


GFP_Edit

by Sensors & Software Inc.

USER'S GUIDE

© Copyright 2009 Sensors & Software Inc.

2007-00061-02

s u b s u r f a c e i m a g i n g s o l u t i o n s

Sensors & Software Inc.
1040 Stacey Court
Mississauga, ON L4W 2X8 Canada

Tel: (905) 624-8909
Fax: (905) 624-9365

E-mail: sales@sensoft.ca
Website: www.sensoft.ca

SENSORS & SOFTWARE INC. PRODUCT LICENCE, COPYRIGHT, LIABILITY AND WARRANTY INFORMATION

Important

Please read this document carefully before removing the *SOFTWARE PRODUCT* storage media from their protective cover or assembling the *HARDWARE PRODUCT*. By removing the storage media or assembling the hardware, you are agreeing to be bound by the terms of this agreement. If you do not agree to the terms of this agreement, promptly contact Sensors & Software, Inc. at the address indicated at the end of this document.

Definition

The word *PRODUCT* as used herein defines any tangible item sold by Sensors & Software, Inc. and may be comprised of *HARDWARE PRODUCT* which consists of physical objects and *SOFTWARE PRODUCT* which means computer programs, codes and related support materials.

Software Product Licence Agreement

In order to preserve and protect its rights under the applicable laws, Sensors & Software, Inc. (hereafter SSI) does not sell any rights to its Software product. Rather, SSI grants the right to use its software, diskettes (or other storage media) and documentation (hereafter collectively called *SOFTWARE PRODUCT*) by means of a *SOFTWARE PRODUCT* licence. You acknowledge and agree that SSI retains worldwide title and rights to all its software and that the *SOFTWARE PRODUCT* contains proprietary materials protected under copyright, trademark and trade secret laws.

Grant of Software Product Licence

In consideration of payment of the licence fee which is the price you pay for the *SOFTWARE PRODUCT* and your agreement to abide by the terms and conditions of this Licence Agreement, SSI grants to you, the Licensee, a non-exclusive right to use the *SOFTWARE PRODUCT* under the following conditions:

You may:

- use the *SOFTWARE PRODUCT* on a single workstation owned, leased or otherwise controlled by you
- copy the *SOFTWARE PRODUCT* for backup purposes in support of your use of the product on a single workstation

You may not:

- copy, distribute or sell copies of the *SOFTWARE PRODUCT* or accompanying written materials, including modified or merged *SOFTWARE PRODUCT* to others
- sell, licence, sublicense, assign or otherwise transfer this licence to anyone without the prior written consent of SSI
- modify, adapt, translate, decompile, disassemble or create derivative works based on the *SOFTWARE PRODUCT*

Termination

This licence is effective until terminated. You may terminate the licence at any time by returning the *SOFTWARE PRODUCT* and all copies to SSI. The licence will automatically terminate without notice by SSI if you fail to comply with any terms or conditions of this agreement. Upon termination, you agree to return all copies of the *SOFTWARE PRODUCT* to SSI.

Update Policy

SSI may create, from time to time, updated versions of its *SOFTWARE PRODUCT*. At its option, SSI will make such updates available to licencees who have paid the update fee.

Product Warranty, Limited Remedy and Limited Liability

SSI warrants the *PRODUCT* to be free from defect in material and workmanship under normal use for a period of one year (365 days) from the date of shipment. Any third party computer systems or other items not manufactured directly by SSI purchased with any *PRODUCT* or independently from SSI are subject to the original manufacturer's warranty and are not the responsibility of SSI.

SSI makes no other warranties including, but not limited to, any implied warranty of merchantability or fitness for a particular purpose. If this product is defective within the warranty period stated above, your exclusive remedy shall be, at SSI's option to replace or repair the SSI product or refund the purchase price of the SSI product. Except where prohibited by law, SSI will not be liable for any loss or damage arising from this SSI product, whether direct, indirect, special, incidental or consequential regardless of the legal theory asserted.

All statements, technical information, and recommendations related to SSI products are based on information believed to be reliable, but the accuracy or completeness is not guaranteed. Before using this product, you must evaluate it and determine if it is suitable for your intended application. You assume all risks and liability associated with such use. Any statements related to the product which are not contained in SSI current publications, or any contrary statements contained on your purchase order shall have not force or effect unless expressly agreed upon, in writing, by an authorized officer of SSI.

SSI warrants the diskettes or other storage media on which the *SOFTWARE PRODUCT* is furnished to be free from defects in material and workmanship under normal use for a period of ninety (90) days from the date of purchase as evidenced by a copy of your invoice.

Except as specified above, any *SOFTWARE PRODUCT* is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, the use or result of use of the product in terms of correctness, accuracy, reliability, currentness or otherwise. The entire risk as to the results and performance of the *PRODUCT* is assumed by you. If the *PRODUCT* is defective or used improperly, you, and not SSI or its dealers, distributors, agents, or employees, assume the entire cost of all necessary servicing, repair or correction.

SSI's entire liability and your exclusive remedy for *SOFTWARE PRODUCT* shall be, at SSI's option, either

- the replacement of any diskette or hardware components which do not meet SSI's Limited Warranty and which are returned to SSI postage prepaid with a copy of the receipt, or
- if SSI is unable to deliver a replacement diskette which is free of defects in material or workmanship, Licensee may terminate this agreement and have the licence fee refunded by returning all copies of the *SOFTWARE PRODUCT* postage prepaid with a copy of the receipt.

If failure of any *PRODUCT* resulted from accident, abuse or misapplication, SSI shall have no responsibility to replace the *SOFTWARE PRODUCT*, refund the licence fee, or replace or repair the *HARDWARE PRODUCT*.

Do not tamper with any *PRODUCT*. *PRODUCT* contains no user serviceable parts. If tampering is evident in SSI's opinion, warranty is void and null.

No oral or written information or advice given by SSI, its dealers, distributors, agents or employees shall create a warranty or in any way increase the scope of this warranty and you may not rely on any such information or advice.

Neither SSI nor anyone else who has been involved in the creation, production or delivery of the *PRODUCT* shall be liable for any direct, indirect, special, exemplary, incidental or consequential damages, claims or actions including lost information, lost profits, or other damages arising out of the use or inability to use this *PRODUCT* even if SSI has been advised of the possibility of such damages.

This warranty gives you specific rights. You may have other rights which vary from province to province, territory to territory and certain limitations contained in this limited warranty may not apply to you.

General

pulseEKKO®, Noggin®, SpiView®, Conquest® and SnowScan® are registered trademarks of SSI. No right, licence, or interest to such trademarks is granted hereunder with the purchase of the *PRODUCT* or the *SOFTWARE PRODUCT* licence.

Governing Law

In the event of any conflict between any provision in this licence agreement and limited warranty and any applicable provincial legislation, the applicable provincial legislation takes precedence over the contravening provision. This agreement shall be governed and construed in accordance with the laws of the Province of Ontario, Canada.

Serviceability

Should any term of this agreement be declared void or not enforceable by any court of competent jurisdiction, the remaining terms shall remain in full effect.

Waiver

Failure of either party to enforce any of its rights in this agreement or take action against any other party in the event of a breach of this agreement shall not be considered a waiver of the right to subsequent enforcement of its rights or actions in the event of subsequent breaches by the other party.

Acknowledgement

You acknowledge that you have read this agreement, understand it and agree to be bound by its terms and conditions. You further agree that this agreement is the complete and exclusive statement of agreement between the parties and supersedes all proposals or prior agreements oral or written between the parties relating to the subject matter of this agreement.

Should you have any questions concerning this agreement, please contact in writing:

Sensors & Software Inc.

1040 Stacey Court
Mississauga, Ontario
Canada L4W 2X8
Tel:(905) 624-8909
Fax:(905) 624-9365
E-mail: radar@senssoft.ca

1 Introduction

The GFP_Edit utility program is designed to create, view and edit GFP (**G**PR **F**iles and **P**arameters) files.

A GFP file contains information about groups of GPR data lines. Typically, these are data lines that are related to one another in some manner, for example, data lines collected over a grid to cover an area. The GFP file contains the names of the GPR data lines, information about the position and direction of the data lines within the grid and any data processing to be applied to the data lines.

When GPR data lines are organized under a GFP file, the data can be quickly read into Sensors & Software software programs like EKKO_Mapper, processed and visualized.

2 Overview

2.1 GFP_Edit Main Screen

2.1.1 Opening an Existing GFP File

An existing GFP file can be opened for viewing and editing by selecting **File > Open GFP**.

The GFP_Edit main screen is shown in **Figure 2-1**.

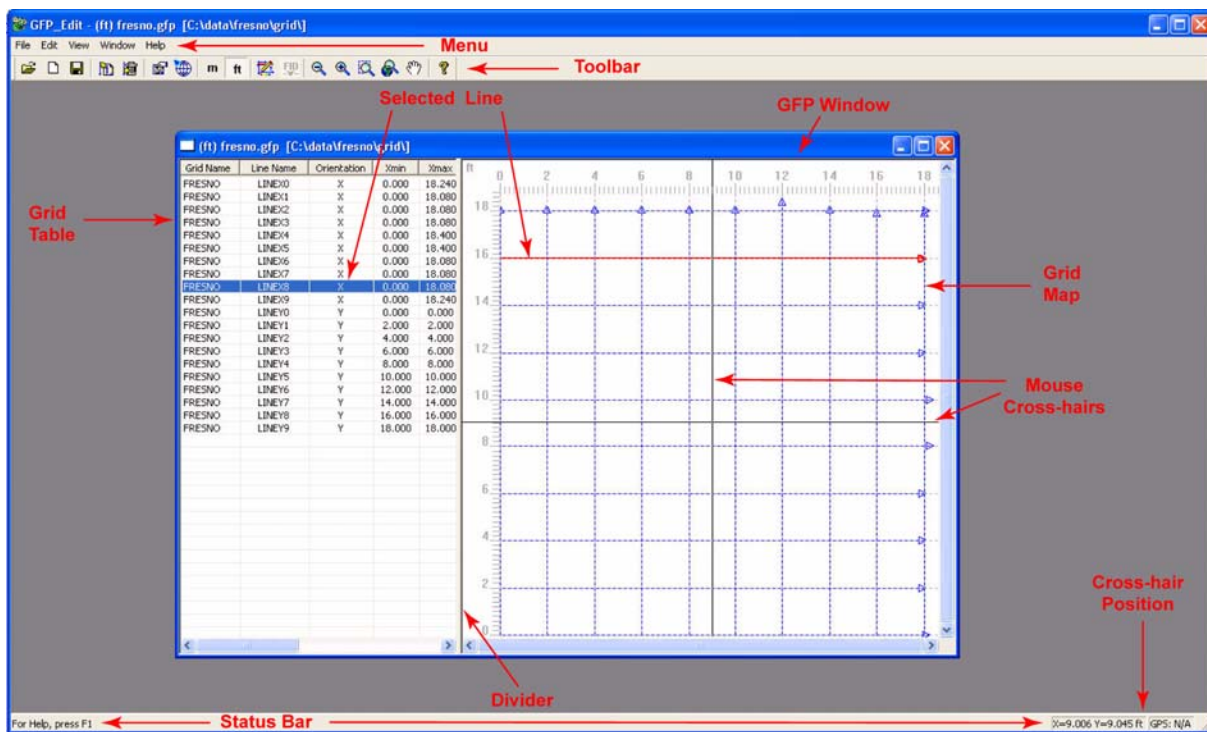


Figure 2-1: The GFP_Edit main screen.

The GFP_Edit main screen consists of a window with two main sections, the **Grid Table** and the Grid Map.

The left portion of the window is the Grid Table displaying the names, positions and other information about each data line in the grid.

The right of the window is the Grid Map, showing the relative position, length and direction of each data line in the grid.

If GPS files were collected during data collection and added to the GFP file (see **Open GFP**, **Adding GPS during Line Import** and **Add GPS**), the raw GPS lines can also be displayed in the Grid Map (**Figure 6-1**).

The color of the GPR (and GPS) Lines is selected in the **View > Line Settings** menu option.

Selecting one or more data lines files in the Grid Table will highlight the row(s) and the corresponding line(s) will change color on the Grid Map (**Figure 2-1**).

2.1.2 Creating a New GFP File

A new GFP file is created by selecting **File > Create New GFP for Grid Lines.**

Data lines are imported into the GFP file using the **Edit > Import Line(s)** option.

If the GPR lines were collected with GPS, the Import Lines option allows GPS to be added to the GFP file (**Adding GPS during Line Import**). GPS data can also be added manually (**Add GPS** and **Manual Input of Global Coordinates**).

Data lines are deleted from the GFP file using the **Edit > Delete Line(s)** option.

A GFP file is edited by selecting the **Edit > Edit GFP File** option.

2.1.3 Grid Table

The Grid Table lists the following information about each data line in the GFP file:

Grid Name: The name of the grid. This name is used to organize data lines from the same grid.

Line Name: The name of the data line.

Orientation: The line direction, either X or Y. By convention, X lines are parallel to the X (horizontal) axis and Y lines parallel to the Y (vertical axis).

Xmin: The minimum X value on the data line in the **Display Units** selected.

Xmax: The maximum X value on the data line in the **Display Units** selected.

Ymin: The minimum Y value on the data line in the **Display Units** selected.

Ymax: The maximum Y value on the data line in the **Display Units** selected.

Length: The total length of the data line in the **Display Units** selected.

Step: The step size (or station interval) between traces on the data line in the **Display Units** selected.

The Step can be a negative value if the data line was collected in the reverse direction starting at a positive value and stepping in a negative direction towards the zero position. This is common when Noggin^{plus} grid data are collected with a forward/reverse survey format.

Edit: Whether the data line has been edited from the original data file while being imported into the GFP file.

The three options are: No, Yes and RLD (Reverse Line Direction). RLD means that the only editing done to the original data line was to reverse its direction (**Reverse Line Direction**). Yes means that more substantial editing was done to the data.

GPR Data: The path and file name of the GPR data (DT1) line. If the DT1 name is followed by a plus (+) sign, it indicates that other files associated with the DT1 file have been added to the GFP file; for example, a GPS file.

GPS: If the GPS field is a check-mark, the GPS file associated with the GPR data line is used for the **Compute from GPS** calculation to add GPS to the GFP file.

If the GPS field is not checked, the GPS file associated with the GPR data is not being used in the calculation to add GPS to the GFP file. Use the **Edit > GPS Data > Remove GPS** option to remove one or more GPS files from the GFP file.

If the GPS field is blank, no GPS files were found for the GPR data lines.

If the GPS column contains zero (0), a GPS file is present but does not contain valid GPS data, either no data or less than two GPS points.

If the GPS column contains a question mark (?), no GPS file is present but there is GPS information in the DT1 file trace headers. In this situation, the GPS files can be recovered using the **Edit > GPS Data > Recover GPS Files** option.

If the GPS column contains an X, the GPS file is present but it could not be opened. For example, another application could be using it.

2.1.4 Selecting Lines

Individual data lines can be selected on the Grid Table by clicking anywhere on the row (**Figure 2-2**). Multiple data lines can be selected by clicking and dragging over more than one row or by clicking the first and last data line you want to highlight while pressing down the **Shift** key on the keyboard. Specific data lines can also be selected by clicking anywhere on the row while pressing down the **Ctrl** key on the keyboard. Use **Edit > Select All Lines** or press **Ctrl-A** to select all the lines in the list. Pressing **Ctrl-D** will deselect all lines.

Selected lines will appear in the Grid Map providing the display of GPR Lines is enabled under **View > Line Settings**. The color of the GPR Lines on the Grid Map are also defined under the **View > Line Settings** option.

GPR Lines can be selected on the Grid Map by clicking on the data line or clicking and dragging a box across several lines. Any data line that intersects the box will change color on the Grid Map and be highlighted in the Grid Table.

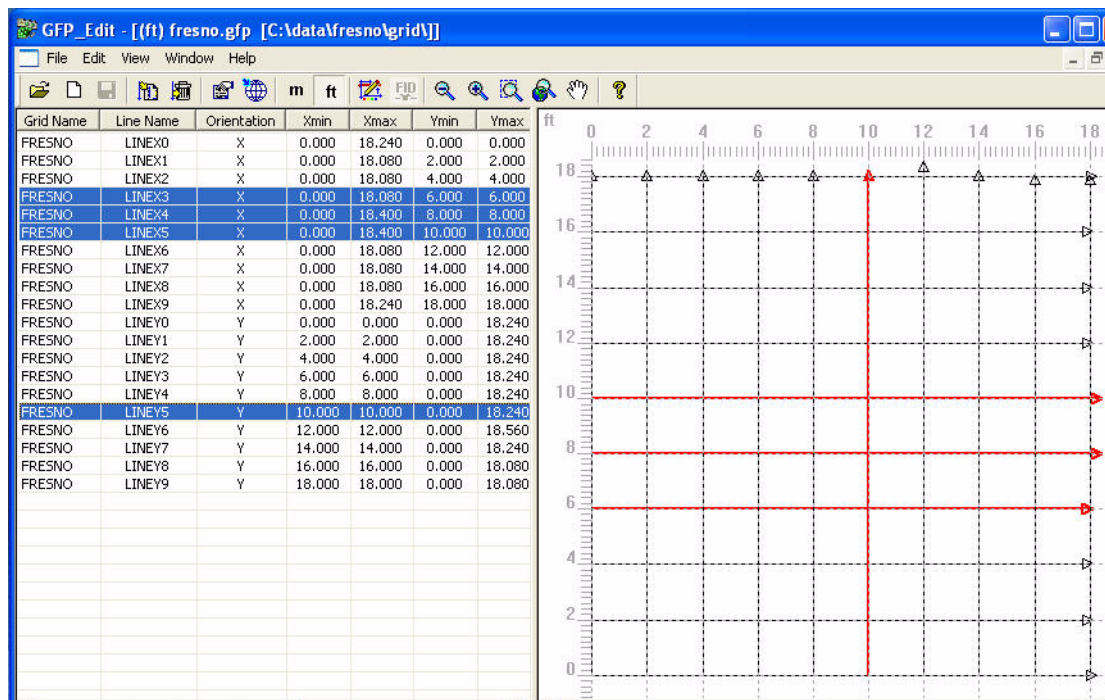


Figure 2-2: Select lines by clicking on rows on the Grid Table or lines on the Grid Map. Selected lines will appear in the color defined under View > Line Settings on the Grid Map.

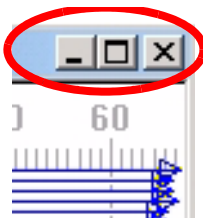
2.1.5 Changing Window Size

The Grid Map always retains the correct aspect ratio of the GPR data regardless of how the size of the GFP window is changed. For example, square grids will always appear square in the window and rectangular grids will always appear rectangular.

To change the size of the GFP window, click and drag any frame or corner of the window. As the size of the GFP window changes, the size of the Grid Map also changes to maintain the correct aspect ratio but if the window gets small enough the Grid Map or Grid Table will disappear.

The relative size of the Grid Table and the Grid Map can be changed by dragging the divider (**Figure 2-1**) to the left or right. It is possible to make either the Grid Table or the Grid Map close completely.

Windows can also be resized and closed using the buttons located in the upper right corner:



Any window can be maximized to take up the full screen by pressing the **maximize** button:



A maximized window can be restored by pressing the **restore down** button in the upper right corner of the window:



Any window can be minimized to an icon by pressing the **minimize** button:

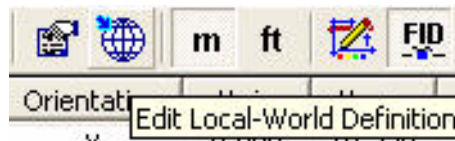


2.2 Toolbar

Most operations can be performed using the toolbar (**Figure 2-1**). The Toolbar is made visible by checking it under **View > Toolbar**.



A brief description of the function of a button is displayed by holding the mouse cursor on the button for about 1 second.



There is also a longer description of the button function on the **Status Bar** on the bottom of the screen.

2.3 Status Bar

The status bar (**Figure 2-1**) is visible on the bottom of the screen when the **View > Status Bar** option is checked.

As the mouse cursor is moved over buttons on the Toolbar, the status bar at the bottom of the screen provides helpful descriptions of the purpose of the particular button. For example, holding the mouse over the **Delete Line(s)** button will display the following on the Status Bar:

Delete currently selected line(s) from the GFP file.

When the mouse cursor is located on the Grid Map, the right side of the status bar displays the current XY position in the grid:

X=3.357 Y=2.135 m

2.3.1 GPS Displayed in Status Bar

If GPS has been added to the GFP file, moving the mouse cursor over the Grid Map displays the GPS position in Latitude-Longitude and/or UTM coordinates on the right side of the Status Bar:

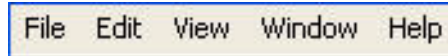
X=4.576 Y=2.572 m Lat: 53.2793077 N, Long: 9.0572013 W, E: +496186.01, N: +5903343.46, Z: 29U

The format of the GPS information can be changed under **Edit > GPS Format**.

The display of GPS coordinates is disabled by unchecking the **Use Global Positions** checkbox in the **View > Local - Global Relationship** (see **Local-Global Coordinates Relationship**).

3 Menus

Details of the GFP_Edit menus are covered in the next several sections.



Menu options can be accessed by clicking on them with the mouse cursor or by pressing the Alt key followed by the underlined letter.

Alt+F = File

Alt+E = Edit

Alt+V = View

Alt+W = Window

Alt+H = Help

Sub-menus can then be accessed by pressing the next underlined letter. For example, to select the Open sub-menu under the File menu, press Alt+F and then O.

Other hot keys include:

F5 to edit the GFP file

Alt+A to select all data lines

Insert to import data line(s) into the grid

Delete to delete selected data line(s) from the grid

4 File

4.1 Open GFP

The **File > Open GFP** option allows the user to select an existing GFP file to open and display for editing.

The Open dialog allows the user to select a file with a .GFP extension.

The File > Open option can also be accessed by pressing **Ctrl-O** on the keyboard or by clicking on the Open button on the **Toolbar**:



More than one GFP file can be opened at the same time resulting in multiple windows open on the screen.

The current active window is indicated by a dark blue title banner.

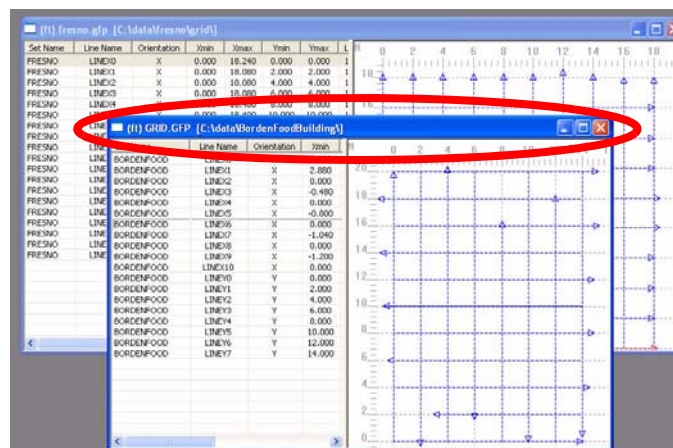


Figure 4-1: When multiple GFP files are open, the active window is indicated by the dark blue title banner.

Open windows can be modified using the options under **Window**.

4.1.1 Automatically Add GPS when GFP File is Opened

When a GFP file is opened, if GPS files are detected in the same folder as the GPR lines and the GPS files have not already been added, the program automatically prompts the user to add the GPS files into the GFP file.

GPS can also be added manually by selecting one or more GPR lines in the Grid Table (**Figure 2-2**) and then selecting **Edit > GPS Data > Add GPS**.

Even if the GPR data were not collected with GPS it is still possible to add GPS to the GFP file by defining the relationship between the Local XY grid and the Global coordinates (**Manual Input of Global Coordinates**).

4.2 Close GFP

The **File > Close GFP** option closes the current active GFP file and associated window.

4.3 Save GFP

The **File > Save GFP** option saves the current active GFP file.

The File > Save GFP option can also be accessed by pressing **Ctrl-S** on the keyboard or clicking on the Save button on the **Toolbar**:



When the original GFP file is edited and saved for the first time in GFP_Edit, a backup of the original is made. This file uses the name of the GFP file with "-original" appended to it.

4.4 Save GFP As

The **File > Save GFP As** option saves the current GFP file to a different name or a different folder.

4.5 Create New GFP for Grid Lines

Not all GPR grid surveys will have an associated GFP file. Specifically, earlier grid data acquisition software on a PC or the DVL (Digital Video Logger) does not automatically generate a GFP file. To use software that requires GFP files for input, like the EKKO_Mapper program for plan view data analysis, the user must create a GFP file for the grid survey.

The **File > Create New GFP for Grid Lines** option creates a new GFP file by importing GPR data lines and specifying their positions within the grid. Note that the GFP file must be in the same folder as the data lines to be imported or in a folder above.

The File > Create New GFP for Grid Lines option can also be accessed by pressing **Ctrl-N** on the keyboard or from the **Toolbar** by clicking the **New** button:



4.6 Recent Files

If the desired file is one of the last four (4) GFP files opened, rather than using the **File > Open** option, it can be opened by selecting it from the Recent Files list under **File**.

4.7 Exit

Selecting this option will close all windows that are open as part of the current GFP_Edit session and exit the application.

5 Edit

5.1 Edit GFP File

When one or more data lines have been highlighted on the Grid Table or the Grid Map (**Selecting Lines**), the **Edit GFP File** option becomes accessible either by:

- 1) Selecting the menu option **Edit > Edit GFP File**.
- 2) Pressing the **F5** on keyboard.
- 3) Double-clicking or Right-clicking on a line in the Grid Table, or
- 4) Clicking on the **Edit GFP File** button in the **Toolbar**:



Selecting **Edit GFP File** opens the Editing dialog box consisting of several tabs for editing the line(s) currently highlighted. The following sections describe the function of each tab.

When method 3 above is used to access Edit GFP File, the dialog will automatically open to the tab related to the right-clicked column in the Grid Table. For example, right-clicking on the Line Name opens the **Name** tab and right-clicking in the Length column opens the **Length** tab.

After a GFP file with added GPS (see Automatically Add GPS when GFP File is Opened or Add GPS), has been edited, the Compute from GPS operation should be run again to ensure the best possible fit between the Local and Global Coordinates.

5.1.1 Name

If a single file is selected, the name of the file is displayed and can be changed.

If more than one file is selected, this option is not accessible (it does not make sense to change several files to the same name).

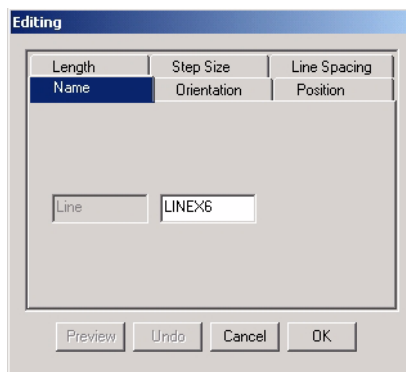


Figure 5-1: The Name tab changes the name of one line in the Grid Table.

After editing the line name, press **OK** to change, **Cancel** to exit without making the change, **Undo** to change back to the original name and **Preview** to see the effect in the Grid Table before deciding whether to make the change or not.

Selecting a different tab implements the change but the change can be undone by clicking **Undo**.

Be cautious when clicking the **Undo** button because it will undo the last operation performed, even if you are on a different tab.

5.1.2 Orientation

The Orientation tab is used to change the orientation of the selected line(s).

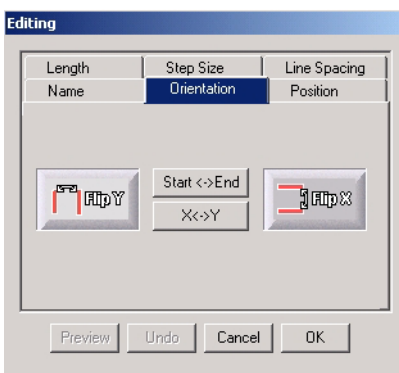


Figure 5-2: The Orientation tab changes the orientation of one or more lines.

The **Start<->End** button reverses the current line direction. This option performs the same function as the **Reverse Line Direction** option when importing lines.

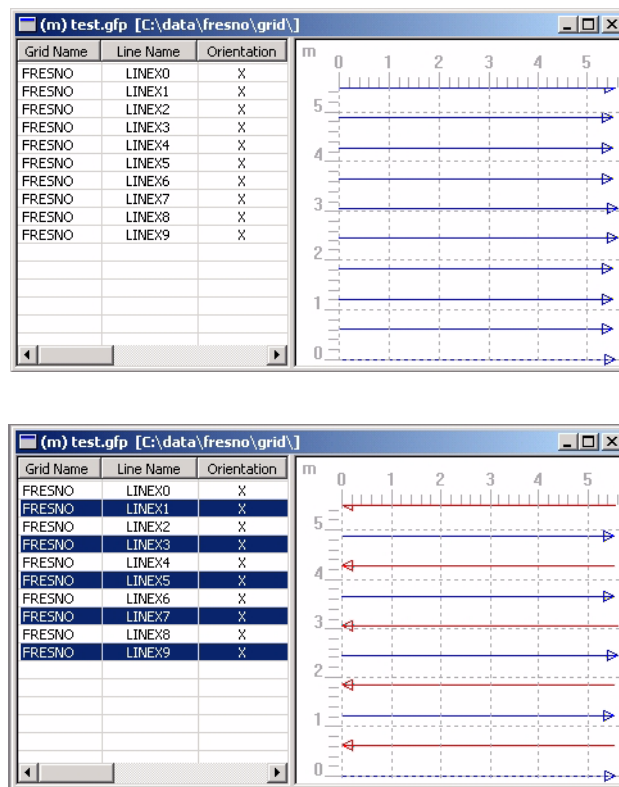


Figure 5-3: The Start<->End option reverses the direction of the selected lines.

The **X<->Y** button changes the lines from X lines to Y lines or Y lines to X lines.

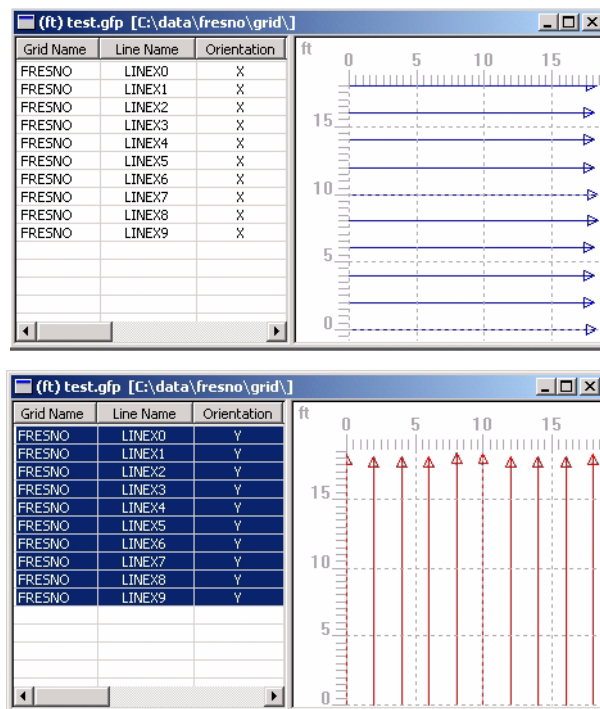


Figure 5-4: X<->Y changes the selected lines from X lines (top) to Y lines (bottom). It also changes Y lines to X lines.

The **Flip Y** button flips the current order of the Y lines. For example, if Y lines are numbered 0 to 9 from left to right, the order will change from 9 to 0 from left to right.

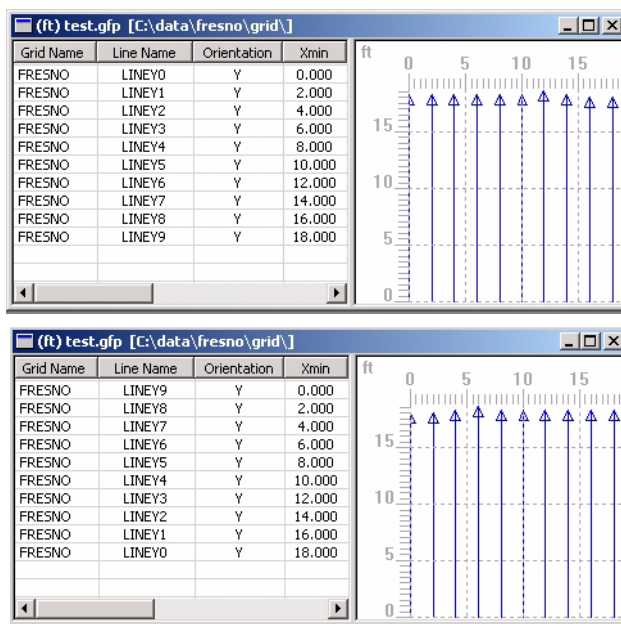


Figure 5-5: The Flip Y option flips the order of the Y lines on the grid.

Similarly, the **Flip X** button flips the current order of the X lines. For example, if X lines are numbered 0 to 9 from bottom to top, the order will change from 9 to 0 from bottom to top.

Flip X and Flip Y are most commonly used to re-orient lines collected in a different quadrant than the first quadrant. Two-dimensional plan map software like EKKO Mapper and 3D software like Voxler expect data from the first quadrant.

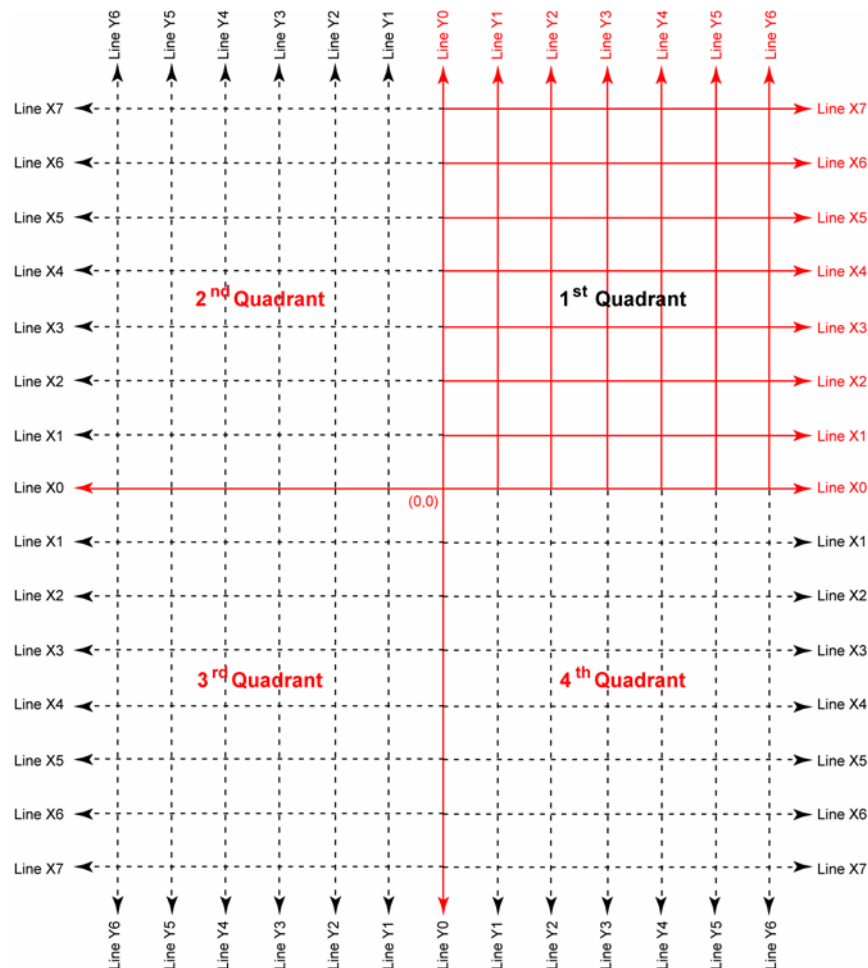


Figure 5-6: The grid data are expected to be collected in the first quadrant with the origin ($X=0$, $Y=0$) in the bottom left corner and X line names incrementing up and Y lines incrementing to the right. If data were collected in a different quadrant, the Flip X and Flip Y functions in the Orientation tab can help edit the line positions so the grid data is properly displayed.

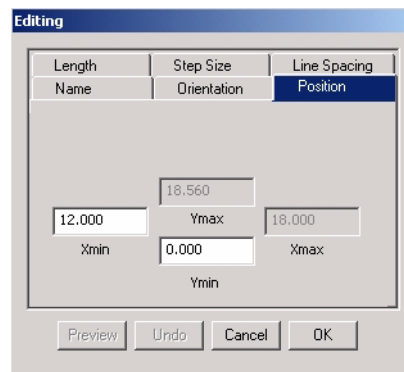
After changing the line orientations, press **OK** to change, **Cancel** to exit without making the change and **Undo** to change back to the original orientation.

Selecting a different tab implements the change but the change can be undone by clicking **Undo**.

Be cautious when clicking the **Undo** button because it will undo the last operation performed, even if you are on a different tab.

5.1.3 Position

The Position tab moves the selected line(s) to a new position within the grid.



The current Minimum X (XMin) and Minimum Y (YMin) positions of the selected lines are displayed. Lines are moved as a group to a new position by changing the XMin and YMin values and clicking on OK.

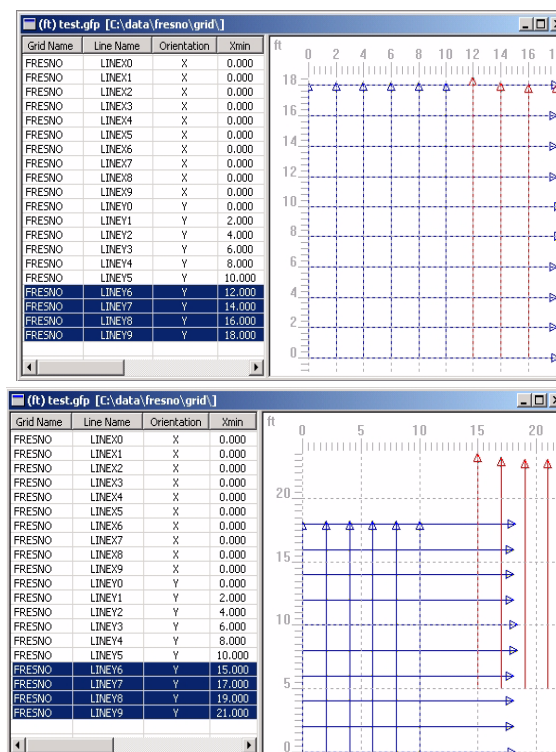
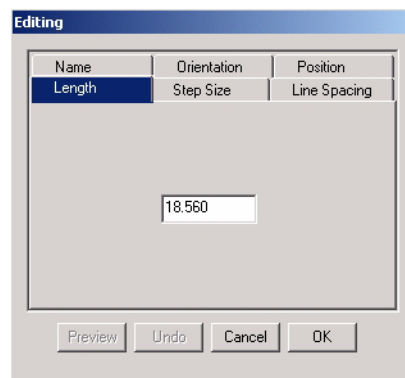


Figure 5-7: Position is used to move the selected lines to a new position. Lines are moved as a group based on the new XMin and YMin position.

After repositioning the lines, press **OK** to changes, **Cancel** to exit without making the changes, **Undo** to change back to the original positions and **Preview** to see the effect in the Grid Table and Grid Map before deciding whether to make the change or not. Note that if both the XMin and YMin were changed, **Undo** must be clicked twice to undo both changes.

5.1.4 Length

The Length tab changes the length of the selected line(s).



The current length of the line is displayed. If more than one line is selected, the length of the longest line is displayed. The line length is changed by recalculating the Step Size (the distance between traces). No traces are added to or deleted from the data file; only the position of each trace changes.

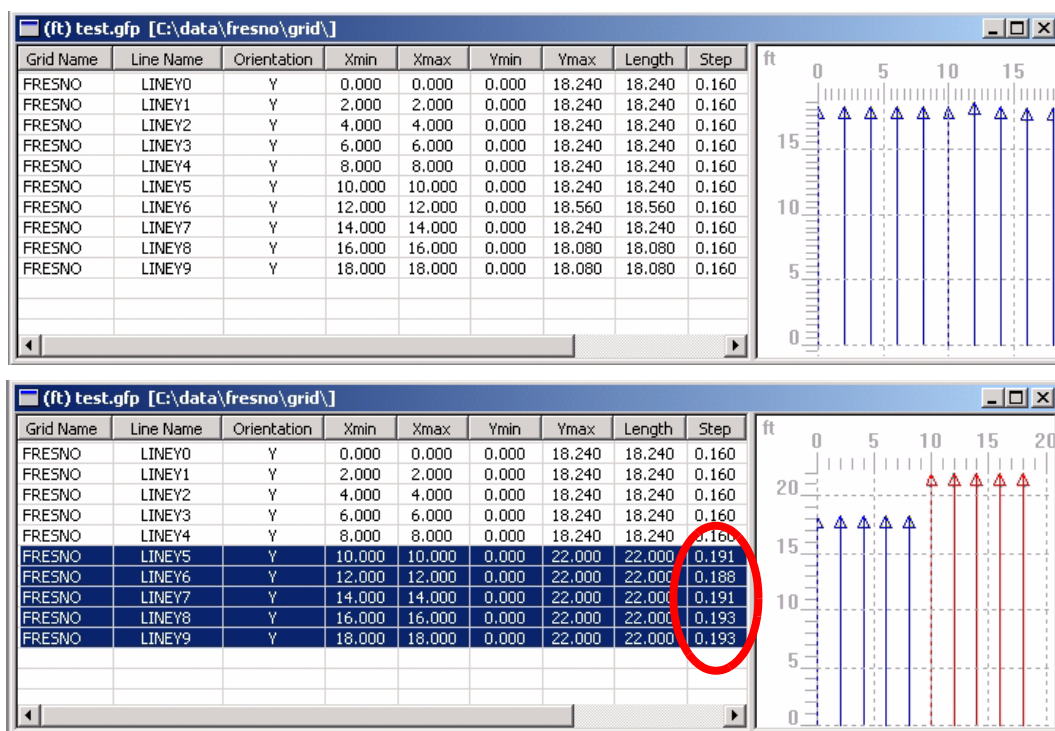


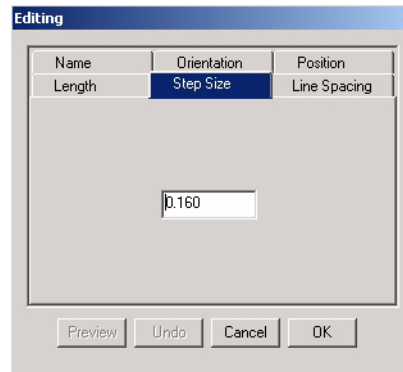
Figure 5-8: The Length tab changes the lengths of one or more lines by changing the distance between traces (the Step Size). In this example, lines Y5 to Y9 were lengthened to the specified 22 feet by changing the step size (circled on the Grid Table).

All the selected lines are set to the same length. If the lines were originally different lengths, their Step Size will be different (Figure 5-8). To change the length of lines but keep their step size and relative lengths consistent, use the **Step Size** routine.

After changing the line length, press **OK** to change, **Cancel** to exit without making the change, **Undo** to change back to the original length and **Preview** to see the effect in the Grid Table and Grid Map before deciding whether to make the change or not.

5.1.5 Step Size

The Step Size tab changes the distance between traces on the selected line(s).



The current step size is displayed. If more than one line is selected, the largest step size is displayed. Changing the step size will change the length of the line.

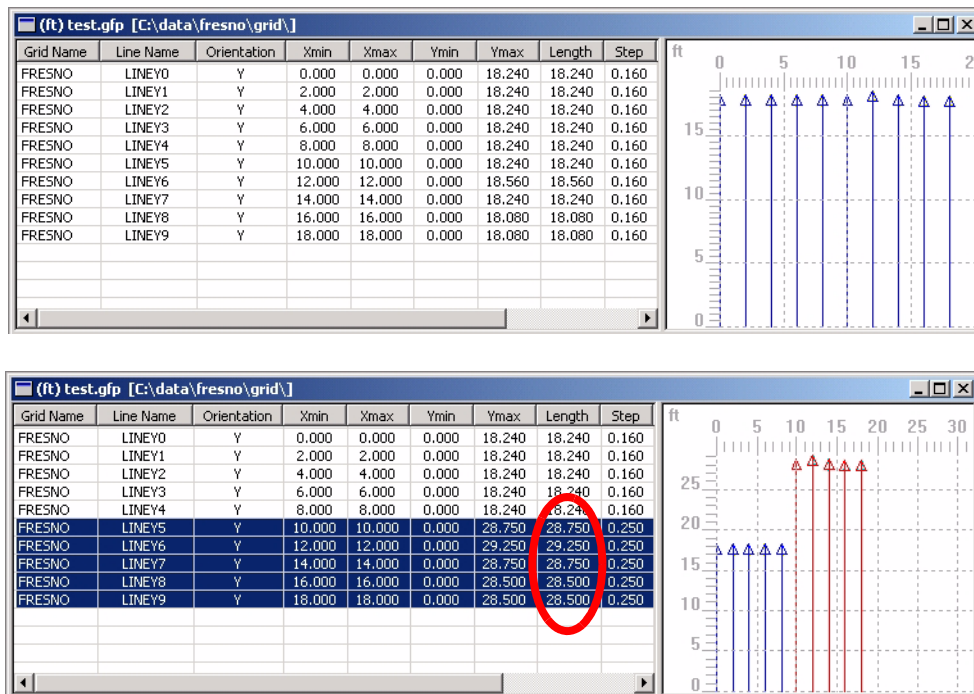
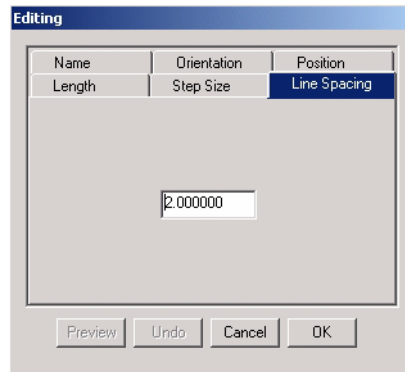


Figure 5-9: The Step Size tab changes the step size of one or more lines. In this example, the step size for lines Y5 to Y9 was changed from 0.16 to 0.25 feet. This change lengthened the lines (circled on the Grid Table).

After changing the step size, press **OK** to change, **Cancel** to exit without making the change, **Undo** to change back to the original step size and **Preview** to see the effect in the Grid Table and Grid Map before deciding whether to make the change or not.

5.1.6 Line Spacing

The Line Spacing tab changes the distance between the selected lines.



If one line is selected, the Line Spacing option is greyed out and not accessible.

The current line spacing is displayed. If several lines are selected and the line spacing varies, the average spacing is displayed.

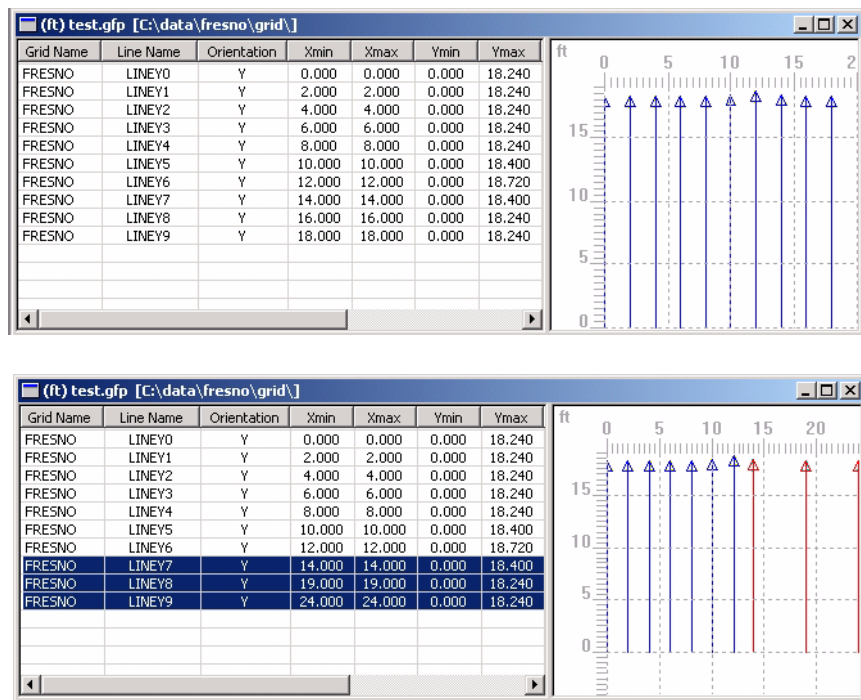


Figure 5-10: The Line Spacing tab changes the distance between the selected lines. In this example, the spacing between lines Y7 to Y9 was changed from 2 to 5 feet.

After changing the line spacing, press **OK** to change, **Cancel** to exit without making the change, **Undo** to change back to the original line spacing and **Preview** to see the effect in the Grid Table and Grid Map before deciding whether to make the change or not.

5.2 Import Line(s)

Data lines are imported into the GFP file by selecting the menu option **Edit > Import Line(s)**, by pressing **Insert** on the keyboard or by clicking the Import Line(s) button from the **Toolbar**:



GFP_Edit is very flexible and allows the user to create or edit a GFP file to group any GPR data lines together, even if they were collected by different systems or have different hardware settings. However, software programs that read GFP files may have restrictions on the data lines that can be read in. For example, the EKKO_Mapper software, used to create depth slice images from data lines collected in a grid, requires that all data lines have the same hardware settings for frequency and temporal sampling interval. Other parameters, like Step Size and Line Spacing, can vary. Trying to open a GFP file containing data lines with different hardware settings in EKKO_Mapper will result in an error message.

The first step is select the data line or lines to be imported.

Data lines must be in the same folder as the GFP file or in a sub-folder.

The Open dialog box lists the data lines and allows the user to select the data line(s) to import.

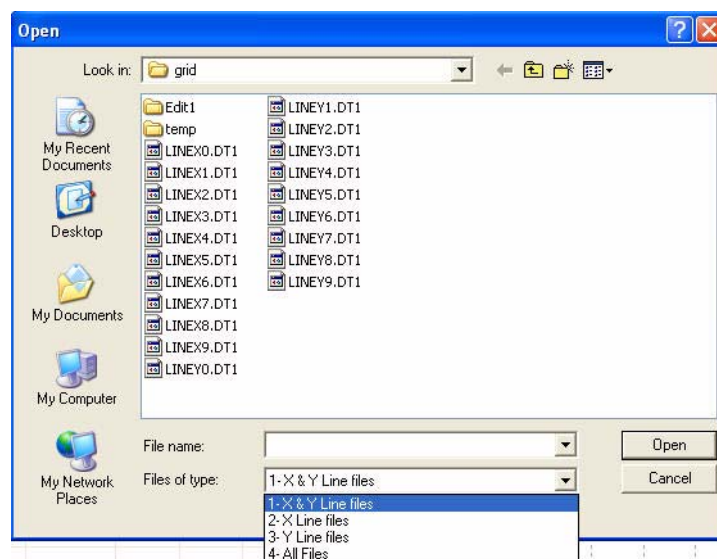


Figure 5-11: The File Type drop-down list can be used to select the name format of data lines to list. The options are X and Y, X, Y or All Files.

The default file type is to list **X and Y Line Files**, that is, all the data lines (DT1) files with an X and Y as part of the data line file name, but this can be changed to **X Line Files**, **Y Line Files** or **All Files** using the drop-down list.

Grids of data lines collected using Sensors & Software pulseEKKO PRO, Noggin^{plus} and Conquest systems automatically embed an X or a Y into the line name to indicate the line direction, for example, Noggin^{plus} grids are saved to lines named LINEX0, LINEX1, LINEX2 etc.

If the grid data lines being imported are in both the X and Y direction, use the **X and Y Line Files** file type.

If the grid data lines being imported are in the X direction only, use the **X Line Files** file type.

If the grid data lines being imported are in the Y direction only, use the **Y Line Files** file type.

If the grid data lines were collected as a Noggin^{plus} Line Project, a Conquest Line Scan or with an older pulseEKKO system on a PC, the names may have no indication of the line direction. In this case, to import the lines into the GFP file, use the **All Files** file type.

5.2.1 Importing a Grid of Data Lines

To import multiple data lines, highlight them in the Open dialog box and select **Open**.

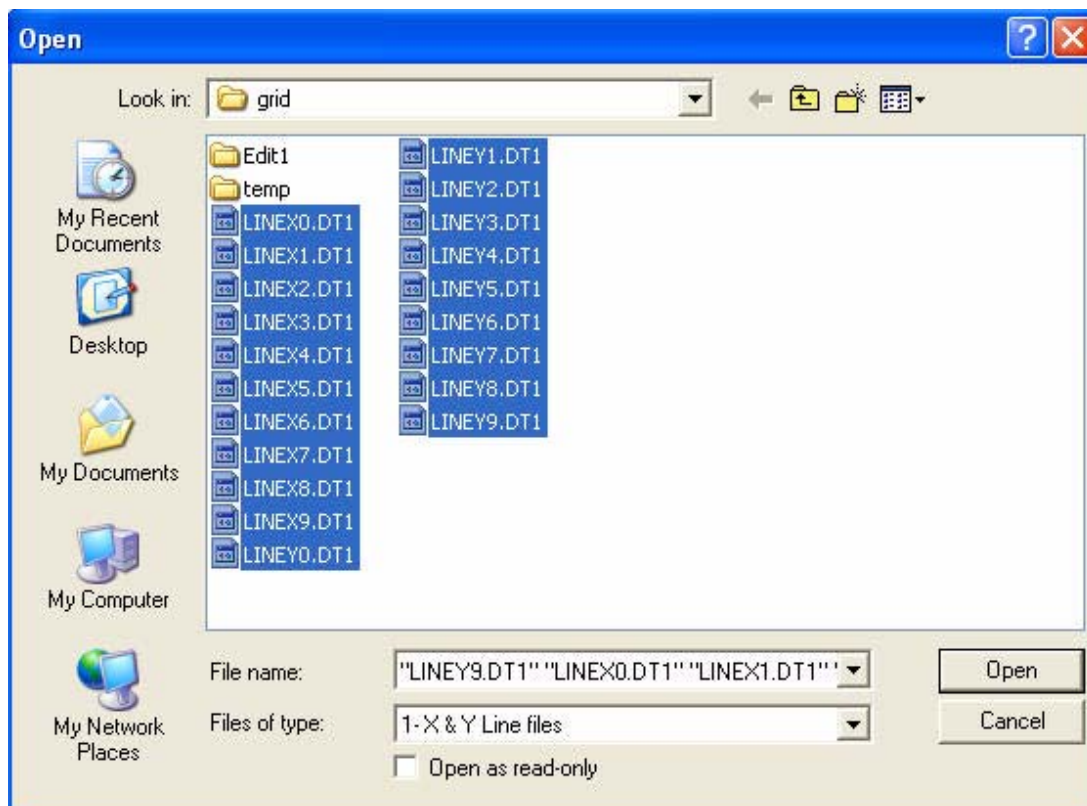


Figure 5-12: Importing multiple data lines into the GFP file.

Multiple data lines can be selected by clicking the first and last data line you want to highlight while pressing down the **Shift** key on the keyboard. Specific data lines can also be selected by clicking the data line name while pressing down the **Ctrl** key on the keyboard.

The Import Lines Parameters dialog is used to input the grid name, line direction(s), line positions, line spacings and GPS.

Figure 5-13: The Input Lines Parameters dialog allows the user to input the grid name, line direction, line spacing and line position of the data line(s) being imported. GPS can also be automatically added if GPS files are present and the Add GPS checkbox is checked.

5.2.1.1 Import Lines as

This option allows the user to select the line direction the data lines will be imported as. The options are **X & Y Lines**, **X Lines** or **Y Lines**.

This option will usually default to the same File Type selected in the **Import Line(s)** dialog but this can be overridden by the option selected here. For example, data lines with names that include an X, can be forced to be Y lines using this option.

5.2.1.2 Reverse Line Direction

The Reverse Line Direction checkbox allows the user to reverse the line direction from the original direction when importing the data line into the GFP file.

The most common use of this option is when pulseEKKO grid data were collected in a zig-zag fashion **but the start position and step size direction were not updated for every file**. For example, a grid was collected in the following way but the start of every line was set to zero no matter which direction it was actually collected in.

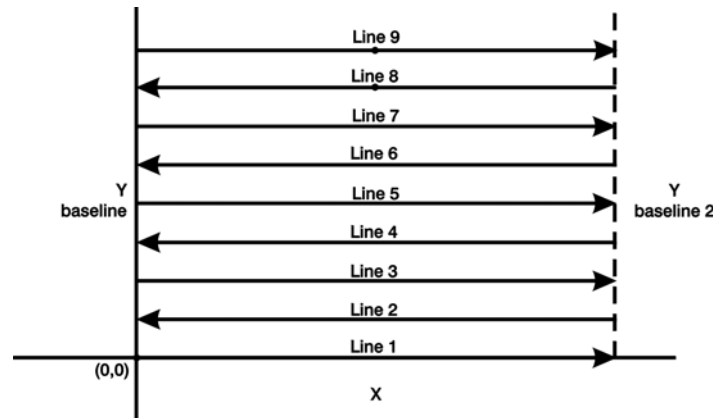


Figure 5-14: Data collected in the Forward-Reverse or zig-zag manner, without updating the Start Position of every line, will require every second line to be reversed to have every line positioned correctly in the grid.

Collecting data like this results in every second line being reversed compared to its adjacent lines. If the user attempts to view the grid lines in a plan or 3D view, the reversed lines will not be in the correct spatial positions, resulting in erroneous and uninterpretable views of the data.

To remedy this situation, the user can import every second data line in the reverse line direction, so all data lines are running in the same direction. This will require the data lines to be imported in two groups; the normal lines imported without the **Reverse Line Direction** option checked and the reversed lines with the **Reverse Line direction** option checked. Then verify the lines were imported correctly by ensuring that the line directions on the Grid Map match the directions of the actual grid survey.

Be aware that Reverse Line Direction should NOT be used when data were collected with a Noggin^{plus} system in Grid mode with the Survey Format set to Forward/Reverse. In this case, the data acquisition software automatically sets the Start Position so the position of every line is correct.

5.2.1.3 Grid Name

All the data files imported into a GFP file under one Grid Name are associated with one another and are processed, displayed and analyzed together in Sensors & Software software programs that open GFP files, for example, EKKO_Mapper.

GFP files can contain information for more than one set of data (see [Importing Multiple Grids](#)).

5.2.1.4 Line Spacing Conversion Factor

The Line Spacing Conversion Factor tries to assist the user in importing the data lines to their correct positions in the grid by using the number part of the data line name as a multiplication factor. For example, if the imported X data lines have names like LINEX0, LINEX1, LINEX2 and the desired line spacing is 2 feet, set the Conversion Factor to 2 feet. The Y positions of the data lines will be calculated in the following manner:

$$\text{LINEX0: } 0 \times 2 \text{ feet} = 0 \text{ feet}$$

$$\text{LINEX1: } 1 \times 2 \text{ feet} = 2 \text{ feet}$$

$$\text{LINEX2: } 2 \times 2 \text{ feet} = 4 \text{ feet}$$



Figure 5-15: The Line Spacing Conversion Factor is used to quickly import and position data lines with incrementing numbers as part of their name.

This assumes an origin of X=0 and Y=0. If X and Y are offset from the origin, this offset will be added to the final position values (see **Offset from Current Origin**).

Importing Conquest Lines: Be careful when importing Conquest lines into a GFP file. Remember that Conquest line names have numbers that indicate the line spacing in centimeters, i.e. XL0000, XL0005, XL0010 etc. This means to get the line spacing correct, the Line Spacing Conversion Factor must be set to 0.01 m or 0.0328 feet.

Different Line Spacing: If data lines in the X direction have a different line spacing than data lines in the Y direction, import the X lines first with one Line Spacing Conversion Factor and the Y lines second with a different Line Spacing Conversion Factor.

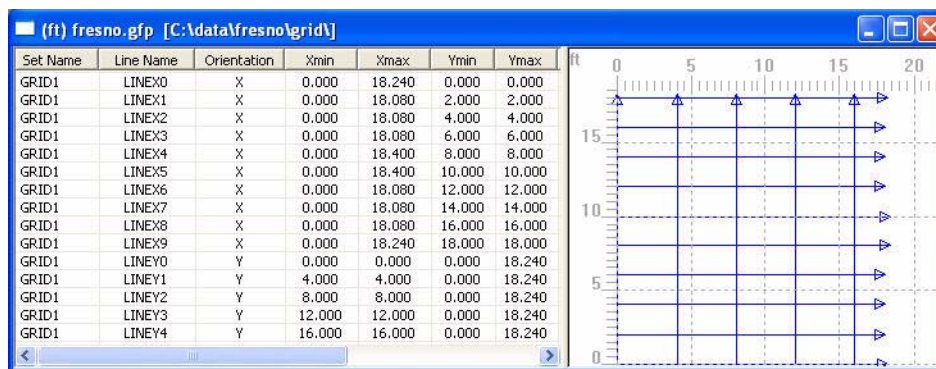
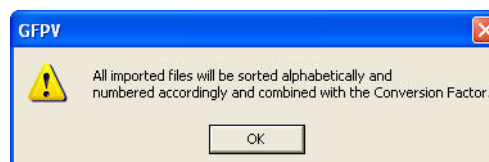


Figure 5-16: If the line spacing is different in the X and Y direction, import the X lines with one Line Spacing Conversion Factor and then import the Y lines with a different Line Spacing Conversion Factor.

Data Lines without Numbers in the Name: If the imported data line names do not contain numbers, i.e. TOM, DICK and HARRY, the user will see this warning message when importing the files:



This indicates that the Conversion Factor will be used but the order will be alphabetical with the first file position being set to zero.

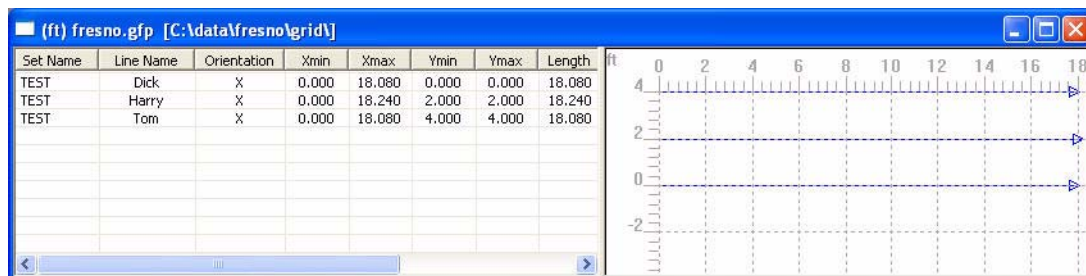


Figure 5-17: When data lines are imported without numbers in their names, they are arranged alphabetically. To import these files in a different order, they must be imported one at a time.

If this does not set the positions correctly, each data line may need to be imported individually and the position set using the offset from the origin option (see [Importing a Single Data Line](#)).

5.2.1.5 Offset from Current Origin

These X and Y offset values allow the user to shift the imported data lines away from the absolute origin at X position = 0 and Y position = 0 to some other origin values. For example, the data lines can be imported with the origin set to X = 100 and Y = 55.

Therefore, the position of the lines used in the example under [Line Spacing Conversion Factor](#) are imported with offsets from the origin they would be positioned as follows:

LINEX0: X Position = 100 Y Position = $55 + (0 \times 2)$ feet = 55 feet

LINEX1: X Position = 100 Y Position = $55 + (1 \times 2)$ feet = 57 feet

LINEX2: X Position = 100 Y Position = $55 + (2 \times 2)$ feet = 59 feet



Figure 5-18: The Offset from Current Origin option allows the data lines to be offset from the X=0, Y=0 origin.

5.2.1.6 Adding GPS during Line Import

If GPS files were created during data collection, checking the **Add GPS if found** checkbox (**Figure 5-13**) in the Import Line Parameters dialog will add GPS to the GFP file when the lines are imported. To be added, the GPS files must reside in the same folder as the GPR lines and must have the same name as the GPR line but with a .GPS extension.

5.2.2 Importing a Single Data Line

Importing a single data line is most commonly used in the following situations:

- 1) importing the second part of a data line with a gap in it,
- 2) importing lines without numbers in the name and,
- 3) importing a grid of data lines with non-equal line spacing.

To import a single data line, highlight the name in the Open dialog box and select **Open**.

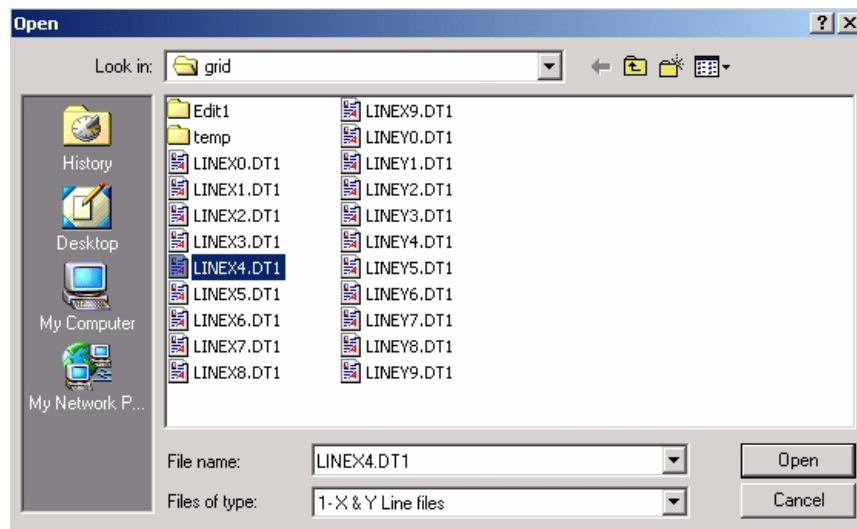


Figure 5-19: Importing a single data line into the GFP file.

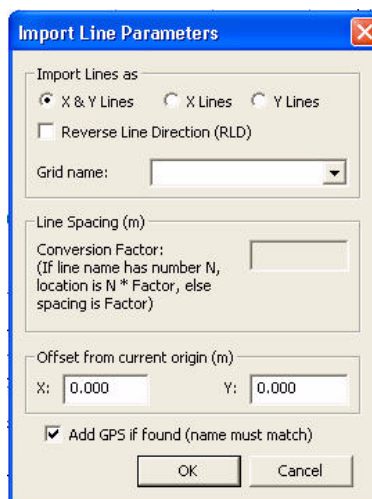


Figure 5-20: When importing a single line into an existing grid, make sure that the Grid Name is the same as the rest of the grid. For a single data line, the Line Spacing Conversion Factor is not accessible and the position of the line is determined using the Offset from Current Origin option.

5.2.2.1 Importing a Broken Line into a Grid

To import the second part of a data line that was broken into two pieces because of an obstruction:

- 1) Import the grid of data lines into the GFP file ([Importing a Grid of Data Lines](#)).
- 2) Import the single data line after the gap in the data ([Figure 5-19](#)) and open the Input Lines Parameters dialog ([Figure 5-20](#)).
- 3) Select the Line Direction using the **Import Lines as** option.
- 4) Make sure the **Grid Name** is the same name as the rest of the grid.
- 5) Use the **Offset from Current Origin** option to position the data line.

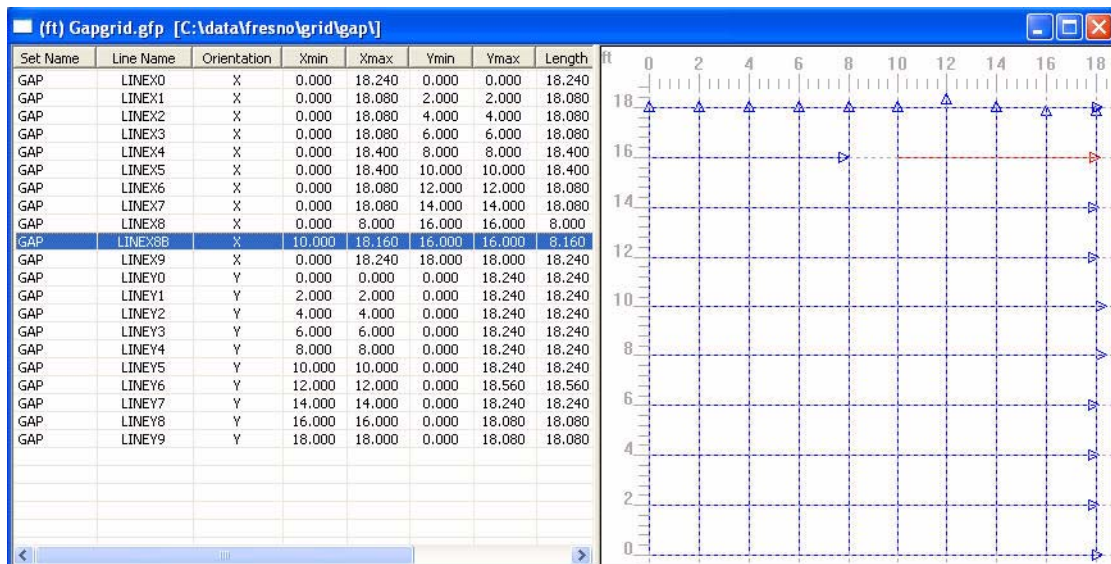


Figure 5-21: Importing a single line on the other side of a gap in the grid survey.

5.2.2.2 Importing Data Lines without Numbers

Data lines with names that do not include numbers are put in alphabetical order when imported as multiple files ([Importing a Grid of Data Lines](#)). If alphabetical order is not the correct order of the files in the grid, one option is to rename the files by appending appropriate numbers then importing them. Another option is to import them as single files.

- 1) Import the single data line ([Figure 5-19](#)) and open the Input Lines Parameters dialog ([Figure 5-20](#)).
- 2) Select the Line Direction using the **Import Lines as** option.
- 3) Make sure the **Grid Name** is the same name as the rest of the grid.
- 4) Use the **Offset from Current Origin** option to position the data line.

- Repeat steps 1 to 5 until all the files have been imported.

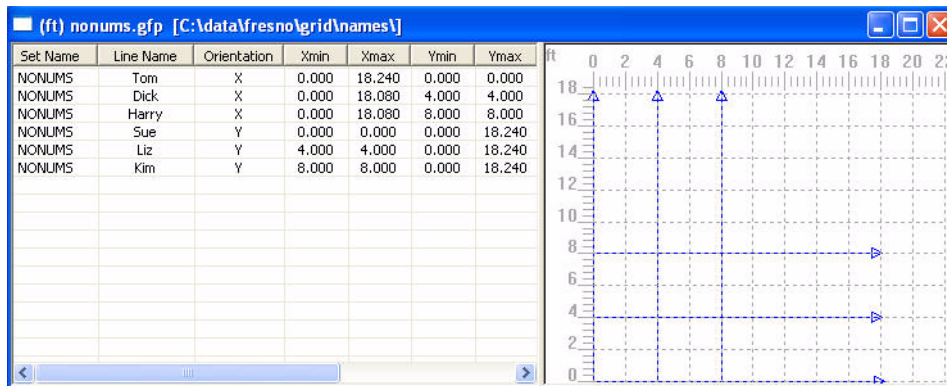


Figure 5-22: When data line names do not contain numbers, they must be imported one file at a time. Make sure that the Grid Name is the same and use the Offset from Current Origin option to position each line.

5.2.2.3 Importing Lines with Variable Line Spacing

Data lines are easier to import into the GFP file when they are equally spaced but they do not have to be. If data lines have variable line spacing, they can be imported one at a time.

- Import the single data line (**Figure 5-19**) and open the Input Lines Parameters dialog (**Figure 5-20**).
- Select the Line Direction using the **Import Lines as** option.
- Make sure the **Grid Name** is the same name as the rest of the grid.
- Use the **Offset from Current Origin** option to position the data line.
- Repeat steps 1 to 5 until all the files have been imported.

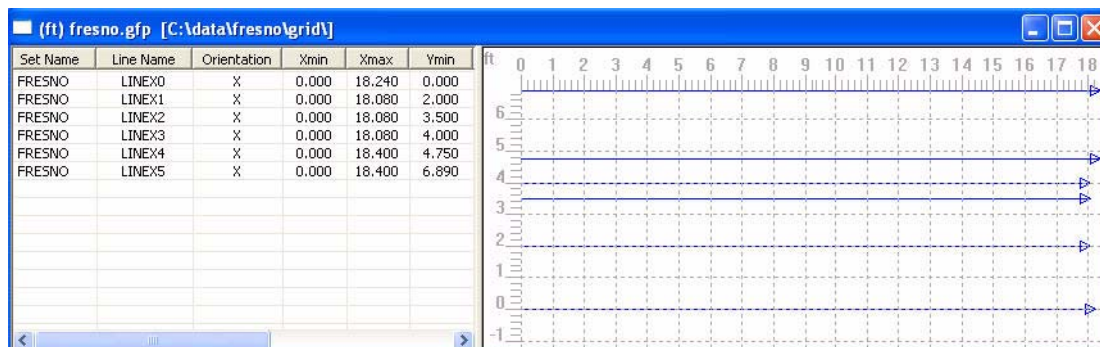


Figure 5-23: Grid data with variable line spacing requires the data lines to be imported one at a time.

5.2.3 Importing Multiple Grids

The GFP file can contain more than one grid. The data lines for the other grid(s) can either be in the same folder as the first grid or in a sub-folder.

For example, if the GFP file is in folder **C:\data**, data lines from the first grid could be in the sub-folder **C:\data\grid1** and the data lines for the second grid could be in the sub-folder **C:\data\grid2**.

To import a second grid, follow the instructions from [Importing a Grid of Data Lines](#) and use the **Offset from Current Origin** to offset the second grid from the first.

The Grid Name for the second grid can be a new Grid Name or the same Grid Name as the first grid. If the two grids have different Grid Names, be aware that some Sensors & Software software programs like EKKO_Mapper can only process the data lines under one Grid Name at a time. So if you want to process both grids at the once, give them the same Grid Name.

To process multiple grids together, they must have the same frequency and temporal sampling interval.

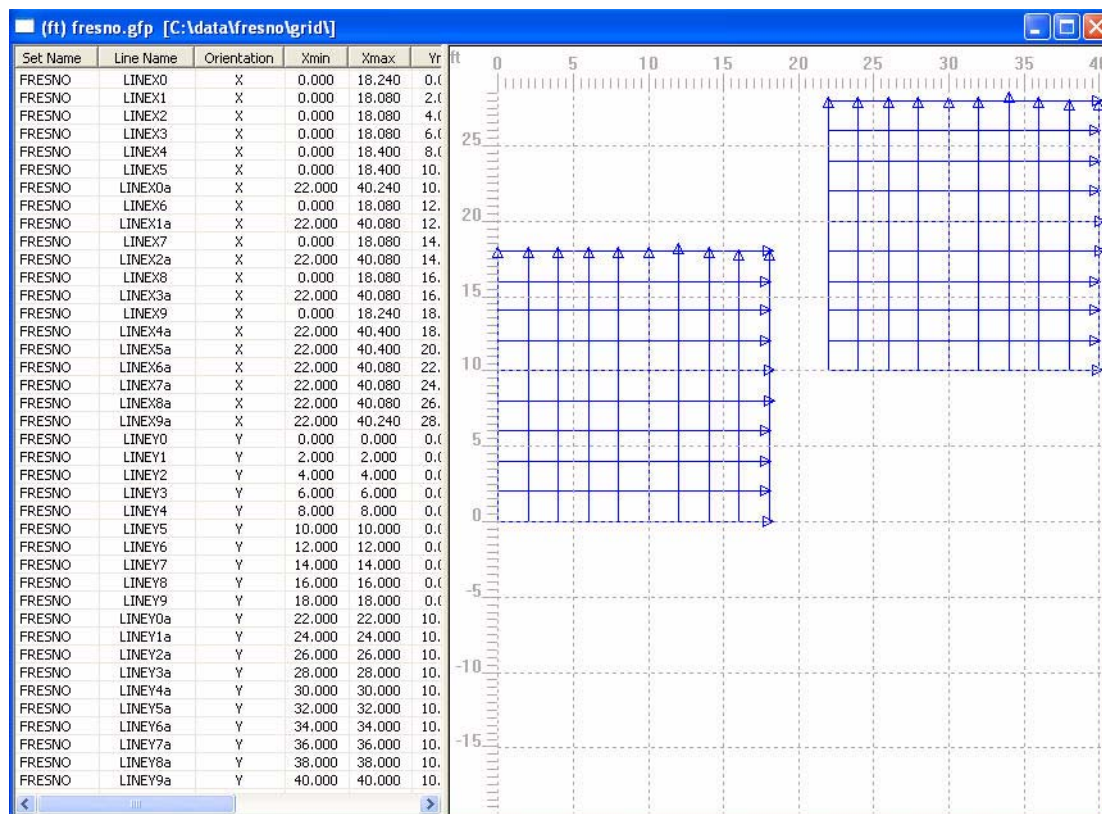


Figure 5-24: Multiple grids can be imported into one GFP file. The grids can be saved under the same Grid Name or different Grid Names. Only data with the same Grid Name can be processed and displayed together.

5.3 Delete Line(s)

After data lines have been imported into the GFP file and one or more data lines have been highlighted on the Grid Table or the Grid Map (**Selecting Lines**), the Delete Line(s) option becomes accessible.

To remove the highlighted data lines from the GFP file, select the menu option **Edit > Delete Line(s)** or press **Delete** on the keyboard.

The Delete Line(s) option can also be accessed from the **Toolbar** by clicking the **Delete Line(s)** button:



5.4 Select All Lines

To select all the lines currently selected in the Grid Table, select the menu option **Edit > Select All Lines** or press **Ctrl-A** on the keyboard.

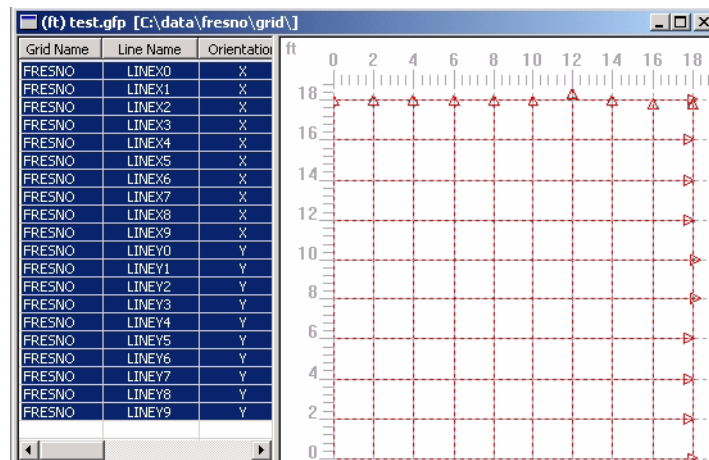


Figure 5-25: Select all lines by selecting **Edit > Select All Lines** or by pressing **Ctrl-A** on the keyboard.

5.5 Deselect All Lines

To deselect all the lines selected in the Grid Table, select the menu option **Edit > Deselect All Lines** or press **Ctrl-D** on the keyboard.

5.6 GPS Data

The GPS Data menu is mainly used to manually add GPS data into the GFP file. It can also be used to Remove the GPS data from the GFP file and export GPS positions into the trace headers for use with other software.

5.6.1 Add GPS

If GPS data were collected with the GPR data lines, GPS files with the same name as the GPR data line with a .GPS extension reside in the data folder, for example, LINEX5.GPS.

5.6.1.1 Adding GPS Automatically

When a GFP file is opened, if GPS files are detected in the same folder as the GPR line data files, and the GPS files have not already been added, the program automatically prompts the user to add the GPS files into the GFP file (see [Automatically Add GPS when GFP File is Opened](#)).

5.6.1.2 Adding GPS Manually

If the user declines to add the GPS data when prompted after opening the GFP file, GPS data can be added later by highlighting one or more file names in the Grid Table (see [Figure 2-2](#)) and then selecting the **Edit > GPS Data > Add**. Typically, all GPS files would be selected to add to the GFP file but any GPS data files known to be corrupt or inaccurate should not be selected.

5.6.1.3 GPS Fitting and Accuracy

The GPS positions for the added GPS files are processed to calculate the best fit of the GPS data to the GPR lines in the grid. Be aware that the accuracy of the raw GPS data affects the accuracy of GPS position of the grid and consequently the GPS positions of targets interpreted in the data when viewed in the EKKO_Mapper and EKKO_View software programs.

5.6.1.4 Viewing GPS Positions

After GPS positions have been added, the GPS lines, relative to the GPR grid lines are viewed by enabling the **Raw GPS** in the **View > Line Settings** dialog (see [Figure 6-2](#)).

GPS information is displayed in the **Status Bar** under the following conditions:

- 1) If **Edit > Local-Global Coordinates Relationship > Use Global Positions** is enabled, GPS is displayed in the format defined under [GPS Format](#) as the mouse cursor is moved around the Grid Map image in GFP_Edit (see [Figure 6-1](#)). GPS positions are also displayed in the EKKO_Mapper software (see the EKKO_Mapper User's Guide) and the EKKO_View software.
- 2) If **Edit > Local-Global Coordinates Relationship > Use Global Positions** is disabled and no GPS files are present, "GPS: N/A"
- 3) If **Edit > Local-Global Coordinates Relationship > Use Global Positions** is disabled and there are GPS files present, "GPS: Disabled"
- 4) If the gps point translates to a invalid point, "GPS: Invalid, Out of Bounds". Note that this can happen at the poles.

5.6.1.5 GPS in Trace Headers

GPR lines are saved in two files: a data (.DT1) file and a header (.HD) file. The GPR signal amplitude values for every trace and a trace header are saved in the .DT1 file and the survey parameters to the .HD file. For more details about the DT1 and HD files, see the GPR Data File Format in Appendix A of the GPR System User's Guide.

If GPS data have been added to the GFP file, the **Add GPS** option also writes a unique GPS position for every trace to the trace headers. Writing GPS positions to the trace headers is necessary for viewing the GPS positions in the EKKO_View software, used for plotting cross-sectional GPR line data.

Note that there may be a difference between GPS positions on GPR Lines displayed in GFP_Edit/EKKO Mapper software and the EKKO_View software.

For EKKO_View, which plots GPR cross-sectional lines, the GPS position is based interpolating the GPS positions saved to the GPS file during data collection.

For GFP_Edit/EKKO Mapper, which use many GPR lines combined into a grid, GPS positions are determined by using the defined **Local-Global Coordinates Relationship** and grid line positions.

Therefore, the GPS positions for any individual line in the grid will differ slightly from the GPS file collected with that line.

5.6.2 Remove GPS

The Remove menu option removes the selected GPS file(s) from the GFP file. Highlight one or more file names in the Grid Table (see **Figure 2-2**) and then select the **Edit > GPS Data > Remove**.

Inaccurate GPS files should be removed to increase the accuracy of the best fit calculation of the GPS position of the GPR lines and grid.

After removing GPS files, the Compute from GPS operation should be run again to ensure the best possible fit between the Local and Global Coordinates.

Note that **Remove GPS** does NOT remove GPS positions from the trace headers (**GPS in Trace Headers**) so GPS positions are displayed in the EKKO_View software. For more details, see the EKKO_View User's Guide.

5.6.3 Recover GPS Files

The Recover menu option is used to create a GPS file when the original has been lost or when GPS positions were added to the trace headers using a different method than the **Edit > GPS Data > Add GPS** menu option (see **Add GPS** in the **EKKO_View Deluxe User's Guide**).

Recover is only available in the situation where the GPS positions are saved in the trace headers of the DT1 file and there are no GPS files in the folder with the GPR data lines. The **Grid Table** indicates this with a question mark (?) in the GPS column.

The Recover option generates a GPS file with the same name as the GPR data line but with a .GPS extension.

Highlight one or more file names in the Grid Table (see **Figure 2-2**) and then select **Edit > GPS Data > Recover**. The Recover operation will never overwrite an existing GPS file.

5.7 GPS Format

If GPS data were added to the GFP file, the **GPS Format** option allows the format of the GPS display on the **Status Bar** to be modified.

The GPS format selected is also used for the GPS display on the Status Bar in the EKKO_Mapper software (see the EKKO_Mapper User's Guide).

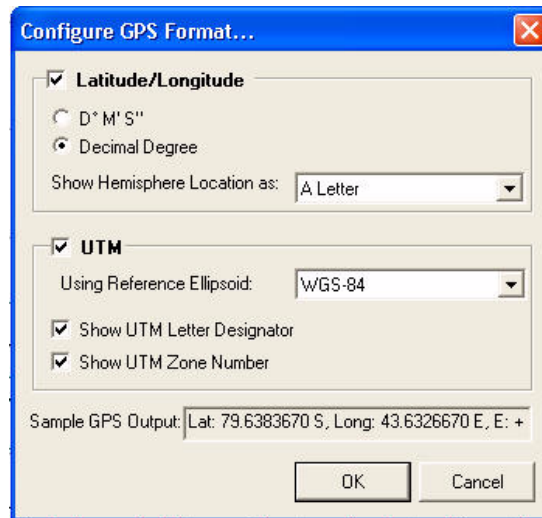


Figure 5-26: GPS Format dialog.

5.7.1 Latitude/Longitude

If Latitude/Longitude is selected with the checkbox, the display options are:

- 1) **Degrees Minutes Seconds**
- 2) **Decimal Degrees**

The options for the Hemisphere are:

- 1) **Do not show**
- 2) **Positive or Negative:** A plus (+) sign if Latitude is in the Northern hemisphere or Longitude is in the Eastern Hemisphere and a minus (-) sign if Latitude is in the Southern hemisphere or Longitude is in the Western Hemisphere.
- 3) **Letter:** For latitude, "N" for North or "S" for South. For Longitude, "E" for East or "W" for West.
- 4) **Word:** For latitude, "North" or "South". For Longitude, "East" or "West".

A sample of the current GPS output is shown at the bottom of the dialog box.

5.7.2 UTM

If UTM is selected with the checkbox, the **Reference Ellipsoid** can be selected from the drop-down list. The default is **WGS-84**.

To display the **UTM Zone Number** and/or the **UTM Letter Designator**, select those options.

A sample of the current GPS output is shown at the bottom of the dialog box.

5.8 Local-Global Coordinates Relationship

The Local-Global Coordinates Relationship dialog defines the relationship between the Local XY (GPR grid) coordinates and the Global coordinates (Latitude-Longitude or UTM). If the GPR data were collected with GPS, this relationship is best calculated using the **Compute from GPS** routine. It can also be established by defining two points or one point and a heading in both the XY and Global coordinates.

The Local-Global Coordinates Relationship dialog is accessible by selecting the **Edit > Local-Global Coordinates Relationship** menu option or by pressing the button on the **Toolbar**:



The Local-Global Coordinates Relationship dialog box is shown in **Figure 5-27**.

Figure 5-27: The Local-Global Coordinates Relationship dialog is used to define the relationship between Local XY and Global coordinates.

The **Help** button displays text that explains what the Local-Global Coordinates Relationship is and ways that it can be defined.

5.8.1 Use Global Positions

Enable the input of Global Coordinates by ensuring the **Use Global Positions** checkbox is checked. When this option is disabled GPS coordinates do not appear on the **Status Bar** when the mouse cursor is moved on the Grid Map. Instead, “**GPS: Disabled**” or “**GPS: N/A**” is displayed.

If **Use Global Positions** is disabled, GPS coordinates are not displayed on the Status Bar in the EKKO_Mapper software nor is the ability to export slice images to KMZ files for display in Google Earth (see the EKKO_Mapper User’s Guide).

5.8.2 Compute from GPS

If GPR data lines were collected with GPS, the most common method of determining the relationship between the Local XY grid and the GPS positions is by calculating the best-fit. This calculation may have been done when the GPS was added to the GFP file (see [Automatically Add GPS when GFP File is Opened](#) or [Add GPS](#)). If so, the results of the best-fit calculation are displayed when the Local-Global Coordinates Relationship dialog is first opened.

The best-fit calculation minimizes the length of the [GPS Whiskers](#) but depending on the GPS accuracy and visual correlation with the grid lines, a manual adjustment may be necessary in some cases.

The best-fit calculation is affected when the XY positions of lines are edited (see [Edit GFP File](#)). Specifically, changing the position, orientation, length, step size or line spacing of one or more GPR lines will affect the best-fit calculation.

The Compute from GPS calculation to define the Local-Global Coordinates Relationship should only be done (or redone) AFTER the GPR lines have been edited or GPS files have been removed.

The best-fit calculation is done (or re-done after editing GPR Line positions) by pressing the **Compute from GPS** button. This button will be greyed out and not accessible if GPS data have not been added to the GFP file.

The Compute from GPS process calculates the best-fit in UTM coordinates for the Local XY origin (0,0) and the corresponding Northing and Easting are displayed in the **1st Reference Point** fields. The calculated UTM zone and hemisphere are displayed in the **Global Coordinates - UTM** fields.

The Latitude and Longitude of the best-fit calculated position for the Local XY origin (0,0) are displayed in the **1st Reference Point** field by changing the **Global Coordinates** to Latitude-Longitude (see [Global Coordinates](#)).

Be cautious when clicking the **Compute from GPS** button and then greatly changing any of the editable fields in the Local-Global Coordinates Relationship dialog and pressing OK. In some cases, small manual changes to the Local XY Point, Y-Axis Heading, Latitude, Longitude, UTM Northing, Easting may provide a better visual fit of the Local and Global coordinates. However, large changes in these values or changing the Zone and/or Hemisphere may result in the Local XY grid being widely separated from the Raw GPS Lines. If the Raw GPS Lines do become greatly separated, a warning message will appear. The Raw GPS Lines can always be recovered by pressing the Compute from GPS button again.

5.8.3 Global Coordinates

Global Coordinates are defined as Latitude-Longitude or UTM (Universal Transverse Mercator). Select the desired coordinate system for calculating the Local-Global Coordinates Relationship. Note that the **Compute from GPS** option always initially displays UTM but can be changed to Latitude and Longitude by changing the setting.

If UTM is selected, the Hemisphere (northern or southern) and the Zone can be edited, however, editing these values after pressing **Compute from GPS** may result in errors. These fields are primarily designed to be edited when manually entering Global Coordinates (see [Manual Input of Global Coordinates](#)).

5.8.4 Manual Input of Global Coordinates

If GPS data were not collected for the entire GPR data grid but one or two GPS positions in the grid area are known, GPS positions for the entire grid can be calculated.

Or if the **Compute from GPS** does not provide an acceptable fit to the GPR data grid, manually entering the reference points may provide better results.

First, using the radio button (see **Figure 5-27**) select the method used for calculating the Local-Global Coordinates Relationship:

- 1) two reference points
- 2) one reference point and the Y-axis heading angle

Enter the reference points as described below and then select the **Preview** button to see how the Local-Global Coordinates Relationship looks. Selecting Preview allows the user to move the mouse cursor over the grid image and see the proposed GPS values displayed on the **Status Bar**. If the Local-Global Coordinates Relationship is acceptable, press the **OK** button to save the settings and exit the dialog. If unacceptable, either change the definition or press the **Cancel** button and exit the dialog with no change.

5.8.4.1 Using GPS Positions from Third-Party Sources

Global positions in Latitude/Longitude or UTM can be obtained from an independent GPS that calculates the GPS position for two known XY points in the GPR grid, for example, two corners. These positions can simply be recorded before, during or after the GPR data survey and the entered using **Manual Input of Global Coordinates**.

Another place to obtain Global positions for reference points in the area of your grid is the Google Earth program available free from Google. Find the location of the GPR grid in Google Earth and use the mouse cursor to find the GPS position for a particular point near or within the grid.

To obtain better accuracy for points, use the **Ruler** option in Google Earth to change the mouse cursor from a hand to cross-hairs.



Figure 5-28: Third-party sources can be used to determine global coordinates in or near the GPR grid. For example, if the GPR survey grid was collected near roads or structures, find the latitude and longitude of the reference points using Google Earth.

GFP_Edit expects Latitude-Longitude values expressed in decimal degrees or UTM. Google Earth usually displays in degrees-minutes-seconds. The Google Earth display can be changed to decimal degrees or UTM under **Tools > Options > 3D View Tab > Show Lat/Long**.

It is important to remember, however, that GPS positions obtained from Google Earth may be in error by up to several meters.

5.8.4.2 Entering Two Reference Points

Figure 5-29 shows how to set the Local-Global Coordinate Relationship by entering the Local XY and Global Latitude/Longitude (or UTM) coordinates for two reference points in the grid area.

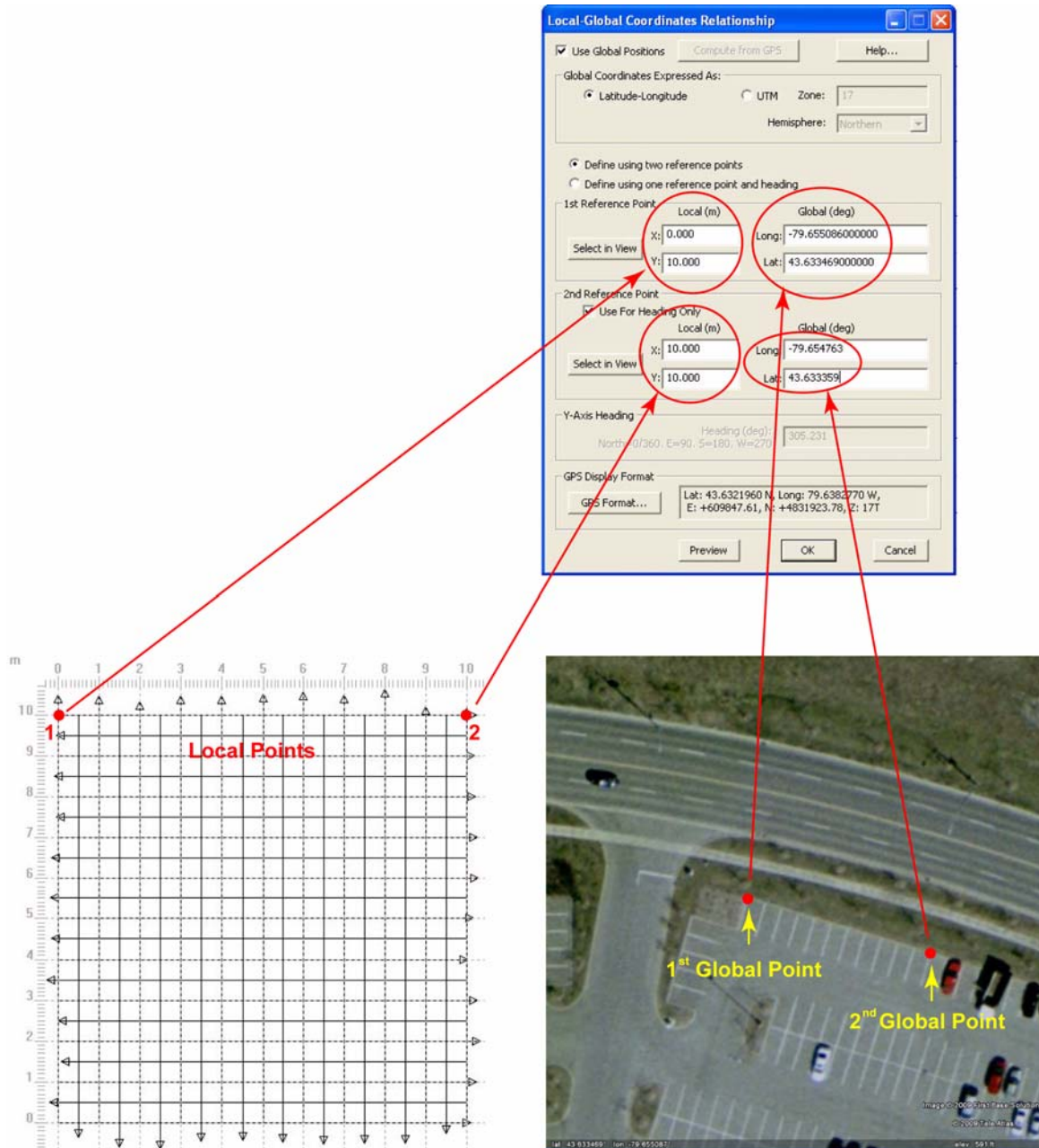


Figure 5-29: Defining the Local-Global Coordinates relationship by entering the Latitude-Longitude positions of two XY positions in the grid. With the “Use for Heading Only” option selected, the heading of Point 1 to Point 2 is used; not the absolute position of Point 2. This method uses the local GPR odometer positioning saved during data collection when plotted with Global coordinates, for example in Google Earth.

1st Reference Point

Input the first point by entering the X and Y positions of that point under 1st Reference Point. The **Select in View** button is provided to allow the user to click on the button then a point in the grid and have that X and Y position automatically entered into the fields. The XY value is entered in meters or feet, depending on the **Display Units** currently set in GFP_Edit. Then, enter the corresponding Latitude and Longitude or UTM Northing and Easting for the XY point (**Figure 5-29** and **Figure 5-32**).

Latitudes north of the Equator are positive values and south are negative values. Longitudes east of the Prime Meridian (Greenwich) are positive and west are negative. Latitude and Longitude values are always entered in decimal degrees.

UTM Northing and Easting values are always entered in meters and can be positive or negative.

2nd Reference Point

If entering 2 reference points to define the Local-Global Coordinates Relationship, enter the 2nd Reference Point by selecting the radio button to enable it and then entering the X, Y, Latitude, Longitude (or UTM Northing and Easting) values the same way as the first point was entered above ([Figure 5-29](#)).

After entering the second reference point, decide whether to enable the **Use for Heading Only** checkbox. The **Use for Heading Only** option determines whether local or global positioning is used.

Use for Heading Only

If **Use for Heading Only** is enabled, the Local XY positions and the heading between the first and second reference point is used to determine the Local-Global Coordinate Relationship. When a GPR depth slice is plotted in global coordinates, for example in Google Earth, the actual size of the grid is determined by the GPR odometer positions used during data collection. In general, having **Use for Heading Only** enabled is more accurate so having it enabled is the default setting.

The Heading Only option is commonly used when determining a heading using two points from third-party sources like Google Earth; for example, using Google Earth to line up the GPR grid to the edge of a building or road that you know defined the edge of the GPR grid ([Figure 5-30](#)).

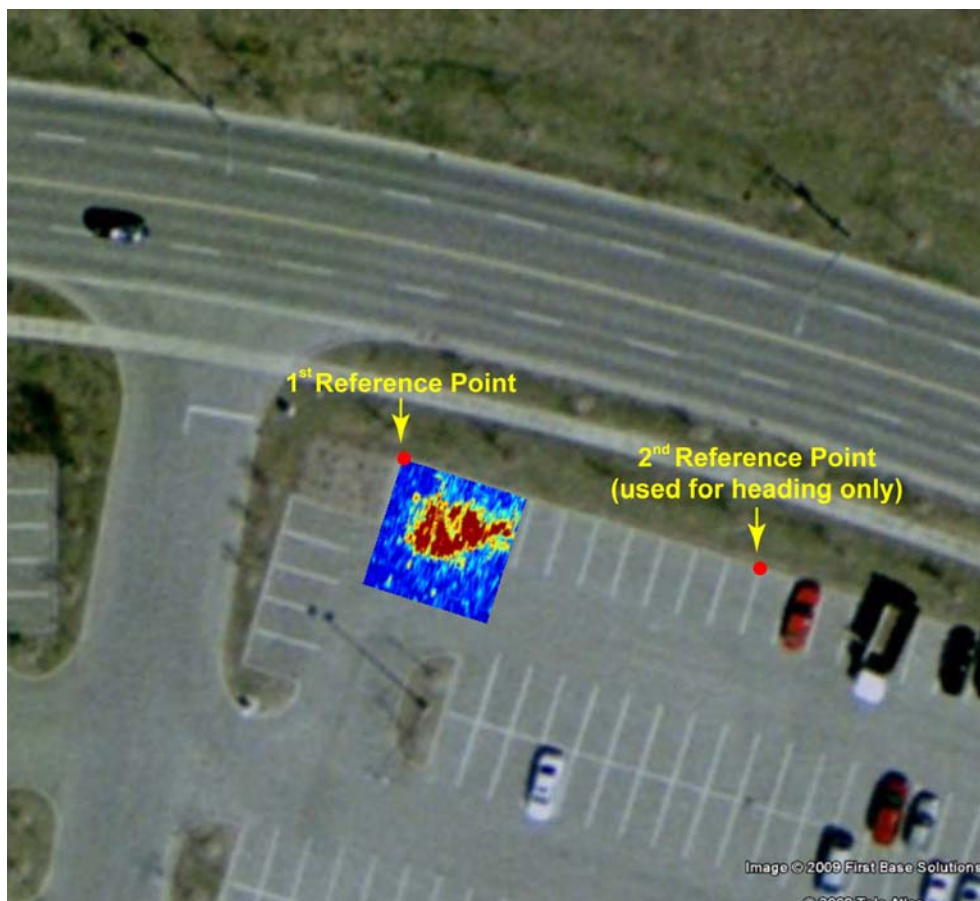


Figure 5-30: Defining the Local-Global Coordinates relationship by entering the Latitude-Longitude (or UTM) positions of two XY positions in the grid. With the “Use for Heading Only” option selected, the depth slice is scaled using the local coordinates obtained from the GPR odometer positioning saved during data collection.

Absolute Points

If Use for Heading Only is disabled, the Local XY positions and the absolute global positions of the first and second reference points are used to determine the Local-Global Coordinate Relationship. When a GPR depth slice is plotted in global coordinates, the actual size of the grid is determined by the absolute global positions. This may result in the depth slice image being stretched or squeezed from the actual XY grid size when displayed in global coordinates, for example, in Google Earth.

If the XY distance between the 1st and 2nd reference points is different than the distance between the UTM or Latitude-Longitude points, the slice image is stretched or squeezed in UTM or Latitude-Longitude to fit to these positions (see [Figure 5-31](#) and compare to [Figure 5-30](#) where Use for Heading Only is enabled) . Therefore, the distances measured by the odometer during data collection of the grid lines are no longer valid when plotted in global coordinates.

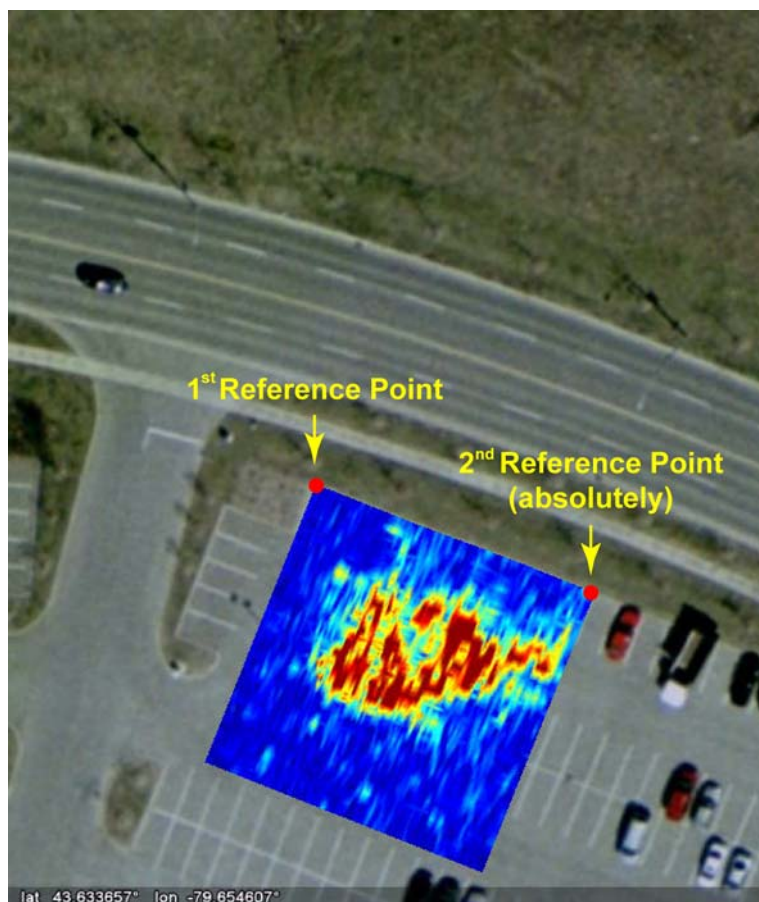


Figure 5-31: Defining the Local-Global Coordinates relationship by entering the Latitude-Longitude positions of two XY positions in the grid. With the “Use for Heading Only” option NOT selected, the depth slice is scaled to using the Global coordinates of Point 1 and 2. This method ignores the GPR odometer positions saved during data collection.

For example, if the 2 reference points are 10 meters apart in XY coordinates but 15 meters apart in UTM coordinates, the grid is stretched so the two points are separated by 15 meters in UTM.

5.8.4.3 Entering One Reference Point and the Y-Axis Heading

Figure 5-32 shows how to set the Local-Global Coordinate Relationship by entering the Local XY and Global Latitude/Longitude (or UTM) coordinates for one reference point in the grid area and the Y-Axis Heading.

This method uses the local GPR odometer positioning saved during data collection when plotting data slices in Global coordinates, for example in Google Earth.

Enter the first reference point as described above.

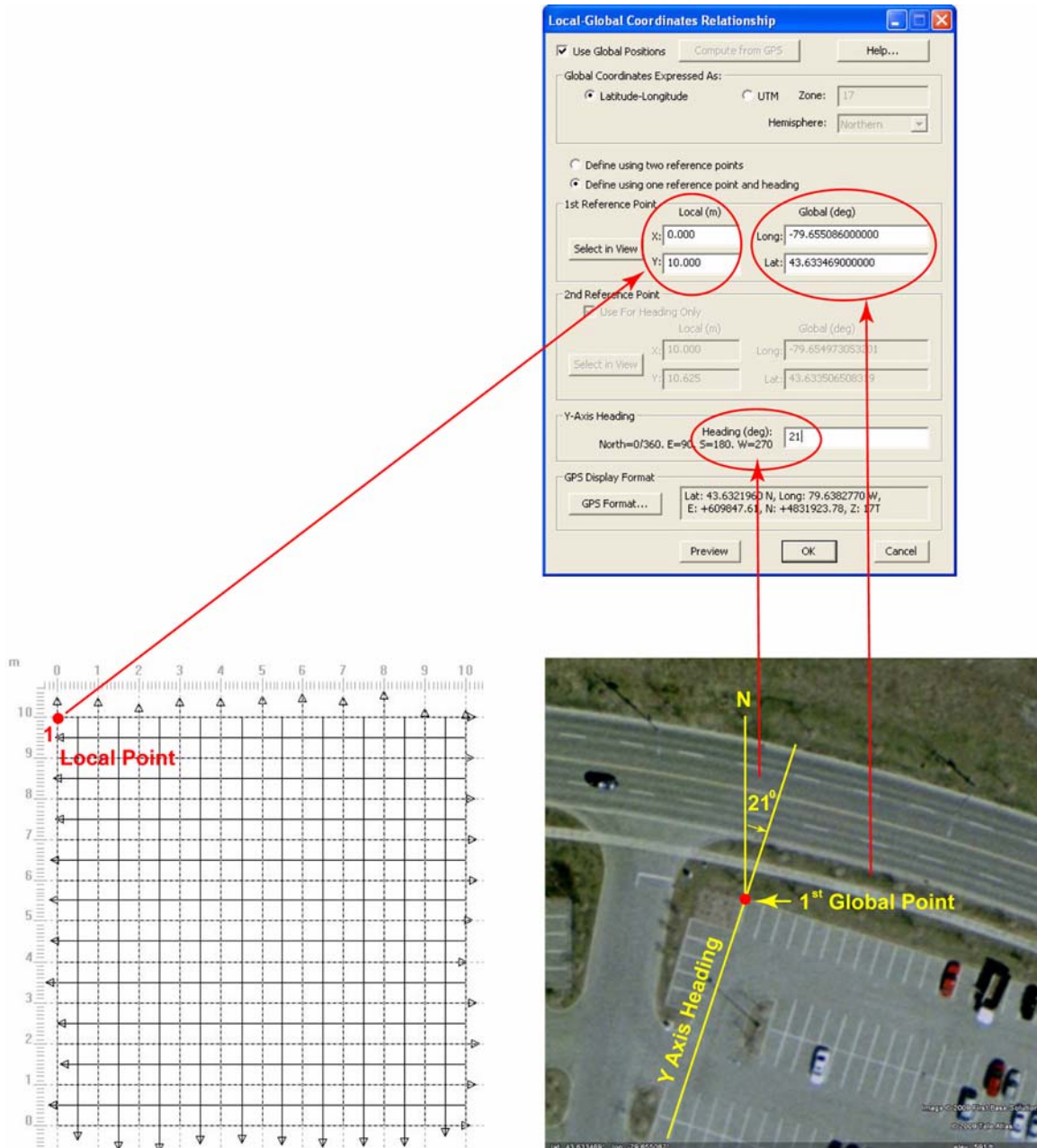


Figure 5-32: Defining the Local-Global Coordinates relationship by entering the Latitude-Longitude position of an XY position in the grid and the heading of the Y-axis. This method uses the local GPR odometer positioning saved during data collection when plotted with Global coordinates, for example in Google Earth..

Y-Axis Heading

If entering a point and a heading to define the Local-Global Coordinates relationship, enter the Y-Axis Heading by selecting the radio button to enable it and then entering the heading in degrees from 0 (zero) to 360. North is 0 (zero) and 360. Angles are defined positive in the clockwise direction and negative counter-clockwise direction. For example, with East is +90 or -270, South is +180 or -180 and West is +270 or -90 degrees. See [Figure 5-32](#).

5.8.4.4 Manual Input of Global Coordinates with Added GPS

Sometimes even though GPR data were collected with GPS and Added into the GFP file, it may be desirable set the Local-Global Coordinates Relationship to a different GPS location than the position calculated from the [Compute from GPS](#) option.

When this is done, a warning may appear alerting the user that the calculated GPS position is far from the GPS position that was manually input.

5.8.5 GPS Format

The format of the GPS coordinates on the [Status Bar](#) is set by selecting the **GPS Format** button in the Local-Global Coordinates Relationship dialog or the **Edit > GPS Format** menu option. For more information on setting the GPS format, see [GPS Format](#).

5.9 Re-import Fiducials

Fiducials are markers and/or comments added during data collection at specific trace positions along the line (see [Display Fiducials](#)). Fiducials can also be edited or added after the survey using a routine in the EKKO_View Deluxe software.

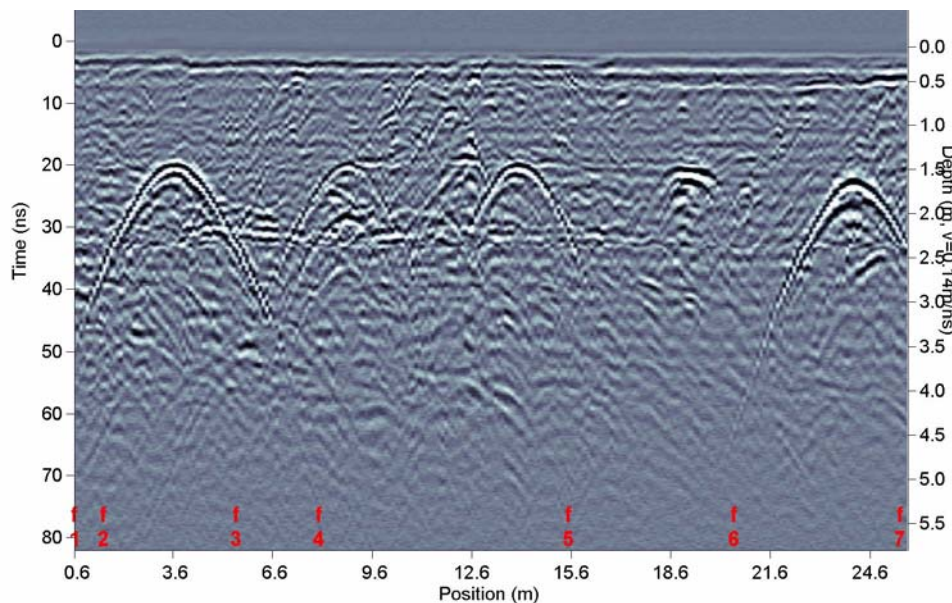


Figure 5-33: Fiducial markers (bottom of image) are added at significant positions during data collection. They usually consist of an “f” followed by an incrementing value. Existing fiducials are edited and new ones inserted using the EKKO_View Deluxe software.

Fiducials contained in the grid data lines (DT1 files) are automatically imported into the GFP file when the lines are imported.

However, if fiducials in the DT1 files are edited using the EKKO_View Deluxe software package, they are **not** automatically changed in any GFP files associated with those DT1 files. To ensure the GFP file contains the latest fiducials from the DT1 files, the fiducials must be imported again.

6 View

6.1 Line Settings

Line Settings allows the user to define the lines to display in the Grid Map (GPR and/or GPS).

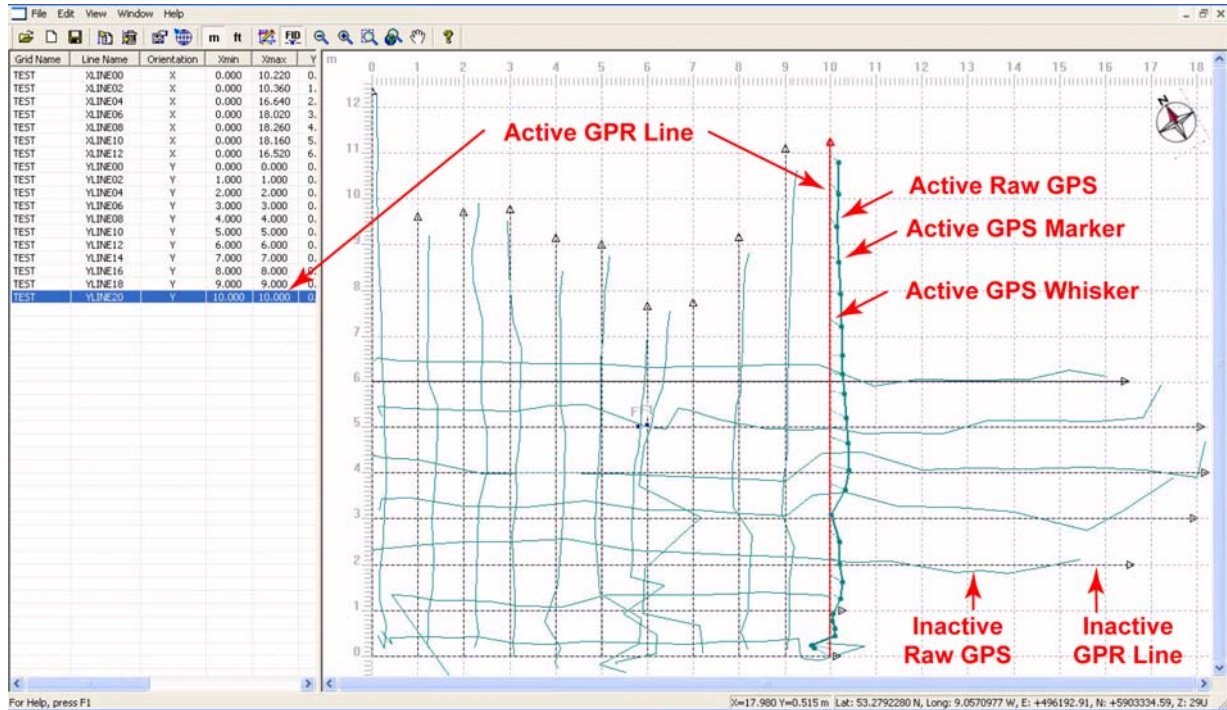


Figure 6-1: Types of lines displayed in the Grid Map.

The lines can be edited for color, style and weight. GPR and GPS points can also be edited for color, marker shape and size.

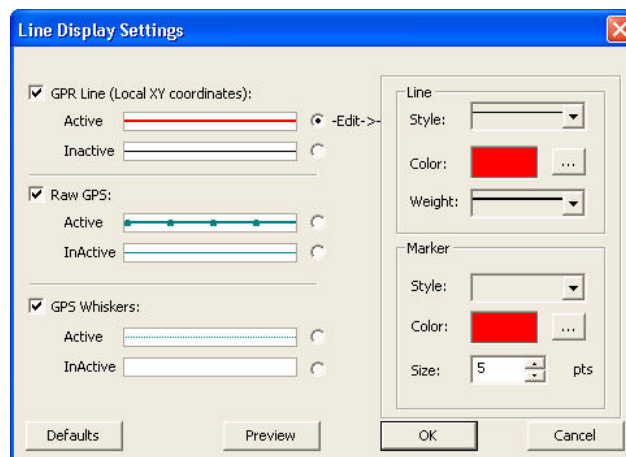


Figure 6-2: Line Display Settings dialog.

Lines Settings is accessible by selecting **View > Line Settings** or by pressing the button on the **Toolbar**:



6.1.1 GPR Lines

If GPR Lines are enabled by clicking the checkbox (**Figure 6-2**), they are visible in the Grid Map (**Figure 6-1**).

GPR lines can have different properties when they are Active (selected) than when they are Inactive (not selected). See **Selecting Lines** for more details. Lines are Active when they have been highlighted in the Grid Table or selected in the Grid Map (**Figure 6-1**).

Change the properties of the Active and Inactive GPR Lines by selecting the corresponding **Edit** option and then modifying the line **color**, **style** or **weight** and the **marker color**, **style** or **size**.

It is best to leave the marker style for GPR lines blank because the GPR traces that the markers represent are usually so close together that individual markers are not visible until zoomed in very close.

6.1.2 Raw GPS

If the GPR Lines were collected with GPS and the Raw GPS lines are enabled by clicking the checkbox (**Figure 6-2**), they are visible in the Grid Map (**Figure 6-1**).

Raw GPS lines can have different properties when they are Active (selected) than when they are Inactive (or not selected). See **Selecting Lines** for more details. Raw GPS lines are Active when their corresponding GPR line has been highlighted in the Grid Table or selected in the Grid Map (**Figure 6-1**).

Markers represent points where GPS data were collected. The Raw GPS lines are displayed in the Grid Map by adding straight lines between the markers.

The number of raw GPS points collected along a GPR line depends on the GPS settings during GPR data collection (see the GPS section in the GPR System User's Guide for more information).

Change the properties of the Active and Inactive Raw GPS lines by selecting the corresponding **Edit** option and then modifying the **line color**, **style** or **weight** and the **marker color**, **style** or **size**.

6.1.2.1 GPS Accuracy

The difference in linearity and the distance between the Raw GPS line and the corresponding GPR line is an indication of the accuracy of the GPS used for data collection. Non-linear Raw GPS lines indicate poor GPS accuracy and the user should be cautious when using the extracted GPS positions of targets interpreted in the GPR data when viewed in the EKKO_Mapper and EKKO_View software programs.

6.1.3 GPS Whiskers

If the GPR Lines were collected with GPS and the GPS Whiskers are enabled by clicking the checkbox (**Figure 6-2**), they are visible in the Grid Map (**Figure 6-1**).

GPS Whiskers connect the raw GPS position marker to the corresponding GPR trace.

Change the properties of the Active and Inactive Raw GPS lines by selecting the corresponding Edit option and then modifying the **line color**, **style** or **weight** and the **marker color**, **style** or **size**.

It is best to leave the Line and Marker style for Inactive GPS Whiskers blank to avoid them cluttering up the Grid Map.

Displaying the GPS Whiskers is a good way to quickly see GPR lines that may have accidentally been reversed because the whiskers will connect the Raw GPS to the opposite ends of the GPR line than expected.

6.1.3.1 GPS Accuracy

The length of the whiskers indicates the accuracy of the GPS positions compared to the corresponding GPR trace positions. Very long whiskers indicate poor GPS accuracy or a poor Local-Global Coordinates Relationship and the user should be cautious when using the extracted GPS positions of targets interpreted in the GPR data when viewed in the EKKO_Mapper and EKKO_View software programs.

6.2 Display Fiducials

Fiducials are markers and/or comments added during data acquisition at specific trace positions along the line (**Figure 5-33**). Fiducials can also be edited or added after the survey using a routine in the EKKO_View Deluxe software.

Fiducials are automatically displayed on the Grid Map image (**Figure 2-1**) providing they have been imported into the GFP file (**Re-import Fiducials**). The fiducials will appear as small squares on the line (**Figure 6-3**).

Fiducials can also be turned on and off by clicking the Fiducial toggle button on the **Toolbar**:



If **Fiducial with Text** is on, the text associated with the Fiducial is also displayed.

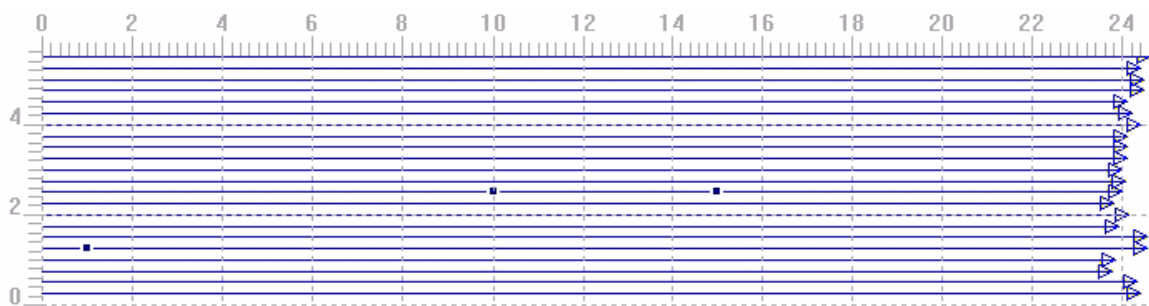


Figure 6-3: Fiducial markers added during data acquisition or added later are displayed by turning on the Show Fiducials option. Fiducials appear as little squares on the plan view image.

If the grid survey data does not contain any fiducials, this option is greyed out and not accessible.

If the display of GPR Lines are disabled under **View > Line Settings**, Fiducials and Fiducial Text are not displayed.

6.3 Fiducial with Text

If **Display Fiducials** is enabled, the **View > Show Fiducial Text** option is accessible. This option displays the text associated with the fiducials.

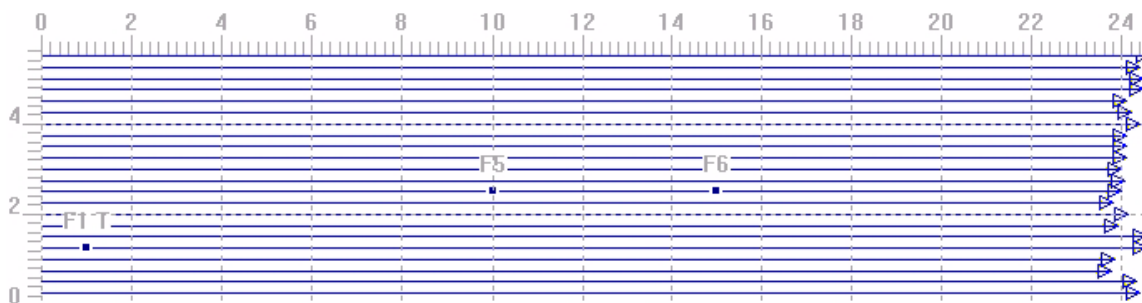


Figure 6-4: The text associated with fiducials is displayed by enabling the Show Fiducial text option.

If the grid survey data does not contain any fiducials, this option is greyed out and not accessible.

If the display of GPR Lines are disabled under **View > Line Settings**, Fiducials and Fiducial Text are not displayed.

6.4 Display Units

The distance units displayed on the Grid Table and the axes around the Grid Map can be displayed in meters or feet. The units default to those used during the original grid data collection but can be converted and displayed in either meters (m) or feet (ft).

The Display Units option can also be accessed from the **Toolbar** by clicking on one of the units buttons:



The display units can only be changed *after* the data lines have been imported in their original units.

6.5 Zoom

The Zoom options zoom in and out of the Grid Map image.

There are 4 ways of using the Zoom option:

- 1) Zoom in to the current image size by selecting **View > Zoom > In** or by pressing the following button on the Toolbar:



- 2) Zoom out of the current image size by selecting **View > Zoom > Out** or by pressing the following button on the Toolbar:



- 3) Draw a box around the area to zoom to by selecting **View > Zoom > Select Area** or by pressing the following button on the Toolbar:



After selecting the option to zoom to an area, draw a box on the image by clicking and dragging from one corner diagonally to the opposite corner. A box will be superimposed on the image as you drag it. Dropping the box will cause the image in the box to zoom to the full window size.

- 4) Zoom to the full grid size by selecting **View > Zoom > Fit to Window** or by pressing the following button on the Toolbar:



This option is usually selected to quickly return to the full image view after zooming in.

After zooming into an image, scroll bars will appear on the edges. Use the scroll bars to move around on the image and view different areas. The width of the scroll bar gets narrower each time the image is zoomed in to indicate that a smaller percentage of the full image range is displayed.

A zoomed in image will still display the X and Y scales.

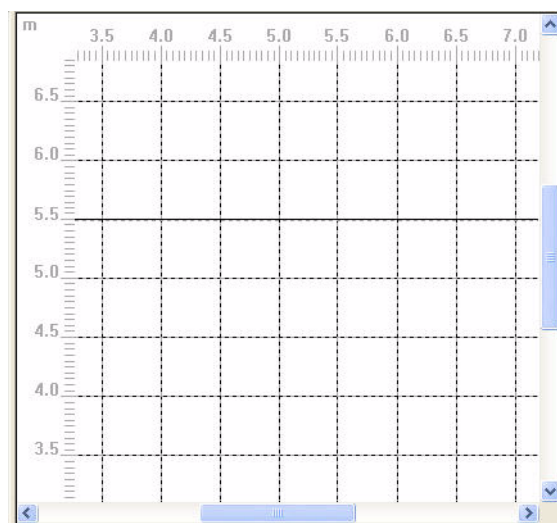


Figure 6-5: Zoomed image. Use the scroll bars on the right and bottom to move the zoomed area around the image.

The zoomed in image may show more data than defined by the box because the additional data will be added to the right or bottom of the image so it always retains the correct aspect ratio.

6.6 Pan

Pan allows the user to move around a zoomed in image. In Pan mode, the mouse cursor becomes a hand that can be dragged and dropped to view different areas of the image.

It can be selected under **View > Pan** or by pressing the following button on the **Toolbar**:



Once in Pan mode, click and drag the data image to a new location. As the image is dragged, a dashed box outlining the current viewed image is formed. The image will move to the location of this dashed box.

To exit from Pan mode, select the option again under **View > Pan** or depress the same button on the Toolbar.

6.7 Toolbar

If **Toolbar** is checked, the Toolbar appears below the menu bar (**Figure 2-1**).

The Toolbar can be dragged to other locations on the screen, if desired.

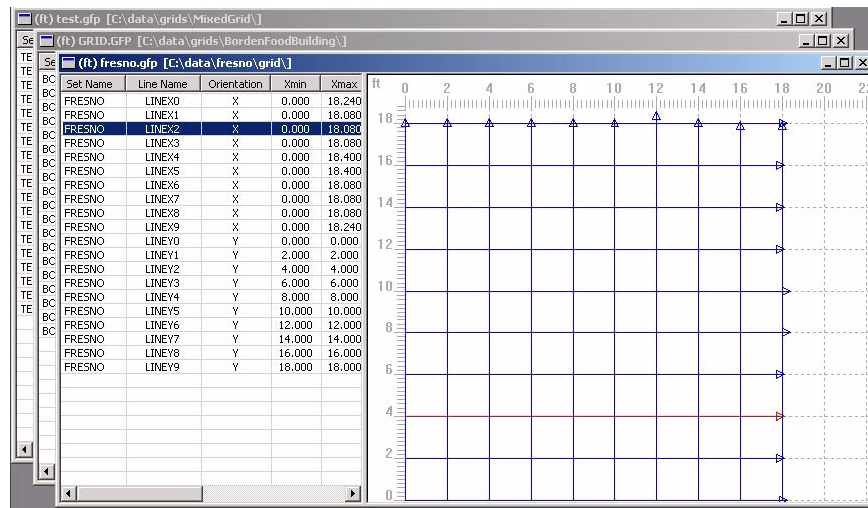
6.8 Status Bar

If **Status Bar** is checked, the Status Bar appears along the bottom of the GFP_Edit window (**Figure 2-1**).

7 Window

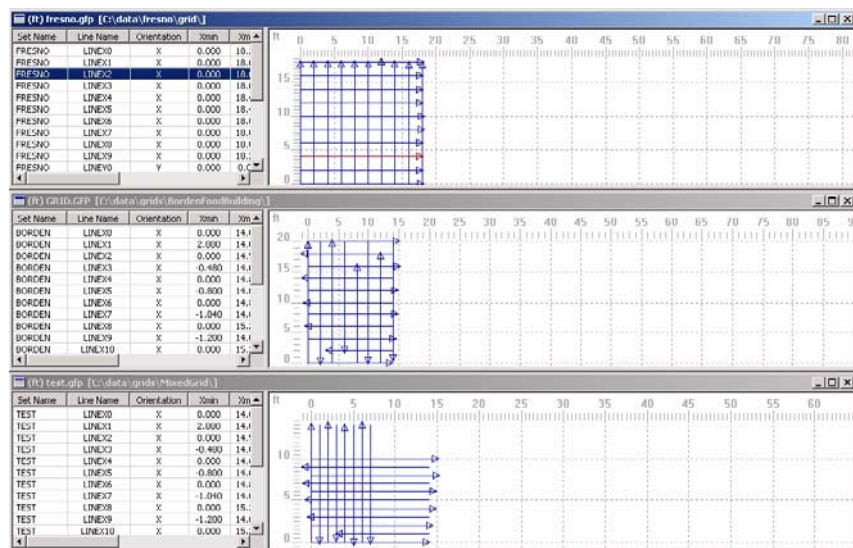
7.1 Cascade

Selecting **Window > Cascade** will rearrange open windows so they cascade on the screen, that is, the front window is completely visible and the title lines from the other windows are visible and accessible.



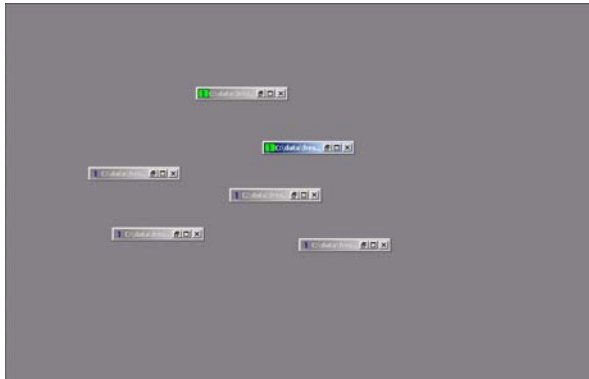
7.2 Tile

Selecting **Window > Tile** will rearrange all open windows so they are tiled on the screen, that is, all windows are resized so they are all visible and accessible.



7.3 Arrange Icons

Selecting **Window > Arrange Icons** will order all the icons (minimized windows).



7.4 Selecting an Open GFP Window

A list of all the currently open GFP windows is available under the **Window** menu option. The current active window is indicated by a check-mark. The active window can be changed by selecting a different one from the list.

```
✓ 1 (ft) fresno.gfp [C:\data\fresno\grid\]  
  2 (ft) test.gfp [C:\data\grids\MixedGrid\  
  3 (ft) GRID.GFP [C:\data\grids\BordenFoodBuilding\]
```

8 Help

8.1 Help Topics

The Help Topics option opens this document in PDF for viewing.

The Adobe Acrobat Reader program must be installed on the PC to open this document. If not, the user is prompted to download it from the Adobe website.

8.2 Sensors & Software contact information...

Displays contact information for Sensors & Software including mailing address, e-mail addresses, phone and fax numbers.

8.3 Feedback Form

The Feedback Form allows the user to document a problem about or suggestion for the GFP_Edit software and report it to Sensors & Software by e-mail, fax or letter.

8.3.1 Suggestions

To send a suggestion for the GFP_Edit software, select the Suggestion button.

The screenshot shows a Windows-style dialog box titled "FEEDBACK FORM". At the top, it displays "GFP_View", "Version 1", "Release 1", and "PN:2006-00213-00". Below this, there are input fields for "Contact Name:" (containing "User"), "Contact Phone:" (containing "905 624-8909"), and "Email:" (containing "radar@sensoft.ca"). To the right of these is a text area for "Company and Address:" containing "Sensors & Software Inc.", "1040 Stacey Court", "Mississauga, ON", and "L4W 2X8". Below the input fields are two buttons: "Suggestion" and "Problem Description". To the right of these buttons is a checkbox labeled "Fax Header" which is currently unchecked. Below the "Suggestion" button is a large text area for the user's input. To the right of the text area is a "Report Options" section with buttons for "Email*", "Save To File...", "Notepad...", "Clipboard...", and "Close". At the bottom left, there is a checked checkbox for "Send Diagnostic Information". At the bottom right, there is a note "* Requires MAPI".

8.3.2 Problems

To report a problem with the GFP_Edit software, select the Problem Description button

The more information you include about the problem, the better chance we have of solving it. If the error is reproducible, list the steps that generate it. You must also fill-in the **Severity**, **Type of Defect** and **Frequency** descriptions from the drop down lists.

Checking the **Send Diagnostic Information** checkbox will scan a log file saved with the GFP_Edit software on your PC and add additional text to your message that may help Sensors & Software to diagnose why the problem is occurring.

To help us troubleshoot the problem, you can ZIP the grid scan data files and attach them to your email message.

8.3.3 Contact Information

The upper part of the form is your contact information. Any information filled in here will be included in the report sent to Sensors & Software. You are not required to fill in these fields but remember that, if you want us to contact you about the report you send, we need your contact information.

Clicking the **Fax Header** checkbox will automatically add Sensors & Software's fax information to the top of the e-mail or text file.

After writing the suggestion or problem description in the field provided, select one of the report options.

8.3.3.1 Email

Clicking on the Email option will automatically generate an e-mail to Sensors & Software as long as your system is MAPI-enabled. MAPI is short for *Messaging Application Programming Interface*, a system built into Microsoft Windows applications like Outlook.

If selecting the Email option does not open your e-mail application program, contact your IT department or consider using one of the other methods below.

8.3.3.2 Save to File

This option prompts the user to save the report as a text file. This text file can be attached to an email or printed out and faxed or mailed to Sensors & Software.

8.3.3.3 Notepad...

The Notepad option opens the Notepad program and automatically writes the report text into the program. The report can then be saved as a text file can be attached to an email or printed out and faxed or mailed to Sensors & Software.

8.3.3.4 Clipboard

The Clipboard open writes the report text to the clipboard so it can be quickly pasted into an email and sent or pasted into any word processing software like Microsoft Word. The report can then be saved and attached to an email or printed out and faxed or mailed to Sensors & Software.

8.4 Diagnostic Mode

Diagnostic Mode is used to help resolve the issue when the GFP_Edit program unexpectedly terminates or freezes without a warning or error message.

If you have data lines that consistently causes the program to crash or freeze, the next time you run the program, turn **Diagnostic Mode** on. Then, open the GFP file for the grid survey and perform the steps necessary for the crash to occur again. Diagnostic Mode causes the program to run much slower than normal, because it is logging all the data processing steps, so please be patient.

After the crash, run the program again but DO NOT open any data. Immediately go to **Help > Feedback Form** and send a message to Sensors & Software. The message will contain valuable diagnostic data to help us determine the cause of the problem. Please mention that the attached message is to report a crash and the program was in diagnostic mode.

8.5 About

This option displays a description, version number and product number of the GFP_Edit program currently in use.

