved to an ASCII text file. The log file is located in the application directory and will have the following name format: ContactRes_[yymmdd]_[hhmmss].txt

In order to improve contact resistances above 2000Ω, common practice is to first check the contact between the electrode and the cable takeout (note rusty electrodes may need to be wire brushed or replaced), then to water soil around the electrode position with fresh or salt water or add bentonite slurry.

5 Data Collection

Menu: ACQUISITION > START SURVEY > ACQUIRE BY-LEVEL ***or***
ACQUISITION > START SURVEY > ACQUIRE IN ROLLING MODE

Toolbar:  

Shortcuts: CTRL+F1
CTRL+F2

5.1 Introduction

Data collection can either proceed 'By-Level' or in 'Rolling Mode' depending on preference.

In the By-Level configuration data is collected across and down (i.e. by row or level) whilst in the Rolling Mode configuration data is collected down (the levels) and across (i.e. by column).

Rolling Mode has the advantage that once the complete set of measurements down the levels has been completed the leftmost electrode associated with that group is redundant and can if necessary be removed.

This speeds up array setup in cases where roll-along spreads are required as it means that the electrodes can be moved from the back to the front of the line (ready for the next spread) before data collection has been completed. It is recommended that this is only done in situations where data quality is high as it means that there is no opportunity to repeat measurements at the end of the measurement sequence.

Rolling Mode is the recommended mode of collection for dipole surveys (particularly in areas where treatment of the electrodes is required to reduce contact resistances) as it enables the ground around the (trailing) current dipole electrodes to be treated without affecting the potential (P1, P2) electrodes. This requires the current electrodes to be treated immediately prior to their use rather than treating the complete array at once.

Whilst a measurement is being taken the relevant cell within the pseudo-section displays an Omega symbol and the active electrodes in the Electrode Array are highlighted in darker blue (Figure 9).

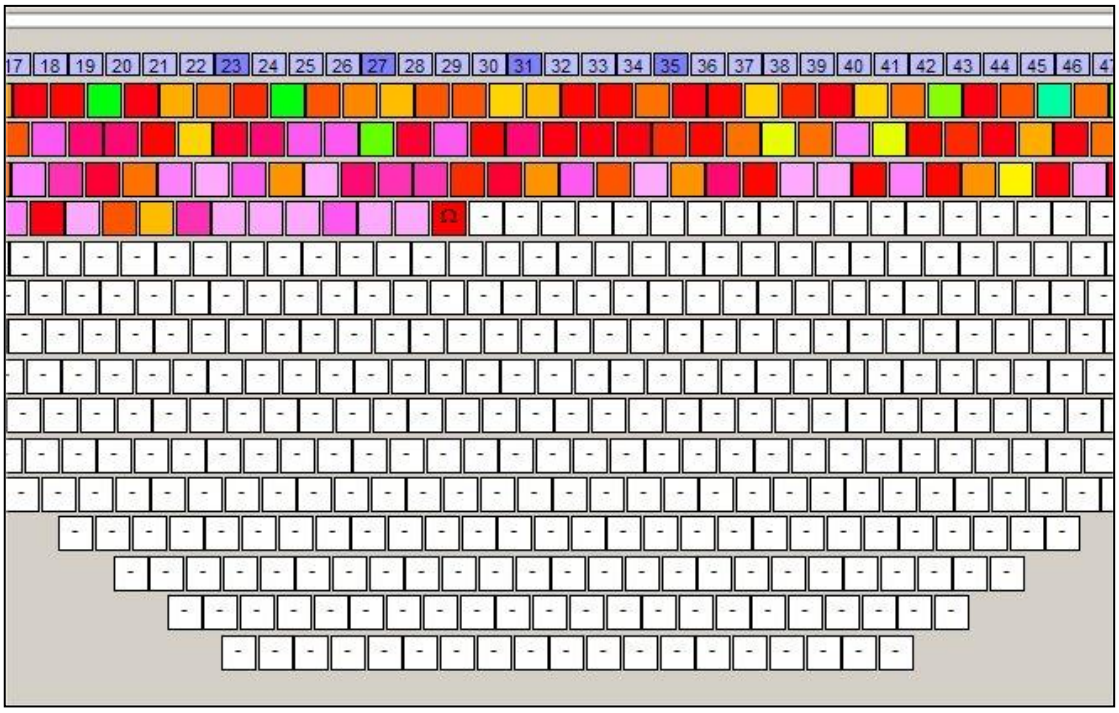


Figure 9: Display of data in the Survey Designer pseudo-section display during data collection.

5.2 Pausing & Resuming Data Collection

Menu: ACQUISITION > START PAUSE (RESUME)
Toolbar:

Shortcuts: CTRL+P

Toggles data collection on and off during a data acquisition run. The toolbar button and menu label will change to indicate RESUME once the button has been pressed once. There may be a short delay after the button has been pressed whilst the software completes the current measurement.

5.3 Terminating Data Collection

Menu: ACQUISITION > TERMINATE
Toolbar:

Shortcuts: CTRL+T

Used to terminate the active data acquisition sequence. There may be a short delay after the button has been pressed whilst the software completes the current measurement.

Exiting data collection allows the user to adjust survey parameters at any time during acquisition. This is useful, for example, if the data on a particular level is found to be noisier or more stable than expected.

Note that it is only possible to restart data collection from the position of the last measurement if the previous data acquisition sequence was 'Acquire by Level' (see Section 5.7 for further details).

5.4 Viewing the Voltage Waveform

Menu: ACQUISITION > VIEW WAVEFORM
Toolbar: 

Shortcuts: CTRL+W

Use the WAVEFORM toolbar button to view the voltage waveform for the most recent measurement. The waveform is displayed in a separate window and is updated automatically after each measurement.

To remove the background self potential (SP) values from the waveform use the FILE > TOOLS > SUBTRACT SP menu on the voltage waveform window. The SP is measured by calculating the difference between the average voltages measured during the positive and negative portions of the measurement cycle.

To save an image (Windows Metafile or Bitmap) of the current waveform use the FILE > TOOLS > SAVE IMAGE menu on the voltage waveform window.

To export the latest voltage waveform data to an ASCII text file use the FILE > TOOLS > EXPORT to ASCII FILE menu.

5.5 Saving Data during Collection (QuickSave Function)

Menu: n/a
Toolbar: 

Shortcuts: n/a

Use the QUICKSAVE function to save the current contents of the Data Table to a temporary RES file at any time during data collection. The file is saved in the

application directory. The filename is automatically generated using the current date and time in the form:

Autosave_[yymmdd]_[hhmmss].res

The user is prompted to delete any Autosave files that are present in the current application directory when the software is exited.

5.6 Display of Data during Collection

The Acquisition Status Bar at the bottom of the screen provides confirmation of each stage in the measurement cycle, which electrodes are being used and the current TIGRE parameters (output current, number of cycles, waveform time on and time off).

The resistivity readings for each cycle of the current measurement are displayed briefly together with the percentage error on the Data Display Status Bar, which is located next to the Toolbar near the top of the screen.

Following completion of the measurement the measured values of self potential and resistance and the calculated percentage error and apparent resistivity are updated in the Data Display Table and the measurements cell in the pseudo-section is coloured depending on its value and the current colour table settings (see Section 3.8.4). The data table automatically scrolls during data acquisition to display the current measurement.

If the measurement fails the cell displays an X symbol.

5.7 Restarting Data Collection

As long as the 'Acquire by Level' option was selected data acquisition can be restarted at any time after acquisition has been exited as long as the survey design (array size, geometry) has not been changed.

On resumption of acquisition the following prompt is displayed:

Press YES to resume acquisition from the last reading or NO to restart acquisition from the first reading in the current selection. This will be the first measurement in the pseudo-section with its 'Active' flag set to True.

5.8 Acquiring Single Readings

When operating in ALL READINGS mode, following completion of all measurements the program will carry out all necessary repeats (when this option has been chosen) and then revert to SINGLE READING mode. This allows the user to repeat individual data points where necessary simply by clicking on the appropriate cell with the left mouse button.

Single readings can also be taken from the Survey Designer window in the same manner by selecting SINGLE READING mode from the Acquisition Parameters tab on the Survey Options dialog box (see Section 3.8.2).

5.9 Acquiring User-Defined Survey Data

Menu: FILE > USER-DEFINED SURVEY
Toolbar: n/a
Shortcut: CTRL+U

The User-Defined Survey option provides the ability to take measurements using any combination of four electrodes, through the use of a user-defined control file, similar to the PRM parameter file used with the original Geopulse / Tigre DOS Imager software.

The ImagerPro2006 control file is a comma-delimited text file with the same .PRM file extension. An example of a typical file is presented below. The PRM file can be defined using Microsoft Excel or any other editing program capable of producing comma-delimited files.

```
Wenner Alpha Spread
/MeasurementType, #Readings, UnitElectrodeSpacing, Sub-ArrayType, X-LocationType
1,5,1,1,2
/Current,Cycles,T-On,T-Off,P1,P1-x,P1-y,P1-z,P2,P2-x,P2-y,P2-z,C1,C1-x,C1-y,C1-z,C2,C2-x,C2-y,C2-z
1,3,2,0.5,31,1,0,0,30,2,0,0,32,0,0,0,29,3,0,0
1,3,2,0.5,30,2,0,0,29,3,0,0,31,1,0,0,28,4,0,0
1,3,2,0.5,29,3,0,0,28,4,0,0,30,2,0,0,27,5,0,0
1,3,2,0.5,28,4,0,0,27,5,0,0,29,3,0,0,26,6,0,0
1,3,2,0.5,27,5,0,0,26,6,0,0,28,4,0,0,25,7,0,0
```

The first four lines of the file comprise the file header:

Header Line 1: Survey title

Header Line 2: Identifies the parameters listed on the third line

Header Line 3: Array parameters. The *Measurement Type* indicates whether the resulting data are in apparent resistivity (0) or resistance (1) format. In all cases this should be set to (1) as the array geometry is unknown. The *Unit Electrode Spacing* represents the physical distance between the electrodes in the array. The *Sub-Array Type* identifies whether the array follows one of the conventional array geometries (e.g. Wenner). The X-Location Type parameter is set to (1) if the x-location values for the electrodes are true horizontal distances and (2) if they represent ground distances.

Header Line 4: Identifies the parameters listed in the main data section.

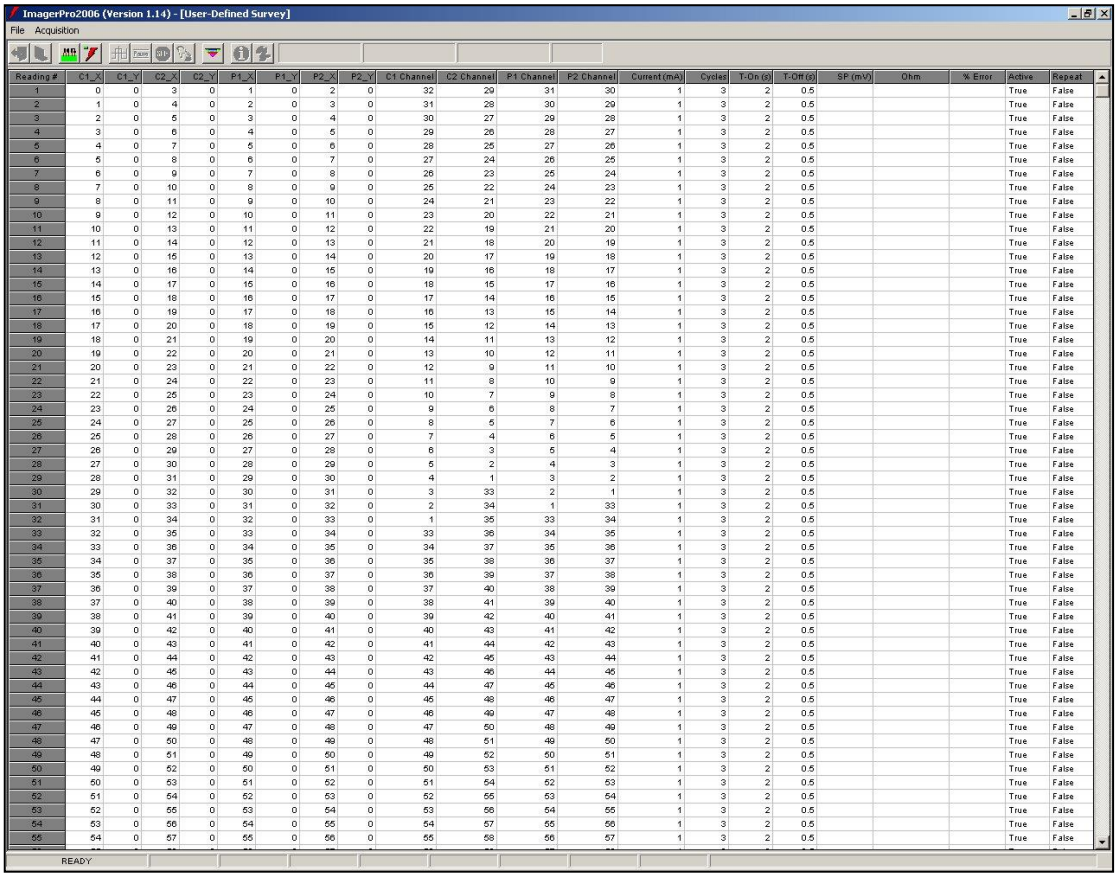
The file header is followed by the data for each individual measurement. The first four parameters comprise the various meter settings, whilst the remaining sixteen identify the channel number and xyz locations of the current (C1, C2) and potential (P1, P2) electrodes.

The description of each electrode location in three dimensions is provided to enable the design of 3D surveys.

After selecting the User-Defined Survey menu the program prompts the user to select the required PRM file using the Open file dialog box.

Navigate to the file and then click OK.

The main Survey Window is then replaced by a data table (The User-Defined Survey Window) listing the parameters for each measurement as illustrated in Figure 10 below.



Reading #	C1_X	C1_Y	C2_X	C2_Y	P1_X	P1_Y	P2_X	P2_Y	C1 Channel	C2 Channel	P1 Channel	P2 Channel	Current (mA)	Cycles	T-On (s)	T-Off (s)	SP (mV)	Ohm	% Error	Active	Repeat
1	0	0	3	0	1	0	2	0	32	29	31	30	1	3	2	0.5				True	False
2	1	0	4	0	2	0	3	0	31	28	30	29	1	3	2	0.5				True	False
3	2	0	5	0	3	0	4	0	30	27	29	28	1	3	2	0.5				True	False
4	3	0	6	0	4	0	5	0	29	26	28	27	1	3	2	0.5				True	False
5	4	0	7	0	5	0	6	0	28	25	27	26	1	3	2	0.5				True	False
6	5	0	8	0	6	0	7	0	27	24	26	25	1	3	2	0.5				True	False
7	6	0	9	0	7	0	8	0	26	23	25	24	1	3	2	0.5				True	False
8	7	0	10	0	8	0	9	0	25	22	24	23	1	3	2	0.5				True	False
9	8	0	11	0	9	0	10	0	24	21	23	22	1	3	2	0.5				True	False
10	9	0	12	0	10	0	11	0	23	20	22	21	1	3	2	0.5				True	False
11	10	0	13	0	11	0	12	0	22	19	21	20	1	3	2	0.5				True	False
12	11	0	14	0	12	0	13	0	21	18	20	19	1	3	2	0.5				True	False
13	12	0	15	0	13	0	14	0	20	17	19	18	1	3	2	0.5				True	False
14	13	0	16	0	14	0	15	0	19	16	18	17	1	3	2	0.5				True	False
15	14	0	17	0	15	0	16	0	18	15	17	16	1	3	2	0.5				True	False
16	15	0	18	0	16	0	17	0	17	14	16	15	1	3	2	0.5				True	False
17	16	0	19	0	17	0	18	0	16	13	15	14	1	3	2	0.5				True	False
18	17	0	20	0	18	0	19	0	15	12	14	13	1	3	2	0.5				True	False
19	18	0	21	0	19	0	20	0	14	11	13	12	1	3	2	0.5				True	False
20	19	0	22	0	20	0	21	0	13	10	12	11	1	3	2	0.5				True	False
21	20	0	23	0	21	0	22	0	12	9	11	10	1	3	2	0.5				True	False
22	21	0	24	0	22	0	23	0	11	8	10	9	1	3	2	0.5				True	False
23	22	0	25	0	23	0	24	0	10	7	9	8	1	3	2	0.5				True	False
24	23	0	26	0	24	0	25	0	9	6	8	7	1	3	2	0.5				True	False
25	24	0	27	0	25	0	26	0	8	5	7	6	1	3	2	0.5				True	False
26	25	0	28	0	26	0	27	0	7	4	6	5	1	3	2	0.5				True	False
27	26	0	29	0	27	0	28	0	6	3	5	4	1	3	2	0.5				True	False
28	27	0	30	0	28	0	29	0	5	2	4	3	1	3	2	0.5				True	False
29	28	0	31	0	29	0	30	0	4	1	3	2	1	3	2	0.5				True	False
30	29	0	32	0	30	0	31	0	3	33	2	1	1	3	2	0.5				True	False
31	30	0	33	0	31	0	32	0	2	34	1	33	1	3	2	0.5				True	False
32	31	0	34	0	32	0	33	0	1	35	33	34	1	3	2	0.5				True	False
33	32	0	35	0	33	0	34	0	33	36	34	35	1	3	2	0.5				True	False
34	33	0	36	0	34	0	35	0	34	37	35	36	1	3	2	0.5				True	False
35	34	0	37	0	35	0	36	0	35	38	36	37	1	3	2	0.5				True	False
36	35	0	38	0	36	0	37	0	36	39	37	38	1	3	2	0.5				True	False
37	36	0	39	0	37	0	38	0	37	40	38	39	1	3	2	0.5				True	False
38	37	0	40	0	38	0	39	0	38	41	39	40	1	3	2	0.5				True	False
39	38	0	41	0	39	0	40	0	39	42	40	41	1	3	2	0.5				True	False
40	39	0	42	0	40	0	41	0	40	43	41	42	1	3	2	0.5				True	False
41	40	0	43	0	41	0	42	0	41	44	42	43	1	3	2	0.5				True	False
42	41	0	44	0	42	0	43	0	42	45	43	44	1	3	2	0.5				True	False
43	42	0	45	0	43	0	44	0	43	46	44	45	1	3	2	0.5				True	False
44	43	0	46	0	44	0	45	0	44	47	45	46	1	3	2	0.5				True	False
45	44	0	47	0	45	0	46	0	45	48	46	47	1	3	2	0.5				True	False
46	45	0	48	0	46	0	47	0	46	49	47	48	1	3	2	0.5				True	False
47	46	0	49	0	47	0	48	0	47	50	48	49	1	3	2	0.5				True	False
48	47	0	50	0	48	0	49	0	48	51	49	50	1	3	2	0.5				True	False
49	48	0	51	0	49	0	50	0	49	52	50	51	1	3	2	0.5				True	False
50	49	0	52	0	50	0	51	0	50	53	51	52	1	3	2	0.5				True	False
51	50	0	53	0	51	0	52	0	51	54	52	53	1	3	2	0.5				True	False
52	51	0	54	0	52	0	53	0	52	55	53	54	1	3	2	0.5				True	False
53	52	0	55	0	53	0	54	0	53	56	54	55	1	3	2	0.5				True	False
54	53	0	56	0	54	0	55	0	54	57	55	56	1	3	2	0.5				True	False
55	54	0	57	0	55	0	56	0	55	58	56	57	1	3	2	0.5				True	False

Figure 10: The User-Defined Survey Window

The menu bar and toolbar represent cut-down versions of the menu and toolbars displayed in the main Survey Window. Select the lightning icon on the toolbar or go to ACQUISITION > START on the menu bar to commence acquisition. The data table entry for the currently active measurement is highlighted in green during acquisition.

All the other toolbar buttons have the same functionality as those on the main Survey Window toolbar.

On completion of data collection the data can be saved in a variant of the RES format and in RES2DINV DAT format. The format of DAT files generated using the User-Defined Survey option conforms to the RES2DINV general array format (array type 11) (see the RES2DINV user manual for further details).

It is important to note that due to the non-conventional nature of the measurements RES and DAT files acquired using the User-Defined Survey option can neither be viewed nor edited in ImagerPro2006.

6 Saving Data (Conventional Arrays)

Menu: FILE > SAVE DATA SET
Toolbar: 
Shortcut: F2

6.1 Introduction

During acquisition the raw resistance measurements are stored in a data table along with the associated electrode positions, reading errors, self-potential reading (SP) and calculated apparent resistivity values.

Before exiting the program the data should be saved to disk. A warning message is presented if the user attempts to exit the program before saving any previously unsaved data.

The current Survey Layout **cannot** be altered until the Data Table has been cleared: To clear the Data Table select:

EDIT > CLEAR DATA TABLE (shortcut CTRL + D).

If the user attempts to clear the data table before any existing data has been saved the software will display a warning message.

Two output file formats are available; ImagerPro2006 RES format and the RES2DINV DAT format. It is recommended that even if saved to a DAT format file that data is also saved in RES format. These files give greater flexibility for conversion to other formats and for subsequent correction of any array geometry errors made in the field.

6.2 ImagerPro2006 RES Format

The ImagerPro2006 .RES file is a comma delimited file containing detailed information for each measurement in the active survey array. An example of part of a RES file collected using the Wenner Beta array type is presented below:

```
/ImagerPro2006 (Ver1.1) .RES Format File: Created on 08/08/2007 @ 18:13:01
/Job Description:  P0856-07: Line 1 / Spread T1
/Array Type: Wenner Beta
/Survey mode: Traverse
"ArrayType","Mode","Readings","Levels","Electrodes","Spacing(m)","Multiple","RO
Electrodes"
4,1,321,6,64,5,1,64
"ID#","Level","Level ID#","X-Coord","N
Factor","Current(mA)","Cycles","P1","P2","C1","C2","%Error","SP(mV)","Res(Ohms)","Res(Oh
m-m)"
1,1,1,7.5,1,.5,3,30,29,31,32,0,0,15.11095,474.7241
2,1,2,12.5,1,.5,3,29,28,30,31,0,0,11.66848,366.5758
```



```
3,1,3,17.5,1,.5,3,28,27,29,30,0,0,12.59037,395.5379
4,1,4,22.5,1,.5,3,27,26,28,29,0,0,6.791249,213.3532
5,1,5,27.5,1,.5,3,26,25,27,28,0,0,7.03896,221.1353
```

Unlike the RES2DINV DAT file format, RES files retain information on the array and meter parameters, as well as the x-location, n-factor and the results (SP, %error, resistance and where applicable, apparent resistivity) for each measurement position.

RES format files saved from the User-Defined Survey function (Section 5.5) have a slightly different format, containing additional information on the xyz locations of each of the current and potential electrodes and lacking apparent resistivity values. These files cannot be viewed or edited in ImagerPro2006.

Note that RES files of either format **cannot** be imported into RES2DINV! RES files can be converted to DAT format using the ImagerPro2006 concatenation function (see Section 7.1).

The RES file format has been extensively altered since ImagerPro2000. It is not possible to read old ImagerPro2000 format RES files into ImagerPro2006. Note also that the RES import function in RES2DINV relates to the old Campus International Products Ltd Imager64 (DOS) file format.

6.3 RES2DINV DAT Format

This is the file format accepted by RES2DINV. Three variants of the DAT format are provided by ImagerPro2006. The DAT format used depends on the selected array type:

1. Non-dipole conventional arrays (Wenner α, β and Pole-Pole)
2. Conventional dipole arrays (Wenner-Schlumberger, Dipole-Dipole & Pole Dipole)
3. Non-conventional (General) arrays (see Section 5.5)

For types (1) and (2) the first five lines after the title line comprise five survey parameters; *unit electrode spacing*, *array number* (e.g. 1 for Wenner α, 2 for Pole-Pole, 3 for Dipole-Dipole, 4 for Wenner β, 6 for Pole-Dipole, 7 for Wenner Schlumberger), *number of readings*, *x-location type* (always 1) and *IP Flag* (0 if no IP data present, 1 if IP data is present).

The format of each data entry after the file header depends on whether the file contains non-dipole or dipole data:

For non-dipole arrays (array numbers 1, 2 and 4) the data entries comprise three parameters; the *x-location* of the data point, the *a-spacing* (the distance between adjacent electrode pairs) and the measured apparent resistivity value.

For dipole arrays (array numbers 3, 6 and 7) the data entries contain an additional parameter; the first value is the *x-location* of the data point, the second value represents the distance between the potential (or current) electrode pair (P1-P2). This is determined by multiplying the Dipole Multiple by the Unit Electrode Spacing. The third value is the *n-factor* (also referred to as the dipole separation factor – see Section 3.8.2). The fourth value represents the measured apparent resistivity value.

Only files collected using the Traverse Survey Type can be saved in DAT format directly from the SAVE DATA SET menu. Roll-along survey data must firstly be saved in RES format and then converted to a DAT file or merged with a traverse file using the CONCATENATION function (see Section 7.1) before being read into RES2DINV.

When collecting dipole arrays using more than one value for the Dipole Multiple, the results for each multiple can be combined in a single DAT file ready for processing. This option also allows data from forward and reverse pole-dipole arrays to be combined.

To append data to an existing file simply select the file using the Save As dialog box. If the software detects that the DAT file contains dipole array data it will automatically ask whether the new data should be appended.

See Section 7.2 on how to add topography data (survey levels) to DAT files.

The DAT format for non-conventional arrays is discussed on Section 5.9.

The user is referred to the RES2DINV user manual for more information on the DAT file format.

7 File Utilities & Data Processing Functions

7.1 Concatenating Files

Menu: TOOLS > CONCATENATE IMAGERPRO (RES) FILES
Toolbar: n/a
Shortcut: n/a

In order to collect continuous data for a line length greater than that of the electrode array it is necessary to acquire a series of 'roll-along' sections before finishing the line with a traverse.

ImagerPro2006 enables splicing of up to ten RES format roll-on files with a RES traverse file using the CONCATENATE function (Figure 11).

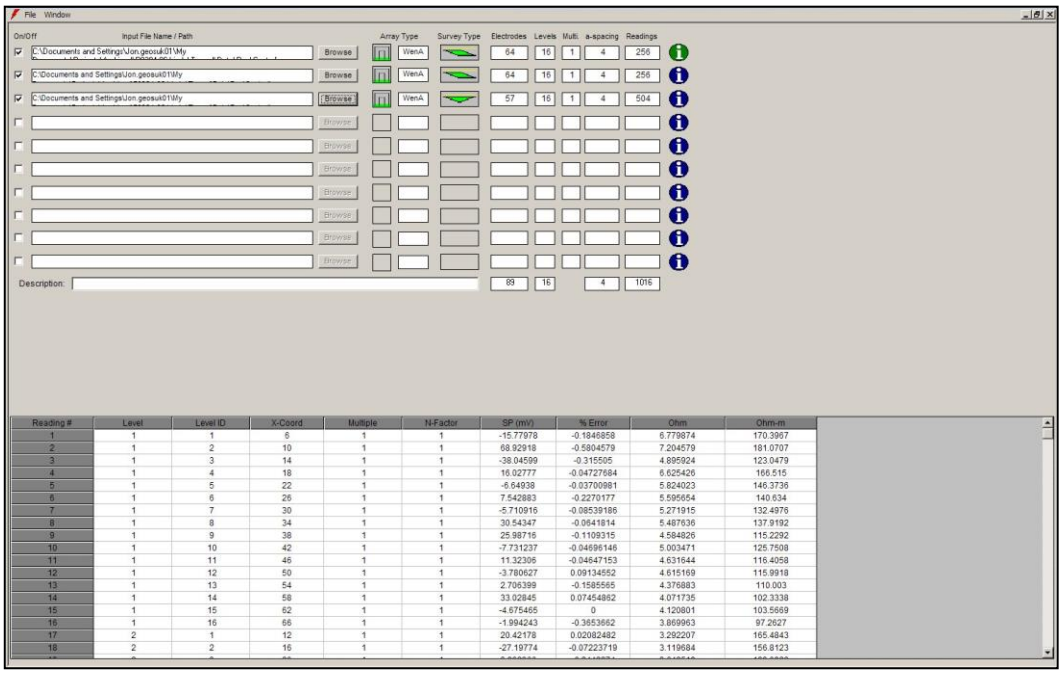


Figure 11: The Concatenate window

Selection of the required files is made using the check boxes and BROWSE buttons on the left-hand side of the window. The survey parameters (array type, survey type, number of electrodes, measured levels, a-spacing, dipole multiple and the total number of readings) for each individual file and the combination of files are indicated on the right-hand side as shown above.

Following specification of the OUTPUT FILE name (.DAT format), minimum electrode separation and comment line, press OK to start concatenation.

Note: the default comment line is read from the header of the first file specified. This box can be edited or left blank. Leaving it blank will result in just the date and time being written to the output file.

Individual roll-on files can be converted to .DAT files for use in RES2DINV by omitting a traverse file name. The right hand side of the roll-on section will be truncated to produce a .DAT traverse pseudo-section.

To view a list of the contents of any of the selected data files click on the information icon  to the right of the required file entry.

The Concatenation function will automatically determine whether the selected input files are suitable for concatenation and reports any violations (e.g. attempting to merge files with different array geometries).

7.2 Adding Topographic Data to RES2DINV DAT Files

Menu: TOOLS > ADD TOPOGRAPHY to RES2DINV (DAT) FILE
Toolbar: n/a
Shortcut: n/a

Select the required DAT file using the INPUT FILE browse button and then the ASCII format file containing the topographic data. The file should have a .XYZ suffix and be in the following format:

0, 101.79
3, 101.92
48, 102.64

where the first column contains the distance from the start of the line and the second column contains the elevation.

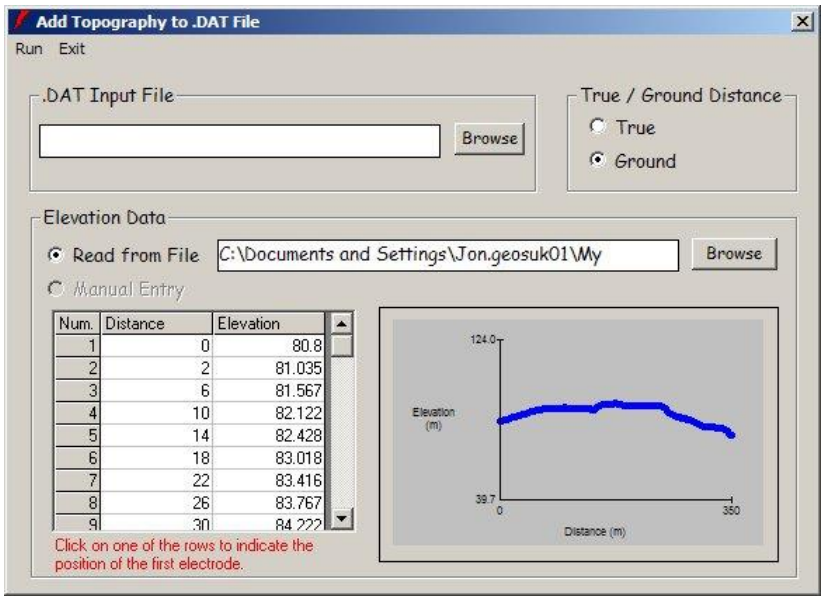


Figure 12: The Add Topography window

The topography profile is plotted as a graph in the bottom right of the Add Topography window (Figure 12).

Select whether the topography data is in true distance or ground distance coordinates using the radio buttons.

To add the topographic data to the .DAT file click on RUN in the top menu. A file with the modified name *[filename]_topo.dat* will be created. Click on EXIT to close the window and return to the Survey Designer.

Note: See the RES2DINV manual for more information on using topographic data with .DAT files.

7.3 Data Inversion & Forward Modelling

ImagerPro2006 can be used to automatically launch RES2DINV and RES2DMOD if these are available on the host computer.

To access RES2DINV: from the menu bar, select TOOLS > 2D DATA INVERSION (RES2DINV)

To access RES2DMOD: from the menu bar select TOOLS > 2D FORWARD MODELLING (RES2DMOD).

RES2DINV can alternatively be accessed from the toolbar using the  toolbar button.

ImagerPro2006 will initially look in the default program directory for the relevant .EXE file. If the directory or file does not exist the user will be prompted to locate the .EXE or quit. The link to the .EXE is stored for future use until removed by the user (see below) or until the relevant program directory or executable file is removed.

To break a link to a defined executable select: TOOLS > REMOVE SOFTWARE LINKS.

This is required, for example, if a link to an incorrect executable was defined. Breaking the link will result in the option to relocate an executable when RES2DINV or RES2DMOD is next selected.

8 Viewing Data Sets

Menu: FILE > OPEN DATA SET
Toolbar: 
Shortcut: F1

8.1 Introduction

RES and DAT format data files generated by ImagerPro2006 are viewed in the Data Display window (Figure 13). It is also possible using this function to view DAT files that have been edited in RES2DINV.

It is not currently possible to view dipole array DAT files that contain data for multiple P1-P2 separations (Dipole Multiples) or DAT files of the general array type (array number 11).

The Data Display window (Figure x) comprises a pseudo-section display similar to that displayed in the Survey Design window (with the addition of distance and depth axes) and a Survey Parameters Table.

The pseudo-section depth axis is based on calculated median depths of investigation for each measurement level in the dataset (see Section 3.7 for an explanation of how these are calculated).

The Survey Parameters Table located below the pseudo-section displays information on the dataset, including; the file location, title, array type, number of measurements and survey type.

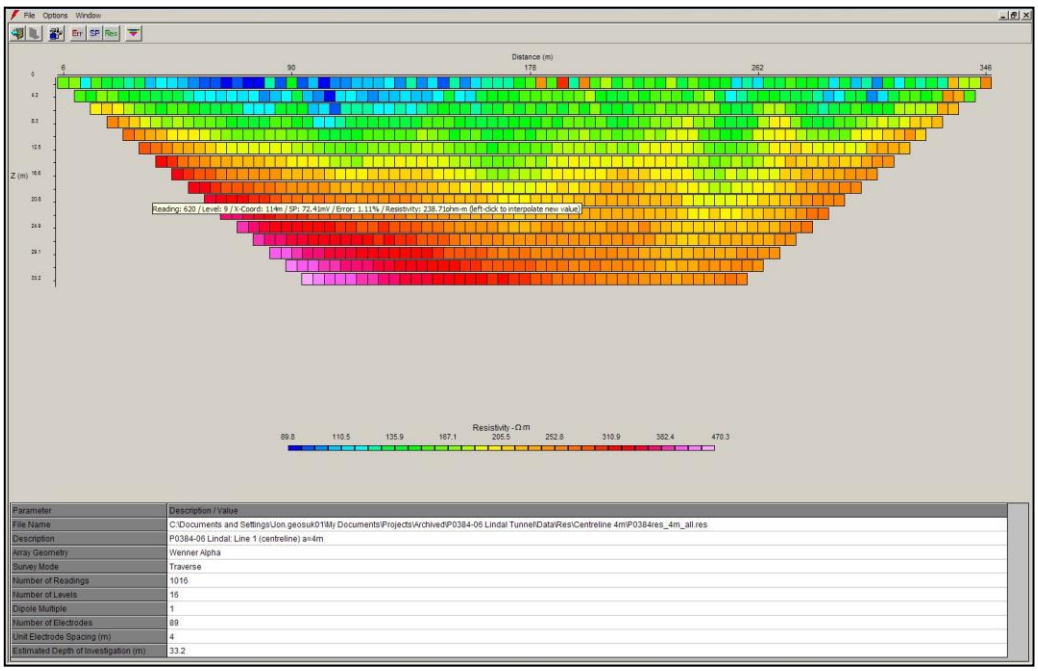


Figure 13: Data Display window

Each of the individual 'cells' in the pseudo-section represents a measurement point and is colour coded using the currently selected colour table and colour table distribution type. These are selected along with the colour table range (manual or automatic) from the Colour Table Tab on the Survey Options dialog box (Section 3.8.4).

Individual cells can be queried by holding the cursor over the required cell for several seconds. This displays a tool-tip text box containing information on the measurements location in the array and the measured values of SP, % error and apparent resistivity.

When viewing RES data files the software provides the option of displaying the % error, the self potential (SP) values or apparent resistivity values. To toggle between the datasets use the toolbar buttons located below the menu bar at the top of the screen. Note that the current user-defined colour table range will be reset to the automatically determined range when the user toggles to a different data type.

8.2 Editing Measurements

Any empty data cells within the pseudo-section can be filled with an interpolated apparent resistivity value by clicking the left hand mouse button whilst the cursor is held over the required cell.

The software calculates a new value for the cell by determining the median value of the two adjacent cells. For cells located on the edges of the pseudo-section the new value will be the same as that of the adjacent cell.

This function was designed to be used for replacing zero resistivity values, as these can't easily be dealt with in RES2DINV, but it can also be used to remove data spikes associated with poor and noisy measurements.

The edited dataset can be saved from the FILE > SAVE AS menu or by using the SAVE AS button on the toolbar. The menu option and toolbar button only become active when one or more edited cells are present within the pseudo-section.

9 Help Menu

9.1 Wenner Array Survey Planner

Menu: HELP > WENNER ARRAY SURVEY PLANNER
Toolbar: n/a
Shortcut: n/a

This tool calculates the total number of readings, numbers of roll-on electrodes, estimated survey duration and other parameters for a defined survey length when using either the Wenner α or Wenner β array types (Figure 14).

Calculations can either be based on a required ground distance (survey line length) or a specified distance at the required depth of investigation ('Minimum distance required at final level').

Once the various survey parameters have been set click the 'Apply Settings' button to update the display.

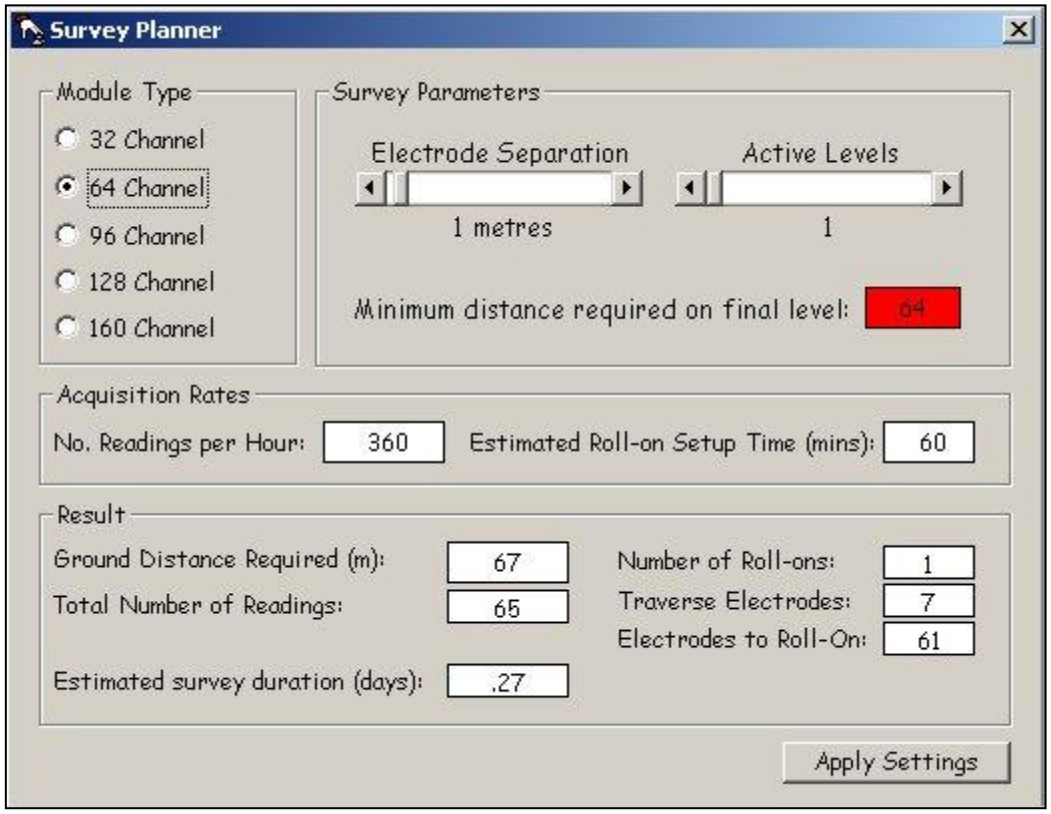


Figure 14: The Wenner Survey Planner

9.2 2D Array Sensitivity Diagrams

Menu: HELP > ARRAY SENSITIVITY DIAGRAMS
Toolbar: n/a
Shortcut: n/a

Array sensitivity diagrams (or 2D sensitivity sections) graphically illustrate '*...the degree to which a change in the resistivity of a section of the subsurface will influence the potential measured by the array*'. '*The higher the value of the sensitivity function, the greater is the influence of the subsurface region on the measurement*'. (Loke 2003).
This helps the user to select the most appropriate array geometry for a given target.

For example, the array sensitivity diagram for the Wenner Alpha array shows near horizontal contours below the centre of the array indicating that the array is most sensitive to vertical changes in resistivity and is thus best suited for resolving horizontal (i.e. layered) structures.

In contrast the diagram for the Dipole-Dipole array (Figure 15) shows greater sensitivity to horizontal changes in resistivity and is therefore more appropriate for resolving vertical structures (for example faults, dykes).

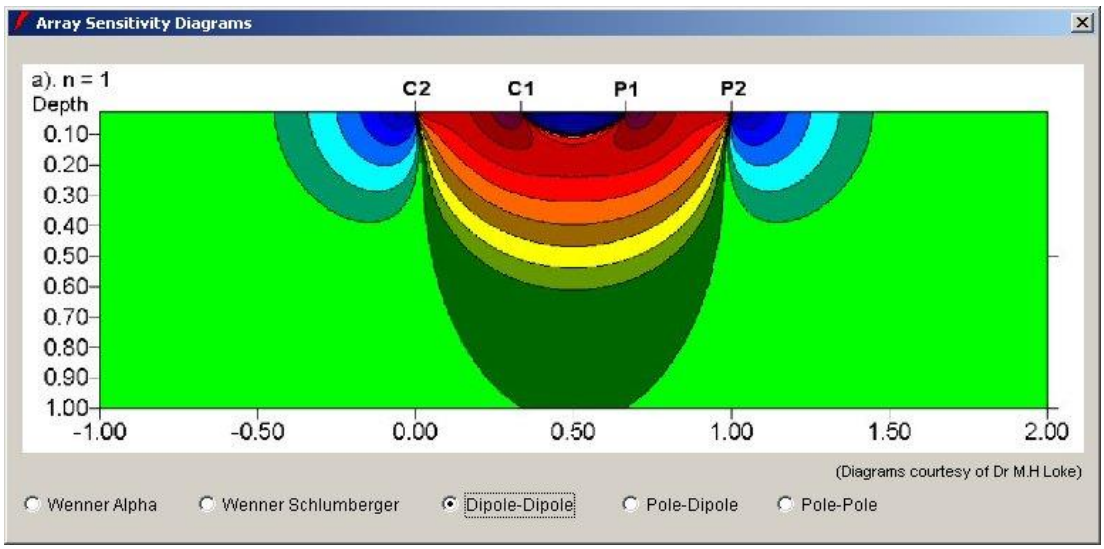


Figure 15: Array Sensitivity Diagram selection window

ImagerPro2006 will initially display the array sensitivity diagram for the currently selected array geometry. The sensitivity diagrams for other arrays can be selected using the option buttons below the diagram.

Note that for dipole arrays, only the sensitivity diagram for an *n-factor* of 1 is provided.

Blue regions of the diagram indicate negative sensitivity, corresponding to areas of anomaly inversion.

The array sensitivity diagrams provided in ImagerPro2006 were obtained from Loke, 2003. The reader is referred to this document for a more complete explanation of 2D sensitivity sections.

10 Error Messages & Troubleshooting

Error Message	Cause(s)	Solution
NO ANSWER FROM METER	Meter not switched on or battery is dead.	Ensure meter is on prior to starting acquisition. Charge battery or connect external 12V supply.
NO ANSWER FROM METER AFTER MODULE SETUP	Software received no response from the meter after trying to set the module relays. Possible COM's error.	Check module is installed in the meter (Geopulse). Check PC contains compatible serial port.
NO ANSWER FROM GAIN SET	Problem occurred whilst trying to set the gain.	Check electrode contacts.
NO ANSWER WHILE RECEIVING READINGS	Possible break in circuit during measurement cycle. Possible COM's error.	Check electrode contacts. Check PC contains compatible serial port.
NO ANSWER FROM MODULE	No module installed or module failure.	Check module is installed. Contact Campus International Products Ltd for further advice.
NO ANSWER FROM CALIBRATION	COM's error.	Check PC contains compatible serial port.
NO ANSWER FROM SETTINGS STATUS	COM's error.	Check PC contains compatible serial port.
CONSTANT CURRENT ERROR	No current circuit	High electrode contact resistance, electrodes not connected or break in wire – check C1 & C2 electrodes.
METER TEMPERATURE OUT OF RANGE	Temperature inside meter box is too high (>50°C) or too low (<0°C).	Keep meter temperature within range by shading or warming.
BATTERY LOW	Battery voltage is below 10V.	Recharge internal battery or connect external 12V source.
GAIN ERROR INPUT VOLTAGE HIGH	High input voltage probably due to poor P electrode contacts.	Check P1 and P2 electrodes.

11 Cable Layout & Channel Addressing

11.1 Tigre 64-Channel Systems

When using ImagerPro2006 with the Tigre 64 channel system the cables should be laid out with the two cable drums at opposite ends of the survey line with the Tigre and computer located at the centre of the spread.

Electrode 1 is designated as the last take out on the drum connected to Channels 1-32 on the Tigre and corresponds to Channel 32. Conversely Electrode 32 corresponds to Channel 1. The channel assignments / electrodes for the second cable (Channels 33-64) are coincident (e.g. Channel 33 = Electrode 33). This arrangement is illustrated below:

REEL---------- (OPERATOR) ----------REEL

Channel 32----------Channel 1 Channel 33----------Channel 64

Elec. 1----------Elec. 32 Elec. 33----------Elec. 64

Note: Channel 32 will always be the first electrode in the spread (i.e. 0m) **even when using only one cable.**

11.2 Tigre 96- & 128-Channel Systems

When using the software with a 96-channel or 128-channel Tigre system, the cables should be laid out as follows:

REEL---------- REEL---------- (OPERATOR) ----------REEL ----------REEL

CH32-----CH1 CH64-----CH33 CH65-----CH96 CH97-----CH128

The last take out on the cable connected to Channels 1-32 is designated Electrode 1 and the remainder are then numbered 2 to 128 consecutively from left to right.

The cables assigned to Channels 1-32 and Channels 97-128 are thus connected to the Tigre via additional extension cables.

Note: the above arrangement should **always** be maintained for correct operation, **even when operating the system with less than the full complement of electrodes / cables.**

11.3 Channel / Electrode Numbering

During data acquisition the C1, P1, C2, P2 display on the Acquisition Status Bar indicates the electrodes currently active in the spread. The corresponding channel numbers are displayed in brackets after the electrode numbers.

The channel numbers refer to the relays in the Tigre. They are also displayed on the Tigre LCD display and in the ImagerPro2006 Data Display Window.

12 References

Dr. M.H. Loke, 2003: 'Tutorial: 2D and 3D electrical imaging surveys', www.geoelectrical.com/

Geotomo Software, July 2007: 'RES2DINV ver. 3.56', www.geoelectrical.com/

Campus International Products Ltd, Geopulse Tigre Resistivity Meter User's Manual', www.campusinternational.co.uk/campus_tigre.html

