

For more detailed and in-depth instructions regarding proper usage of the instrument, please consult the *ABEM Terraloc Pro 2 User Manual*.

LAYOUT PROCEDURE FOR LINEAR SURFACE ARRAYS

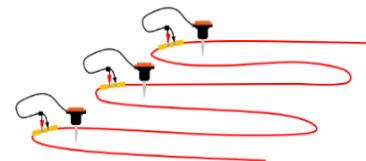
A. Setting-up for survey

- Lay out geophones.** Use survey tapes as a positioning guide or, if using the spread cables at their full take-out spacing, lay out the cables first, and then use the take-outs as a guide for geophone positions.
- Ensure geophones are 'grounded'.** They should be vertical, making firm contact with the ground, and be free from vegetation that could blow onto the casing and create 'noise'. It may be necessary to scrape away loose surface material to find compact soil to hold the geophone firm.
- Lay out seismic cables [option 1: increasing].** A common layout, with the cable take-out numbers increase along the survey line (see figure, below).
 - Place Take-out 1 of Cable 1 adjacent to the first geophone in the spread. Walk the cable reel to the center of the spread until all take-outs of Cable 1 are aligned with a geophone.
 - Next, place Take-out 1 of Cable 2 at the next available geophone position and walk it out from the center of the spread until all take-outs align with a geophone position.

- Lay out seismic cables [option 2: mirror].** In this format, take-out numbers increase or decrease out from the spread center.

- Put first (or last) take-out of each cable on the geophones next to the instrument, then spool outwards until all take-outs are aligned with a geophone. Edit the layout in the *Setup Wizard* (or the *Receiver Spread* menu, see shortcuts at end) to match the cable layout, prior to measurement.

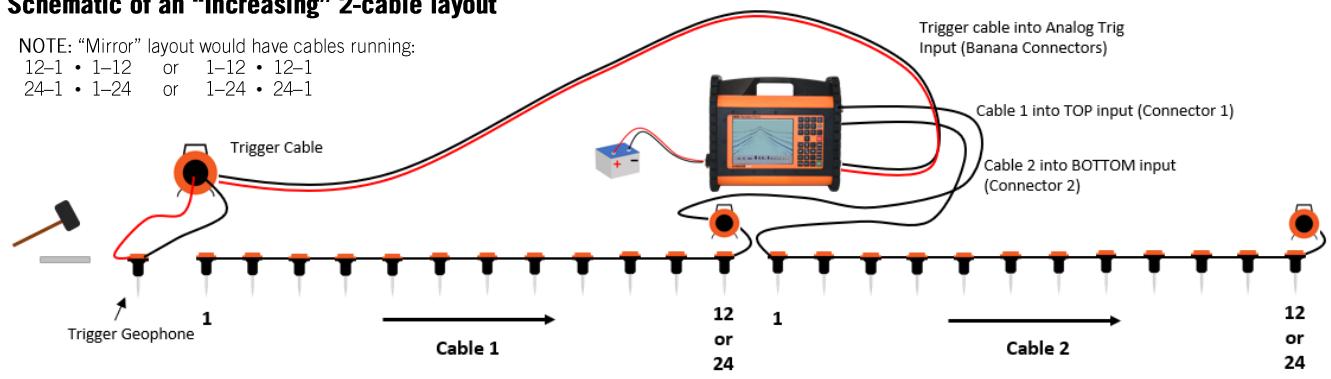
- Note:** If the geophone spacing is considerably smaller than the cable take-out spacing, avoid coiling and excessive overlapping of spare cable between the take-outs (right).



- Lay out the remaining survey equipment.** Place the Terraloc instrument in the middle of the survey line (between Cable 1 and Cable 2), then move the seismic source ready for a test shot and run the trigger cable back to instrument.

Schematic of an "Increasing" 2-cable layout

NOTE: "Mirror" layout would have cables running:
 12-1 • 1-12 or 1-12 • 12-1
 24-1 • 1-24 or 1-24 • 24-1



B. Connecting and powering the system

- Connect geophones to cable take-outs.** If using Mueller clips, connect the small clip (black) to the smaller take-out, and the bigger clip (red) to the larger take-out.
- Connect seismic cables to instrument.** At the center of the spread, take the end connector of Cable 1 and attach it to 'Connector 1' on the instrument side panel. Then, attach the end connector of Cable 2 to the instrument connector labelled 'Connector 2'.
- Connect trigger device.** Trigger devices can be connected to the seismograph via a physical trigger cable connection or a wireless radio link (optional accessory, see Guideline Geo website for details). Both the trigger cable and the radio unit connect to the seismograph via the analogue trigger input on instrument end panel. Many electromechanical sources will use an alternative connection to the digital (TTL) trigger input.
- Note:** Diagram above depicts a geophone as the trigger device; however, it is also common to use the hammer as a trigger device. To do this, a trigger switch must be attached near the hammer head and the trigger switch leads should be connected to the trigger cable reel.

- Connect power to instrument and power on.** The instrument can be powered from the Li-ion internal batteries, an external 12V battery, or a small generator (requires use of the ABEM Power Adapter). External power sources all use the same power port. When using an external 12V battery, use the external power cable to connect the instrument to the battery.

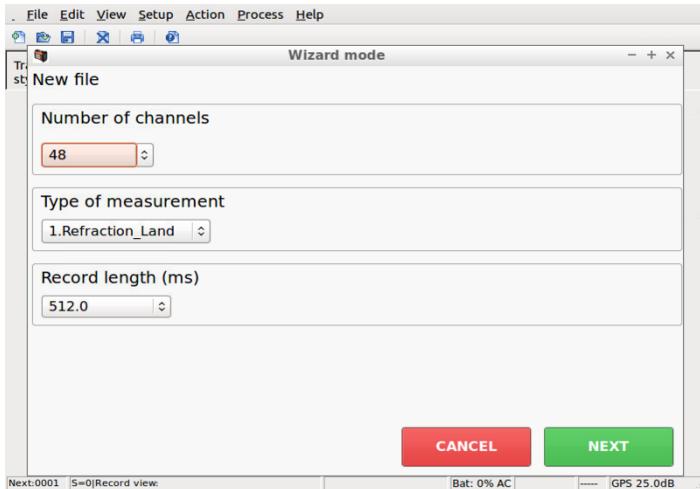
- Note:** The office power supply supplied with the instrument is not suitable for outdoor use.



INTRODUCTION TO THE WIZARD AND BASIC SEISTW SETUP

A. Set-up Wizard

The *Setup Wizard* opens automatically on start-up of SeisTW instrument software. The Wizard allows quick configuration of the instrument for measurement by inputting a few survey details. **Note:** Based on *Setup Wizard* inputs, the software will load acquisition settings designed to work for a broad range of site conditions. Please see the Terraloc Pro 2 User Manual for more comprehensive coverage of setting up the Terraloc Pro 2 and details of the advanced user settings.



- **Controls in the Setup Wizard.** The following keys can be used in combination with the arrow keys and number pad. An external mouse and keyboard can also be used.



Jump between fields

Hold *Shift + Tab* to jump backwards

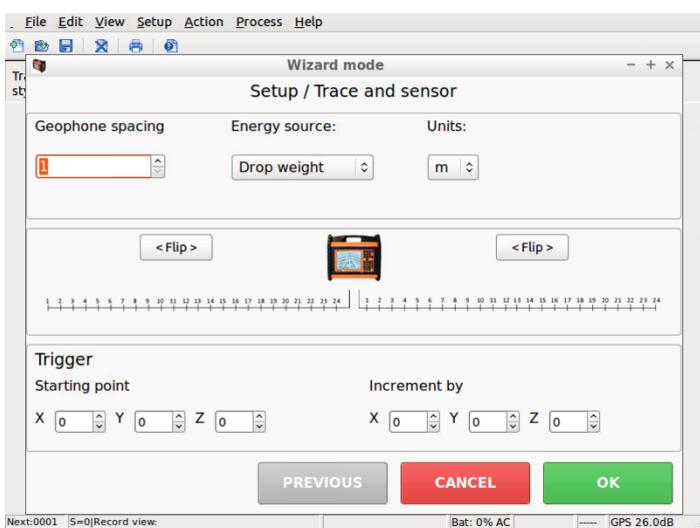
Open drop-down menu

Confirm choice

- **Set Number of channels** i.e. number of geophones, in the Setup Wizard this is limited to 12, 24 or 48.

- **Select Type of measurement.**

- **Choose NEXT to progress to the second screen.**



- **Set Geophone spacing.** This requires whole numbers, for decimal values, select smaller units; for example, use 150cm instead of 1.5m.

- **Select an Energy source.** If selected, the type of energy source will be written into the header data of the shot record. It does not impact any acquisition settings.

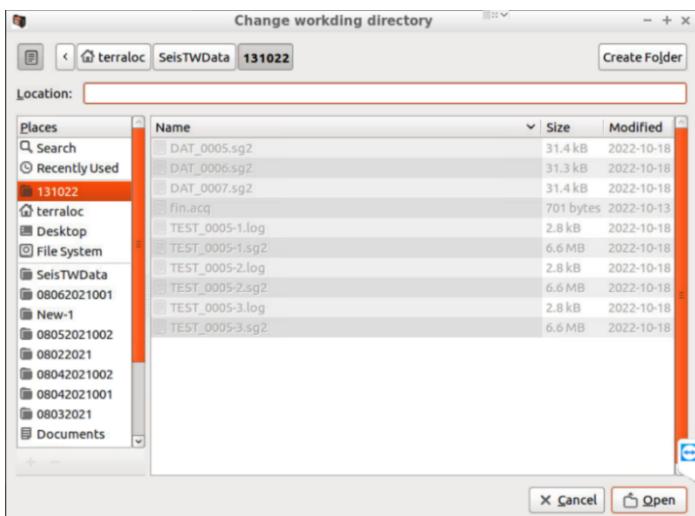
- **Check cable layout.** Ensure cable diagram matches real-world field layout. It is possible to “Flip” cables by selecting the button above Cable 1 or Cable 2 on the diagram.

- **Set-up Trigger Starting Point and Increment.** The trigger position is relative to the geophone array (by default 0,0,0 describes the first geophone on the survey line). If the trigger location will move forward by a set distance after each shot, enter this into the increment. Otherwise, leave it blank.

- **Select ‘OK’ to confirm details and exit the Wizard.**

B. Create a Working Folder

Once the *Setup Wizard* is closed, the software will immediately display the ‘Data View’. However, it is recommended to define a Working directory prior to starting data acquisition on a project. All shot records will then be saved within the same project folder.



- **Set new working directory.** This option is accessed from the *File* menu. Use a mouse or the following keypad shortcuts:



Hold *ALT + Space* to highlight taskbar

Open drop-down menu

- Navigate to the file menu using arrow keys, highlight Change working directory and press enter.

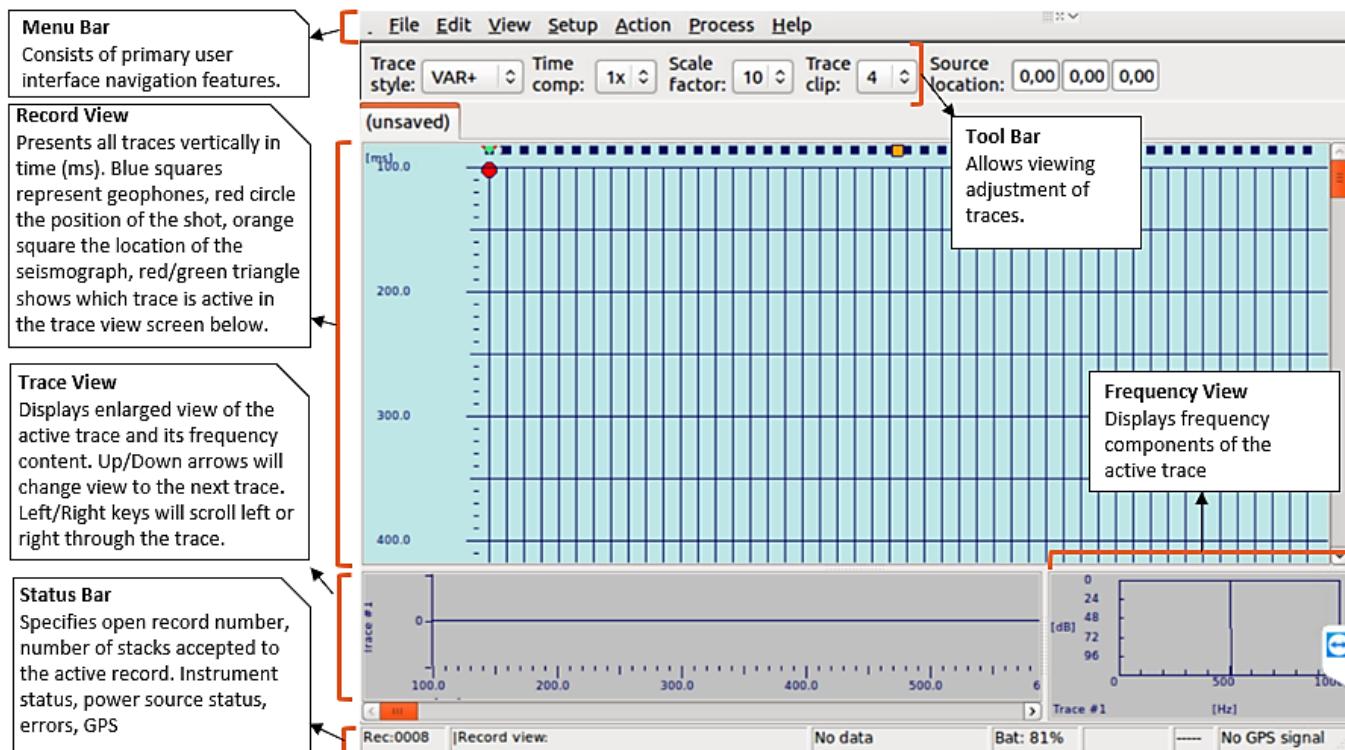
- Create new folder in the *SeisTWData* folder. Select *Open* to confirm this as the new working directory.

- Using dates to name the folder (e.g. 12-07-2020, or 20221112) means an external keyboard is not required.

- **Note:** *CTRL + 9* will open the preferences menu and allow for the automatic file numbering to be reset to 1.

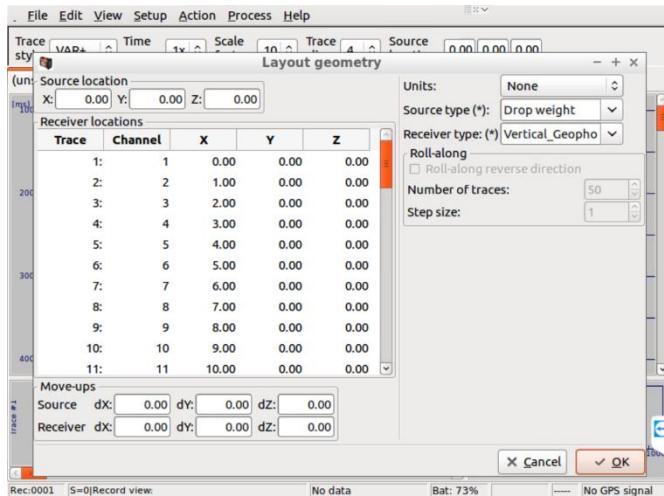
C. SeisTW Data View

The *SeisTW Data View* is the screen that will present shot records, individual traces, and trace frequency views. However, the user can also access other menus within the Menu Bar some of which are further explained in Section D, below.



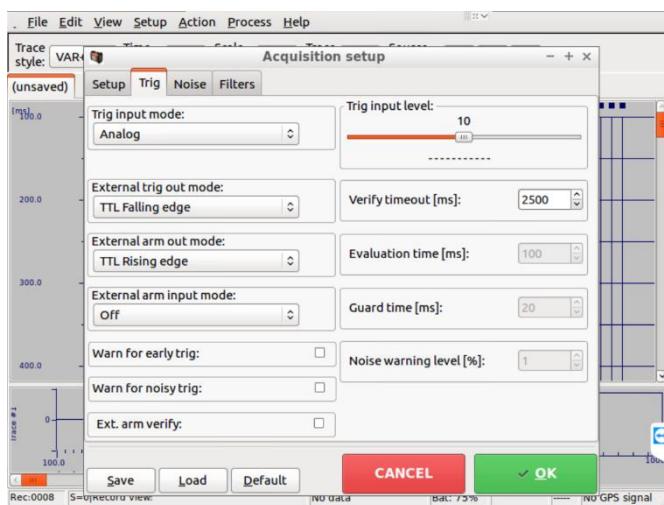
D. Acquisition Settings

After setting up for survey via the *Setup Wizard*, it may be necessary to access and review other acquisition settings menus. Some of the menus are summarized below; however, please consult the Terraloc Pro 2 User Manual for more detailed information pertaining to all acquisition settings.



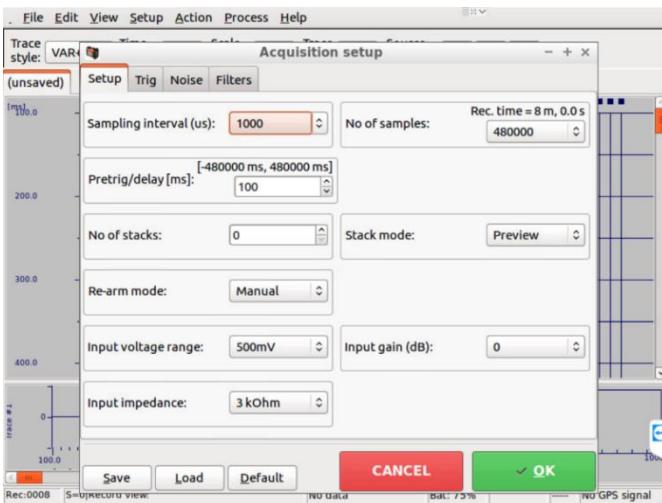
Layout Geometry

- Accessible under **Setup** on the *Menu Bar*.
- Shortcut to this menu with keypad shortcut **6**
- Manually update shot and/or geophone locations during survey, using this menu.
- You can press space **—** whilst any of the receiver location cells are highlighted to bring up the layout helper. Layout helper can be used to quickly update all receiver locations.
- Using **CTRL + ↓** in any of the X/Y/Z columns will update with same spacing as previous entry.



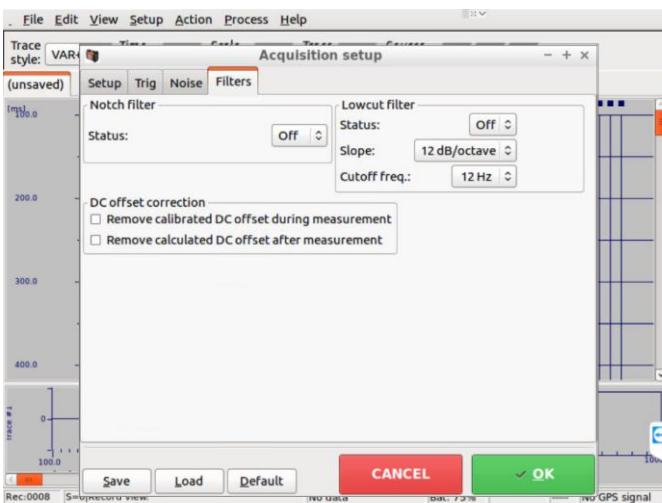
Acquisition Setup: Trig

- Accessible under **Setup** on the *Menu Bar*.
- Shortcut to this menu with keypad shortcut **2**
- Set the type of trigger being used and settings related to that form of initiator.
- By default, the trigger type is analogue, and the trigger input level can be adjusted to fine tune the sensitivity.
- For hammer switches, use make break.
- Digital triggers (used on many electromechanical sources) use TTL.



Acquisition Setup: General Setup

- Accessible under **Setup** on the *Menu Bar*.
- Shortcut to this menu with keypad shortcut **1**
- Configure recording parameters from this menu.
- *Sampling interval* and *No of samples* combine to give the total trace length. Very short sample intervals can result in excessively noisy data.
- Set *No of Stacks* to “0” and then shot records will only be saved when the user presses *SAVE* on the keypad.
- Set *Stack mode* to “Preview” so quality of each shot can be assessed before adding them to the record.
- 500mV / 3kOhm are correct settings for geophones, for other sensors consult the User Manual



Acquisition Setup: Filters

- Accessible under **Setup** on the *Menu Bar*.
- Shortcut to this menu with keypad shortcut **4**
- This menu relates to filters that will be applied to the data during data collection – these are not just changing how the data are displayed, the data will be saved in its filtered state.
- It is recommended to always enable the *Remove calculated DC offset after measurement* filter.
- If there is excessive noise, thought to originate from powerline interference, a 50 or 60Hz notch filter can be applied.

Measurements

Data acquisition

- Press the **ARM** button on the front panel to begin data acquisition; the status bar will display “<<ARMED>>”.
- If activated, the **noise monitor** will appear, use it to assess background noise and choose quieter periods to make shots.
- **Make a shot** which should initiate the trigger device and cause the instrument to begin recording data.

Tip: It is generally recommended to not place shot positions directly next to geophones to avoid damaging the geophones.

- **Note:** To **force trig** (i.e. cause the instrument to begin recording data without making a shot – useful for collecting passive datasets where there is no user-controlled source), use **CTRL + ARM**. The message “<<<TRIGGERED>>>” will display in the status bar, shortly followed by “Transferring data...”, “Data in memory” and then “<>>”.
- If stack mode is set to “Preview”, the recorded shot data will display in the ‘Data View’. Assess the shot record and determine whether it is good quality. **Press OK to “Accept” or ESC to ‘Reject’** or (navigate to the buttons on screen) to either move forward with the survey and add another stack to (or save) the record, or reject this stack and re-do the shot.

Tip: Stacking data at a shot point improves the signal-to-noise ratio (data quality). The first shot is a good opportunity to check data quality along the line. If a geophone is noisy, it may be poorly-coupled to the ground, or has a poor connection to the cable; check the geophone and re-do the shot. The Terraloc Pro 2 can perform a geophone test which tests the natural frequency and amplitude of all geophones attached to the spread cables. Use **SHIFT + ARM** to run the test (more details can be found in the Terraloc Pro 2 User Manual). It is recommended to perform this test after geophones have been in storage or transit.

- When ready to **take another shot** at the same location (i.e. stacking), repeat the process of arming and shooting. Up to 999 stacks may be completed at each shot position, or up to the predefined number set in the acquisition settings.
- **Press the <SAVE> button** to save the shot record. The instrument will auto-increment the record ready for the next shot position.
- Move to the next shot location. If there was no auto-increment distance specified for the shot position in the *Setup Wizard* or in the *Layout Geometry* menu, then the user must manually **update the x,y,z shot/source locations**.
- Continue acquiring records until all shot positions needed for the dataset have been collected.

FILE MANAGEMENT

Data transfer using a USB Memory Drive

- The most effective way to download data from the instrument is via a USB drive. Terraloc Pro 2 has built in USB 2.0 ports on the end-panel for fast and easy file copying to a USB memory stick / external hard disk drive.
- Data can either be copied manually to a USB storage device by opening the file manager from the start menu (Start menu / Accessories / File Manager), or by using *Quick backup* found in the Context menu (accessible with the **SPACE** key).
- Quick backup will create a backup of the entire SeisTWDData folder to a destination folder that can be specified. If a USB storage device is connected, it will be selected as the default destination folder.

ABEM TERRALOC PRO 2 COMMON KEYPAD SHORTCUTS

General Functions on Main Screen (some shortcuts are only available when files are open / data are present / shot is recorded etc.)

| | | | |
|--|--|--|---|
| | Open Context Menu | | Open Quick Menu |
| | Select Menu Bar | | Show/hide Toolbar |
| | Show/hide Trace View and Frequency View | | Show/hide Logging Window |
| | Shift horizontal divider between Record View and Trace View / Frequency View | | Shift vertical divider between Trace View and Frequency View |
| | Open Preferences dialog | | Open OS menu |
| | Open Acquisition setup | | Open Receiver Spread dialog |
| | Open Trigger setup | | Open Layout Geometry dialog |
| | Open Noise Monitor setup | | Open Header Info dialog |
| | Open Acquisition Filter setup | | Open View Options dialog |
| | Navigate between view panels or fields in dialogs | | Navigate back between view panels or fields in dialogs |
| | Select Trace Style toolbar | | Select Scale Factor toolbar |
| | Select Time Comp toolbar | | Select Trace Clip toolbar |
| | Arm the instrument | | Run a geophone test & display results |
| | Force the instrument to trigger | | Disarm an armed instrument or reject current shot / stack |
| | Delete the last shot / stack (if the data is still in the channel memory) | | Save current shot / stack to the record |
| | Edit source/receiver positions for current file | | Edit header information for current file |
| | Record View: move trace marker right / left Trace View: scroll trace right / left | | Scroll Record View down / up (combine with Shift to increase step-size) |
| | Move time-line down / up (hold to accelerate, or combine with Shift to increase step-size) | | Set a First Break marker at time-line position on selected trace |

Velocity Analyzer

| | |
|--|--|
| | Start velocity analysis |
| | Select field in Velocity Analyzer bar at top of page |
| | Move analysis line down / up trace |
| | Move analysis line right / left one trace |
| | Decrease / increase apparent velocity |
| | Lengthen / shorten analysis line by one trace |

Noise Monitor

| | |
|--|--|
| | Increase / decrease threshold level |
| | If only monitoring noise (i.e. instrument not armed), send a test pulse to the geophones |
| | Increase / decrease minimum on dB axis |
| | Decrease maximum on dB axis |
| | Increase maximum on dB axis |
| | Close Noise Monitor |

Receiver Spread Dialog

| | | | |
|--|--|--|---|
| | Set polarity in selected cell in Polarity column | | Define channel order in Channel column Set Polarity for all cells in Polarity column |
| | Toggle selected cell value in either Polarity, Stack or Trace column | | Toggle all values in Polarity, Stack, or Trace columns |
| | Enable/Disable selected channel in Stack or Trace column | | Enable/Disable all channels in Stack or Trace column |

Layout Geometry Dialog

| | | | |
|--|---|--|---|
| | Open Layout Helper when cursor is in the Receiver Locations box | | Fill-down with previous geophone spacing (when cursor is in the X, Y or Z column of the Receiver Locations box) |
|--|---|--|---|

File Management

| | | | |
|--|---|--|---------------------|
| | Save the current file (overwrite prompt if file already exists) | | Open Save As dialog |
| | Force save current file (overwrite any existing file) | | Quick Backup |