FieldGenius 2008 v4.0.1 (10/24/2008)

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Technical Support

MicroSurvey Software Technical Support is available to help you get the most out of your MicroSurvey program. The following information explains how to prepare for your call so that your inquiry can be answered promptly and accurately.

Please prepare yourself before you call for Technical Support

Take a few minutes before you place your call to check the printed documentation and the online help files to see if the answer is already at your disposal. Our Web site on the Internet can also save time. Please check it for assistance if you can. Please have the following information available if requested: Hardware model, version of the program, and your Technical Support Number.

Please make sure that you have all the steps you completed prior to your problem and can explain them to the technical support representative. We may ask that you forward a copy of your data to us if we cannot find the problem immediately.

MicroSurvey offers a 90-day complimentary support period to all of our registered users, starting the date of purchase. Introductory support is available weekdays between 8:30am and 5:00pm (Eastern Time), and between 8:00 am and 5:00pm (Pacific Time) - Monday to Friday excluding holidays.

Yearly Support

For clients who have had their original 90-day complimentary support period expire and feel that they will need on going support over the next year, we have a Yearly Support Contact option available. This gives you the ability to contact us for technical support, as much as you require, and you pay a flat fee once a year. This option is not to be used in place of training but is to assist you on the occasions when you really need it. The charge for the Yearly Support Contract is to be billed and paid for prior to the support commencing. This rate is subject to change, call for current rates.

Electronic Support

MicroSurvey maintains and provides at no charge, our Internet Web site at the following address: www.microsurvey.com

This web site has sections on frequently asked questions, Technical Notes, Technical Specifications, and as required, free updates and program fixes, along with a lot of other helpful information.

Training

MicroSurvey Software Inc. can provide training to you, in your office or in a classroom situation (where facilities and numbers allow. MicroSurvey has training staff that will travel to almost anywhere and provide you with the professional skills you require to operate your MicroSurvey program. Please feel free to call and ask for a quotation or inquire about potential classroom situations. Your local dealer may also be able to setup or arrange a training session for you. Contact our head office for more information about training.

Table Of Contents

GETTING STARTED

Introduction

MicroSurvey FieldGenius 2008 was designed for Land Surveying, Civil Engineering, Seismic Surveying, and Construction Staking to provide unequaled data collection simplicity and field calculating performance.

The Graphic User interface allows you to build the drawing as you measure, providing you with instant visual confirmation of accurate data collection and survey calculations. It includes the ability to draw linework as you measure from point to point without the need for cumbersome line coding.

Because of Windows CE touch screen capability, FieldGenius 2008 takes advantage of this by allowing you to tap points and lines in your drawing to open toolbars with all the function you need instantly. Functions that are not available directly from FieldGenius graphics display are available from a simple main menu which is organized by task. Please spend some time looking over this document or watch our movies to become familiar with the functionality of FieldGenius.

Once you've collected your data in the field you can export it directly out of FieldGenius using many different file types such as ASCII, DXF, XML or ESRI. If you have MicroSurvey Desktop software, then you can read your FieldGenius projects directly. FieldGenius raw file is based on the popular TDS RW5 format which means you probably already have software that can import this raw file type and process it. This means you don't need to purchase expensive products to process your FieldGenius projects.

Importing data into FieldGenius is just as easy as exporting. You can import ASCII, XML and DXF files directly into FieldGenius.

Our instrument control is easy to use and very powerful. Access to your instrument controls is available on the main interface at all times so there is no need to swap to other screens or menus.

As always, MicroSurvey welcomes your comments and suggestions for our products.

Hardware Requirements

FieldGenius 2008 may be installed on the following Windows CE, PocketPC, and Windows Mobile devices. We recommend that you purchase a compact flash sleeve for some of the devices and store your program and data files on the compact flash card. Some devices will lose data if you forget to charge the device for a few days. It is well worth the investment to have secure data!

- **Juniper Systems Allegro CE / CX (Windows CE / CE.NET)** - FieldGenius installs to C_Drive by default which is secure.
- **Juniper Systems Archer (Windows Mobile 5.0) -** FieldGenius installs to secure RAM by default; a storage card is not necessary for persistent storage.
- **MicroSurvey Tracker, MicroSurvey Tracker Xtreme** - FieldGenius installs to the SystemCF by default which is secure.
- **At Work Computer Ranger** - FieldGenius installs to Disk by default which is secure. Must have Windows CE 3.0 or higher with a minimum of 64 MB of RAM.
- **Compaq iPAQ Pocket PC H4100/3600/3700/3800/3900** series or newer - FieldGenius installs to volatile RAM by default which is not secure; you should install the program to a storage card. 64 MB of RAM required.
- **Compaq iPAQ Pocket PC H3210 and H3215** - FieldGenius installs to volatile RAM by default which is not secure; you should install the program to a storage card.
- **HP iPAQ (Windows Mobile 2003 / 2003SE)** - FieldGenius installs to volatile RAM by default which is not secure; you should install the program to a storage card.
- **HP iPAQ (Windows Mobile 5.0 / 6.0) -** FieldGenius installs to secure RAM by default; a storage card is not necessary for persistent storage.
- **Itronix FS4** - FieldGenius installs to Disk by default which is secure. Must have Windows CE 3.0 or higher with a minimum of 64 MB of RAM.
- **Leica RX-1250 -** FieldGenius installs to StorageCard by default which is secure.
- **Symbol PDT 8100 Pocket PC** - FieldGenius installs to volatile RAM by default which is not secure; you should install the program to a storage card.
- **TDS Nomad (Windows Mobile 6.0) -** FieldGenius installs to secure RAM by default.

- **TDS Ranger, Trimble TSCE (Windows CE / CE.NET) -** FieldGenius installs to Disk by default which is secure. Must have Windows CE 3.0 or higher with a minimum of 64 MB of RAM.
- **TDS Ranger (Windows Mobile 2003SE)** - FieldGenius installs to volatile RAM by default which is not secure; you should install the program to Disk.
- **TDS Ranger, Trimble TSC2 (Windows Mobile 5.0)** - FieldGenius installs to secure RAM by default.
- **TDS Recon (Windows CE.NET) -** You need to have a storage card installed and make sure you install FieldGenius on the storage card.
- **TDS Recon (Pocket PC)** - FieldGenius installs to RAM by default which is not secure; you should install the program to Built-in Storage
- **TDS Recon (Windows Mobile 5.0 / 6.0) -** FieldGenius installs to secure RAM by default.
- **Topcon FC-100 (Windows CE.NET)** - FieldGenius should be installed to CF Card which is secure.
- **Topcon FC-1000 (Windows CE)** - (check our web site for more information)
- **Topcon FC-2000 (Windows CE) -** (check our web site for more information)

Call MicroSurvey at 1-800-668-3312 or check our web site at www.microsurvey.com if your device is not listed here.

Installing FieldGenius

The first thing is to confirm that your hardware is supported by FieldGenius 2008. If you're reading this topic then you probably already know if FieldGenius will run on your data collector. If you're not sure, you can refer to the hardware requirements topic or call our technical support department.

To install onto your data collector you need to make sure you have a Microsoft ActiveSync or Windows Mobile Device Center connection established between your computer and your data collector.

There are two ways that you can install FieldGenius onto your device. The first is to install from the CD that came with your purchase or download it directly from the www.microsurvey.com/helpdesk website.

If you purchased our MicroSurvey Tracker or Tracker Xtreme, or Juniper Systems Allegro or Archer, then FieldGenius comes pre-loaded.

Starting FieldGenius

During install, shortcuts are created and will be located in either your Start Menu, or Start Menu | Programs, or directly on your desktop. Simply press the shortcut to start the program.

Auto Repair

Upon startup FieldGenius checks the registry for corruption, and also checks to make sure important system files are where they need to be for FieldGenius to run properly. If it detects any problems, it will automatically fix them for you.

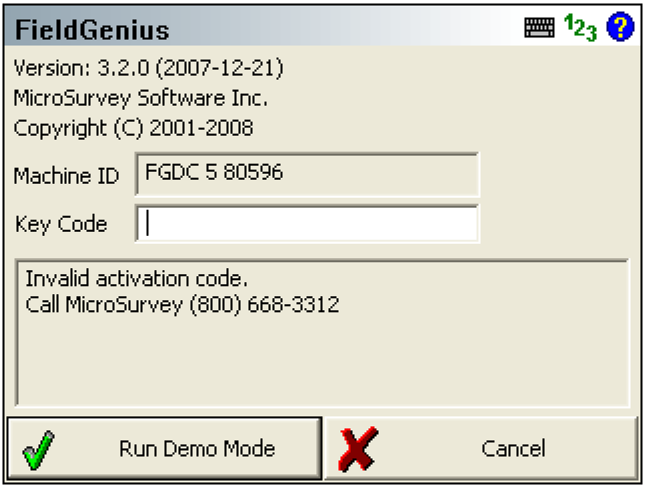
Hard Reset or Battery Drain

In these scenarios with other software, you would usually have to re-install your software. However, because FieldGenius can repair itself all you need to do is use the File Explorer or My Computer program on your data collector to browse to where FieldGenius is installed and find the programs folder. In there, if you run the "splash" program it will automatically fix all problems and re-install your shortcuts for you.

The splash program will be an executable file and it will include the word "splash" in it. For example on the Archer, the file is called **SplashPPC.exe**.

Registration & Demo Mode

When you start FieldGenius for the first time you will see the registration screen which will list the machine ID. This ID is unique for each device that FieldGenius is installed on.



Run Demo Mode

To run FieldGenius in demo mode press the **Run Demo Mode** button.

In Demo mode the program is limited to taking only 10 shots, and also the Instrument Settings that you set up will not be saved. Roads that you create will not be saved, and XML files can not be exported.

Activating FieldGenius

To activate FieldGenius you need to call us, or email us your Machine ID. We will then issue you a Key Code that you can enter in the Key Code field. When you enter the code you will see the words "Activation Key Valid" and it will also list the modules that were registered. The **Run Demo Mode** button will also change to say **Continue**.

There are four modules available for use on a data collector and they're as follows: Standard, Advanced, Robotic and GPS. A fifth module called Desktop Observations is available for the Tablet Edition of FieldGenius, which is for use on Tablet PC's or Field Laptop Computers which will be connected to an instrument.

To compete the activation make sure you press the **Continue** button on the bottom left.

To register or purchase FieldGenius 2008 please call us at (800) 668-3312.

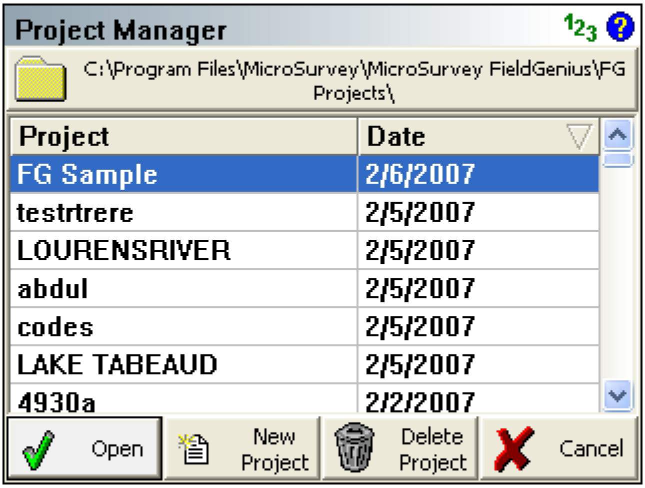
Technical Support

If you need help with FieldGenius please contact Technical Support.

Project Manager

Main Menu | Project Manager

The Project Manager is used to create, open, or delete projects currently residing in your data collector. When you start FieldGenius this is always the first screen you will see.



By default the project manager will display the contents of the ...\MicroSurvey FieldGenius\FG Projects\ directory, which is the default location for all new projects that you create. You can sort the list by project name or date by tapping on the column's header.

FG Projects Folder

Use this to specify a different project folder than the default. The default is**...\MicroSurvey FieldGenius\FG Projects**. Once you set the directory it is written to the msurvey.ini file so it is used for all subsequent projects.

Open Project

To open an existing project, simply select it in the list and press the **Open** button.

New Project

To create a new project, simply press the **New Project** button. You will then see the new project screen which will allow you to enter a name, choose your automap library and set the units for the project.

Delete Project

To delete a project you first need to select it in the list and then press the **Delete Project** button. You will be asked to confirm that you really want to delete the project.

> **Notes:**
> You can not delete the current project that is opened in FieldGenius.
> Projects that have been deleted can not be restored.

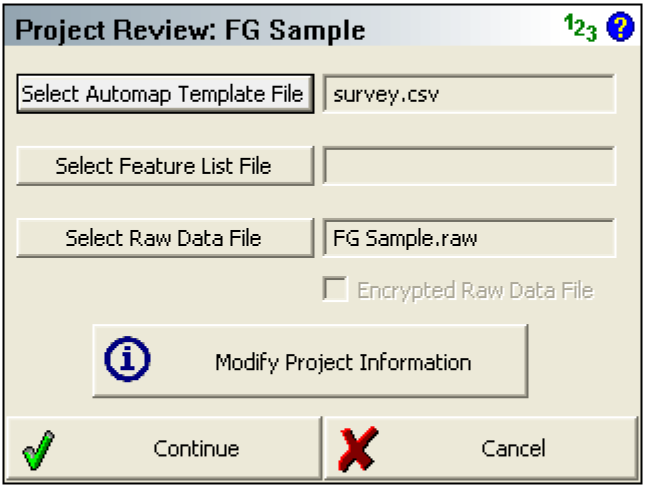
Exit

To exit from the project manager press the **Exit** button.

Project Review

When you create a new or open an existing FieldGenius project you will always see the Project Review screen.

For most projects all you need to select is the Automap Library Template File that you want to use.



Select Automap Template File

This indicates the Automap Library Template that will be loaded into the project. You can change it by pressing the button and either choosing a different template library or creating a new blank library. Automap files contain pre-defined descriptions that can be used in FieldGenius. The template library that you select will be copied into the project's folder with a name of yourprojectname_automap.csv, and any changes that you make to the Automap Library will affect only the project library, not the template library.

Select Feature List File

Use this to select a feature list that you want to use with the project, for collecting GIS point attributes.

Select Raw Data File

This indicates the name of the raw file that is going to be used. You can select a different one by pressing the button and either creating a new raw file or choosing the one to open.

The Encrypted option indicates whether or not this raw file is encrypted. You can only change this option when creating a new project; once set, this option can not be undone. Encrypting the raw file ensures that users can not accidentally or intentionally edit their raw files with a text editor or other software.

> **Note:**
> At this time, no other applications besides FieldGenius 2007 (or newer) and MicroSurvey CAD 2008 (or newer) can read an encrypted raw file. Previous versions of MicroSurvey CAD, inCAD, and FieldGenius will not be able to read FieldGenius encrypted raw files.

Modify Project Information

This option will take you directly to the Project Information screen, where you can enter notes about the project. Please see the Project Information topic for further information.

FieldGenius Project Files

Every FieldGenius project will contain usually 7 files, but may contain more depending on what files you've exported or copied to the directory. Typically you will see that the file names will begin with the name of your project.

File Name.cdx	This is the index for the database file.
File Name.dbf	This is the database file that contains your coordinate information.
File Name.ini	This file contains information pertinent to your project.

File Name.raw or File Name.rae	This is the raw file that contains you observations. If the raw file is encrypted it will have a .rae extension. Note you can have more than one raw file.
File Name_figures.dbf	This is the database for your figures in your project.
File Name_figures.cdx	This is the index file for the figures database.
File Name_automap.csv	This is the Automap Library for your project.

When you create a new project, the project name that you use will become the "folder" for your project files. By default, your project will be stored in the ...\MicroSurvey FieldGenius\FG Projects\ directory.

Note:
After creating a new project, do not later rename the folder containing your project's files or the actual files, doing so will cause FieldGenius to not recognize the folder as a valid project and you will not be able to open it.

Automatic Save

There are a few things to keep in mind when manually entering data in FieldGenius:

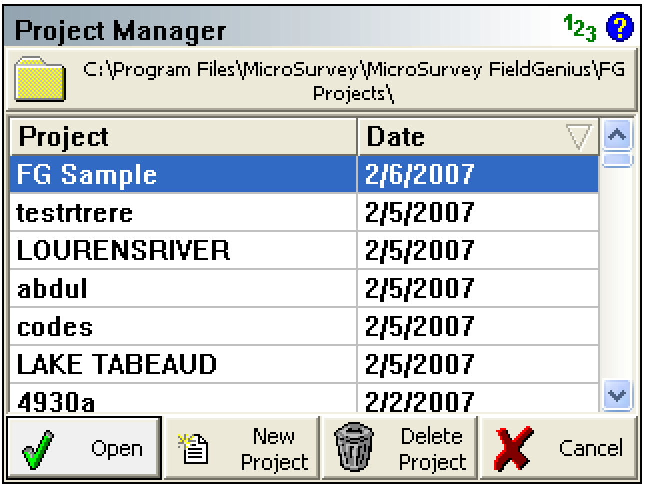
All stored data is automatically saved. There is no need for a Save function. Always close the program by going to the Main Menu and choose the Exit button to prevent loss of measurement data.

Input fields that are left blank are stored as undefined. For example, if you enter only northing and easting for a point, leaving the elevation field blank, we do not automatically set the elevation as 0.000. The elevation remains undefined.

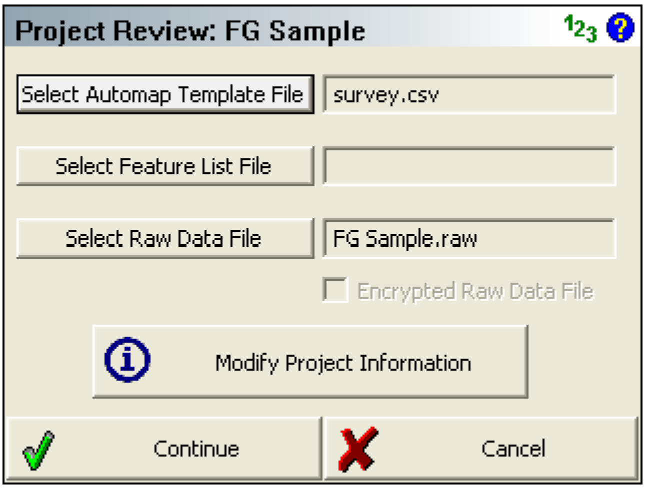
Quick Start: Existing Project

1. When you start FieldGenius you will see the Project Manager which allows you to create or open a project. By default a project named FG Sample is installed. For this example let's open it by

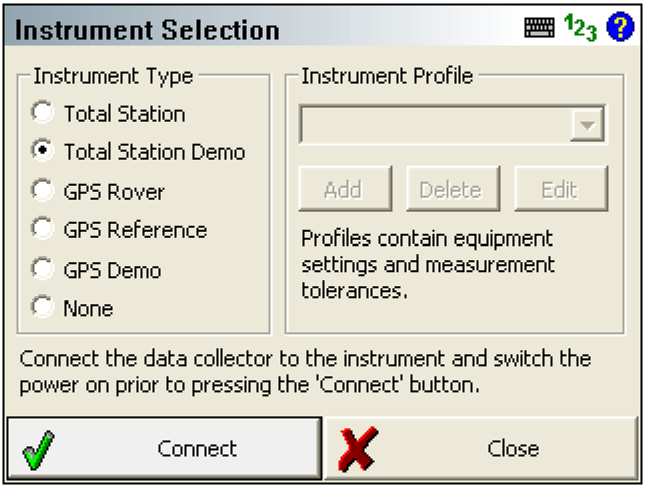
highlighting it and pressing the **Open** button. You can also double tap the file name which will also open it.



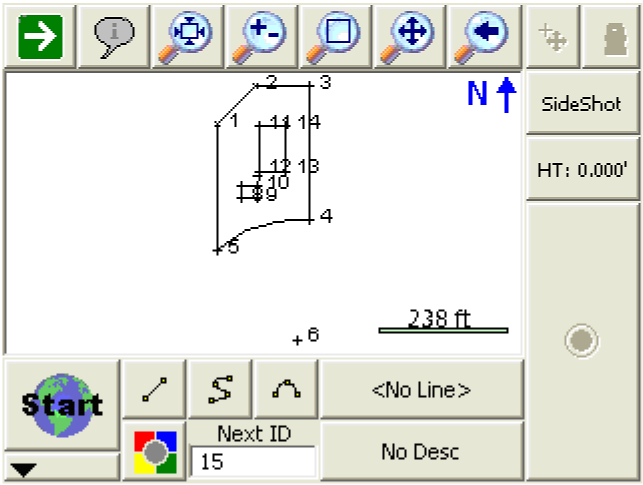
2. You will then have to review the project files and decide what you want to load. FieldGenius checks in the project's msurvey.ini file to determine which files should be opened. Press **Continue**.



3. You are then prompted to select the instrument that you want to connect to. Let's set it to <u>Total Station Demo</u> and press **Connect** to continue.

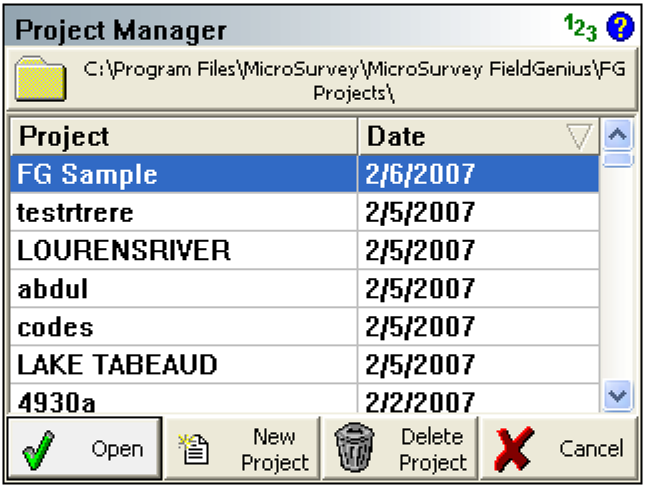


4. Now the Map screen will be displayed. You should now see your project, here is what the FG Sample project should look like:

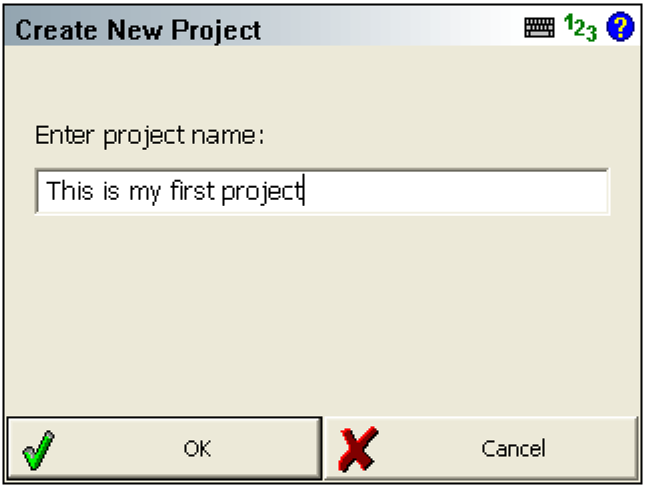


Quick Start: New Project

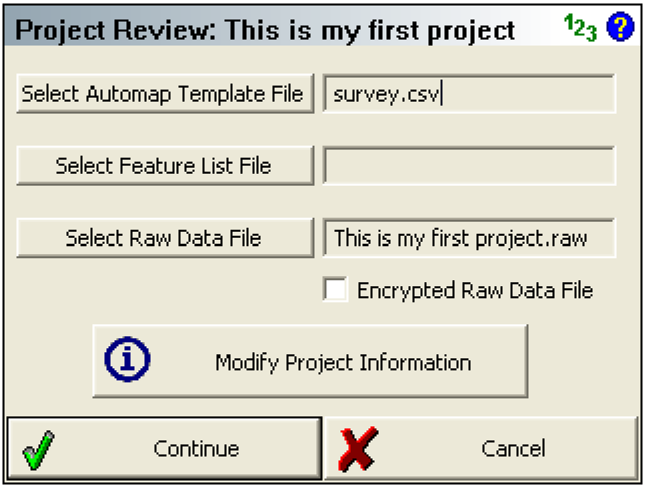
1. When you start FieldGenius you will see the Project Manager which allows you to create a new project. You can press the **New Project** button to create a new project.



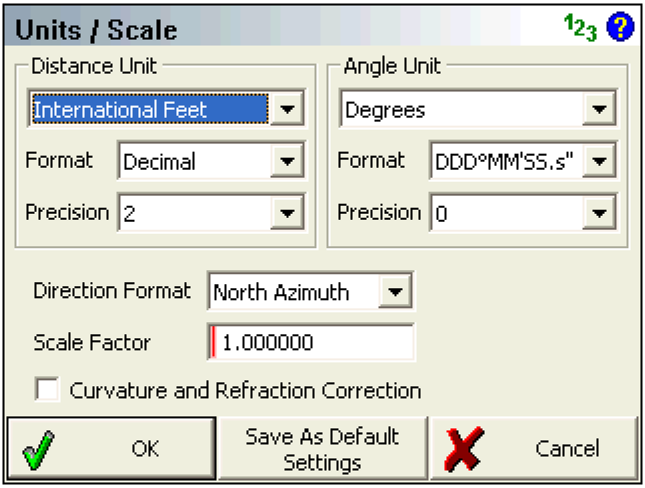
2. You will then have to enter a name for your new project, press **OK** to continue.



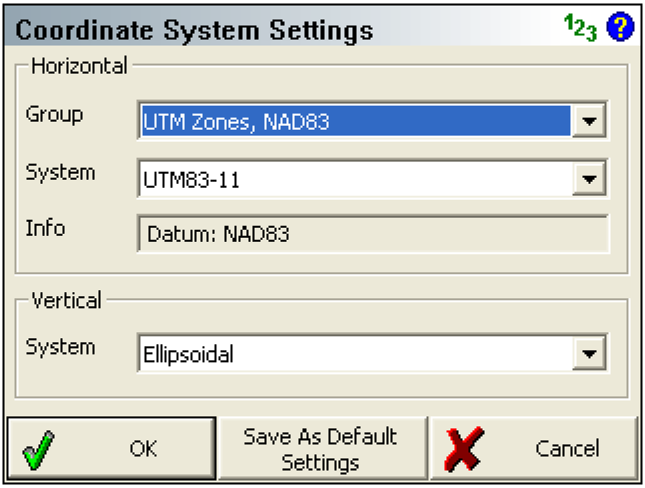
3. You will now see the Project Review screen. This is where you can specify which Automap Library Template File, Feature List File, and Raw File to use, whether you want your raw file to be encrypted, or enter project information. Press **Continue**.



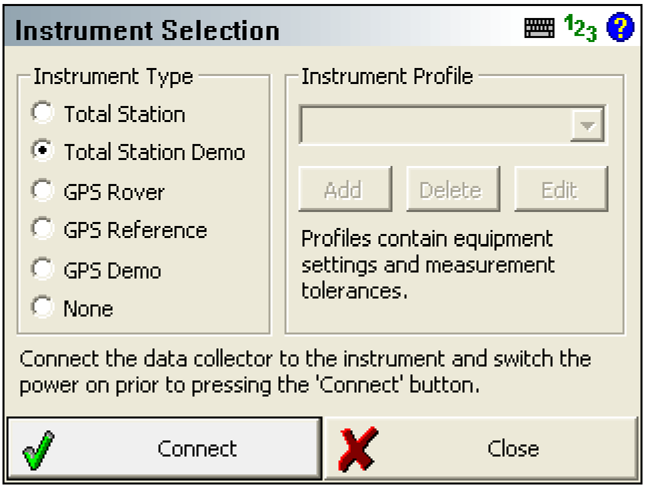
4. Now the Unit/Scale Settings screen will appear allowing you to setup your units for your project. Set them as desired, then press the **Save As Default Settings** button to remember these settings, then press **OK**.



5. You will now be asked "Would you like to define a coordinate system now?" This will be used for Transformations and GPS Localizations. Press **No** to skip over this, or **Yes** to see the Coordinate Settings screen if you need to select a coordinate system.

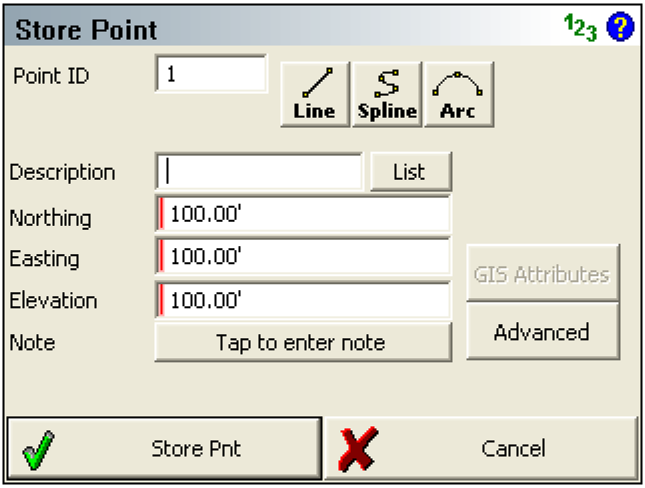


6. You will then see the Instrument Selection screen.

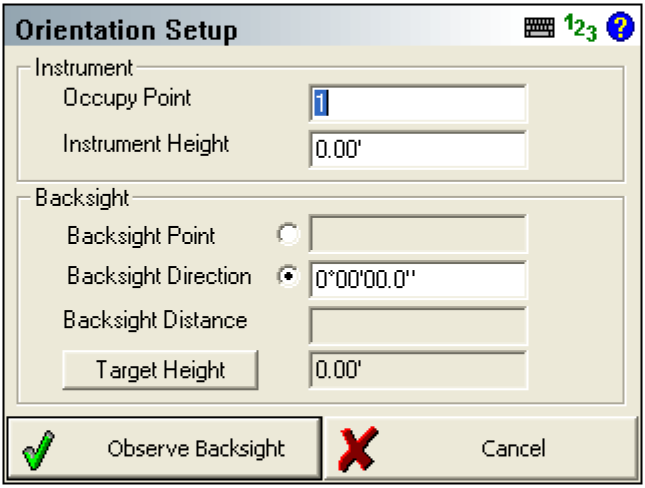


Choose the type of instrument you would like to connect to. If you choose **Total Station** you can **Add** a new profile for your instrument, then **Edit** it to see the Total Station Configuration screen which will allow you to setup your instrument settings. If you choose **GPS Rover** or **GPS Reference**, you can **Add** or **Edit** a profile to configure your base or rover receivers. Choose **Total Station Demo** mode to manually simulate using a total station or **None** if you are not connecting FieldGenius to an instrument. After selecting your Instrument Type, and configuring or selecting the profile for your instrument settings, press **Connect**.

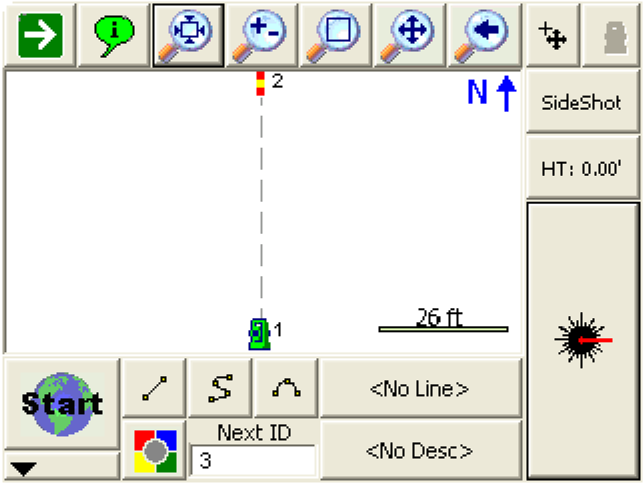
7. If you selected Total Station or Total Station Demo, you will then see a message asking "**Would you like to create a new reference point which will be used to occupy the instrument?**" Press **Yes** if you would like to which will open the Store / Edit Points screen. The default coordinates that are displayed are retrieved from the msurvey.ini file found in the programs directory, and if you change these coordinates they will be remembered for next time. Selecting **No** will take you to the main interface.



8. If you choose to create a reference point in the step above, you will be asked **"Would you like to occupy the reference point you just created?"** Press **Yes** if you would like to do so which will open the Setup Occupy Point screen for measuring your backsight. Selecting **No** will take you to the main interface.

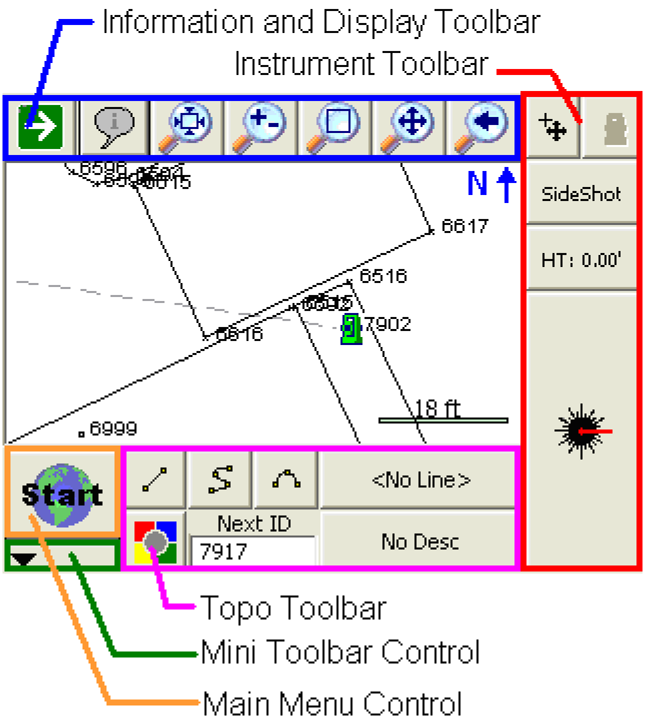


9. Once you complete the setup routine and have measured your backsight, you will see your setup and backsight positions in the map view.



Main Interface

The FieldGenius interface is separated into five sections. These five sections contain common functions or tools that the user will use most often.



[Information and Display Toolbar](#)

[Instrument Toolbar](#)

[Topo Toolbar](#)

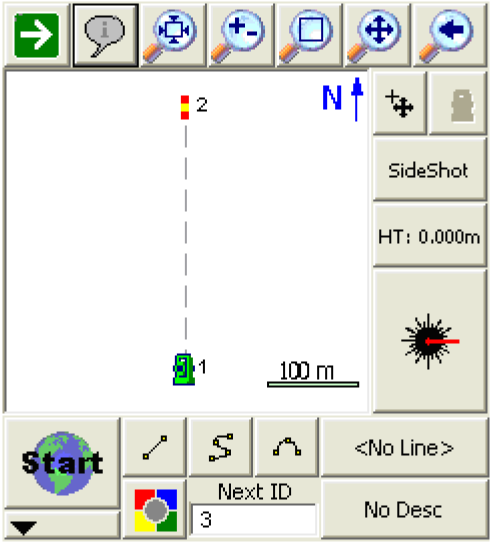
[Mini Toolbar Control](#)

[Main Menu button](#)

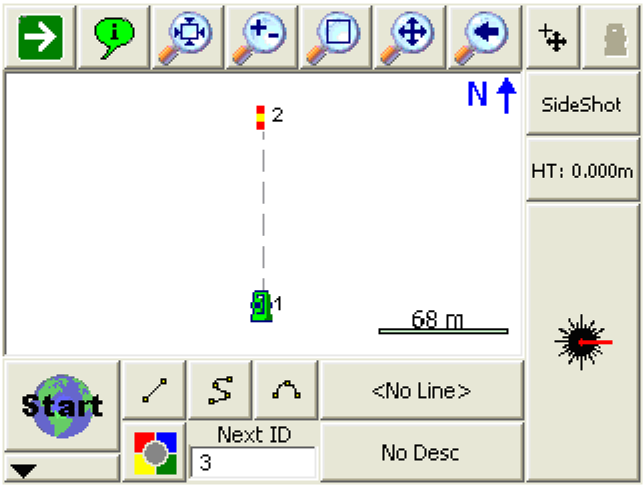
Two Versions of the User Interface

There are two version of the user interface depending on which Windows CE device you're using. The Handheld PC Pro has the advantage of a standard button keyboard and dialogs look more similar to your desktop windows PC. The Pocket PC utilizes a virtual keyboard activated by a small keyboard look-a-like button in the lower right corner of the display. Note that the function of both versions is essentially the same.

[Pocket PC Interface (Archer, Recon, iPAQ)](#)



Handheld PC Interface (Allegro, Tracker, Ranger)



Common FieldGenius Buttons

The FieldGenius interface has a consistent structure and to use it effectively the user needs to become familiar with several commonly used buttons.

Clicking on this button will open up the keypad.

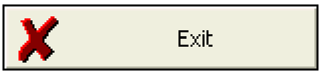
Clicking on this button will open up the Windows Start Menu. Available on Pocket PC and Windows Mobile devices only.

Clicking on this button will open up the RPN Calculator.

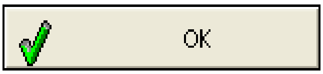
Clicking on this button will open up the help page for whatever topic you are currently at. The help page will open up in an Internet Explorer window.

This button will take you back to the main menu.

This button will take you back to the map screen.



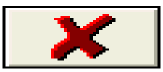
This button will save your project and close FieldGenius.



This button will accept the changes you've made and will return you to the previous screen.

This button will close the current screen and return you to the previous screen without saving any changes.

This button will take you to the next step in an operation.



Pressing this will close the currently open toolbar and return you to the previous screen.

Pressing this will open the Point Chooser toolbar.

Data Entry (Extended Edit Fields)

Throughout FieldGenius you will see edit fields for entering various values. These types of fields are called Extended Edit Fields, and can be used not only for typing values, but can also launch related commands such as the keypad, calculator, point chooser, inverse tool, etc. This type of functionality is unique to FieldGenius.

You can control how these Extended Edit Fields will be triggered by changing the "Extended Edit Boxes" option in the Options screen to require a single tap, a double tap, or to disable them so that you can only type values into them.

Text Entry

For most text entry fields in the program, tapping in it will open up the SIP keypad. On PocketPC and Windows Mobile devices you can select which keypad to display by changing the "SIP Type" option in the Options screen.

Points

When you see an extended edit field for a point id, tapping in it will open the point chooser toolbar.

Distance and Angles

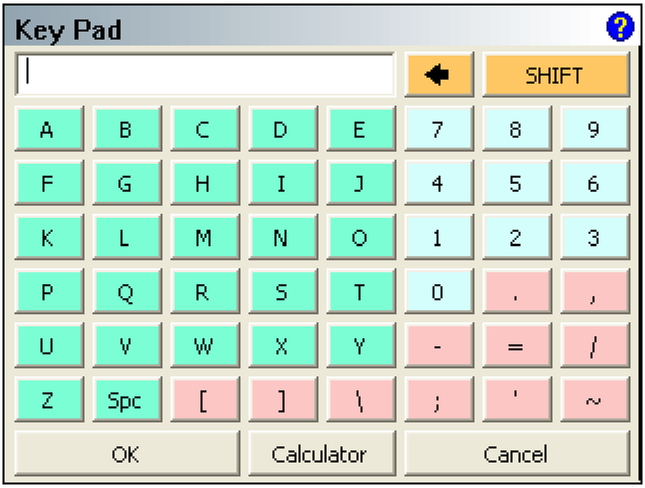
Tapping in other numeric fields such as those for directions and distances will open the RPN Calculator, and some distance fields will open the Inverse tool.

Multi-function Fields

Some fields will display a pop up menu if multiple functions can be opened from that field, just select the desired function from the list.

Keypad

The keypad can be opened from any extended edit entry field. This provides a method of easy text and numeric entry on devices that do not have a physical keypad (such as the Archer, Recon, Nomad, or iPAQ) but it can be used on any device.



Calculator

The RPN Scientific Calculator can be called up from the keypad by pressing the **Calculator** button. If you press the Calculator button, the value entered in the keypad entry field will be copied to the calculator's command line (Note, it must be a numeric value, alpha portions will be stripped off in the calculator) where it can be used for any calculations. When you are done with the calculator, pressing its OK button will return the result back into the keypad.

OK

Pressing the **OK** button will close the keypad, and set the entered value into the text field from which the keypad was opened.

Cancel

Pressing the **Cancel** button will close the keypad without setting anything into the text field from which the keypad was opened.

Keypad Settings

There are two important settings related to the keypad, which are both found in the Options screen.

SIP Type

Use this to specify which SIP keypad type you want to use, such as the full screen MicroSurvey alphanumeric keypad, the small PocketPC qwerty keypad, or the small PocketPC MicroSurvey numeric keypad. Not all SIP types are available on all data collectors.

Extended Edit Boxes

Use this to control how you want to bring up the selected keypad when tapping in an edit box: either with a single tap, a double tap, or off. Users of devices with a keyboard should leave this set to Single Click, and users of devices without a keyboard should set this to Double Click. Setting this to Off disables both the keypad and any other commands that may be started directly from the extended edit field, such as the Point Chooser or Inverse Tool, so that edit fields can only be used for typing values from your physical keypad.

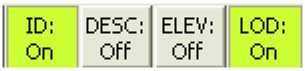
Points / Lines / Descriptions

Points

FieldGenius projects typically are comprised of points that have been imported, calculated or measured. These points are always stored in a file made up of the project name and will have an extension of DBF. DBF files can be viewed using a DBF reader or with Microsoft Excel.

Point Labels

In the drawing area you will always see a node or dot that marks the coordinate location of the point. For each point you can control what is displayed on the screen such as the points number, elevation, description and note. To control the visibility of the labels, use the buttons on the Display Toolbar.



Point Toolbar

At any time you can tap on an existing point to open the Point Toolbar. This toolbar will contain common functions that are done with points. Please refer to the point toolbar topic for more information.

Editing Single Points

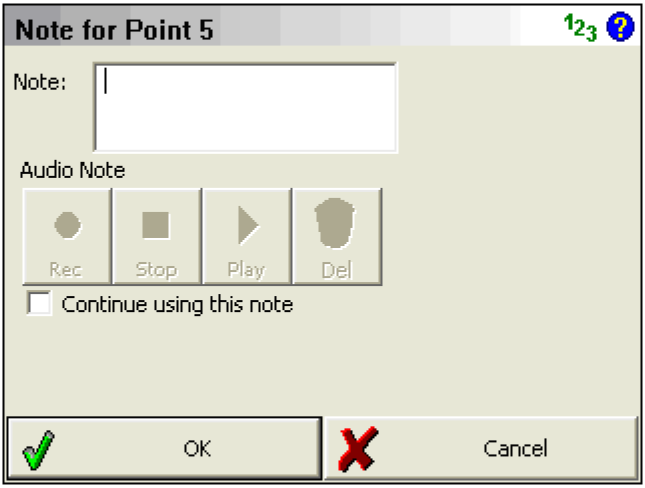
To edit a point you can tap on it which will open the Point Toolbar. Press the EDIT button to open the Review / Edit Points screen.

Working with Multiple Points

If you need to search, list, rotate, translate, delete, or edit multiple points at the same time you will use the Coordinate Database Editor. Please see the Coordinate Database topic for more information.

Notes

Use this to enter or record audio notes for your points. You can access the notes screen by pressing the **Notes** button on the Store / Edit Points screen.



Text Notes

You can type a note up to 32 characters in length and it will be stored in the project's DBF file. You can not enter more than this limit into the Note field.

When the file is imported into MicroSurvey CAD or inCAD desktop software the note will appear in its own field, or can be appended to the point's description field.

Continue using this note: Use this if you want to use the note your just entered automatically for future points that are stored.

Audio Notes

Use this function to record and playback audio notes that are related to stored points. These notes will be transferred to MicroSurvey CAD or inCAD desktop software for playback in the office.

The notes will be stored in your project directory and will be automatically named for you. Example, if you recorded a note for point 2, a file would be created pnt2.wav. The file that is created is a standard windows WAV file that can be played by most audio players.

MicroSurvey CAD or inCAD desktop software will automatically link to any audio note you recorded. This allows you to easily see which points have audio notes.

Recording and Playback Controls

Circle = record

Square = stop

Triangle = playback

Trash = delete

Note that not all handheld devices support audio notes. You must have a record and playback functionality, which for some units requires optional accessories.

To Store an Audio Note:

1. Tap the red circle to activate recording. Speak into your microphone to record the desired information. "This post is bent" etc.
2. Press the square button to stop the recording
3. To confirm your note, press the playback arrow, now green on color displays, and listen to your note

To replace an Audio Note with a new note:

1. Delete the existing audio note. You will be prompted to confirm the deletion.
2. Record a new audio note.

Figures

Tangents, arcs and curvy lines in FieldGenius are also called figures. Figures are created automatically for you as soon as you connect points in the drawing.

Figures can be created while you survey in realtime using our active linework or you can manually create the figure using the pencil tool.

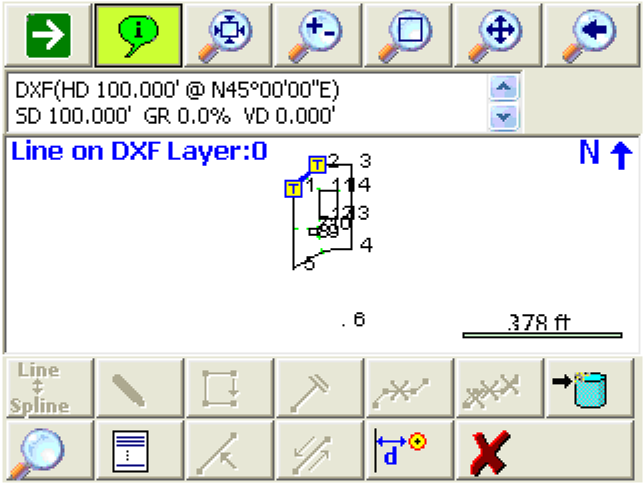
FieldGenius Figures

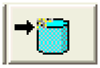
When you click on a figure the Line Toolbar will appear. You will also see bold text in the drawing area indicating what you selected. The inverse information for the line or arc will appear in the results toolbar.

DXF Linework

When you import a DXF drawing you will see all the linework that exists in the drawing. When you select a DXF line or arc you will see the Line Toolbar but everything will be grayed out except for the stake and perpendicular distance buttons. If you press the stake button or perpendicular offset to point button, they will open up their respective toolbars.

When you click on a DXF entity you will see bold text in the drawing area indicating that you picked a DXF line or arc. When you click into the results toolbar, you will see the inverse information based on the line or arc you picked.



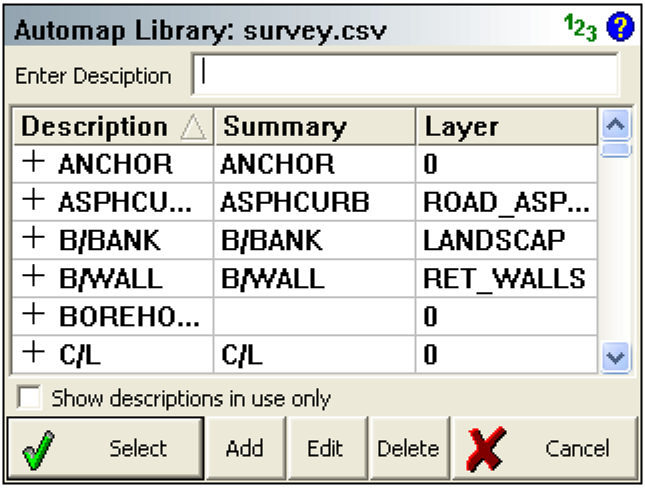


Coordinate DXF Data

You can add coordinates to the DXF entity by pressing the Coordinate DXF Data button.

AutoMap Library

The AutoMap Library editor allows the user complete control over the visibility of points and lines based on the descriptions used to code the points. It also allows you to set attributes for the descriptions such as point and line color.



Enter Description

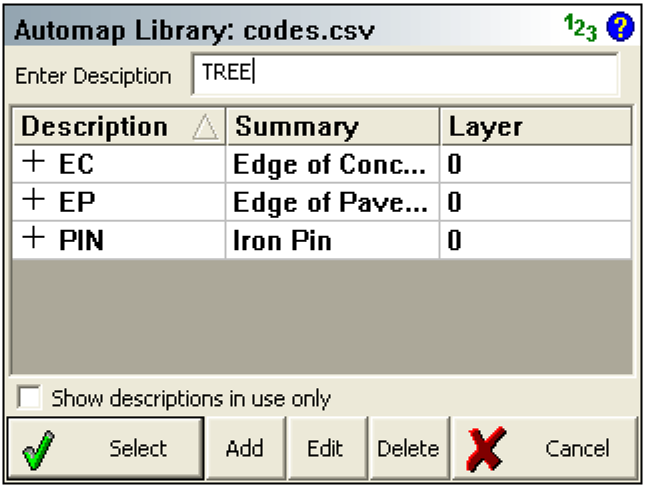
Use this field to auto scroll to description in your list. For example, typing the letters AS will scroll down to the ASPHCURB description. If you type a unique description and press enter, you will be prompted for whether you want to add it into the Automap Library or not..

Show descriptions in use only

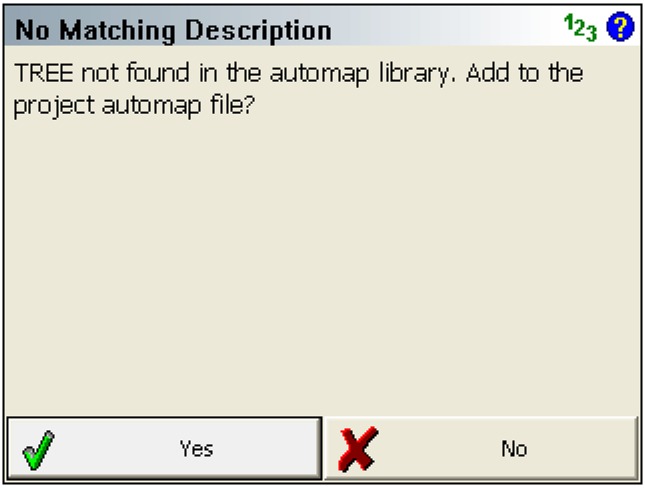
Use this to display only the descriptions found in your AutoMap Library that are used in the current project.

Adding Descriptions to the Library from FieldGenius

While you're working you can add descriptions to the Automap Library on the fly. When you enter a description that isn't in the library you will be prompted with a message asking you if you want to add it to your project's Automap library file.



Note: This prompt can be turned off so FieldGenius always uses the new descriptions without adding them into the Automap Library file. To do this you need to make sure you have the **"Prompt New Descriptions"** toggle turned off in the Program Settings menu.

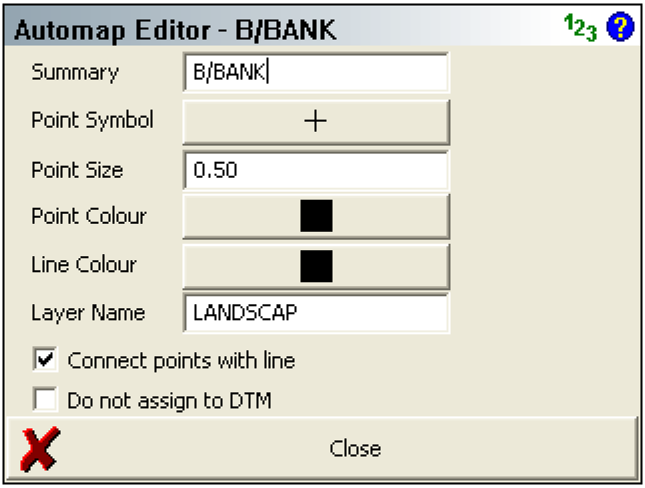


If you answer **Yes**, then the description will be added into the project's Automap Library file (not to the Automap Template file).

If you answer **No**, then the description will be used without adding it into the Automap Library. If you do not add it to the Automap Library, then you will not be able to set options such as defining the layer and color of points and lines with this description.

Editing Descriptions in the Library from FieldGenius

The Automap Library editor allows you to edit properties for each description in the library. Pressing the Edit button will bring up the menu shown below for the selected entry:



These properties are stored in the library in specific columns. Please refer to the topic below about editing the library for more information.

Summary

You can use this field to summarize your description. For example, a description IP may have a summary Iron Pin.

Point Symbol

You can define a marker for a point. These markers are not automatically transferred back to the desktop and are not similar to CAD blocks or parts. They are simply point nodes that will be displayed in the map view to help distinguish different points on the screen. There are 27 different marker types. The symbol for each description is also shown on the Automap Library screen.

Point Size

This allows you to change the size of the marker. You will find that using a number of 1 is a good starting point. Adjust from there as needed.

Point Color

This allows you to set the color of the markers. You can choose from a list of 255 colors.

Line Color

This allows you to change the color of lines in your drawing.

Layer Name

This specifies the layer that will be used for lines and points with this description.

Connect Points With Line

If this is checked, when you select the description from the topo toolbar on the main display, the connect lines toggle will be turned on automatically. Use this for descriptions that typically are connected by lines such as an edge of road or ditch center line.

Do not assign to DTM

This is very useful for the creation of Realtime surfaces. If you toggle this ON, then these points will not be included in any DTM created with FieldGenius.

Deleting Descriptions from the Library from FieldGenius

The Automap Editor allows you to delete descriptions from the library. Pressing the Delete button will prompt you to make sure that you want to delete the selected entry. This will delete that entry from the project's Automap Library file, it does not affect the Automap Template file.

Editing an Existing Library outside of FieldGenius

The Automap Library is a very powerful feature in FieldGenius. When combined with our desktop products, your downloaded files can literally be imported, layers and symbols placed in seconds. For this topic we will concentrate on helping you work with and edit the Automap library using FieldGenius.

The FieldGenius Automap library is a comma delimited file that can be edited with our MicroSurvey CAD or inCAD desktop software, with a text editor or with Excel. Since not every FieldGenius user owns our desktop software we will discuss editing the file with Excel.

The first row in the file is reserved for the column header. Some of the columns are reserved for our desktop products, but the following columns are used in FieldGenius.

Description = Column A (String value)

Summary of Description = Column B (String value)

Connect Points with Line = Column L (1 = Yes, 0 = No)

Layer Name = Column M (String value)

Line Color = Column O (Number 0 – 255)

Line or Curvey = Column Q (0 = line, 1 = Curvey) *** This works in conjunction with Column L

Marker Type = Column U (Number 0 – 26)

Marker Size = Column V (Number 0 - 10)

Marker Color = Column W (Number 0 – 255)

Exclude from DTM = Column X (1 = Yes, 0 = No)

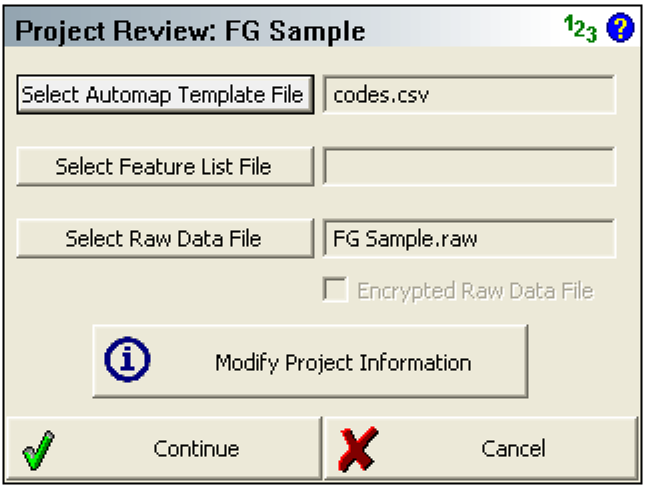
Zone Number = Column AF (Numeric Value)

Create New Library outside of FieldGenius

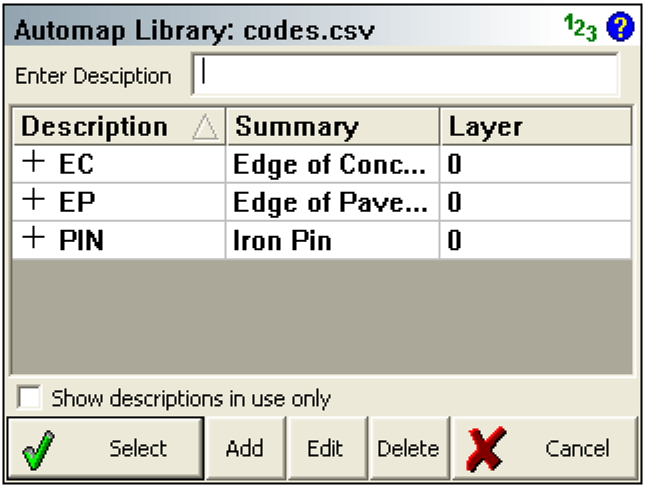
You can easily start a new library from scratch simply by creating a simple text file. In the first row add a header followed by your descriptions and summaries. You have to separate the values with a command and when you're done save the file with an extension of .CSV. An example filename might be CODES.CSV

```
DESCRIPTION,SUMMARY
PIN,Iron Pin,
EC,Edge of Concrete,
EP,Edge of Pavement,
```

You can then copy the file to your ...\MicroSurvey FieldGenius\FG Projects\ directory. When you create a new project or open an exiting one, make sure to select it as the Automap Template File.



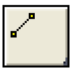
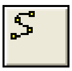
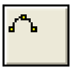
Then when you open your Automap library you will see your codes listed alphabetically.



Using Active Figures

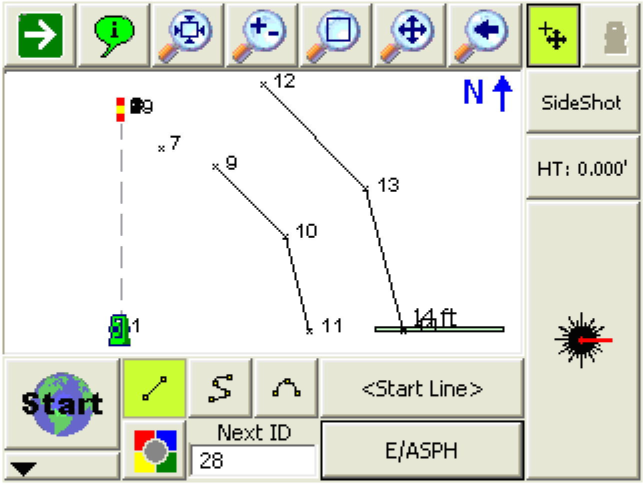
Active Linework Options

We have 3 Draw Options for Active Linework, selected from buttons that appear beside the Description and Active Lines drop down lists:

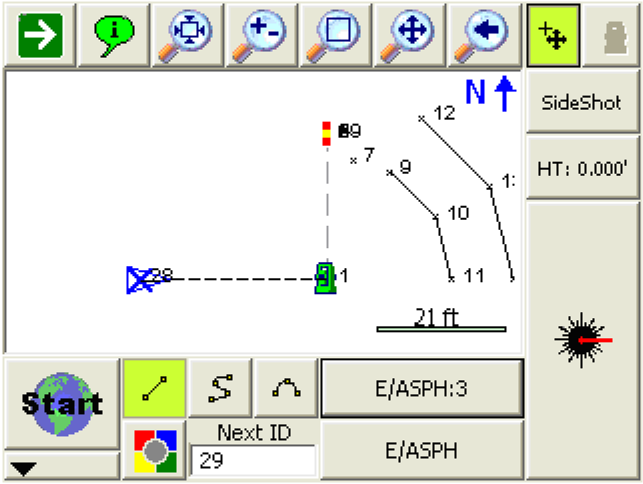
	Draw Lines button = Connect points with straight lines
	Draw Curvy Lines button = Connect Points with a best-fit curvy line.
	Draw 3-Point Arc button = Fit an arc through three measured points

Start the first Line in a Project

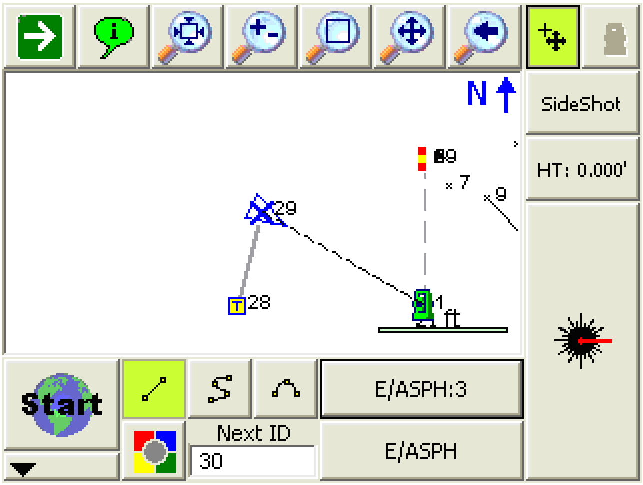
To start the first line in a new project, choose the desired point Description from the Description List and select the desired draw option before you start taking measurements. The Active Lines list will display <Start line> as shown. At this point, the next point measured will be the first point of a new Active Line using the E/ASPH Description. Use the measure button to measure the starting point for the new line.



After the shot to the first point for the new line is complete, the line will be added to the Active Lines list, identified by the current point description and an automatically assigned group number: E/ASPH:3. The group number is three, because this is the third figure using the description E/ASPH.



After the second point for this line has been recorded, the first segment will be created. From this point forward, simply continue taking shots to add to the now current Active Line: E/ASPH:3



Note the insertion of 3: This is the group number. Re-use of the Description E/ASPH for a new line series in the current project will automatically increment the group number by one. This allows you track and store multiple active lines of the same description without the need for multiple entries in your AutoMap Library. For example, E/ASPH2, E/ASPH3, E/ASPH4…9 can now be replaced with a single E/ASPH entry.

Stop adding to a Line

If you wish to stop adding to the current line, simply deselect the current draw option (Line, Curvy line) before taking any more shots. After turning off the draw option, <No line> will display in the Active Lines list button as shown.

Start a subsequent New Line

Much like the first line in the project, just select the desired description from the list and select the desired draw option before shooting the first point for the new line.

The key to note is the display of <Start line> in the Active Lines list. Once the first point for the new line has been measured, the Active Lines list will set and display the new line as current.

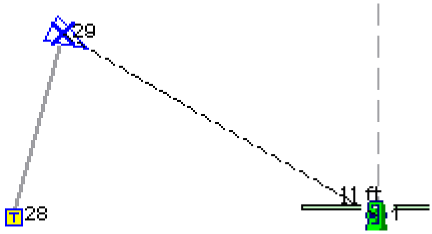
Change Description within an Active Line

You may change the description within one ongoing line. Simply choose a different description and continue taking shots. The ID of the Active Line will not change.

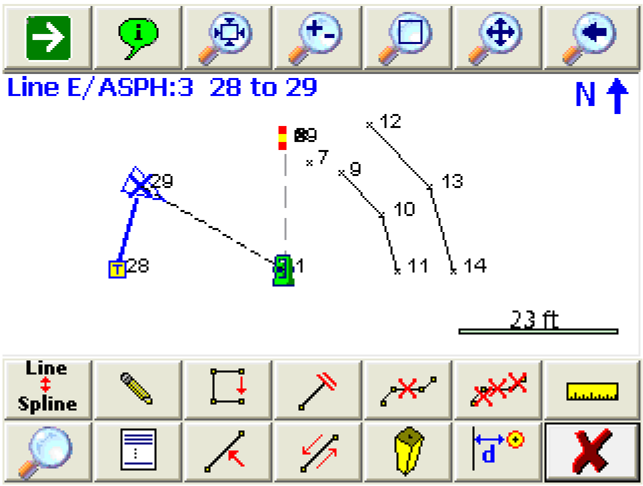
Figure Direction Marker

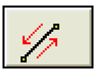
The current line in the map is always defined by a bold outline and a blue X at the end of the line. The blue X indicates the line direction so you know what end of the line the next measurement will be connected to.

You can see that the blue X is on point 29. After you take your next shot, it will be automatically connected to this point.

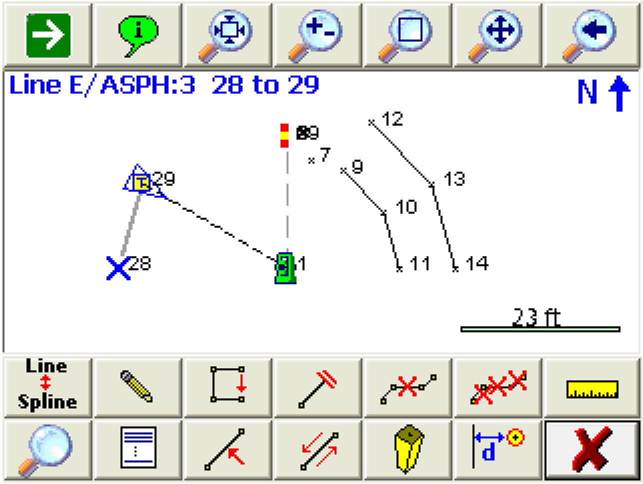


The line direction can be reversed, that is, you can define that you want your measurement connected to the opposite end. To do this you need to select the figure that you want to reverse the direction.





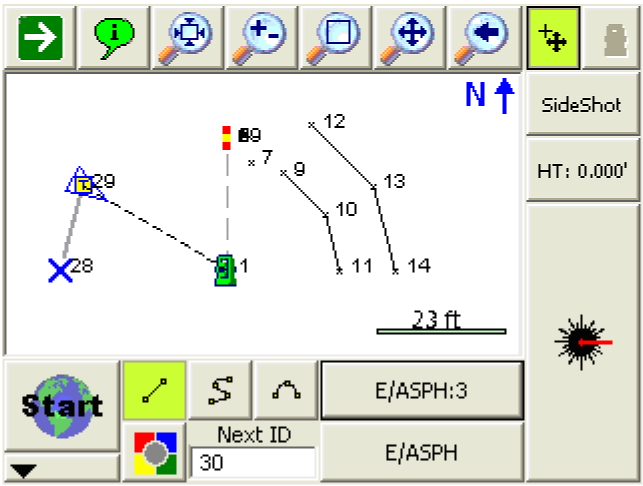
Once you select the figure, you will see the line toolbar. On this toolbar, select this button to reverse the direction. After you switch the direction, you will see the blue "X" move to the opposite end of the figure.



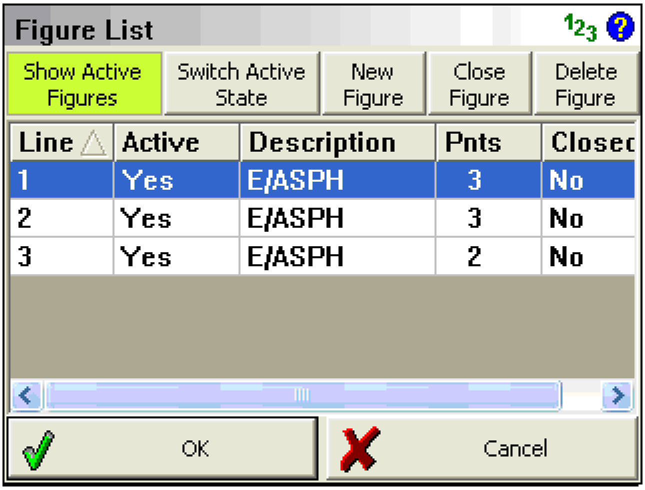
Switching Active Figures

You may work on several lines at once. As described, ongoing lines are listed in the Active Lines list.

You will notice that in this project there are three figures.



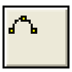
To change the current line, simply select the active line button which will open the Select Figure from List screen. In this example it is the "E/ASPH:3" button.



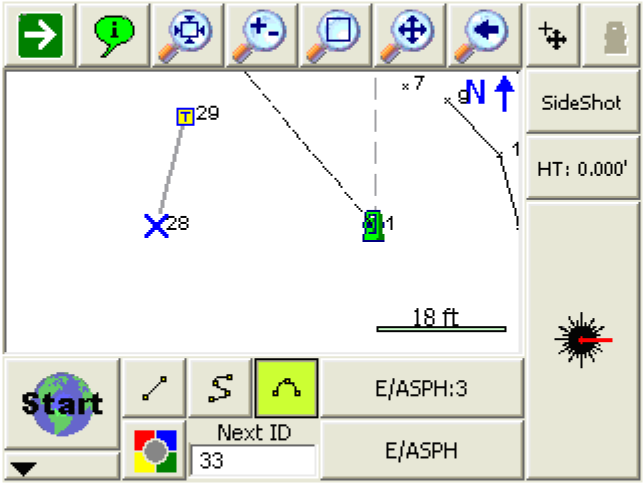
Select the desired figure from the list and continue taking shots to add to the selected line. All settings are stored for each line so there is no need to reselect the Description or draw option.

3-Point Arcs

To draw a three point arc on an ongoing Line, select the Draw 3-Point Arc button before shooting the second of the three points that will define the arc (POC). (Note that this is not the radius point). After measuring to the 2nd point, a dashed line will appear to illustrate that a 3-Point arc is in progress. Shoot the 3rd point and the arc will appear. The current draw option will change from Draw 3-Pt Arc to Draw Line after the third shot and the arc is complete.

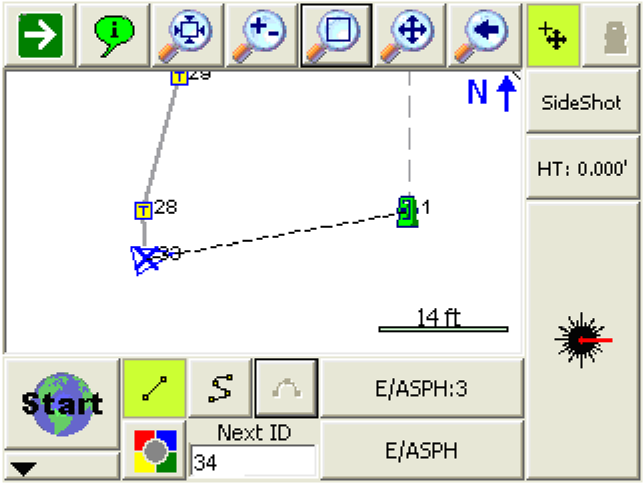


We are going to connect a three point arc to the E/ASPH:3 figure. Since we are shooting the mid point of the arc, you need to turn on the three point arc toggle.

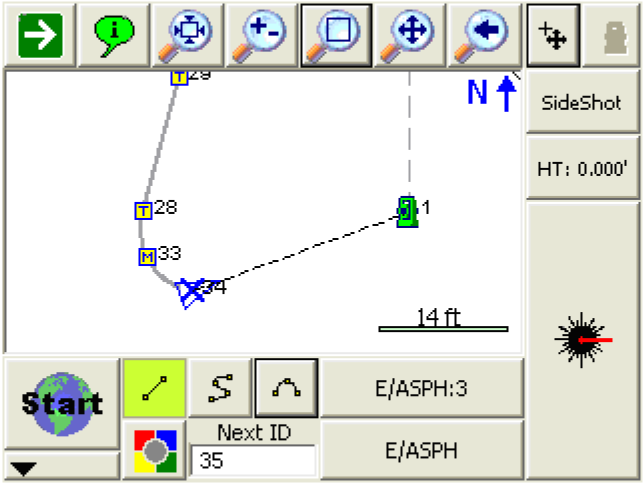


After you take the measurement, you will see the mid point drawn on the screen.

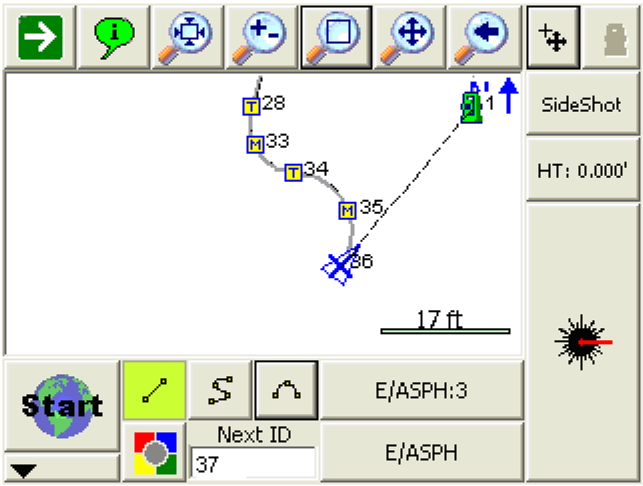
Since compound curves are not allowed, you will see that the three point arc toggle is grayed out. Once you take a shot to define the end of the arc, it will be available again.



Once you finish measuring the third shot, you will see the arc drawn in the map.



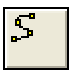
Multiple three point arcs can be connected in series as shown below.



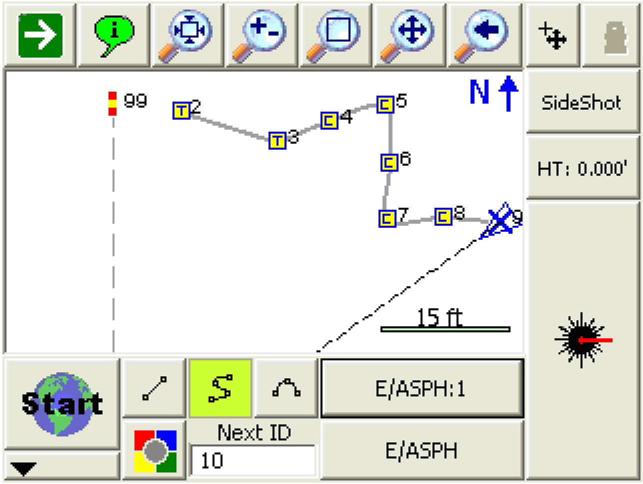
Splines (Curvy) Figures

Figures can contain splines. Splines are "best fit arcs" that are forced to go through the points that define the figure.

Splines can be attached to straight or three point arc segments.



To draw a spline, simply choose the spline toggle.



Changing Active Lines to Curvy Lines

Any Active Line series (figure) can be changed from a series of straight segments to a best-fit curvy line. Select the figure in the drawing to open the line toolbar. On the toolbar press the **Line <-> Spline** button which will convert the line to a curvy line. If the line is already a curvy line, it will convert it to straight tangents between the points.

Note that any 3 point arcs or straight line segments will be lost when you use this function.

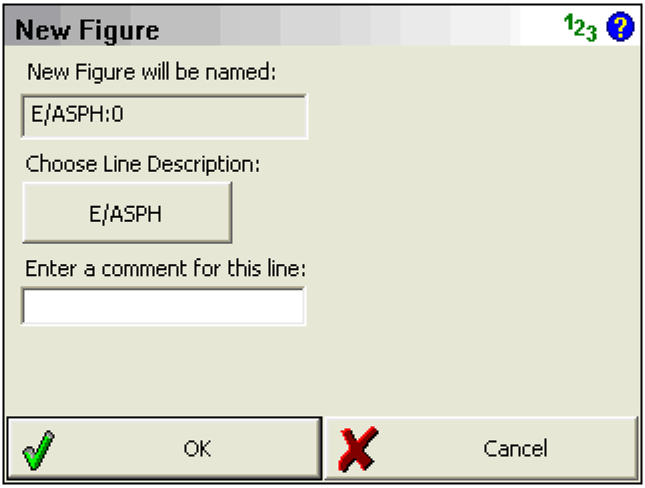
Complex Figure

Figures that contain straight segments, arcs and spline segments are said to be a complex figure.

New Figure

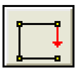
Pre-selection of Line Descriptions

A list of Active Lines (Figures) may be pre-specified to aid in planning for a complicated survey. Use the **New Figure** button on the Active Line List screen to specify a Line Description before taking any shots.

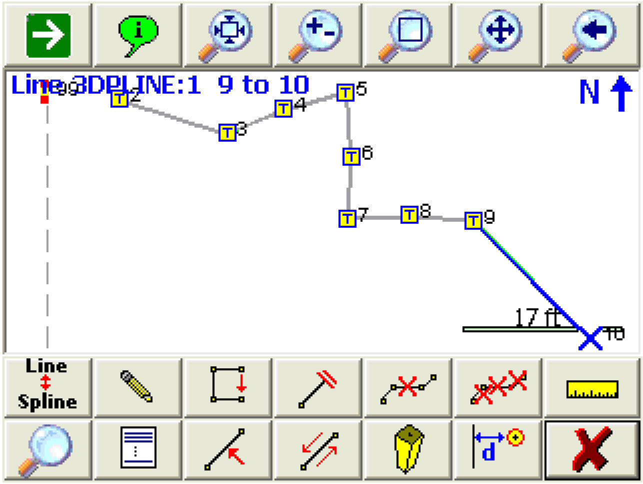


You have the opportunity to use a manually entered comment with this method but the new line will be linked to the selected Line Description. The comment will appear in the Active Lines list to aid correct selection of the line.

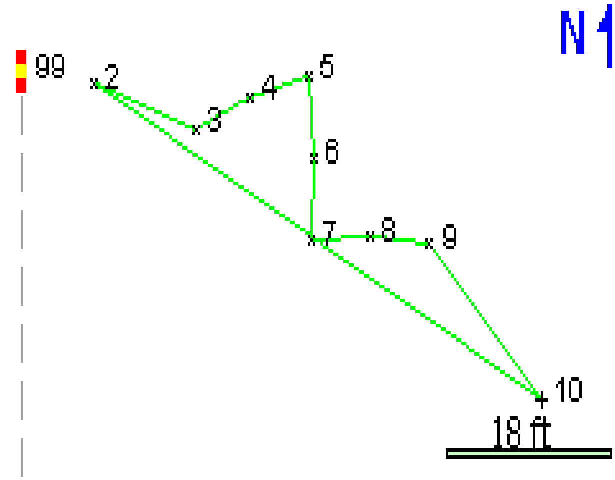
Closing Figures



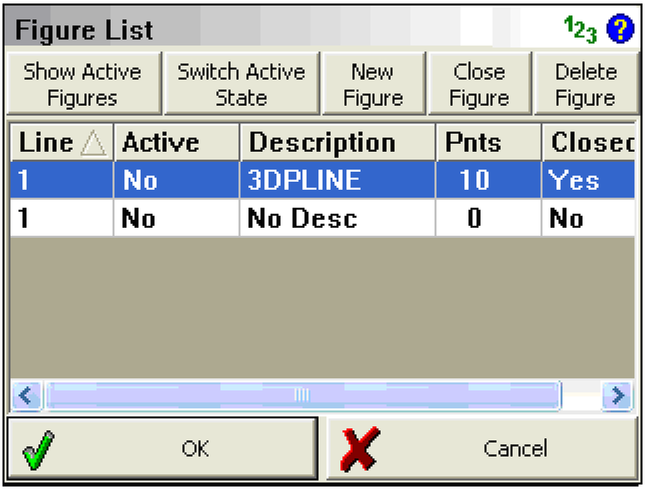
To make a closed figure with an Active Line, select the **Close Current Line** button on the line toolbar. This will draw a line from the last point to the first point shot in the figure. The Line will be removed from the Active Lines list as it is now considered complete.



You will see that the figure now is closed back to the original start point.

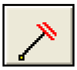


In the active lines list, if you turn off the **Show Active Figures** you will see that the 3DPLINE figure is flagged as Active = NO and Closed = YES.



lternatively, you can also close a figure in this screen by using the **Close Figure** button.

End (complete) a Figure



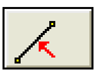
To mark a line as complete or finished, use the End Current Line button on the line toolbar. This will remove the line from the Active Lines list so that no more segments or arcs can be added.

This works similar to closing a figure, but differs in that the figure will not be forced to close back on to the original start point.

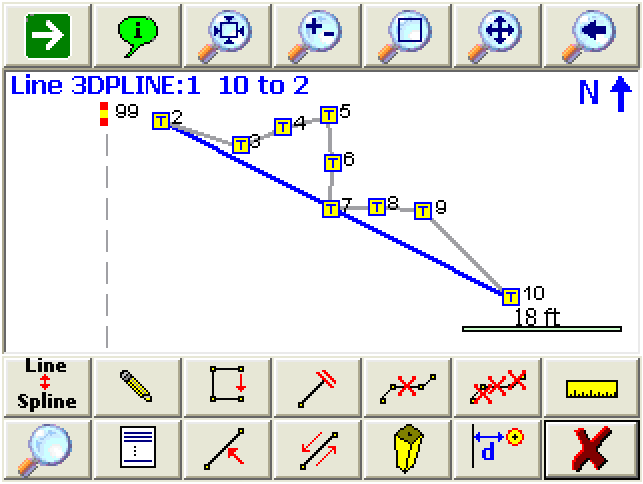
Re-Activating Figures

When a figure has been marked as complete, you can activate it one of two ways:

From the Line Toolbar

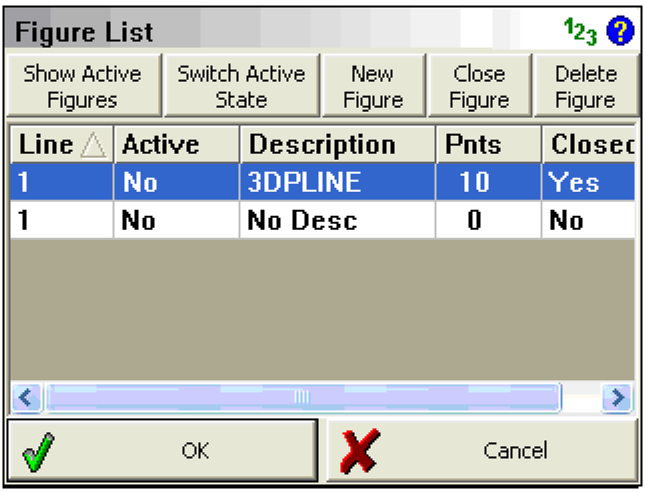


You can visually pick on the map view the figure that you would like to re-activate. On the line toolbar, select the activate button which will make the selected figure active.



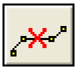
From the Figure List

You can also open the active lines list and if you turn off the **Show Active Figures** button you will see the figures that are marked as not active. Simply select the figure you want and press the **Switch Active State** button which will set it to active.

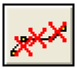


Deleting Figures

To delete linework in your project simply select the figure you want to delete. When you select the figure, the line toolbar will open.

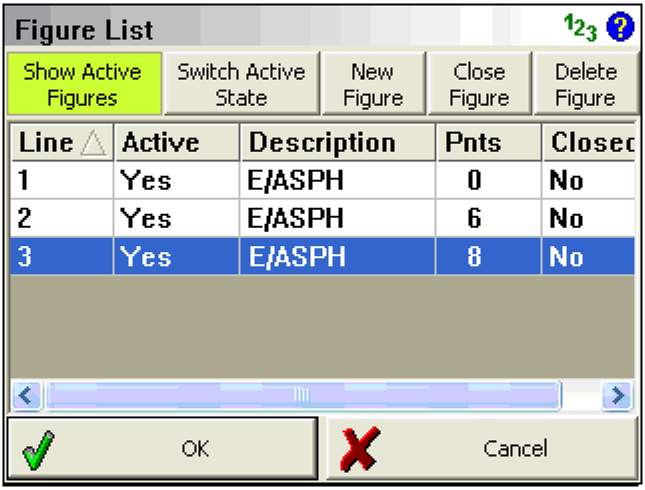


Use this button on the line toolbar to delete an individual segment between two points or a three point arc.



Use this to delete the entire figure that you have selected.

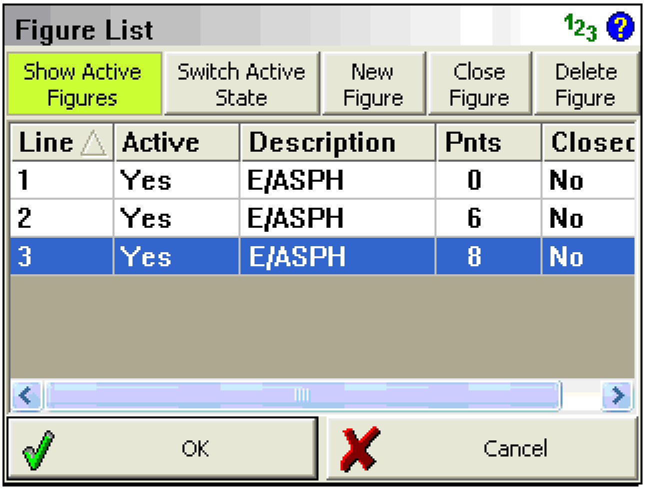
Notes:
Splines: Spline sections are considered to be one entity so using the delete entire figure, or delete segment, each will do the same thing. The entire spline will be deleted.
If a segment or arc is deleted from the middle of a figure, the figure will be broken into two pieces. Each new figure will be assigned a new group number. Closed or ended figures will be re-activated and added to the Active Lines list.



You can also delete a figure by selecting it in the active lines list, then pressing the Delete Figure button.

Figure List

The figure list contains a listing of all figures in your project.



Line Column

This is the group id assigned to the figure. Refer to the Active Linework topic for more information.

Active Column

If the figure is active, you will see the work **YES**. To make a figure not active, press the Switch Active State button.

Description Column

This is the name of your figure which will usually match the description of the first point that the figure is connected to.

Points Column

This is the total number of points that the figure is connected to.

Closed Column

If you closed the figure you will see the word **Yes**.

Show Active Figures

When this is selected (default setting) all of your active figures will be listed. You can select a figure that you would like to work on simply by selecting it in the list and pressing the OK button. If this is turned off, then all the figures in the project will be displayed.

Switch Active State

Use this to change the status of a figure to "finished". When this is done, it will no longer be displayed in the figure list of the Show Active Figures button is on. Once a figure is switched to a not active state, nothing can be added to it.

Figures that are not active, can be made active again simply by selecting the figure you want to use and pressing the Switch State button.

New Figure

Use this to create a new figure in the figure list.

Close Figure

Use this to close a figure so it will close back to the starting point.

Delete Figure

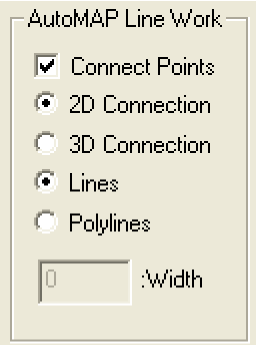
Use this to delete a figure that you have highlighted in the list. You can delete figures that are flagged as active, or not active. Review the delete figures topic for more info on deleting.

Draw Option Defaults

To setup draw option defaults you need to own a copy of MicroSurvey CAD or inCAD. From within MicroSurvey CAD or inCAD you can use the Automap editor to set default draw settings for each Description in the MicroSurvey CAD or inCAD AutoMap Library. When this library is copied to your collector, selecting a Description will choose the correct FieldGenius Draw option for Active Linework in FieldGenius.

Lines

Choose the following in your desktop Automap library editor to set the draw default for FieldGenius to Lines.

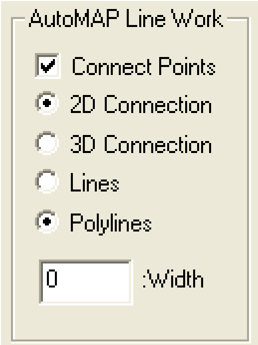


In FieldGenius when the description is selected, the line toggle will be automatically turned on.

As shown below, the line toggle has been automatically turned on when the E/ASPH description was selected from the list.

Curvy Lines

Choose the following to set the draw default for FieldGenius to Curvy Lines

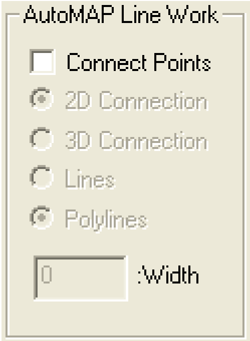


In FieldGenius when the description is selected, the curvey toggle will be automatically turned on.

As shown below, the curvy toggle has been automatically turned on when the E/ASPH description was selected from the list.

None

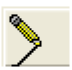
Choose the following to set the draw default for FieldGenius to None



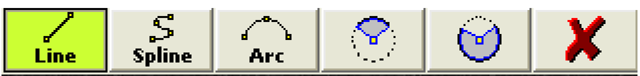
As shown below, when the HUB description was selected, all line connectivity toggles are turned off.

Notes:
The 2D and 3D settings do not affect these defaults in FieldGenius.
We only make use of these settings as defaults in FieldGenius. With FieldGenius data imported to MicroSurvey CAD or inCAD, there is no need to process Automap connections as FieldGenius figures are drawn automatically. For more details on the AutoMap Library, see your MicroSurvey CAD or inCAD Help System.

Draw Figures Manually



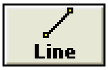
To manually draw a figure, use the Pencil button on either the line toolbar or point toolbar. This will open the pencil toolbar.



If you start a new line, it will be assigned a Line Description based upon the current Point Description, as displayed in the Description list.

To exit the manual drawing function, press the red X button to close the pencil toolbar, then deselect the Pencil button on the line or point toolbar and close it.

Draw Line

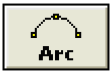


To draw a line, simply select the line option button and tap the points you want to connect.

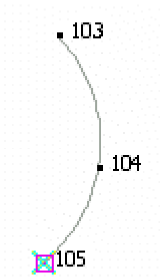
Draw Curvy

To draw a curvy line, select the curvy line option and tap point the points you want to connect.

Draw 3-pt Arc (Case1)

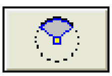


Case 1: Known PC, 1 point on arc and known PT.

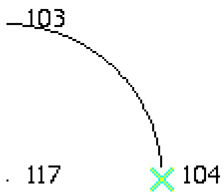


To draw a 3-pt arc, select the first point (Pt. 103) with the Line button then change to the 3-pt arc button before picking the point on curve (Pt. 104), then finish the arc by picking the last point (Pt. 105).

Draw 3-pt Arc (Case 2: Small Arc)

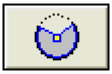


Case 2: Known PC, known radius point and known PT.



To draw this 3-pt arc, select the first point (Pt. 103) with the Line button then change to the 3-pt small arc button before picking the radius point (Pt. 117), now finish the arc by picking the last point (Pt. 104)

Draw 3-pt Arc (Case 3: Long Arc)



Case 3: Known PC, known radius point and known PT.

This is similar to Case 2, but by using the 3-pt long arc button the long arc will be drawn instead.

Smart Tags

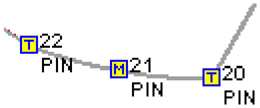
When you select an existing or create a figure in your drawing you will see smart tags appear on the points that make up the figure.

Smart Tag "T"

The T smart tag define points connected to straight line segments.

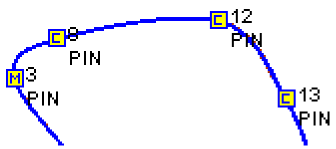
Smart Tag "M"

The M smart tag defines the mid point of an arc.



Smart Tag "C"

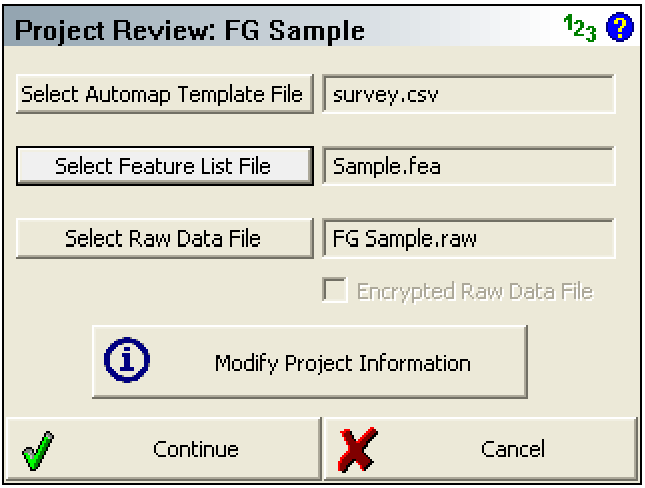
The C smart tag define points connected by a curvy line type.



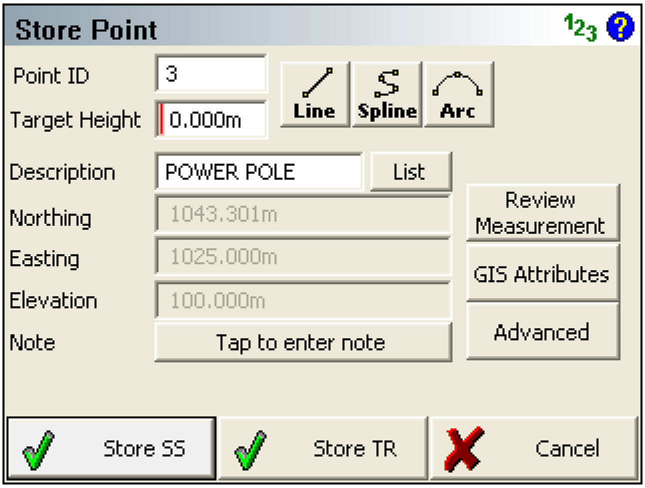
Feature List

A feature list is a tool built into FieldGenius so you can collect attribute data for your points. Feature files allow you to define what data needs to be collected about a point's attributes. You can define mandatory fields, default values, true/false items and select from list options. First you need to create a feature list file using the Feature List Editor which can be installed from your FieldGenius CD. Please refer to the help menu in the editor for more information on how to create an effective feature file.

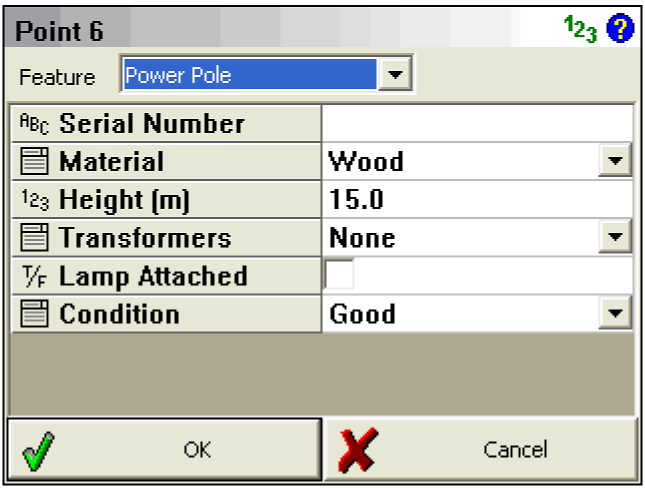
Feature files have a **FEA** extension and they should be copied to your ...\MicroSurvey FieldGenius\FG Projects\ directory. There is no limitation to the number of feature files that can be stored on your data collector. Once you have created your file and copied it to ...\MicroSurvey FieldGenius\FG Projects\ you can open it when you get to the Review Files Screen. In this example we will open a Feature List File named Sample.FEA.



To collect attribute data for a point, you have to press the **GIS Attributes** button on the store and edit dialog.



When you store a point during a measurement or edit one afterwards, you will see that you can select the **GIS Attributes** button. When you press this button, it will look at the point's description and check to see if you have a feature defined that matches. If it does, it will open up that feature for you automatically, in our example you will see that the Power Pole feature was opened.



As you can see, feature files help you collect consistent and accurate notes about a point you measured.

When you store the point, a file will be created in the project directory. The file will have the same name as the feature and will have a DBF extension. In our example, the file would be named POWER POLE.DBF. Each point will be appended to the same database file.

The DBF database file can be opened with Microsoft Excel.

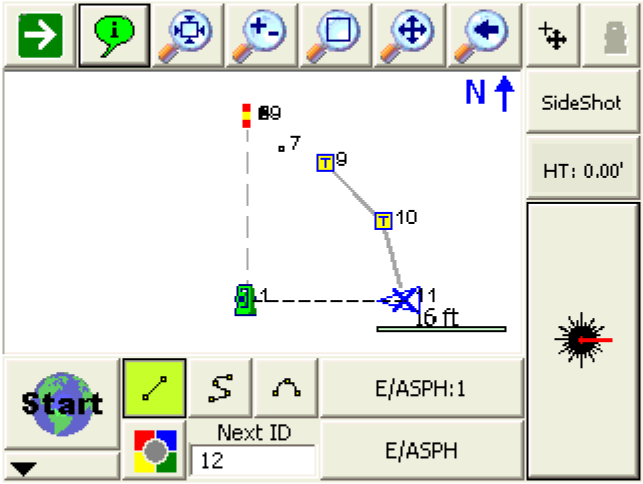
Active Linework

FieldGenius has Code-Free linework control in the field to eliminate the need to remember line codes. To activate linework on the fly while surveying, you simply choose the description you want and start taking shots! For MicroSurvey CAD or inCAD desktop users, line connectivity codes setup in the desktop Automap library will be used by FieldGenius . For more information see the Draw Option Defaults section.

FieldGenius uses the concept of Figures for handling of linework. Some software packages refer to these as "Chains".

At the bottom of the FieldGenius interface, you will see the Active Lines List button on the second row. When a new project is started, it will display **[<No Line>]** as the current, active line.

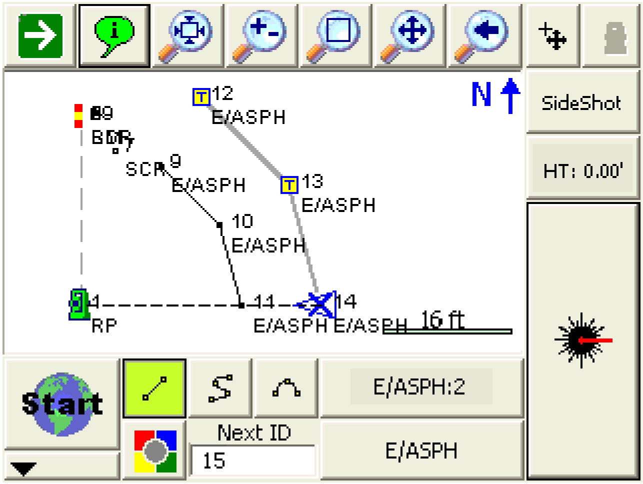
When a new line figure is about to be started, **[<Start line>]** will by displayed on the button. After the first point for a new line has been measured, the active line will be created, made current and displayed.



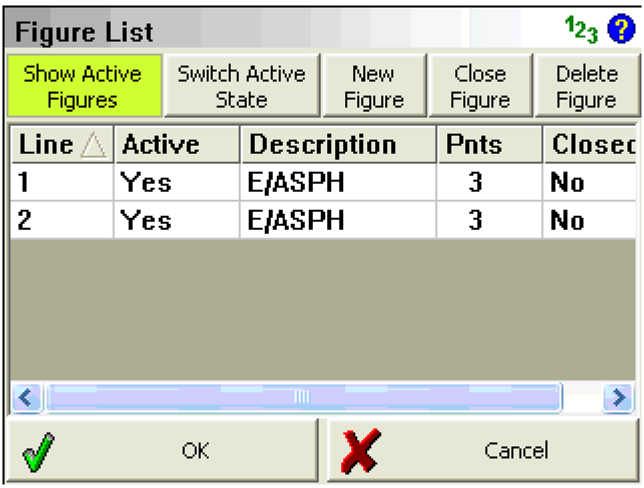
In the example shown, notice E/ASPH:1 on the button. This is the current Active Line. E/ASPH is the point description and 1 is the group number (added automatically). Since this is the first figure in the map, it is assigned group 1.

A Figure is a continuous series of Line, Curve and/or Arc segments. The Figure is identified by Point Description and a group number. Whenever a new line is started, a new Figure is created and added to the Active Lines list with an automatically assigned group number. The group number will increment by one when a previously used point description is used for a subsequent line. (Notice there are two E/ASPH lines in the example)

Furthermore, all linework in FieldGenius is handled in 3D.



When you press the E/ASPH:2 Active Line button you will see a list of the figures in your project.



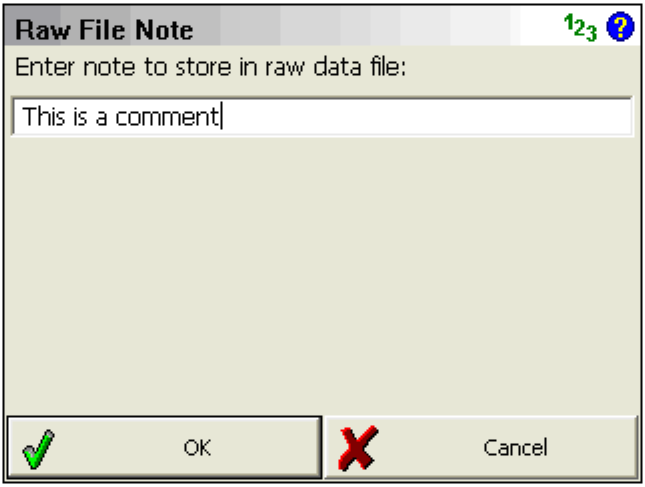
See Also ...

- Automap Library

Raw File Comment

Shortcut Key - X

At any time you can enter a note that will be recorded to the raw file. Simply press the X key on your keyboard device which will open the Enter Comment dialog. Enter a comment that you want appended to the end of your raw file. You are limited to 99 characters.



If you view your raw file your comments will appear as shown in the following example.

```
! --This is a comment                                                    !
```

You can also enter comments into the raw file by using the Raw File Viewer.

TOOLBARS

Topo Toolbar

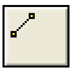
The topo toolbar is used to help automate linework as well as show you the description and next point number for your shot. Just like previous versions of FieldGenius you can control your linework by tuning on and off the line, arc and curvy toggles. There is also a user-programmable button that can be customized to start any command.

Main Menu Button

This button takes you into the Main Menu.

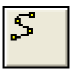
Mini Toolbar Button

This button opens the Mini Toolbar.



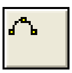
Draw Lines Button

This is used to toggle on and off the draw lines function. When turned on as you shoot your points in the drawing they will be connected with a line.



Draw Curvy Lines Button

This is used to toggle on and off the draw curvy lines button. This function will draw a best-fit curve through your points as you shoot them.



Draw 3-Point Arc button

3-Point arcs can be started using the same method as for a Line or Curvy Line.

However, to switch to 3-Point arc within an ongoing Line, select the Draw 3-Point Arc button before shooting the second of the three points that will define the arc (POC). (Note that this is not the radius point). After measuring to the 2nd point, a dashed line will appear to illustrate that a 3-Point arc is in progress. Shoot the 3rd point and the arc will appear. The current draw option will change from Draw 3-Pt Arc to Draw Line after the third shot and the arc is complete.

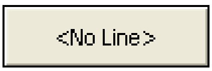
Compound 3-point arcs are supported. Simply re-select the 3-Point Arc button before measuring the next POC.

User Defined Button

This button can be customized to start any command. By default it opens the Coordinate Database, but this can be changed in the Keyboard Shortcuts settings.

Next ID Field

This field displays the point number that will be assigned to your next shot. You can change it at any time prior to recording your shot. In a new project this field will always start at 1. If you open an existing project, then we scan the raw file for the last sideshot or store point and if we find one, we'll set the point number accordingly. For example, if the last sideshot in the raw file was to point 58, then the next time the project is setup we will set the next id to 59.



Active Line List Button

Much like the first line in the project, just select the desired description from the list and select the desired draw option before shooting the first point for the new line. When you press the button a screen will appear listing all your active lines. Selecting one of them and pressing the OK button will make it the current line.

The key to note is the display of <Start line> in the Active Lines list. Once the first point for the new line has been measured, the Active Lines list will set and display the new line as current.

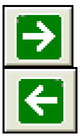
To change the current line, simply select the desired line from the Active Lines list and continue taking shots to add to the selected line. All settings are stored for each line so there is no need to re-select the Description or draw option.

Description Selection Button

Use this button to set the current description that will be used when you shoot your points. When you press the description button you will see a screen listing all the descriptions read in from your AutoMap Library. Select the description you want to use and press the OK button. You can type in the letters of the description which will automatically scroll to the descriptions matching your entry.

Display Toolbar

The display toolbar, located at the top of the map screen, is used to zoom, pan, change 3d perspectives, and for displaying information.

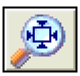


Next, Previous

These switch to the next or previous set of buttons.

Information

This opens or closes the Information Toolbar. Many different functions in FieldGenius will display information in this toolbar, such as when you select a point on the screen, the point's coordinates are displayed in this toolbar.



Zoom Extents

This is a zoom extents which will zoom to the extents of your project.

Dynamic Zoom

This is a dynamic zoom. When enabled, drag from top to bottom of the screen to zoom out, or bottom to top of the screen to zoom in. Or, when enabled, you can also use the arrow keys on your keypad to zoom in and out in the map.

Zoom Window

This is a zoom window. When enabled, drag on the map screen to define a zoom window.

Dynamic Pan

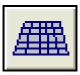
This is a dynamic pan. When enabled, you can drag across your map screen to pan around your project. Or, when enabled, you can use the toggle or arrow keys on your keypad to pan around.

Zoom Previous

You can use this to zoom back up to 10 previous views. This includes zoom and pan changes.

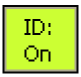
World Button

It is used by the staking commands to hide unrelated points and lines in your map during stakeout.



3D View

This opens the 3D View Toolbar.



Display IDs

This is used to show or hide the point number labels for your points.

Display Descriptions

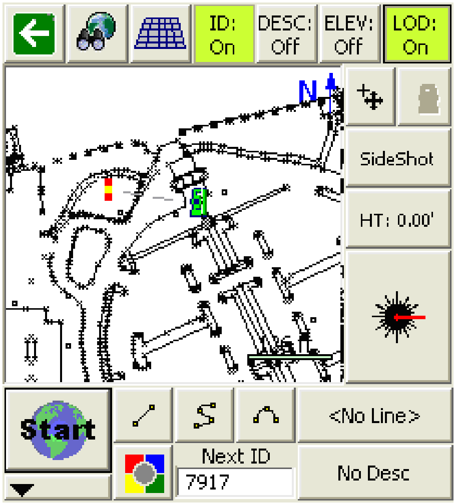
This is used to show or hide the point description labels for your points.

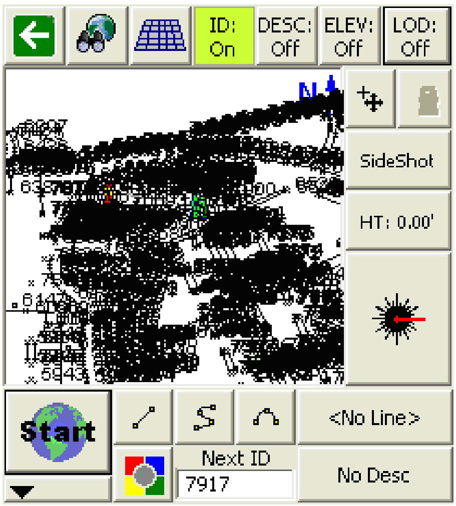
Display Elevations

This is used to show or hide the point elevation labels for your points.

Level Of Detail

The Level of Detail filter, when turned off, will force FieldGenius to show the point labels all the time, independent of your zoom level. If it is turned on, FieldGenius uses an algorithm to determine if displaying the point labels is necessary. This is demonstrated in the following two images, the first one has LOD turned on.





With LOD on, as soon as you zoom in to a reasonable level, the labels will appear automatically. Under normal circumstances you will keep the LOD feature active.

Information Toolbar

The information toolbar is used to display information about points, lines, inverses, shot data, staking data, instrument communication problems and many more types of data. Think of it as a status area that FieldGenius uses to tell you information about objects and events.

To access this information, simply press the info button on the Display Toolbar. If you click into the information toolbar, all the information will be displayed in a full screen dialog so you can see all the data at once without having to scroll through it.

The most common use of this toolbar is to view information about your points and lines in your project, or reviewing shot information.

Points

When you click on a point, you can see more information about that point by opening the information toolbar.

Figures

When you click on a figure, you can see more information about that figure by opening the information toolbar. If the figure contains multiple segments, the distance and direction displayed will be for the segment you selected on the figure.

Shot Information

When you take a shot with your instrument, you can see the results of that shot by opening the information toolbar. It will display the Horizontal Angle, Vertical Angle, Slope Distance, Horizontal Distance, and Coordinates of the resulting point.

3D View Toolbar

The 3D View toolbar is used to help you view your project in a 3D perspective. You can also define a virtual grid that will displayed in the drawing and can be turned on and off.

To turn this feature on select the 3D Views button on the Display toolbar. When you do this the 3D View Toolbar will appear at the bottom of your screen. The buttons on the toolbar are described below.

3D View

When this is turned on you will be able to rotate your project in a 3D perspective. This tool is handy when used in conjunction with Road Alignments, Vertical Plane Projections or with Surfaces. It can also help you find points that have incorrect elevations. To return to plan view, close the 3D View toolbar and press the Zoom Extents button on the Display toolbar.

Center on Point

Use this to center the view on the selected point.

This will not change your current view rotation or zoom depth.

Hz Grid

Use this to turn on a horizontal grid that will be displayed in your drawing. You can set the grid spacing in the settings.

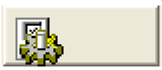
Vert Grid

Use this when using the Vertical Plane Projection tool to turn on a vertical grid that will be displayed in your drawing. You can set the grid spacing in the settings.

Planar View

Use this when using the Vertical Plane Projection tool to set the view perpendicular to the vertical plane, so that the wall or other projected plane is displayed face-on in the map view.

Grid Settings



Use this to set parameters that affect the grid spacing and origin. You can select the grid origin using a point chooser and specify lengths for the sides. You can also specify the interval for the east and north axis.

Mini Toolbar

The mini toolbar control is found directly beneath the Main Menu button. It is used to help you maximize your screen space by allowing you to control which toolbars you need to keep active in the main interface. When you press the mini toolbar control you will see the mini toolbar appear toward the bottom of the main interface.

Δ

Use this to display the full topo toolbar.

Menu

Use this to display the main menu.

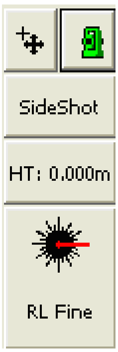
Controls

Use this show or hide the information and display toolbar.

Instrument

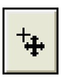
Use this to show or hide the instrument toolbar.

Instrument Toolbar



When you use FieldGenius in either manual or total station mode, you will see the instrument toolbar beside the map area.

This toolbar allows you to control your instrument settings, EDM modes, measurement modes and target heights.



Auto-Center

This turns the auto center feature on or off. If turned on, whenever you take a measurement, the current prism location will always appear in the center of your map display.

Instrument Settings

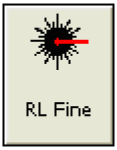
This opens the instrument settings toolbar. On this toolbar you can control specific settings for your total station such as EDM modes.

Measurement Mode

This button will open the Select Measurement Mode screen. From here you can select what type of measurement you will be taking. When you choose your mode, this button will display the mode you're using. Example, if you're using the distance offset mode, the button will display "Dist Off".

Target Height

This is the target height button and it controls the target heights used by FieldGenius. The current target height is always displayed on this button.



Measure Button

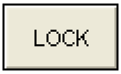
Measure button - use this to trigger your total station to take a measurement. This button also indicates the current EDM mode that will be used for the measurement.

Robotic Instrument Toolbar

When you use FieldGenius in robotic total station mode, you will see the robotic instrument toolbar in the map area. Like the Instrument Toolbar, this toolbar allows you to control your instrument settings, EDM modes, measurement modes, and target heights. It also lets you search and lock onto the prism.

Lock Button

FieldGenius uses a button to trigger the instrument to search for the prism and lock onto it. You can also use



this button to turn the lock off.

The button when not locked on a prism will display a **No Lock** status. To search for the prism, simply press the No Lock button.

After you have pressed the No Lock button you will see a **Search** status on the button while the instrument searches for your prism.

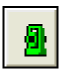
When FieldGenius finds a prism and locks onto it, the button will display a **Lock** status. To stop the instrument from tracking, you can press the Lock button again to set it to a No Lock status.

If you're using multiple prisms and you want to force FieldGenius to look for another one when you're locked onto a prism, double tapping the Lock button will force it to search for the next available prism.

Cursor Tracking

This turns the cursor tracking feature on or off. If turned on, the current position of the target will be displayed on the screen in real time. You can only use this feature once you have specified an instrument setup using the Setup Occupy Point command.

Note: The cursor tracking position will use a coarse measurement to plot your position. When you're not moving the cursor position will be represented with a hollow triangle pointing back towards the instrument. As soon as you start moving, the cursor will become solid and will be pointing in the direction of travel.



Instrument Settings

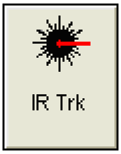
This opens the Instrument Settings Toolbar. On this toolbar you can control specific settings for your total station such as EDM modes.

Measurement Mode

This button will open the Select Measurement Mode screen, From here you can select what type of measurement you will be using. When you choose your mode, this button will display the mode you're using. For example, if you're using the Distance Offset mode, the button will display "Dist Off".

Target Height

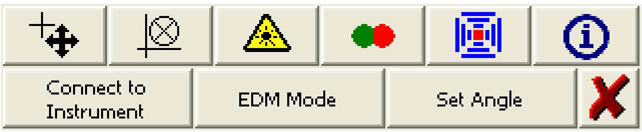
This is the target height button and it controls the target heights used by FieldGenius. The current target height is always displayed on this button.



Measure Button

Use this to trigger your total station to take a measurement. This button also indicates the current EDM mode that will be used for the measurement.

Instrument Settings Toolbar



When you tap on the instrument settings button on the instrument toolbar, you will see the instrument settings toolbar appear near the bottom of your screen. Following is an explanation of what each button will do.

Connect to Instrument / Disconnect Instrument

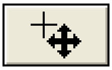
Use this to connect or disconnect FieldGenius from the instrument. When you are connected to the instrument you will see the Disconnect Instrument button.

EDM Mode

Use this to set the EDM mode for your instrument. Every manufacturer has different measurement modes available and as such we will list only those that your instrument supports. Please refer to your instrument manual for more information on the EDM modes your instrument supports. Any time you change your EDM Mode, FieldGenius writes a comment into the raw file indicating which mode is being used.

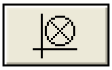
Set Angle

Use this to open the Set Angle Screen. Please see the Set Angle topic for more information.



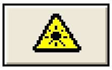
Auto-Center On / Off

Use this to automatically center the map when a point is shot. If turned on, whenever you take a measurement, the current prism location will always appear in the center of your map display.



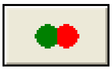
ATR On / Off

Use this to turn on and off your instruments Auto Target Recognition feature.



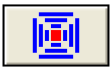
Laser Pointer On / Off

This turns on and off the instrument's red laser pointer.



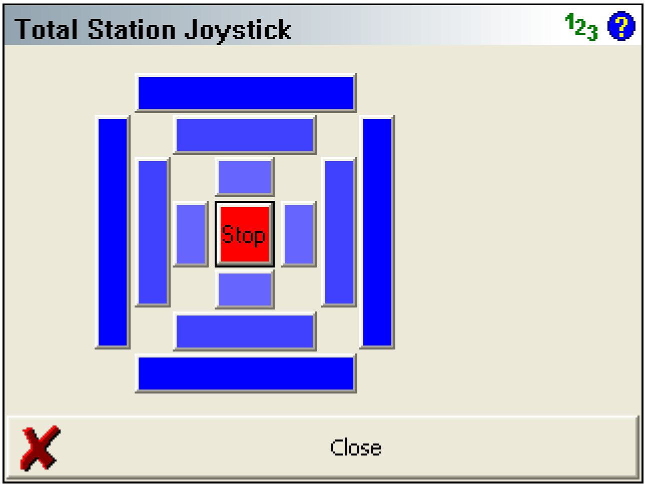
Guide Lights On / Off

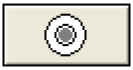
This will turn on and off your instrument's guide lights.



Instrument Joystick

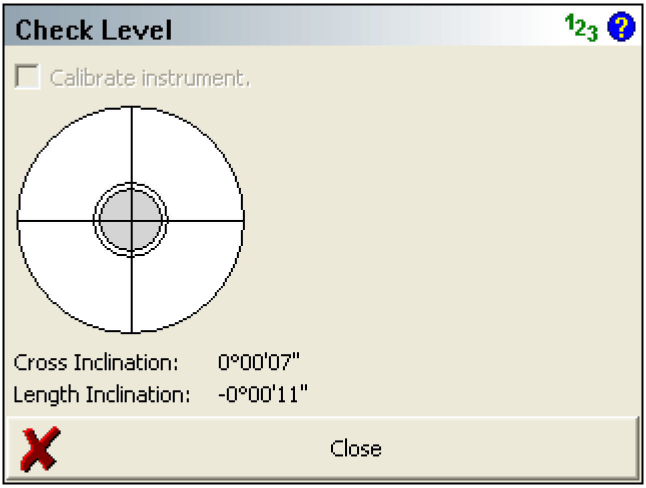
This is the Total Station Joystick function. When activated you will be able to move your instrument to the left, right, up and down by using the joystick touch-screen. There are three speeds that can be activated: slow, medium, and fast. The smaller inside blue buttons activate the slowest turn mode, and the larger outside blue buttons activate the fastest turn mode. To stop the instrument from turning, simply press the red Stop button at the center. **The directions assume you are at the pole looking at the instrument.** Pressing the right buttons will turn the instrument to your right, pressing the up buttons will turn the scope up, etc.

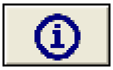




Check Level

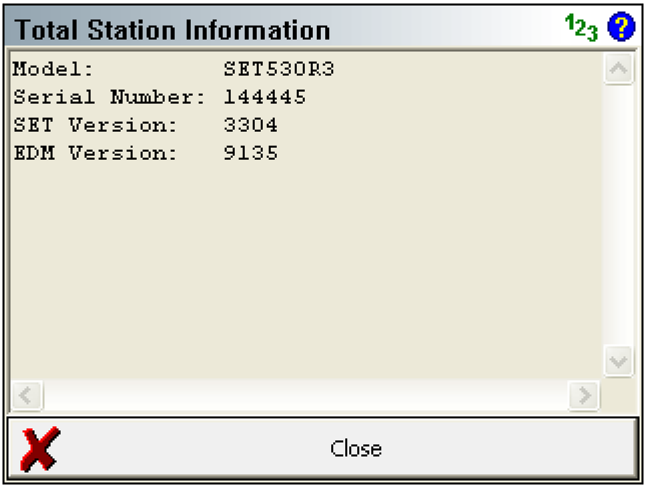
If your instrument supports it, you can check to see how level your instrument is. Also when you're in this screen, if you instrument has a laser plummet FieldGenius will turn it on for you. If you're using a Trimble or Geodimeter instrument you can turn on the **Calibrate Instrument** option and when you press Close it will force the instrument to do a calibration.



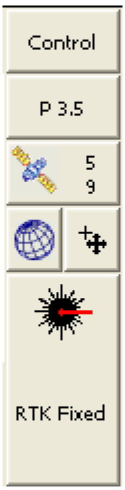


Instrument Information

When this is pressed, we will display the current battery status of your instrument. Note, not all instruments support this.

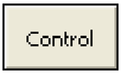


GPS Toolbar



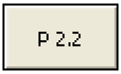
Once the user has selected a GPS receiver and communication has been established, a GPS toolbar will appear.

NOTE: You will only see the GPS toolbar if you selected GPS as your instrument type.



GPS Control Button (GPS Tasks)

If you press this button while you're connected you will see the Select GPS Task screen. At any time this button can be used to stop a GPS survey.



DOP Values

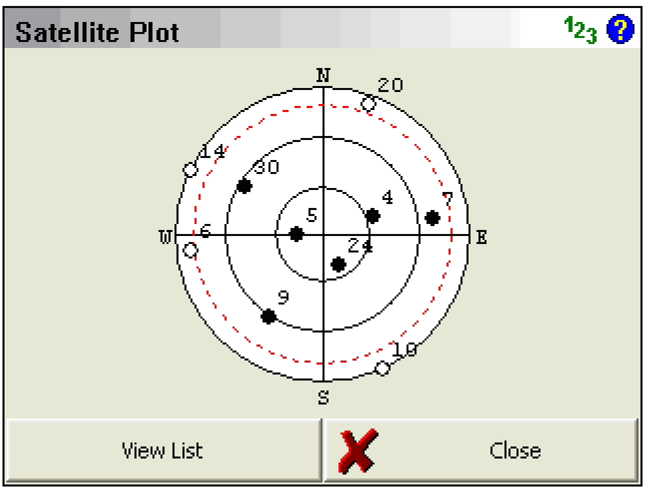
The second button displays the DOP values for the current RTK position. Pressing the button will cycle through the PDOP, HDOP and VDOP. The PDOP is the default setting as this is most often used to ascertain the quality of the geometry in the RTK solution.

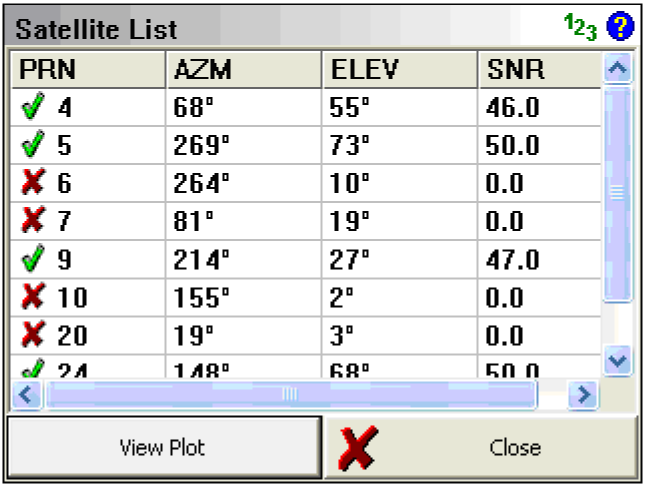
Satellite Plot/Satellite List

The third button is the number of SVs (Satellites) the rover is currently using in the RTK solution, and the total number of SVs visible to the rover. Press this to view a sky plot of the current SVs visible to the rover, or to access the Satellite List.

Press the **View List** or **View Plot** buttons to toggle between the Satellite Plot and Satellite List screens.

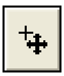
Press the **Close** button to return to the map screen.





Current Position

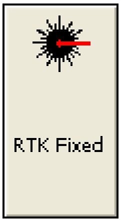
The fourth button is used to display the current position of the cursor in the project. Tapping it will first display the current geodetic position in the current map projection (with applied local transformation) or Latitude and Longitude (WGS 84 derived system). Tapping it again will show the UTM or State Plane coordinates. Tapping it a third time will show the current Hrms and Vrms values for quality control.



Cursor Tracking

The fifth button in the GPS toolbar will recenter the display on the current position of the cursor (RTK position).

Double tapping this button will set the system into an auto-pan mode where the position cursor will always be centered. Tapping the button once more will disable the auto-pan mode.



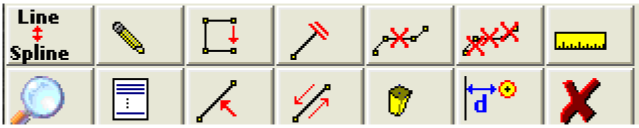
Measure

The sixth button on the GPS toolbar is the measure button.

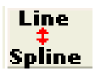
This button also indicates the current solution type. This tells the user if the solution is Fixed, Float, WAAS, DGPS or Autonomous. This button will also indicate to the user if the corrections from the reference station have been discontinued by denoting "No Link".

Please refer to the GPS Measurement topic for more information.

Line Toolbar

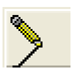


When you tap on an existing line or arc you will see the line toolbar appear near the bottom of your screen. The line toolbar contains functions that are frequently used on line or arcs in your project.
 Following is an explanation of what each button will do.



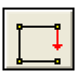
Convert Line to Spline

This will turn an existing figure that is comprised of straight lines into a curvy line.



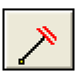
Draw Figure

Use this to draw a line between points or use it to continue an existing figure you've already started.



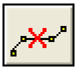
Close Figure

Use this to close a figure so it finishes at the same point it started at.



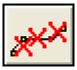
End Figure

Use this to mark a line as complete or finished.



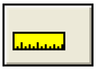
Delete Figure Segment

Use this to delete a segment from a figure.



Delete Entire Figure

Use the delete an entire figure.

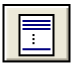


Tap Measure Tool

Use this to open the tape measure tool. This will force the tape measure tool to continue drawing a figure from the end of the figure you selected.

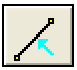
Zoom to Figure Extents

This will center your view on the current segment or arc you have selected.



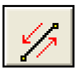
Open Figure List

Use this to display the Active Line List.



Set Figure Current

Use this to make the current line or arc current in the Active Line List.

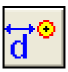


Reverse Figure Direction

Use this to switch the direction of a figure so you can append to the opposite end.

Stake Figure

Use this to open the stake line command and stake the current line you have selected.

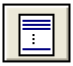


Station Offset

Use this to open the offset toolbar.

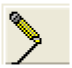
Point Toolbar

When you tap on an existing point in the drawing you will see the point toolbar appear near the bottom of your screen. The point toolbar contains functions that are frequently used on points in your project. Following is an explanation of what each button will do.



Points List

This will display the list of all points in your current project and you can sort the list by tapping on any of the column headings. When you find the point you want simply tap it and press the ok button.



Use this to draw a line between points or use it to continue an existing figure you've already started.

Create Point

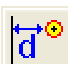
This will open the store and edit dialog and allow you to enter coordinates for a new point.

Edit Point

Use this to edit the coordinate value for the selected point.

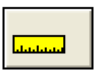
Delete Point

This will delete the selected point from the drawing and database. You will be asked to confirm that you want to delete the point.



Station Offset

This will open the offset toolbar. Pressing this will take you the station offset toolbar.



Tape Measure Tool

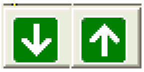
This will open the tape measure tool. This tool can help you draw a house foot print.

Zoom to Point

This button when pressed for the first time will force the point to be centered on the screen. Subsequently, if you keep pressing it, it will continue to zoom in on the point.

Stake Point

Pressing this will help you stake the point that is currently selected and take you to the Stake Points screen.



Select Point

Use these two buttons to scroll up and down numerically through the points in your database.

Point ID

This displays the point id of the point you've currently selected.

Point Chooser Toolbar

The point chooser is a mechanism that is called by routines requiring a point number entry. You access it by selecting the point chooser icon next to point number fields, or by double-tapping in an extended edit point number field.

When select it you will see the point chooser toolbar open up towards the bottom of your screen.

Point ID field

You can either type the Point ID into this field if you know what it is, or when you tap on a point in the map screen its point ID will be displayed here.

Quick Select checkbox

If Quick Select is turned on, then as soon as you tap on a point in the map screen you will be automatically returned to the routine you were selecting the point for. If Quick Select is turned off, then after you tap on a point in the map screen, the coordinate data of that point will be displayed, and you must press the Select button to get back to the previous routine.

Select button

Pressing this will take you and your selected point back to the routine you were selecting the point for.

List button

Use this to open a grid displaying all the points in your project database. From this list you can click on a point and when you press the OK button it will be inserted into the Point ID field.

New button

Use this to open the Store / Edit Points screen. This will enable you to create a new point.

Cancel button

Pressing this will take you back to the routine you were selecting the point for, without selecting the selected Point.

Point Staking Toolbar

The staking toolbar is used to help you navigate to your stake point. If you're using a robotic or conventional instrument the staking process will be similar.

The staking toolbar can be accessed by pressing the Stake Point button on the Stake Points screen. It will also be accessed from many other commands that require a point to be staked.

When you first see the staking toolbar you may see the words "No Data" which means you need to take a measurement first so it can calculate the current position of the rod. Press the measure button if you're using a conventional instrument, or turn on the cursor tracking button if you're using a robot.

"Move By" Distances

The top row contains two sections that display to you the distances and direction you need to travel to stake your point. You can set the orientation of your screen to help you navigate by changing the map orientation in the settings section of the toolbar.

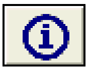
You should define a map orientation in the stake settings. Setting this will twist your map view to help you with your stakeout and change the way the "move by" distance are reported. You can define the map orientation by pressing the settings button as described below.

If your "move by" distances are within the tolerances defined in the stake settings, then you will see a green dot icon. If you are outside the tolerance, you will see a red dot icon. In the above example, we are within tolerances left-right, but still need to move out further.

You can toggle between the computed Cut/Fill values or the current rod Elevation by tapping on the Cut/Fill field.

Store Point

When this is pressed the Store / Edit Points screen will appear so you can store the position of the rod. The default is to store a point in the project database as well as write raw records to the raw file. You might not want to store a point for the staked position but want to have a record of it in the raw file. This can be done by turning off "Store Staked Point" in Stake Settings.

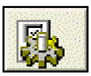


Stake Information

This displays information about the point you are staking. It will list the coordinates of the stake point plus other information that will help you during your stakeout.

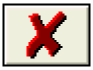
Zoom

This will automatically zoom to the extents of your current target position and the point you're staking.



Settings

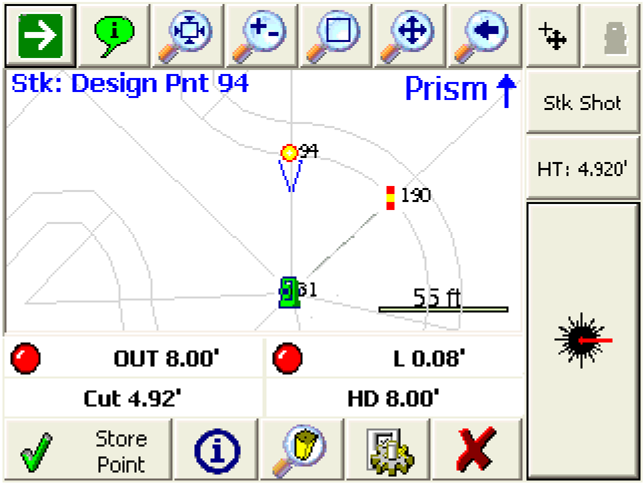
This will open the Staking Settings screen which allows you to setup parameters that will be used during the staking process.



Close

This will close the Staking Toolbar, and return you to the previous screen.

Staking Example



In this example you will see a typical FieldGenius point stakeout. You will always see a dashed line to the backsight, one to the prism and finally one from the prism to the stake point. On the stake point you will see am orange circle symbol and the current position of the rod will be represented by a triangle that always points back to the instrument.

You can see that because the map orientation is set to prism, from the instrument man's perspective, the rod person would have to move (Out) from the instrument 8.00' and to the left 0.08'.

Conventional Total Station Tips

If you're using a conventional total station you need to press the measure button on the instrument toolbar before the navigate distances are displayed.

To help with navigating, set your map orientation to Prism in the staking settings screen. This will force the map to orientate itself so the prism is at the top and the instrument is at the bottom.

You can review the angle you need to turn by scrolling to the bottom of the Results Toolbar.

Robotic Total Station Tips

If you're using a robotic instrument you need to turn on the cursor tracking button on the instrument toolbar before the navigate distances are displayed. Note that with a robotic instrument, there is no need to press the measure button as the cursor tracking provides real-time positions to the staking toolbar.

To help with navigating, set your map orientation to Instrument in the staking settings screen. This will force the map to orientate itself so the instrument is at the top and the prism is at the bottom.

You can set the EDM mode on the instrument toolbar to use a fine measurement setting that can be used to record the position of the point. When cursor tracking is on it uses a coarse mode which might not be suitable for the storing the stake location, but suitable enough to for navigation. For precise stakeout you can use the following procedure:

1. Use cursor tracking to navigate to your point.
2. When you attain the position to be staked you can do one of two things:
    a. If tracking mode is precise enough for your staking needs you can turn off cursor tracking, then press the Lock button to stop the instrument from tracking the prism. It is useful to do this as the instrument will still be pointed at the stake location and prevents the instrument from following the prism if you have to lay it down.
    b. If you need to take a more accurate position before marking the stake point, or pound in your stake. You can turn off cursor tracking, then press the measure button to help you locate the stake point. By doing this it will use the EDM mode set in the instrument toolbar (make certain it is set to a fine mode) instead of using the coarse (tracking) mode. Once the point is located, make sure to press the Lock button to stop the instrument from tracking the prism. It is useful to do this as the instrument will still be pointed at the stake location and prevents the instrument from following the prism if you have to lay it down.
3. Mark your point or pound in your stake.
4. Set the prism on the point you just marked and press the No Lock button which will initiate a search. Since you stopped the instrument from tracking in the previous step the instrument should lock onto the prism very quickly.

5. Press the Measure button to record one final position for the stake point.
6. Press the Store Point button on the staking toolbar to store the final location of the point you just staked.

Raw File

When you store your stake point several records are written to the raw file. Following is an example of a point that was staked out:

```
SP,PN1400,N 715346.319,E 2381454.812,EL1.009,--
CF,EL1.0087,GD1.0000
DE,PN342,N 715346.319,E 2381454.770,EL1.000,--
SD,ND-0.000,ED-0.042,LD-0.009
SK,OP251,FP1400,AR180.00000,ZE89.05000,SD63.0500,--
Design Point: 342
```

The SP record is the point that was recorded when you pressed the Store Point button.

The CF record displays the measured elevation versus design.

The DE record displays the design coordinates for the point to be staked.

The SD record displays the delta values of the staked point. This is the DE record - SP record.

The SK record is the recorded raw observation used to compute the store point (SP) record.

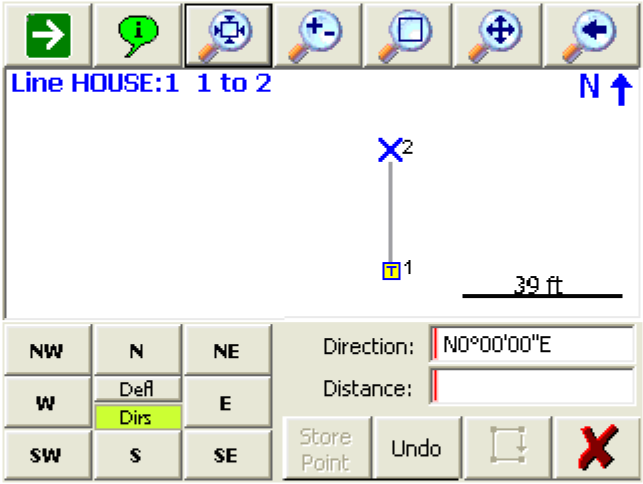
Note: If you turned off "Store Staked Point" in the stake settings, then no SP or CF record will be stored in the raw file.

Tape Measure Toolbar

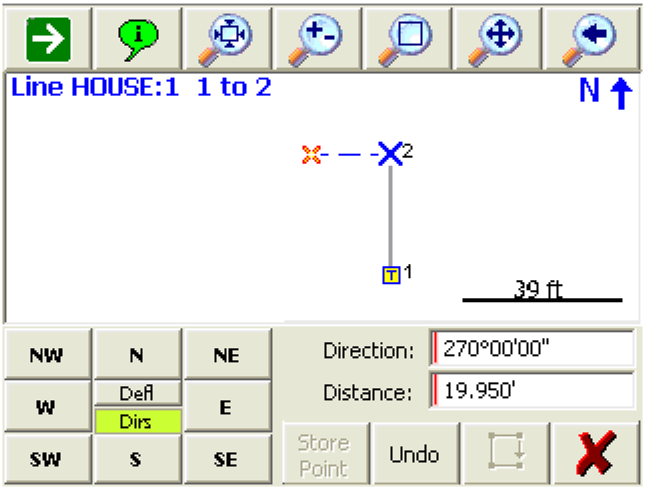
The tape measure tool is used to help you create figures in the field quickly and efficiently. This tool is especially handy when you want to measure up a house or building and plot points in FieldGenius using manually measured distances, or distances measured with a Leica Disto.

Using Cardinal Directions

To use the tape measure tool, all you need to do is tap on a point or a figure which will open either the point toolbar or the line toolbar. From there select the tape measure button to open the tape measure toolbar.



Now you simply select or enter the direction you want to travel and enter a distance. For example for the first line, the direction is westerly at a distance of 19.95'. As soon as you enter a direction and distance, a preview of the line will be displayed in the map. Simply press **Store Point** to accept it.



If you make a mistake you can use the **Undo** button to undo the points stored by the tape measure tool.

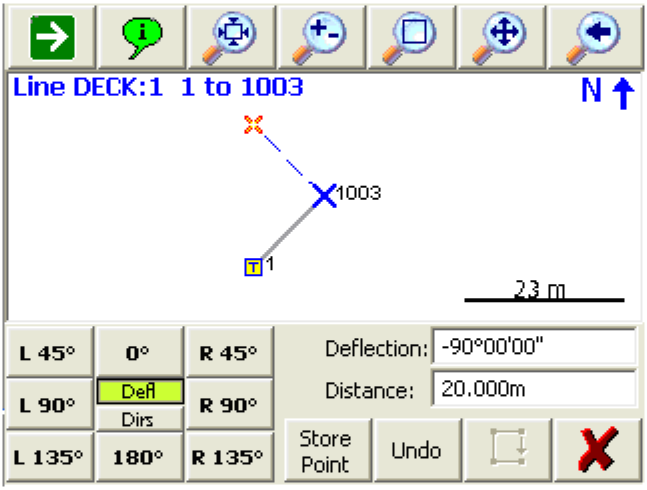
When you get to the last line, you can force it to close back to the staring point automatically by pressing the **Close Figure** button. You could then compare the measured distance to the one FieldGenius creates.

Using Deflection Angles

If your line is at an angle, you can use a different option to help you draw your object. In this example we will assume that the surveyor shot two front building corners for a house, and now he wants to draw points and lines to defined the walls. He also wants to do this by manually measuring the distances with a tape.

To use the tape measure tool, all you need to do is tap on the figure which will open the line toolbar. From there select the **Tape Measure** button to open the tape measure toolbar.

Now on this toolbar press **Defl** to switch the mode to Deflection Angles, this will now force your directions to be deflections.



You simply select or enter the direction you want to travel and enter a distance. For example for the first wall, the direction is north-westerly at a distance of 20m. If you imagine you were looking down the line between point 1 and 1003, you would have to turn a deflection left to head in a north-west direction. As soon as you enter a direction and distance, a preview of the line will be displayed in the map. Simply press **Store Point** to accept it.

If you make a mistake you can use the Undo button to undo the points stored by the tape measure tool.

When you get to the last wall, you can force it to close back to the staring point automatically by pressing the **Close Figure** button. You could then compare the measured distance to the one FieldGenius creates.

Using with a Leica Disto

If you are using a Leica Disto, you can control the directions using the arrow keys on the Disto, which will automatically set the corresponding directions in FieldGenius. After measuring the distance with the Disto, pressing the Bluetooth button on the Disto will send the measurement back to FieldGenius through the Bluetooth connection and it will appear briefly in the Distance field before the new point is automatically stored.

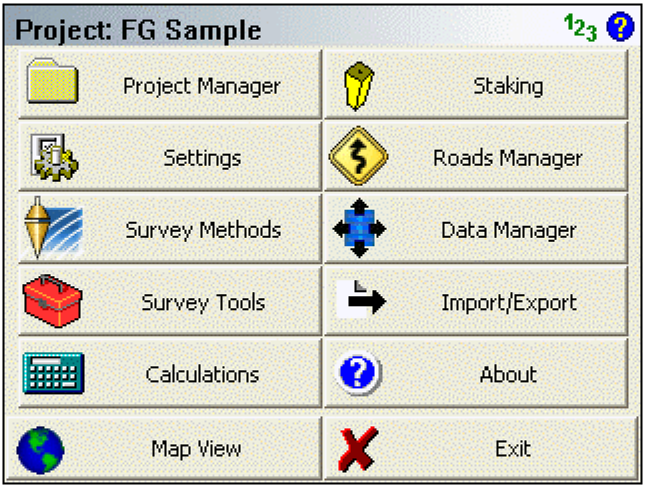
Procedure:

1. Select your starting point or line in FieldGenius and start the Tape Measure Tool as shown above.
2. Press the 2nd button on the Disto so that you see "2nd" displayed in the top-right corner of the screen, to enable selecting the arrow keys.
3. Press the arrow buttons to set the Deflection/Direction in FieldGenius. You will immediately see a dashed line projecting from the current point in that specified direction. Simply press another arrow key to change the direction if necessary.
4. Press the Dist button (on the Disto) to turn on the laser pointer and prepare for the measurement.
5. Press the Dist button (on the Disto) again to measure the distance. Be aware of whether your distance is being measured from the front or rear end of the Disto.
6. Press the Bluetooth button (on the Disto) to send the distance to FieldGenius and store the new point, or repeat steps 4 and 5 to re-shoot the distance if necessary.
7. Repeat steps 3-6 for each additional measurement.
8. At any time you can use the Undo button in FieldGenius if you need to back up.

MAIN MENU

Main Menu

On the main interface of FieldGenius you will see the FieldGenius **Start** icon which will always activate the main menu or display the previously viewed sub-menu. When the button is pressed you will see the main menu screen:



On the main menu, pressing any of the buttons will take you to its sub-menu.

From any sub-menu, pressing the **Menu Home** button will return you to this menu.

The **Map View** button will close the main menu and take you back to the map view.

The **Exit** button will close FieldGenius.

Project Manager

Selecting this will allow you to create, open or delete projects. Please see the Project Manager topic for more information.

Settings Menu

Select this to check or change settings for FieldGenius. Please see the Settings Menu topic for more information.

Survey Methods Menu

Select this to execute survey methods such as occupying a point, checking a point, or measuring an offset. Please see the Survey Methods Menu topic for more information.

Survey Tools Menu

Select this to execute survey tools such as manually storing new points, deleting the previously measured point, or viewing the raw file. Please see the Survey Tools Menu topic for more information.

Calculations Menu

Select this to use our calculating functions such as COGO and inversing. Please see the Calculations Menu topic for more information.

Staking Menu

Select this to access our staking functions. Please see the Staking Menu topic for more information.

Roads Manager Menu

Use this to access tools that will help you create or edit alignments, templates, and profiles. Please see the Roads Manager Menu topic for more information.

Data Manager Menu

Use this to manage your points, DXF files, and surfaces. Please see the Data Manager Menu topic for more information.

Import/Export Menu

Select this to import or export ASCII files, and to export DXF, XML, and other files. Please see the Import/Export Menu topic for more information.

Please note, additional file types can be imported from the Surfaces and the Map Data Layers commands, both located in the Data Manager menu.

About Menu

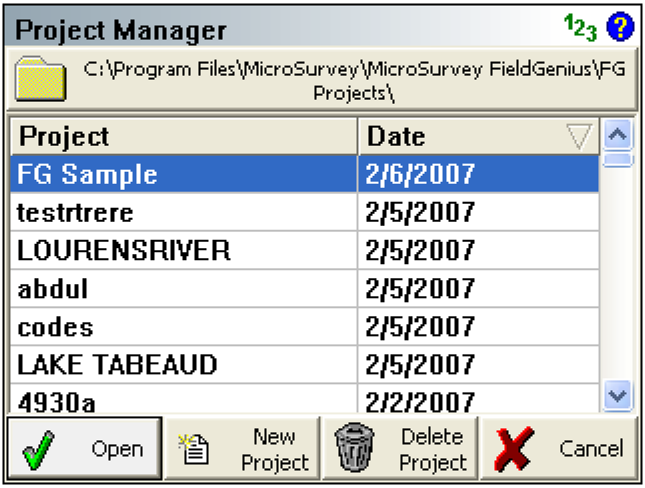
Select this to see what build and which modules you have registered for FieldGenius. Please see the About Menu topic for more information.

PROJECT MANAGER

Project Manager

Main Menu | Project Manager

The Project Manager is used to create, open, or delete projects currently residing in your data collector. When you start FieldGenius this is always the first screen you will see.



By default the project manager will display the contents of the ...\MicroSurvey FieldGenius\FG Projects\ directory, which is the default location for all new projects that you create. You can sort the list by project name or date by tapping on the column's header.

FG Projects Folder

Use this to specify a different project folder than the default. The default is**...\MicroSurvey FieldGenius\FG Projects**. Once you set the directory it is written to the msurvey.ini file so it is used for all subsequent projects.

Open Project

To open an existing project, simply select it in the list and press the **Open** button.

New Project

To create a new project, simply press the **New Project** button. You will then see the new project screen which will allow you to enter a name, choose your automap library and set the units for the project.

Delete Project

To delete a project you first need to select it in the list and then press the **Delete Project** button. You will be asked to confirm that you really want to delete the project.

> **Notes:**
> You can not delete the current project that is opened in FieldGenius.
> Projects that have been deleted can not be restored.

Exit

To exit from the project manager press the **Exit** button.

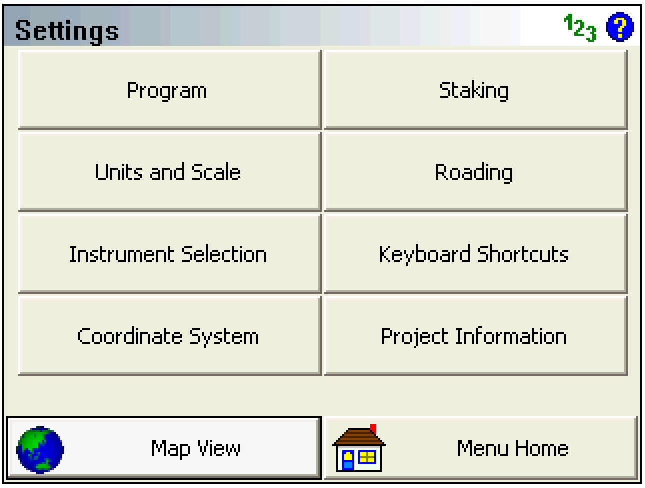
SETTINGS MENU

Settings Menu

Main Menu | Settings

The settings menu is used to setup and review settings that have been set for your current project. You can also specify default settings for new projects that are created.

Most of these settings are stored in a file named msurvey.ini which can be found in the ...\MicroSurvey FieldGenius\Programs\ directory. It is recommended that once you have defined your settings, that you make a backup of this msurvey.ini file.



Options

Use this to set or change settings that affect FieldGenius's functionality. Please see the Options topic for more information.

Units and Scale

Use this to set or change the units, bearings, distances and scale settings for your project. Please see the Units and Scale Settings topic for more information.

Instrument Selection

Use this to set the type of instrument or GPS unit that will be used with FieldGenius. If you're not connecting to a survey or GPS instrument you can specify that you would like to enter your measurements manually. Please see the Instrument Selection topic for more information.

Coordinate System

Use this to define the coordinate system for your project. Please see the Coordinate System Settings topic for more information.

Keyboard Shortcuts

Use this to define shortcuts to FieldGenius commands and assign them to your keys. Please see the Keyboard Shortcuts topic for more information.

Project Information

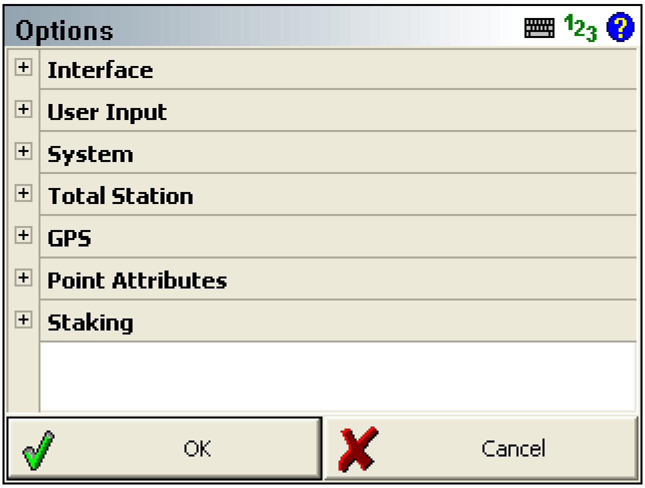
Use this to enter and save information about your project. Please see the Project Information topic for more information.

Options

Main Menu | Settings | Options

The options screen helps you set settings that affect the look and feel of FieldGenius.

Press the [+] buttons along the left to expand (show) each section, and the [-] buttons to collapse (hide) it.



Interface Options

Monochrome Optimized

Use this to specify whether the main interface should display in full color, or in a way more suitable to monochrome screens.

Enable Full Screen

Use this to run FieldGenius in a full-screen mode (PocketPC devices only). This is required for proper operation on newer devices running the Windows Mobile operating system that have a landscape display.

Map Color

Use this to force the background color for the main drawing area to be white or black

Map Orientation

Using this will force the map screen to be oriented to the north or south. This is needed for coordinate systems that are referenced south, such as in South Africa. This is different from South Azimuth directions, as used in Hawaii.

Map Resolution

This option determines the number of segments that will displayed in an arc on the screen. Reducing this number increases program speed; increasing this number slows down graphics display, but improves the quality of arcs and curvy lines displayed on the screen.

Text Size (Info/Grid)

Use this to force the text shown in the Information screens (such as the Results toolbar and the COGO History screen) and grid screens (such as the Project Manager and Angle Offset shots) to use a small or large sized text.

Show Scale Bar

Use this to turn the scale bar shown on the main map screen on or off.

User Input Options

Extended Edit Boxes

Use this to control how you want to bring up the selected keypad when tapping in an edit box: either with a single tap, a double tap, or off. Users of devices with a keyboard should leave this set to Double Click, and users of devices without a keyboard should set this to Single Click. Setting this to Off disables both the keypad and any other commands that may be started directly from the edit field, such as the Point Chooser or Inverse Tool, so that edit fields can only be used for typing values from your physical keypad.

Menu Shortcuts

This will enable menu shortcuts so if you have a keyboard device you can press letter and number keys to navigate around the program.

Instrument Toolbar

You can define if the instrument toolbar is located on either the Right or Left Side of your map screen.

Map Position Select

If this is turned on, tapping a blank part of the map screen will display the Map Toolbar.

Map Point Select

If this is turned on, then tapping on a point from the map screen will select it and open the Point Toolbar.

Map Line Select

If this is turned on, then tapping on a line from the map screen will select it and open the Line Toolbar.

SIP Type

Use this to specify which SIP keypad type you want to use, such as the full-screen MicroSurvey alphanumeric keypad, the small PocketPC qwerty keypad (PocketPC and Windows Mobile devices only), or the small MicroSurvey numeric keypad (PocketPC and Windows Mobile devices only).

System Options

Language Resource

This is used for multi-language support. If you have installed a non-English version of FieldGenius, then set this option to your Language Resource file, for example "ResESM.dll" for Spanish (Mexico).

Application Tips

When turned on, a "Tip of the Day" will be displayed when FieldGenius is started, and tooltips will be displayed when you hover over any button.

Communication Trace File

When turned on it will create a test file displaying information about the shot data going back and forth from FieldGenius and your instrument. It can be used to diagnose communication problems and should only be used in this situation. The text file will be named **tracets.txt** or

tracegps.txt and will be located in your ...\MicroSurvey FieldGenius\Programs\ directory on your device.

Total Station Options

Default Measure Mode

This specifies which measure mode FieldGenius will default to, either SideShot or SideShot (Auto).

Quick Measure Modes

When this is turned on, when you press the Measure button in routines such as the Horizontal Angle Offset or Resections screens, it will force the instrument to take a measurement instantly. If this is turned off, then pressing the Measure button will take you back to the map screen where you have to press the measure button on the instrument toolbar to take a measurement.

If you're using a robotic instrument you will probably want to keep this turned off.

Traverse Reciprocate

When this is turned on, you will be able to use the Reciprocate Traverse option on the Backsight Summary screen, when occupying a traversed point. This recalculates your setup point's position, based on an average of the traverse shot to the point being occupied and the backsight shot from the point being occupied. If this is turned off, then the Reciprocate Traverse option within the Occupy Point routine will be grayed out. For additional details, please refer to the Backsight Summary topic.

GPS Options

EP+ Records

When this is used the standard EP record type specified by the RW5 format will be slightly different. The main difference is that when turned on, the standard deviations for the X, Y, and Z components will be stored. Setting this to on is only required if you want to use FieldGenius with the OmniStar GPS service.

Auto Start Statistics

If this is turned on, during a measurement if the tolerances are met the store point screen will appear automatically. If this is off, then the user is required to press continue to get to the store point screen.

Auto Start Store

If this is turned on, the user will not see the store point screen. It is a fast way to store your GPS points and is useful when used in conjunction with the Auto Start Statistics option.

Point Attributes Options

Coordinate Order

Use this to control the display of coordinate values in FieldGenius. Options are NEH, ENH, XYZ and will affect any area of the program where coordinates are displayed. An important thing to note is that this only affects display of the coordinates, internally in the point database, or raw file we store information as N,E,Z.

Alpha-Numeric IDs

When this is enabled you will be allowed to enter alpha-numeric point IDs such as 21a, AB3, EV2. If this isn't turned on, then FieldGenius will not accept anything but integer numbers. Alpha numeric input of point IDs can contain up to 31 characters. **Note:** Alpha-Numeric ID's are only supported in the MicroSurvey CAD 2008 or newer desktop software. Previous versions of MicroSurvey CAD or inCAD do not support it.

Point ID Range - Minimum

Use this to force FieldGenius to limit the point numbers that are used to a specific range; here you would specify the minimum range value. If you try to use a point number that is less than this value, you will see a message that will ask you to select a different point number. **Note:** If you have the Alpha-Numeric IDs toggle turned on, then any values specified here are ignored.

Point ID Range - Maximum

Use this to force FieldGenius to limit the point numbers that are used to a specific range; here you would specify the maximum range value. If you try to use a point number that is greater than this value, you will see a message that will ask you to select a different point number. **Note:** If you have the Alpha-Numeric IDs toggle turned on, then any values specified here are ignored.

Alphanumeric Point ID's can have a maximum length of 31 characters.

New Description Prompt

This controls how FieldGenius deals with descriptions that don't match anything in your Automap library. If this is on, when you enter a description that isn't in the Automap library you will see a warning message asking you if you want to add it.

If it is off, any description that doesn't have a match in the Automap library will be automatically added to your project's Automap library.

Staking Options

Note: You can also access the staking options directly from the staking toolbar.

Tolerance

This is the error tolerance that the staking command will use. When your staking "move by" distances are equal to or less than this amount, a green circle will be displayed to notify you that you're meeting your tolerance; if you do not meet the tolerance, a red circle is displayed. For example if you set this tolerance to 0.03m, you will see in the example below that my Left or Right distance meets the tolerance, so you see a green circle. Whereas you still need to move out by 0.039m which is greater than the tolerance, so you will see a red circle.

: When you see this it indicates that your current rod position is within the staking tolerance you have defined in the stake settings.

: When you see this it indicates that your current rod position is not within the staking tolerance you have defined in the stake settings.

Orientation Reference

Orientation Reference = North

With the North orientation, North is the reference direction. The "move by" distances are standard cardinal directions.

North: This is the distance you need to move North.

South: This is the distance you need to move South.

East: This is the distance you need to move East.

West: This is the distance you need to move West.

Cut: This is the amount you have to go down from the current rod position to the stake point's elevation.

Fill: This is the amount you have to go up from the current rod position to the stake point's elevation.

Orientation Reference = Instrument

With the staking reference set to Instrument the map view will be twisted so the instrument is centered towards the top of your screen. The "move by" distances are with respect to the rod position looking towards the instrument. This view is useful when using a robotic instrument.

In: This is the distance you need to move towards the instrument.

Out: This is the distance you need to move away from the instrument.

Right: Facing the instrument, move right by this amount.

Left: Facing the instrument, move left by this amount.

Cut: This is the amount you have to go down from the current rod position to the stake point's elevation.

Fill: This is the amount you have to go up from the current rod position to the stake point's elevation.

Orientation Reference = Prism

With the staking reference set to Prism the map view will be twisted so the prism is centered towards the top of your screen. The "move by" distances are with respect to the instrument man looking at the prism. This view is handy when using a non-robotic instrument.

In: This is the distance you need to move towards the instrument.

Out: This is the distance you need to move away from the instrument.

Right: Facing the prism, move right by this amount.

Left: Facing the prism, move left by this amount.

Cut: This is the amount you have to go down from the current rod position to the stake point's elevation.

Fill: This is the amount you have to go up from the current rod position to the stake point's elevation.

Orientation Reference = User Point

With the User Point orientation, you can use an existing point in your project as the reference. The view will be twisted so that the selected point is centered towards the top of your screen.

In: This is the distance you need to move towards your user reference point.

Out: This is the distance you need to move away from your user reference point.

Right: Facing your user reference point, move right by this amount.

Left: Facing your user reference point, move left by this amount.

Cut: This is the amount you have to go down from the current rod position to the stake point's elevation.

Fill: This is the amount you have to go up from the current rod position to the stake point's elevation.

Orientation Reference = Line

When staking lines with the Line orientation, you will be directed towards the line you are staking.

In:

Out:

Right:

Left:

Cut: This is the amount you have to go down from the current rod position to the stake line's interpolated elevation.

Fill: This is the amount you have to go up from the current rod position to the stake line's interpolated elevation.

User Point

If you are using the "User Point" Orientation Reference (see above) then use this to specify which point ID you want to use for the reference point. If you are not using the "User Point" orientation then this does not have any effect.

Store Staked Points

By default this is checked. What will happen is when you store a staked position using the store button on the stake toolbar you will be prompted with a screen allowing you to assign a point number and description to the new point that will be created.

The point description will default to the current description from the Automap Library, as shown on your topo toolbar. If you choose a different description from the library, then it will be retained for all consecutive stakeout points.

Furthermore, when this feature is turned on it will use the value in the Add Id field to determine the point number for the recorded staked position. For example if you staked point 19 and you have an Attached User Id = 1000, then FieldGenius will automatically use 1019 as a point number. This can be changed by the user.

Attached User ID

Use this to add a value to the point number you're currently staking. For example if the point your staking is point 8, and this field is set to 1000. In the raw file it will show that you staked point 1008 and will also store the staked position as point 1008 in the project database.

Turn Instrument Mode

If you have a motorized instrument, including robotics, you can control how FieldGenius turns the instrument during stakeouts. If you want FieldGenius to compute the horizontal and vertical angle needed to stake your point, use the **3D (HA + VA)** option. If all you want is the horizontal angle to be turned, and the vertical left alone, select the **2D (HA)** option.

Line Mode

Use this to control how your navigation distances are computed and displayed when staking a Line.

In Auto mode, FieldGenius will automatically determine if it should display in/out or left/right offsets to the line. Auto mode will display in/out distances if the line of sight intersects the line equal or greater than 45° (In/Out); if it is less than 45° then FieldGenius will display (Left/Right) offsets to the line.

You can force FieldGenius to always display In/Out distances to the line by setting it to In/Out.

Use Left/Right to always see the Left/Right offset to the line.

If you're staking an arc, FieldGenius will always display in/out offsets no matter what line mode setting FieldGenius is set to.

Robotic Staking

If you're using a robotic instrument and this is turned on, if you stake a point FieldGenius will go into a dynamic staking mode. Using this mode will not force the instrument to turn to the stake point. It will go into a tracking mode and will dynamically tell you how far you're away from the stake point.

Cut and Fill Slopes

Use this to specify your cut and fill slopes when you're slope staking. The fill slope value will be used when the hinge point is higher than the calculated catch point and this will occur in areas that require a fill. The cut slope will be used when the hinge point falls below the calculated catch point. This will occur in areas that require a cut.

A Cut of 2:1 means you would have a cut of 1 unit for every 2 units traveled horizontally.

DTM Staking Name

Use this to select a surface that will be used to compute a new z value for the design point. When you select a surface you need to have the Stake to DTM toggle checked. **Once this is turned on, the elevation for any point you stake will be computed using this surface. In other words, if you're doing point staking and the point has a design elevation, it will be ignored. The stake point's N & E will be used to intersect a point on the surface and that elevation will be used to stake the point.**

Roading Options

Stationing Format

You can specify the format for your stations and specify if the alignment should force all components to be tangential.

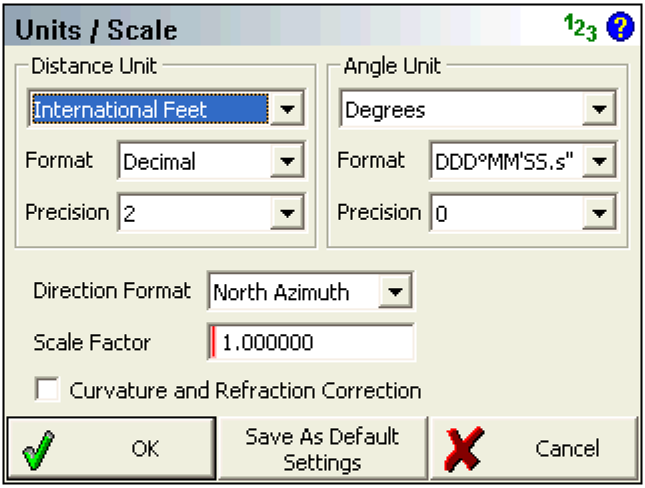
Calculate Directions

The default is to **not** force imported alignment files to be tangential. **You will usually want to keep this turned off.**

Units and Scale

Main Menu | Settings | Units and Scale

The units and scale menu allows you to specify settings for your project. Some of these settings are recorded in the raw file and the project's ini file, as well as recorded in the msurvey.ini file.



You can also set these settings as defaults for new projects by pressing the **Save as Default Settings** button.

Note: the actual precision on distances and angles returned from your instrument may be limited to less than the precision you select here. Selecting a higher precision here will not increase the precision of values queried from your instrument.

Distance Unit

Choose the distance unit that you will be using: Meters, International Feet, or US Survey Feet. All distance values written into the raw file will be recorded in the selected format. All distances will be recorded to the raw file in decimal format. Database coordinates are always stored with 6 decimal places, and rounded to the desired precision for display.

Meters

If you choose Meters as your distance unit, you can also specify the number of decimal places to display within FieldGenius, from 0 to 6.

International Feet / US Survey Feet

If you choose International Feet or US Survey Feet, then you can specify to use either a decimal format with a precision from 0 to 6, or a Fractional format.

If you use the decimal format, distances will be displayed in decimal feet, such as 10.5' to indicate 10.5 feet or 10feet-6inches.

If you use the fractional format, distances will be displayed in feet and fractional inches, such as 10'6 1/2" to indicate 10feet-6.5inches or 10.54166667 feet.

Angle Unit

Choose the angular unit that you will be using: Degrees, Gons/Gradients, or Radians. All angular values written into the raw file will be recorded in the selected format.

Degrees

If you select Degrees, then you can also select which format to use, either DDD°MM'SS.s" for degrees-minutes-decimal seconds, DDD°MM.m' for degrees-decimal minutes, or DDD.d° for decimal degrees. You can also specify the number of decimal places to use, from 0 to 8.

Gons (Gradients)

If you select Gons (Gradients) then you can also specify the number of decimal places to use, from 0 to 8.

Radians

If you select Radians then you can also specify the number of decimal places to use, from 0 to 8.

Direction Format

Choose the direction format that you will be using: North Azimuth, South Azimuth, or Bearings. When entering a direction, you can always override this setting by entering the angle with the cardinal quadrant indicated before or after the angle. If there is no quadrant specified, then the input angle will be interpreted as an Azimuth.

Scale Factor

You can use a scale factor to adjust ground distances to grid distances.

Distances measured with a total station will be recorded in the raw file with the unscaled, true measured slope distance. This scale factor is applied to the computation of coordinates only.

Distances entered using the Traverse/Intersect tool (COGO) will be scaled by the scale factor.

Distances calculated using the Inverse tool, or recalled using the pt..pt format will be scaled by the inverse of this scale factor. The result will be the inversed grid distance times the inverse of the scale factor, so that the ground distance is returned.

This Scale Factor does not affect any GPS measurements. Please see the GPS Local Transformation topic for information on using a GPS Scale Factor.

Curvature and Refraction Correction

When selected, the correction is applied to the computation of drawing coordinates only. Raw data will not be altered in any way. When available from your instrument, we recommend the use of that option and leave this setting toggled OFF in FieldGenius. Note: Be careful to not have this setting toggled ON in both your instrument AND FieldGenius.

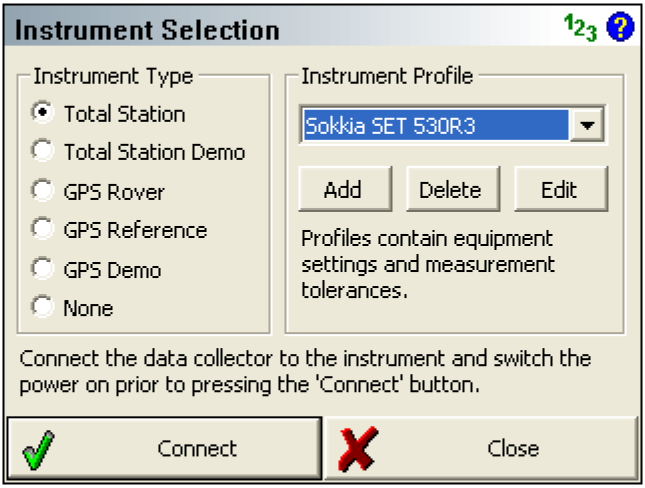
Save As Default Settings

Use this to permanently write the units and scale settings to the msurvey.ini file. When you create a new project, it will use these settings.

Instrument Selection

Main Menu | Settings | Instrument Selection

The Instrument Selection screen allows you to choose the type of equipment you will be connecting to FieldGenius. An Instrument Profile can be created for each different instrument you will be working with, to make changing between different hardware a breeze. Once you have setup a profile for each different instrument you will be using, switching between them is a simple matter of selecting the appropriate profile and pressing **Connect**.



For all future projects you create with FieldGenius, when you create a new or open an existing project you will see the Instrument Selection screen with the profiles you have already created. It will default to the last Profile you used, so if you are using the same instrument just press Connect. If you are using different equipment, just select the appropriate Instrument Type and Profile (or add a new profile if one does not yet exist for it), then press **Connect**.

Total Station

When you select Total Station mode, you will be able to Add, Delete, or Edit a profile to setup parameters for connecting to your conventional and robotic total stations, as well as laser devices. See the Total Station Configuration topic for more details about configuration for your total station.

Your Total Station profiles are stored in the file ...\MicroSurvey FieldGenius\Programs\msurvey.ini so once you have set up the total station profiles on one data collector, you can simply copy this file onto your other data collectors to make the profiles available on them.

For more information on connecting to your instrument please refer to the Conventional Total Station and Robotic Total Station topics.

Total Station Demo

If you choose this you will have to manually enter your shots. Manually entered shots are recorded in the raw file and points are computed based on the values you enter. A profile is not needed for this mode, just press Connect to begin using the Total Station Demo mode.

GPS Rover / GPS Reference

When you set it to GPS Rover or GPS Reference you will be able to Add, Delete, or Edit a profile for your rover or reference receiver. When you edit a GPS Rover or GPS Reference profile, you will see the Configure Rover or Configure Reference screens. For more information about using FieldGenius for GPS surveying, you should review the Starting GPS topic.

Your GPS Rover and GPS Reference profiles are stored in the file ...\MicroSurvey FieldGenius\Programs\GPSPROF4.DBF so once you have set up the profiles on one data collector, you can simply copy this file onto your other data collectors to make the profiles available on them.

If you have not purchased the GPS module for FieldGenius, then you will not have access to the GPS commands and you will see a "Requires GPS module license" message.

GPS Demo

When you set it to GPS Demo you will be able to Edit and Connect to a profile for a simulated rover receiver. When you edit the RTK Demo profile, you will see the Configure Rover screen. Feel free to play with the Tolerance Mode settings, but please do not change the Model and Communications settings. For more information about using FieldGenius for GPS surveying, you should review the Starting GPS topic.

The GPS Demo will simulate connecting FieldGenius to a GPS Rover receiver. The coordinates in the GPS Demo are located outside our office in Westbank, British Columbia, Canada, so to use the GPS Demo mode you need to set your Coordinate System Settings to UTM Zones, NAD83, UTM83-11, Ellipsoidal.

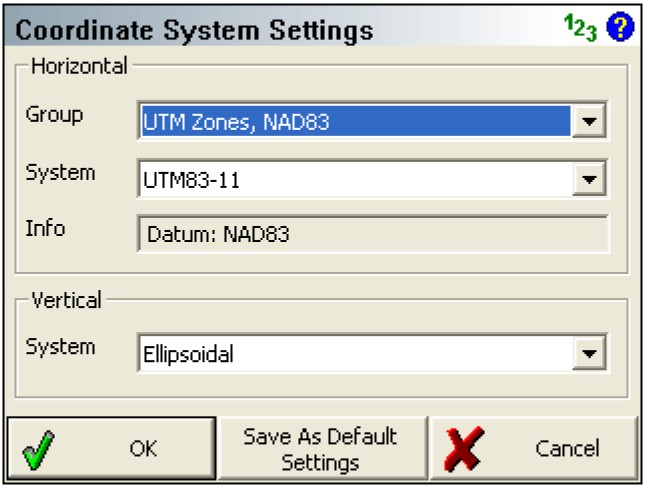
None

Use this option if you're not connecting anything to FieldGenius and also don't need to manually enter any shot information. With this mode, the instrument toolbar will not be displayed in the map screen.

Coordinate System Settings

Main Menu | Settings | Coordinate System

The datum settings are used to transform GPS derived curvilinear coordinates (latitude, longitude and ellipsoidal height) into Cartesian coordinates (northing, easting, and orthometric height) for presentation on the drawing window and data storage.



Simply select the appropriate Horizontal and Vertical systems for your area or project.

Further coordinate transformations can be accomplished with the use of the Local Transformation function of FieldGenius. For localizing on a user defined coordinate system, see the GPS Site Calibration section below.

These settings are stored in your project's .ini file, allowing you to easily use different coordinate systems for different projects.

Many of the horizontal datums and vertical geoid models require the use of "grid" files for coordinate computations. A desktop application has been provided with FieldGenius to extract user defined areas from the original files to create smaller more manageable files for the data collector.

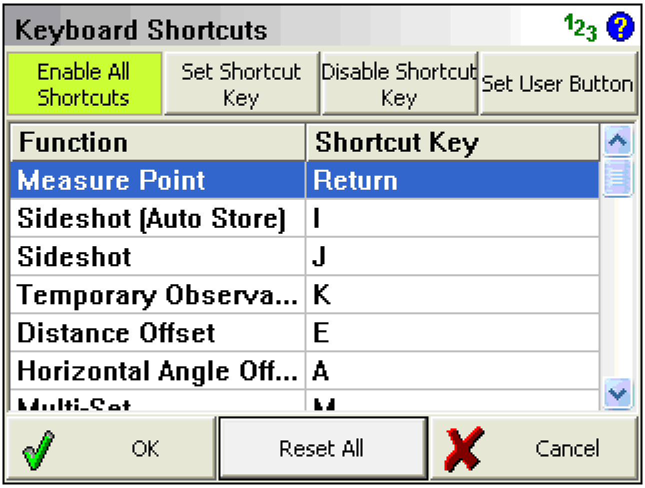
See the topic on Datum Grid Editor for more information.

Keyboard Shortcuts

Main Menu | Settings | Keyboard Shortcuts

You can now assign command shortcuts to keys on your data collector. This has been added to support our new keyboard layout on the newer Trackers but it also works with any device that has a keyboard.

The defaults for the shortcut keys are based on the MicroSurvey Tracker keyboard layout, but you can assign any key you want to the list of available commands. The shortcut definitions are stored in the msurvey.ini file so they're portable to your other data collectors if you've defined a custom layout.



Another great feature is that the EDM mode for the current instrument you have selected can have shortcut keys assigned to them. For example if you refer to the list above, you would press the 1 key to set your EDM mode on the instrument to IR Standard.

The shortcut keys will only function from the map screen.

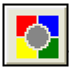
Set Shortcut Key

Use this to assign a command to a key on your keyboard. Highlight the command you want to modify, press the **Set Shortcut Key button**, then press the button on your keyboard to map the command to it. You new key map will automatically be saved to the msurvey.ini file.

Disable Shortcut Key

Use this to disable individual shortcuts.

Set User Button

Use this to set the currently selected command to the User Button found on the main interface. The command currently set with the user button is indicated in the Function list with the same icon.

Reset All

This resets all the shortcuts to the factory defaults and all customized settings will be lost.

Disable All Shortcuts

This is a toggle that controls if the shortcut keys are disabled or enabled.

Default Shortcut Keys

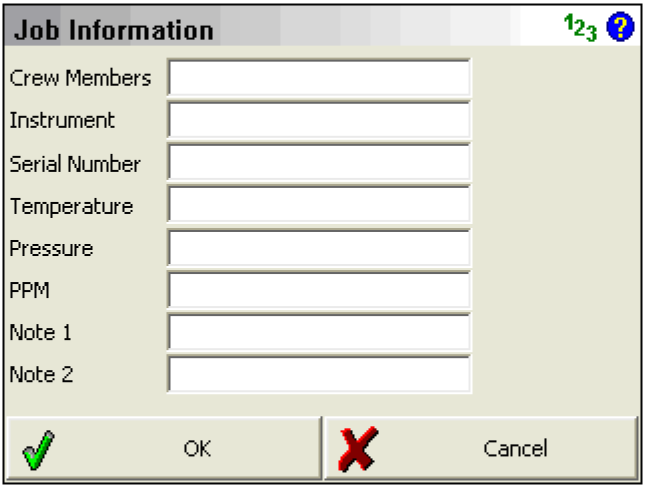
Function	Shortcut Key
Measure Point	Enter
Sideshot (Auto Store)	I
Sideshot	J
Temporary Observation	K
Distance offset	E
Horizontal Angle Offset	A
Multi-Set	M
Resection	R
Set Target Heights	T
Occupy Point	O
Check Backsight	N
Check Point	Q
Stake Points	S
Staking List	Z
Inverse	B

Traverse / Intersect	C
Station / Offset	Y
Calculator	F
Automap Library	D
Figure List	L
Toggle GPS Coordinates	G
Store Points	W
Delete Last Saved Point	Disabled
Point Databse	P
Add Comment	X
Raw File Viewer	U
COGO History	V
Menu Home	H
Map Data Layers	Backspace
SIP Enable/Disable	Disabled
EDM Mode 1	1
EDM Mode 2	2
EDM Mode 3	Disabled
EDM Mode 4	Disabled
EDM Mode 5	Disabled
EDM Mode 6	Disabled
EDM Mode 7	Disabled
EDM Mode 8	Disabled

Prism Search	Disabled
Prism Track	Disabled
Prism ATR	Disabled
Laser Pointer	Disabled
Guide Lights	Disabled
Robot Joystick	Disabled

Project Information

Main Menu | Settings | Project Information



Use this option to record job information about your project.

Tap **OK** to save your information to the raw file, or Cancel to exit without saving your changes. Each entry field can accept up to 21 characters.

This screen can also be accessed by pressing the "Modify Project Information" button located on the Project Review screen.

Save as Default Settings

In the Units and Scale screen, when you press the **Save As Default Settings** button it will write the current parameters that you have specified and write them to the ...\MicroSurvey FieldGenius\Programs\msurvey.ini file. The next time you start FieldGenius, it will load the settings you saved in this file automatically.

Items that will be saved are:

- Distance units
- Angle units
- Direction Format
- Scale Factor
- Correct for Curvature/Refraction

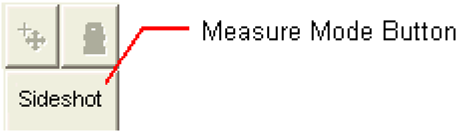
SURVEY METHODS MENU

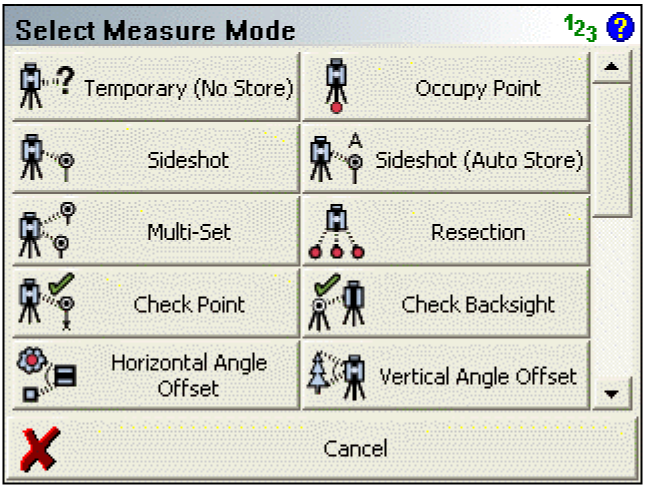
Survey Methods Menu

Main Menu | Survey Methods

Survey Methods are commands built into FieldGenius that will help you measure and map your points. Survey Methods need to be selected before you begin a measurement.

For a faster way to get to the Survey Methods screen, you can also press the measure mode button which is located on the instrument toolbar.





Use the Scroll Bar along the side to access additional measurement modes.

Note: Several of these modes will not be available until you have setup an occupy point and measured a backsight via the Occupy Point, Multi-Set, or Resection commands. Most of these modes will also not be available if you are using GPS.

Temporary (No Store)

This will allow you to take a measurement without storing it. Please see the Temporary (No Store) topic for more information.

Occupy Point

Use this to define an instrument setup. Please see the Occupy Point topic for more information.

Sideshot

This mode allows you to measure a point. After the measurement, it will allow you to review your measurement data and allow you to make changes to the point id and description before it is stored. Please see the Sideshot topic for more information.

Sideshot (Auto Store)

This mode allows you to measure a point, and FieldGenius will use the next available point, description and line toggles specified on the main map screen. Using this is a very fast method for recording your measurements. Please see the Sideshot (Auto Store) topic for more information.

Multi-Set

This will start the multi-set routine that will help you collect repeat observations to your backsight and a new foresight point. Please see the Multi-Set topic for more information.

Resection

This will start the multiple point resection routine to allow you to determine your current instrument position by measuring to known points. Please see the Resection topic for more information.

Check Point

Use this to display a check measurement to an existing point in your project. Please see the Check Shot topic for more information.

Check Backsight

Use this to compare your backsight to your previously measured values. Please see the Check Backsight topic for more information.

Horizontal Angle Offset

This will start the angle offset routine. Please see the Horizontal Angle Offset topic for more information.

Vertical Angle Offset

This will allow you to compute the height of an object. Please see the Vertical Angle Offset topic for more information.

Distance Offset

This will start the distance offset routine. Please see the Distance Offset topic for more information.

Manual Distance

This will record a HA and VA for a shot, but the user can manually enter the distance. Please see the Manual Distance topic for more information.

Manual Entry

This will allow you to manually enter in a shot including HA, VA and SD. Please see the Manual Entry topic for more information

Two Line Intersection

This allows you to measure two baselines and FieldGenius will compute the intersection point. Please see the Two Line Intersection topic for more information.

Line - Angle Offset

This allows you to measure two points to define a baseline, measure an angle, and FieldGenius will compute the intersection point. Please see the Line - Angle Offset topic for more information.

Line - Distance Offset

This allows you to measure two points to define a baseline, then manually enter measured distances. These distances will be used to compute a new point based on the baseline. Please see the Line - Distance Offset topic for more information.

Line - Perpendicular Point

This allows you to measure two points to define a baseline, then you can select an existing point which will be used to compute a perpendicular intersection. Please see the Line - Perpendicular Point topic for more information.

Trilateration

This will allow you to compute new points by observing their distances from two known existing points. Please see the Trilateration topic for more information.

Observe Benchmark

Use this to check your current setup elevation, or compute a new one based on a known elevation. Please see the Measure Benchmark topic for more information.

Add Invert

Use this to open the invert toolbar. You will then be able to record invert measurements. Please see the Add Invert topic for more information.

Vertical Plane Projection

This will allow you to compute points on a user defined vertical plane. Please see the Vertical Plane Projection topic for more information.

Point Scanning

Use this to activate Point Scanning with your motorized reflectorless instrument. Please see the Point Scanning topic for more information.

Temporary (No Store)

Main Menu | Survey Methods | Temporary (No Store)

The temporary mode will allow you to take a measurement with your instrument without establishing a setup. It also doesn't require you to store a point. It is the same as pressing the measure button on the instrument where all it does is report back to you the HA, ZA, SD, HD and VD.

When in this mode you will see the word **Temp** on the measure mode button.

No Setup Established

If you haven't established a setup and you use the temp mode, when you press the measure button you will see the results of your shot in the results toolbar as shown below.

Setup Established

If you have an instrument setup established when you use the temp mode and press the measure button you will see the measurement information as well as calculated coordinates in the results toolbar. The coordinates will be based on the current setup and the reading from the temporary shot.

Note:
When measuring in temp mode, nothing will be recorded in the RAW file.

Occupy Point

Main Menu | Survey Methods | Occupy Point

Use this command to specify the instrument location and orientation. You will be asked to specify the point your instrument is occupying, an instrument height and if you will be assuming a backsight direction or sighting an exiting point. After you have established your setup and backsight, FieldGenius will graphically show you your setup points.

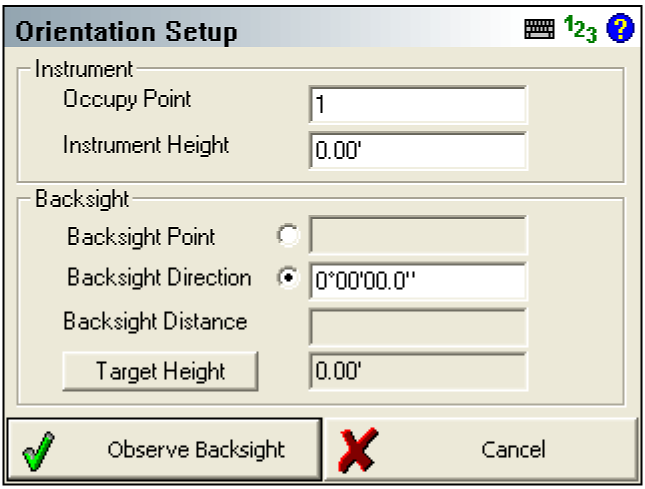
 Occupied Point Location

 Backsight Point Location

Backsight Method: Direction

With the backsight method set to Direction you will be able to specify the point you want to setup on and specify a backsight direction.

When you go to measure you have the option of recording an angle and distance to the backsight, or the option of just recording an angle. If a distance is measured to the backsight you will have the option of storing a point for the backsight after you press the measure button.



Occupy Point

Type in an existing point number, or double tap in this field to open the keypad or to select a point from the map. You will be able to create a new point, pick one from a list, or pick one from your drawing.

Instrument Height

Use this to enter your current instrument height.

Backsight Direction

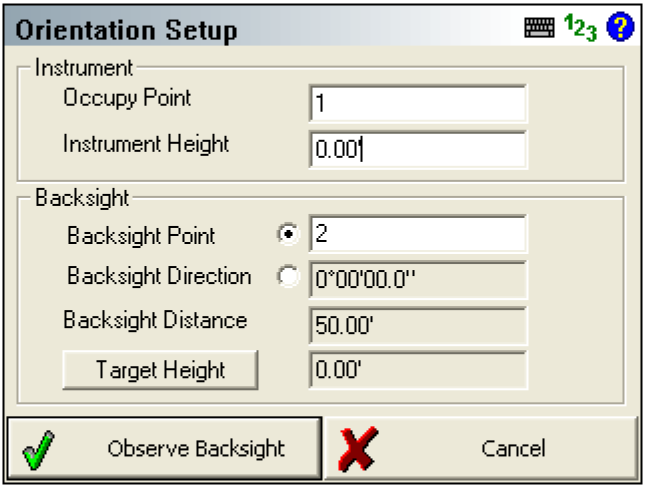
Use this to specify the direction that will be used by FieldGenius. You can enter an azimuth or a quadrant bearing.

Target Height

Use this to enter your current target height.

Backsight Method: Point

Use this method to specify the points that will be used for the current instrument location and backsight.



Occupy Point

Type in an existing point number, or double tap in this field to open the keypad or to select a point from the map. You will be able to create a new point, pick one from a list, or pick one from your drawing.

Instrument Height

Use this to enter your current instrument height.

Backsight Point

Type in an existing point number, or double tap in this field to open the keypad or to select a point from the map. You will be able to create a new point, pick one from a list, or pick one from your drawing.

Backsight Direction & Distance

When you enter in your points FieldGenius will display the inversed horizontal distance and direction between the points you entered.

Target Height

Use this to enter your current target height.

Measuring to the Backsight

Once you've established the backsight method, entered your points and instrument height you can move on to the next step by pressing the **Observe Backsight** button. You will be taken back to the map view where you will see the graphical position of your setup and backsight points. There are a few things you should take note of:

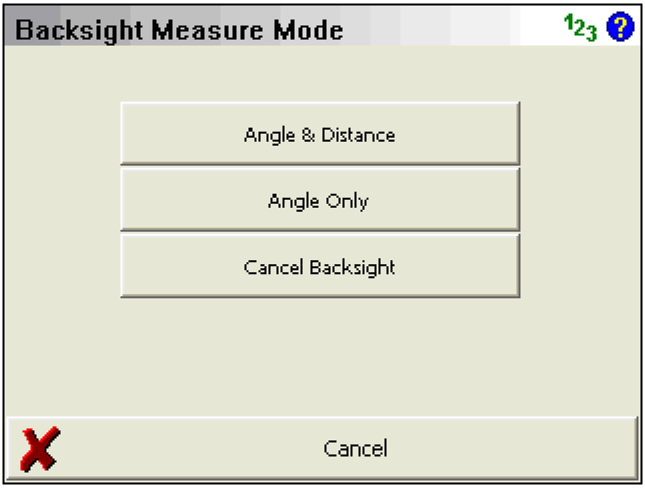
1. You can always tell what mode you're in by the "mode" text that appears near the top of your drawing. Since you're using the occupy point command you will see "Observe Backsight" near the top of the map area.
2. You have two measure modes available to you on the instrument toolbar. You can measure an angle and distance to the backsight, or measure only your current plate reading without measuring a distance. The two options are described in more detail in the Backsight Measure Mode topic.
3. You can cancel the setup by pressing the measure mode button and choosing "Cancel Backsight"
4. While in the backsight mode, you can use any of the controls from the information and display toolbar.
5. You can set the height of target by using the HT button on the instrument toolbar.
6. When you're ready to measure to the backsight, press the Measure button on the instrument toolbar.

Backsight Summary

After you have taken your measurement you will see a summary of your shot. From this screen you can choose to accept the shot or re-shoot it. You can also specify if you want the plate reading set to zero or a specific azimuth (if this is supported on your instrument). For more information see the Backsight Summary topic.

Backsight Measure Modes

Instrument Toolbar | Measurement Modes Button



When shooting to your backsight you have two options available and they can be accessed from the instrument toolbar using the measure mode button. The measure modes available are described as follows:

Angle and Distance

Specifying this will require you to measure a distance to the backsight either to a prism or reflectorlessly. It will also record the current plate reading on the instrument. Both the measure distance and plate reading will be used as the backsight reading in the raw file.

Angle Only

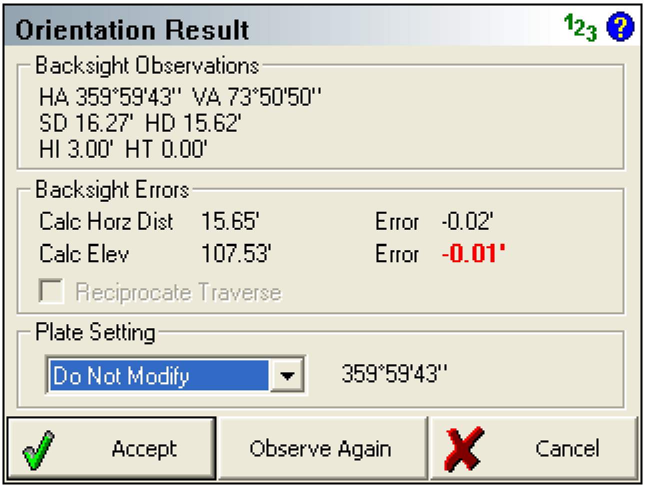
Specifying this will not require you to measure a distance to the backsight. All that will be recorded is the current plate reading on the instrument and this reading will be used as the backsight reading in the raw file.

Cancel Backsight

Use this to cancel your current backsight and occupy point command.

Backsight Summary

After you have taken your measurement you will see a summary of your shot. From this screen you can choose to accept the shot or re-shoot it. You can also specify if you want the plate reading set to zero or a specific azimuth.



Backsight Observations and Errors

If you specified the point backsight method you will see a comparison between what you measured and the theoretical inverse. If you used the measure angle only mode, or defined a backsight direction you will not see a comparison as there isn't enough information available to compute the inverse.

Reciprocate Traverse

This option can only be used if the point being occupied was previously measured and stored as a TR shot. If it was stored as a SS shot then this will be grayed out. This option will also be grayed out if the "Traverse Reciprocate" option in the Program Settings is unchecked.

If this option is turned on then when you measure the backsight, FieldGenius will compute a new elevation for the point being occupied, based on:

1. The measured elevation of the occupy point, based on its previously recorded TR traverse measurement.
2. The computed elevation of the occupy point, based on the backsight observation and the elevation of the backsight point.

These two elevations for the occupy point are averaged together, and a new traverse observation is computed for the occupy point, which will result in the occupy point having this new averaged elevation. This computed observation is written to the raw file as a new TR record, overriding the previous TR record to the occupy point.

Plate Setting

If your instrument supports uploading of angles, the Set To Direction and Set To Zero options will be available to you. If it doesn't support this then these options will be grayed out. These functions can be used to help you set your backsight plate angles on your instrument.

Do Not Modify

With this option selected, the plate reading on the instrument will not be modified by FieldGenius. You will see the current plate reading displayed beside the pull-down list.

Set To Direction

If your instrument supports uploading of angles, the Set To Direction option will be available to you. If it doesn't support this it will be grayed out. Beside the pull-down list you will see the direction field which will contain a value based on two factors:

1. If you specified a points for the occupy and backsight points, you will see the computed (inversed) direction.
2. If you specified a setup point and a direction to the backsight, you will see the direction that you previously entered.

When you press the **Accept** button, FieldGenius will upload the angle to your instrument and set it as the current plate reading. When you Accept the setup, this value will be used as the backsight plate reading in the raw file.

Set To Zero

If your instrument supports uploading of angles, the Set To Zero option will be available to you. If it doesn't support this it will be grayed out. You will see a direction value of zero displayed beside the pull-down list.

When you press the **Accept** button, FieldGenius will upload and set your circle plate reading to zero. When you Accept the setup, this value will be used as the backsight plate reading in the raw file.

Finishing the Setup Routine

Accept

Once you've reviewed your backsight information you can complete it by pressing the **Accept** button. This will write a record to the raw file and exit the setup routine.

If you specified the direction backsight method you will be prompted to "Store the point observed at the backsight?" Press **Yes** to store a point for the backsight, or **No** to complete the setup without creating a new point at the backsight.

Observe Again

If you're not satisfied with the results or made a mistake you can re-shoot the backsight by using this button. Doing so will take you back to the main display where you can take another shot on the backsight.

Occupy Point Raw Records

When you accept your occupy point, points will be stored in the database for the setup and backsight if applicable. Also, the following records will be written to the raw file:

```
SP,PN2,N 918.0848,E 1057.3576,EL0.0000,--
--Orientation
LS,HI5.000,HR5.000
OC,OP1,N 1000.0000,E 1000.0000,EL0.0000,--
BK,OP1,BP2,BS145.00000,BC0.00000
BR,OP1,BP2,AR145.00000,ZE90.00000,SD100.00000
-- Orientation Notes (several comment lines)
```

If the "Reciprocate Traverse" option was used, then the following records will be written to the raw file:

```
TR,OP1,FP3,AR45.00000,ZE90.00000,SD100.00000,--
 (Note: this is the previously measured record, not
part of the occupy routine)
--Reciprocate Traverse
LS,HI5.000,HR5.000
BK,OP1,BP2,BS0.00000,BC0.00000
TR,OP1,FP3,AR45.00000,ZE90.00150,SD100.0000,--
--Orientation
LS,HI5.000,HR5.000
OC,OP3,N 1070.7107,E 1070.7107,EL99.992,--
BK,OP3,BP1,BS225.00000,BC0.00000
BR,OP3,BP1,AR0.00000,ZE89.59300,SD100.01000
-- Orientation Notes (several comment lines)
```

Sideshot

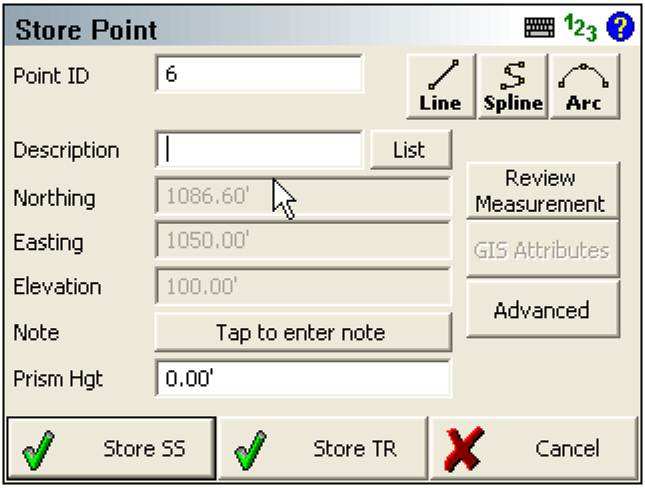
Main Menu | Survey Methods | Sideshot

If you like reviewing your shots prior to being stored in the database and raw file, then this is the mode you should use. When you press the measure button on the instrument toolbar, after the shot is measured you will see the store point screen prior to storing the point.

When you set this mode you will see the word **Sideshot** on the measurement mode button.

When you take a shot using the measure button you will see the Store/Edit Point screen.

You can also confirm or change the Prism Height used for this shot.



After reviewing the information you have three choices to make.

Store SS Button

Press the Store SS button if you want create a sideshot record (SS) in the raw file and store the coordinate in the database.

```
SS,OP350,FP3,AR0.00000,ZE94.50090,SD13.2700,--<No
Desc>
```

Store TR Button

Press the Store TR button if you want to create a traverse record (TR) in the raw file and store the coordinate in the database.

```
TR,OP350,FP4,AR0.00000,ZE94.50080,SD13.2700,--<No
Desc>
```

Traverse records are needed if you want to compute a traverse closure. If your last shot from a setup is recorded as a traverse record, when you use the occupy point routine it will automatically advance you. This is commonly referred to as "leap frogging" your traverse.

Cancel Button

Press the Cancel button cancel the shot and will not store anything.

Note: For more information on the other buttons found on the sideshot screen please read the Store / Edit Points topic.

Sideshot (Auto Store)

Main Menu | Survey Methods | Sideshot (Auto Store)

Use this when you have production in mind and you don't need to review your shots before they're recorded in the database and raw file. The measure mode allows you to press the measure button and it will store the point in the database and plot it in the drawing without asking you for any further information.

When in this mode you will see the words "**Sideshot (Auto)**" on the measure mode button.

It will use the following settings from the main interface when storing the point:

Next Point Number ID

The current point ID on the topo toolbar will be assigned to the point.

Description

The current description on the topo toolbar will be assigned to the point.

Height of Target

The current HT on the instrument toolbar will be used to compute the elevation of the point.

> **Note:**
> When measuring in the Auto Store mode, a SS record will be recorded in the raw file.

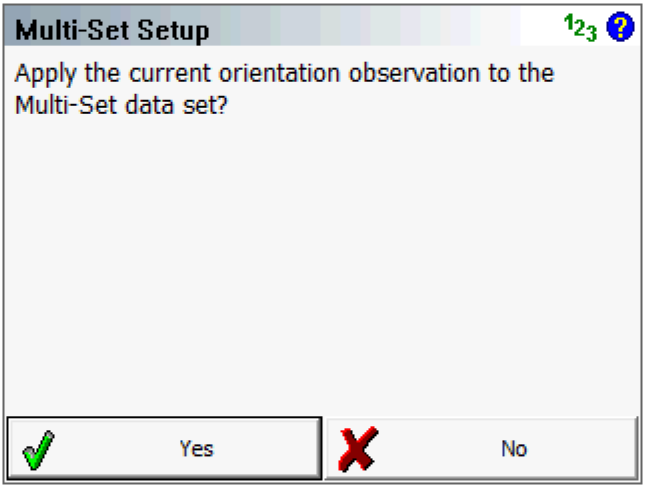
Muti-Set

Main Menu | Survey Methods | Multi-Set

The multi-set routine in FieldGenius allows you to record angular sets in any order you want. You can also review your shot's computed average and standard deviation.

Starting the Multi-Set Routine

If you've previously measured to your backsight and are confident that it hasn't changed very much you can save some time by using the "**Apply the current orientation observation to the Multi-Set data set?**" option. If you select Yes, it will take the last backsight measurement you made and use it for the multi-set session.



You will then see the Setup Occupy Point screen. If you've already established a setup, it will display the same information that you previously entered.

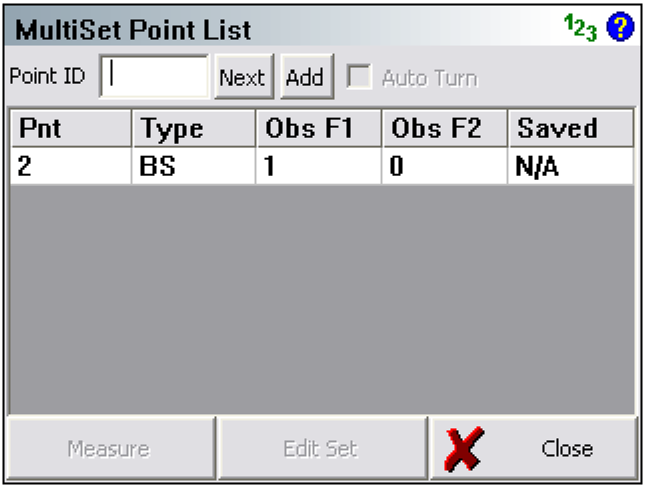
Press the Continue Multi-Set button to move on to the next step.

> **Note:**
> Unlike the regular setup routine, you will not be required to immediately shoot your backsight.

You will now see some instructions to help you use the multisets. If you do not want these Multi-Set Instructions to come up again in the future, you can select the "Stop displaying this message" option. Then press "Continue" to move on to the Multi-Set Point List.

Multi-Set Point List

You will now see the MultiSet Point List screen.



This is the control center for recording your sets. It will begin with a record for your backsight and your foresight shots will be listed after it, in order that they are measured.

Pnt: This is the point number of the point you've measured for your backsight and foresight points. If you see the word "Bearing" this indicates that you assumed a backsight direction.

Type: This is the type of shot that was measured. It will be either a BS (backsight) or FS (foresight) shot.

Obs F1: This will list the total Face 1 (Direct) observations that were recorded for the point.

Obs F2: This will list the total Face 2 (Reverse) observations that were recorded for the point.

Saved: If the foresight shot hasn't been saved you will see a red "X". Shots that have been saved will have a green "checkmark". Since your backsight readings are always to a known point or an assumed direction you will see N/A as there is nothing to save.

Shooting the Backsight

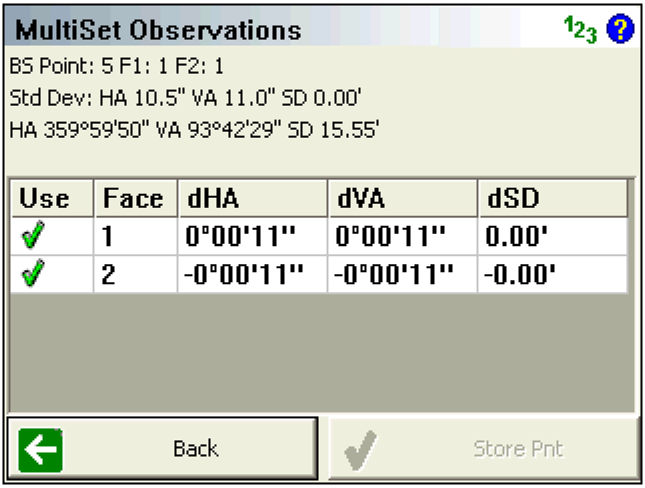
If you want to shoot your backsight, tap on the backsight row so it is highlighted. Then do the following.

1. Highlight the first row which is the backsight record.
2. Press the **Measure** button to start the measurement process.
3. On the map screen confirm that you have selected the correct target height.

4. When you're ready to record the shot press the **Measure** button on the instrument toolbar.
5. You will automatically see the multiset point list where you will see your shot which will be indicated in the F1 or F2 field.

Reviewing the Backsight Shots

If you press the **Edit Set** button you will have a summary of the two shots.



The summary will display the standard deviations for the averaged shots as well as the computed average shot. In the list you will see the delta difference between the measured shot and the average. In our example the HA and VA on the face 1 shot was larger than the average direction by 11 seconds.

By default all shots will be used to compute the averaged position. However, you can decide what shots you want to use to compute the averaged position by pressing the green checkmark icon. Doing so will switch it to a red "X" which will remove it from the computation.

Notes about Shooting the Backsight:

When you first begin the multi-set routine, you are not required to shoot the backsight prior to shooting a foresight.

You are not required to have both a Face 1 and Face 2 reading recorded for the backsight. A shot on either face will work, but it is common practice to record both.

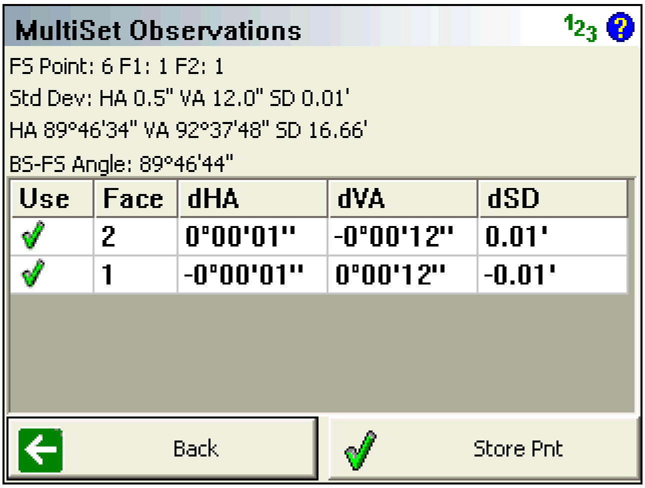
Shooting a Foresight

To record a foresight shot you first have to define a point number in the **Point ID** field towards the top of the multi-set point list. Press the **Next** button to display the next available point ID, or type in the Point ID you want to use. Then press the **Add** button to add the new Point ID into the Multi-Set Point List. After you add the new point number follow these steps to record the shot.

1. Press the **Measure** button to start the measurement process.
2. On the map screen confirm that you have selected the correct target height.
3. When you're ready to record the shot press the **Measure** button on the instrument toolbar.
4. You will automatically see the multiset point list where you will see your shot to your foresight points. They will have the FS tag in the Type column.

Reviewing Foresight Shots

To review you foresight shot for any point, simply highlight it in the list and press the **Edit Set** button.



Towards the top you will see the foresight point you shot to and a summary of the total face 1 and face 2 shots recorded.

Next you will see the standard deviation that is computed using all the directions that have a green check mark.

Next is the averaged direction (plate reading) to the foresight point.

Finally, you will see the computed clockwise angle between the average backsight and foresight direction.

By default all shots will be used to compute the averaged position. However, you can decide what shots you want to use to compute the averaged position by pressing the green checkmark icon. Doing so will switch it to a red "X" which will remove it from the computation.

Once you're satisfied with your observations you can press the **Store Pnt** button which will take you to the Store and Edit screen. From here you can review the description and store it as either a SS or TR shot.

Note: After you store your point, you will not be able to add anymore observations.

Auto Turn Sets

If you have a motorized instrument you will be able to have FieldGenius plunge your scope and turn back to the foresight or backsight for you.

Simply highlight the shot you want to record an observation for, and select the **Auto Turn option** so the checkbox is checked**.**

Now when you press the **Measure** button the instrument will automatically plunge and turn back to your foresight point for you. You can then press the measure button on the instrument toolbar to record the shot.

When you're using the Auto Turn option FieldGenius will first check to see how many Face 1 and Face 2 observations you have. It will automatically keep these numbers equal to one another. For example if you have 1 Face1 shot, and 2 Face2 shots, FieldGenius will automatically sight the foresight using Face 1.

Furthermore, if you're instrument is equipped with auto target recognition, you can use this feature in combination with the auto turn for greater productivity.

Multiset Measure Modes

At any time during the collection of your observations you can choose to shoot an angle & distance or angles only measurement. You can control this by pressing the measurement mode button on the instrument toolbar.

If you're shooting to a foresight you need a minimum of 1 distance before you will be allowed to store it.

Raw File Record

When you store your multi-set points a point is created in the database as well as some records in the raw file.

```
--MultiSet (StdDev HA:0°00'03" VA:0°00'04"
SD:0.005m)
OC,OP1,N 1000.0000,E 1000.0000,EL100.0000,--
SP,PN5,N 1015.5153,E 1000.0000,EL99.1936,--BS
BK,OP1,BP5,BS0.00000,BC359.59495
RB,OP1,BP5,AR0.00000,ZE93.42400,SD15.5479,HR5.000,--
BS
RB,OP1,BP5,AR179.59390,ZE266.17420,SD15.5512,HR5.000
,--BS
RF,OP1,FP8,AR45.52150,ZE92.03370,SD22.3917,HR5.000,-
-FS
RF,OP1,FP8,AR225.52100,ZE267.56580,SD22.4311,HR5.000
,--FS
RF,OP1,FP8,AR225.52100,ZE267.57000,SD22.4311,HR5.000
,--FS
RF,OP1,FP8,AR45.52180,ZE92.03350,SD22.3917,HR5.000,-
-FS
SS,OP1,FP8,AR45.52132,ZE92.03185,SD22.4114,--FS
```

For each foresight point you store a OC record is created to indicate what point you setup on. Also a BK record will be written to record which point you specified for the backsight. An important thing to note here is that the BC value will be equal to the average backsight direction (plate reading) recorded for the backsight.

The Standard Deviations are written into the first comment record, and it will also display "Tolerance Exceeded" if applicable.

RB records are your accepted shots to the backsight.

RF records are your accepted shots to the foresight.

The last item will always be a SS or TR record. This is the averaged direction (plate reading) to the foresight point.

Resection

Main Menu | Survey Methods | Resection

FieldGenius has a multi-point resection routine that can be used to compute a point for a setup. It will use a least squares solution to determine the coordinates from the measurements you make to your points.

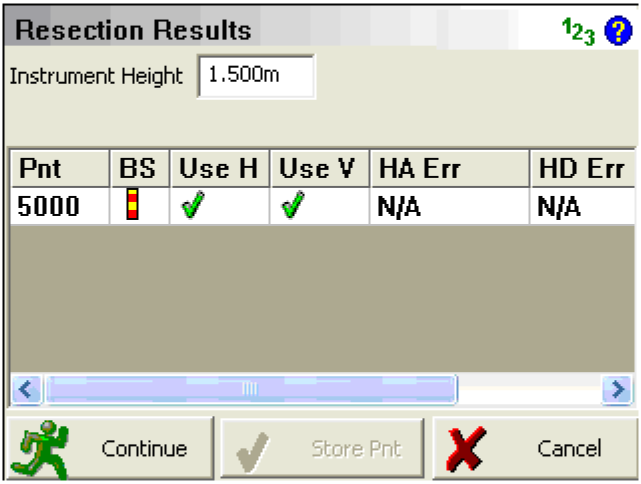
- As a minimum you need to have two points to resect to.
- You can shoot the resection point in the direct or reverse face.

- You can take multiple shots to the same resection point.
- There is no limit to the amount of points you can resect to.
- When you store your resection point, an occupy record will be created for you automatically.

Specify the Resection Points

First Shot

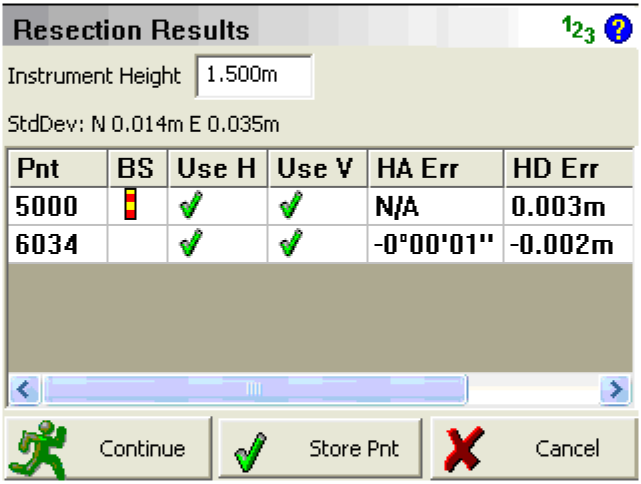
When you start the command you will see the point chooser. By default the first reference point you resect to will be used as the backsight shot, so you might want to ensure that this is the longest shot to increase your accuracy.



You will notice that since this was the first shot that there is a backsight icon next to the point number. Once you record other shots, you can select a different point for the backsight.

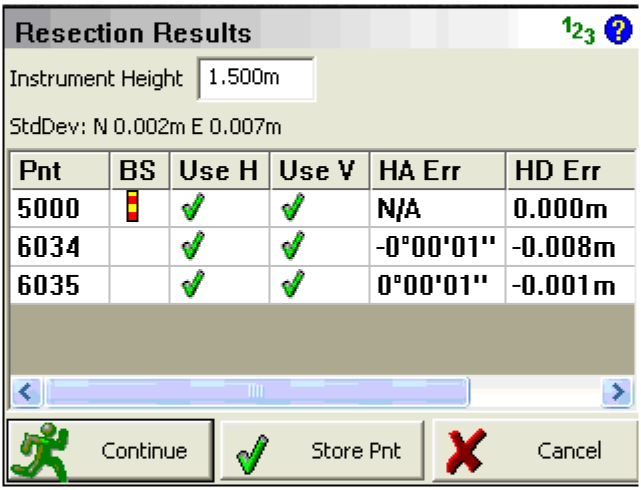
Second Shot

To record the second shot, simply sight the point now. Then press **Continue** to take you to the map screen. From here you can select the next reference point and then press the measure button to record the observation.



Third or More Shots

If you have more points to reference to you can continue measuring them using the same process as you did when you shot the second point. As you record more points you should notice that the standard deviations for the northing and easting will begin to get smaller.



Horizontal and Vertical Filters

You can determine how a shot to a reference point should be used to compute the resection point. By default each observation you make will be used to compute both the vertical and horizontal position for the resection solution. You can control what is used by tapping on any of the green "check marks" which will change them to a do not use state.

Use H	Use V	Result
✓	✓	The shot can be used to compute both the horizontal and vertical position.
✓	✕	The shot can be used to compute only the horizontal position.
✕	✓	The shot can be used to compute only the vertical position.
✕	✕	The shot is to be ignored in the computation.

HA, HD and VD Errors

As soon as you gather enough data, FieldGenius will compute a resection point.

HA Error

The horizontal angle error is computed as follows. Using the computed resection point and the measured horizontal angle, a theoretical direction is computed to the reference point. This direction is then compared to the direction measured (plate reading) and the difference is noted in the HA Err column.

HD Error

The horizontal distance error is computed as follows. An inverse is made between the resection point and the reference point. This inversed distance is then compared to the measured distance and the difference is noted in the HD Err column.

VD Error

The vertical distance error is computed as follows. Using the resection elevation, and the observation to the reference point, a new elevation is computed for the reference point. This computed elevation is then compared to the reference point's original elevation and the difference is noted in the VD column.

Standard Deviation

This is the computed precision for the resection point. Small errors indicate that the measured data "fits" very well with the geometry defined by the known points.

Large errors can indicate that bad measurements were recorded, either due to careless measurement practices such as not holding the prism pole straight or not carefully sighting the prism. Large errors can also happen if the geometry defined by the known points, is not "in the same place" as it was when the points were previously measured.

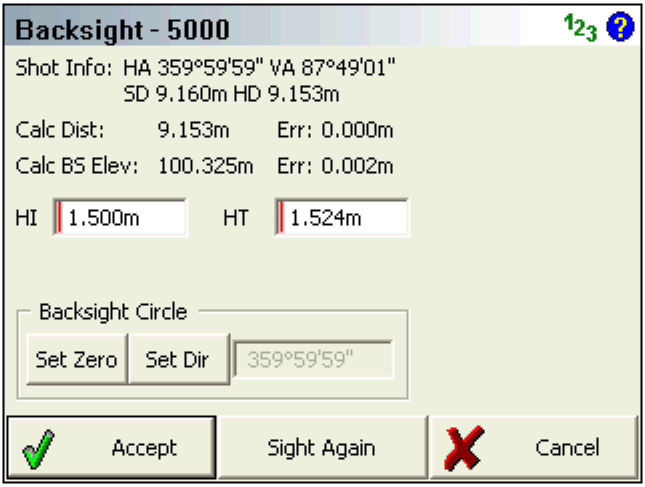
Resection Modes

At any time during the collection of your observations you can choose to shoot an **angle & distance** or **angles only** measurement. You can control this by pressing the measurement mode button on the instrument toolbar after you have started your resection.

Store the Resection Point

When you're satisfied with the resection point you can store its new position by pressing the **Store Pnt** button. This will then display the store / edit screen.

Finally you will see a backsight setup screen.



The backsight point that will be stored will be based on which point you set at the backsight point during the initial resection measurements. As described above, the backsight point is denoted by placing the backsight icon next to it in the reference point list. You do not need to take another measurement to the backsight as it has your original measurement you made. At this point you can do the following:

- Confirm the instrument and target heights.
- Decide if you want to set the plate reading on the instrument to zero or an azimuth.
- Decide if you would like to sight it again and take another measurement.

If you're satisfied with the backsight, you can store it by pressing the **Accept** button. If you're setting a plate reading on the instrument, you need to make sure it is pointing at the backsight point prior to pressing the Accept button. For example, if you want to set zero on the backsight point, you need to make sure that the instrument is pointing at the backsight point.

Raw File Record

After your store you point, several records will be written to the raw file.

```
--Resection
SP,PN5000,N 1009.1534,E 1000.0000,EL100.3244,--
SP,PN6034,N 1006.1995,E 1002.8319,EL99.7321,--FS
SP,PN6035,N 1001.4706,E 1004.8775,EL99.7361,--FS
RS,PN5000,CR359.59590,ZE87.49010,SD9.1600
RS,PN6034,CR24.33000,ZE92.03450,SD6.8280
RS,PN6035,CR73.13080,ZE92.43050,SD5.1010
SP,PN6036,N 999.9998,E 999.9998,EL100.0011,--
OC,OP6036,N 999.9998,E 999.9998,EL100.0011,--
SP,PN5000,N 1009.1534,E 1000.0000,EL100.3244,--
BK,OP6036,BP5000,BS0.00039,BC0.00000
--Occupy Check
-- Observed Values: HA 0°00'00.0" VA 87°49'22.0" SD
9.160m HD 9.153m
-- Distance Calculated: 9.154m
-- Distance Error: -0.000m
-- BS Elevation: 100.324m
-- BS Elevation Error: 0.001m
```

Check Point

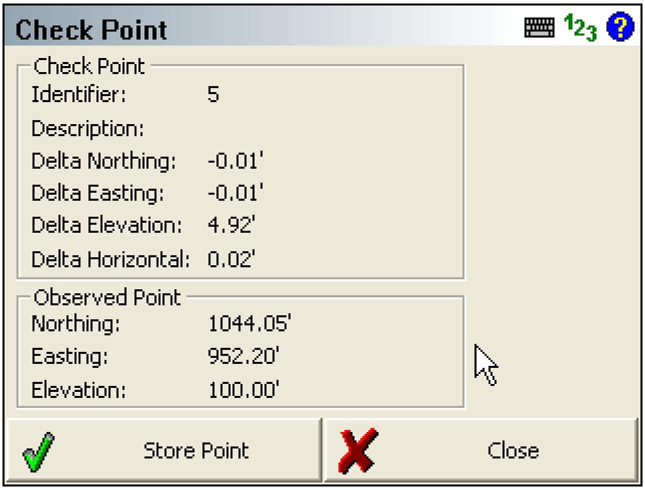
Main Menu | Survey Methods | Check Point

Use this to measure a check shot to an existing point. When you start the command you will see the point chooser appear where you can create a new point or pick an existing one from a list or from the screen. After you choose your point you will be ready to measure. You will note the measure mode will be set to **Check Pnt** and if you need to cancel the operation you can do it by pressing the measure mode button and choose to cancel it.

Check Shot Summary

When you're ready to record the shot press the **Measure** button on the instrument toolbar. You will be presented with a screen that compares your measured values to the ones that were computed for the check shot point.

The deltas that are displayed are computed by subtracting the shot coordinates from the known coordinates. In other works if you add the deltas to the shot point coordinates you will end up at the known point.



Store Point

Pressing this will exit the function and write several notes to the raw file summarizing your check shot, and allow you to store the shot using the Store/Edit Point screen.

```
--Check Point
--   Check Point ID:           110
--   Check Point dNorthing:    -4.59'
--   Check Point dEasting:     -1.82'
--   Check Point dElevation:   -4.96'
--   Check Point dHorizontal:  4.94'
--   Observed Values:          HA 45°00'00.0" VA
90°00'00.0" SD 23.00' HR 5.00'
--   Observed Point Northing:  5016.26'
--   Observed Point Easting:   5016.26'
```

```
-- Observed Point Elevation: 95.00'
```

Close

This will exit the check shot function and not write anything to the raw file or storing a new point.

Check Backsight

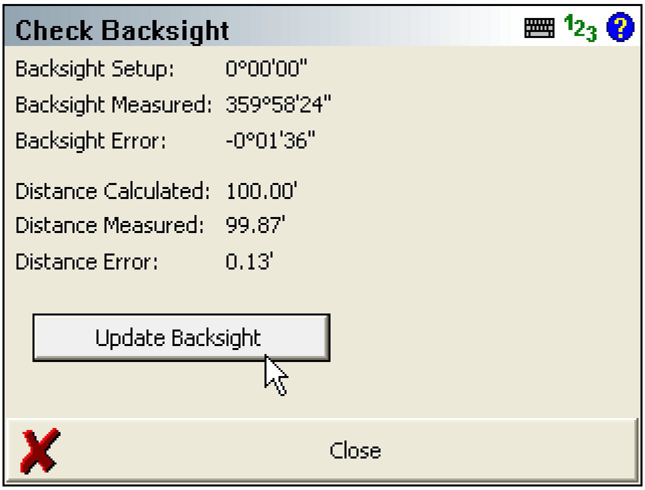
Main Menu | Survey Methods | Check Backsight

Use this to check your backsight. FieldGenius will compare your newly measured value to the one that was stored for your current setup. You will be able to review difference and optionally update your current setup with the new shot to the backsight.

When you start the command you will be taken back to the map screen and the measure mode will be set to **Check BS.** You have two measure modes available when taking a check shot to your backsight. Please see the Backsight Measure Mode topic for more information.

Check Backsight Summary

When you're ready to record the shot press the **Measure** button on the instrument toolbar. You will be presented with a screen that compares your measured values to the ones that were stored for the current backsight.



Update Backsight

Pressing this will create a record in the raw file updating your setup and backsight record with the shot information from your check shot. Several notes will also be written to the raw file summarizing your shot. When you choose to update the backsight, a new OC and BK record is saved as well as the shot information. You will also see the word (Updated) which indicates that the user selected the Update button.

```
OC,OP5,N 763.8748,E 1000.0000,EL0.0000,--
SP,PN1,N 1000.0000,E 1000.0000,EL100.0000,--start
BK,OP5,BP1,BS0.00000,BC0.00000
LS,HI0.000,HR5.000
--Backsight Check (Updated)
--  Observed Values:     HA 0°00'00.0" VA
90°00'00.0" SD 163.12'
--  Backsight Setup:     0°00'00"
--  Backsight Measured:  0°00'00"
--  Backsight Error:     0°00'00"
--  Distance Calculated: 236.13'
--  Distance Measured:   163.12'
--  Distance Error:      73.01'
```

Close

Pressing this will exit the function and write several notes to the raw file summarizing your check shot.

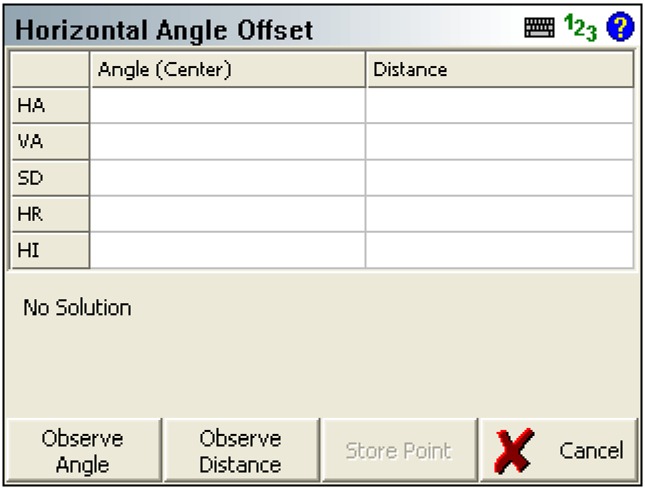
```
--Backsight Check (Not Updated)
--  Observed Values:     HA 0°00'00.0" VA
90°00'00.0" SD 236.10'
--  Backsight Setup:     0°00'00"
--  Backsight Measured:  0°00'00"
--  Backsight Error:     0°00'00"
--  Distance Calculated: 236.13'
--  Distance Measured:   236.10'
--  Distance Error:      0.03'
```

Horizontal Angle Offset

Main Menu | Survey Methods | Horizontal Angle Offset

FieldGenius includes a flexible angle offset routine. It allows you to shoot the angle and distance to a point that can not be occupied by the rod. An example of where you would use this is if you wanted to record the center of a large object, such as a tree.

When you choose the Horizontal Angle Offset measurement mode you will see the following screen.

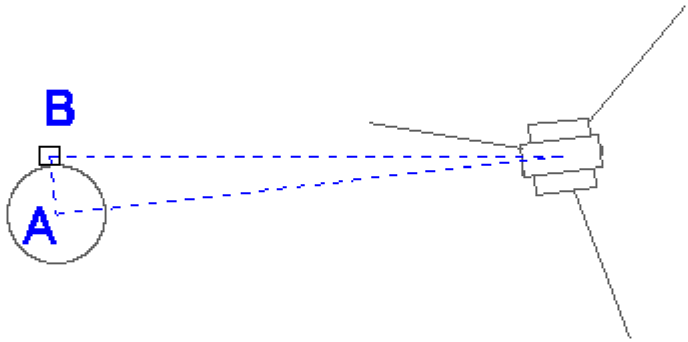


Two observations are required: one to record the angle to the center of the object, and a second to measure a distance perpendicular to the object's center.

On this screen you determine what order you will make these two measurements. All you need to do is press either the **Observe Angle** or **Observe Distance** button.

Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Note: The Quick Measure Modes option in the Options screen will affect what happens when you press the Observe buttons when you are using the offset routines. If Quick Measure Modes is on, a measurement will automatically be taken. If it is off, the Observe button doesn't actually trigger your total station to take a measurement; it simply takes you to the map screen where you can press the  measure button once you are ready to take the measurement.



Angle (Center)

This will record the total station's horizontal angle. When measuring the angle, you should point the total station towards the center of the new point that will be created. This would be measurement "A" in the diagram shown above.

Note: You do not need to sight a prism to record the angle, simply sight the new point and press the **Observe Angle** button.

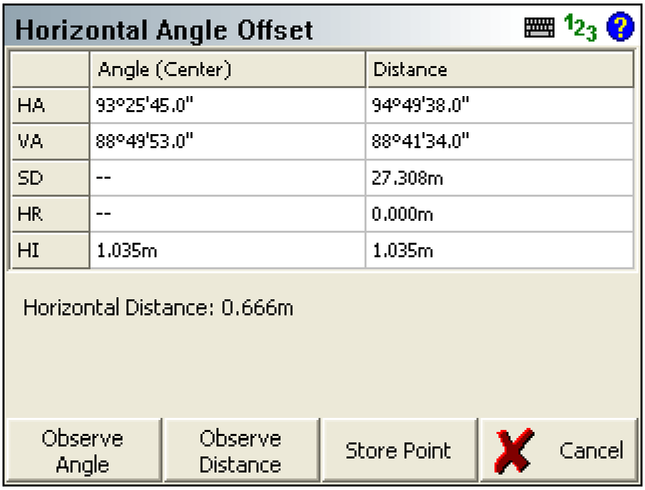
Distance

This will record a distance, measured to a prism which is located at the side of the object. You should try to locate the prism so that it is perpendicular to the center of the object and the line-of-sight from the total station. This is measurement "B" in the diagram shown above.

Note: The target height is important on this shot, because the new point will have the same elevation.

Storing the Shot

After you record your measurements you can store the new point by pressing the **Store Point** button.



After you store the point, you can continue using the offset command to record additional points, or exit it by pressing the **Cancel** button.

Raw File Record

In the raw file the OF records represent the measurements that were made and the SS record is derived using the two OF records

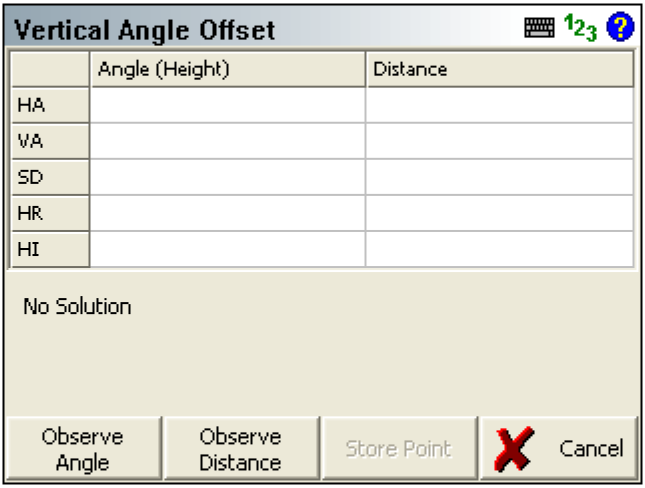
```
OF,AR94.49380,ZE88.41340,SD27.3163
OF,OL93.25450,--Right Angle Offset
SS,OP1,FP23,AR93.25450,ZE88.41340,SD27.3081,--ROAD
```

Vertical Angle Offset

Main Menu | Survey Methods | Vertical Angle Offset

When you begin the vertical angle offset routine, you will see the following screen.

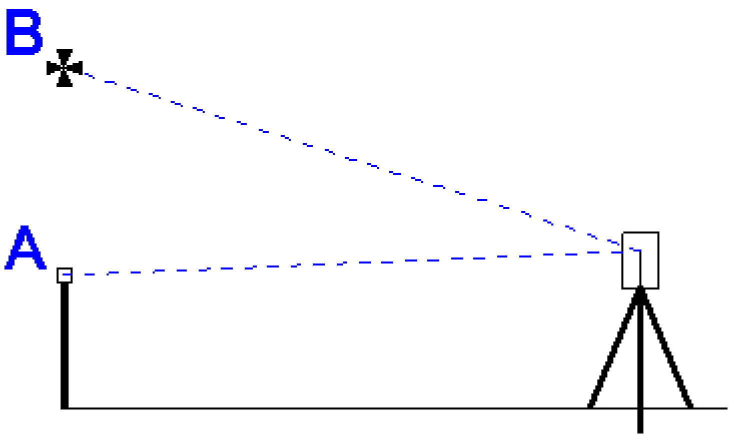
Two observations are required, one to record the top or bottom of the object, and a second to measure a distance that is directly underneath or above the new point.



On this screen you determine what order you will make these two measurements. All you need to do is press either the **Observe Angle** or **Observe Distance** button.

Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Note: The Quick Measure Modes option in the Options screen will affect what happens when you press the Measure button when you are using the offset routines. If Quick Measure Modes is on, a measurement will automatically be taken. If it is off, the measure button doesn't actually trigger your total station to take a measurement; it simply takes you to the map screen where you can press the  measure button once you are ready to take the measurement.



For example if point "B" was the bottom of an underpass, you could measure it's height. Usually it is easier if you position the prism so it is directly beneath the point you want to shoot. You would then record a distance observation to this location which will also be the horizontal position for the new point. Then without turning your instrument, you could rotate the scope vertically so it is sighted on the bottom of the overpass. You could then record this observation which will be used to compute the elevation for the new point.

Once you've recorded these two measurements, you will be able to store the new position.

Storing the Shot

After you make your measurements, you will be able to store the new point. Press the **Store Point** button to store the point.

Raw File Record

In the raw file the OF records represent the measurements that were made. The SS record is the record that was used to compute the coordinate point for the angle offset and will be a compilation of your two shots.

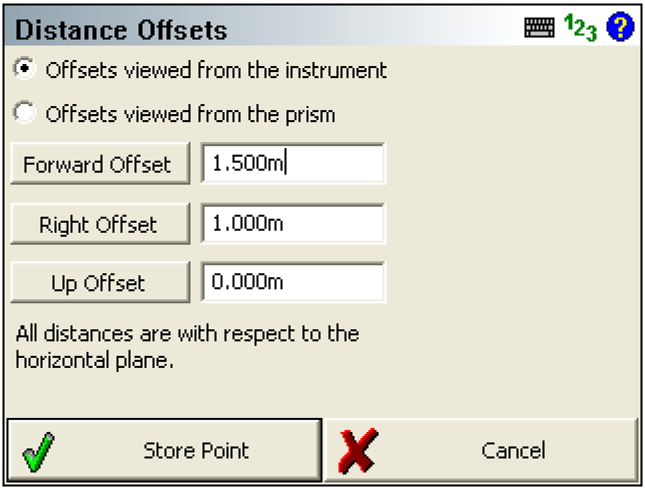
```
OF,AR52.53170,ZE91.12240,SD9.5616
OF,ZE91.12240,--Vert Angle Offset
SS,OP1,FP2,AR52.53170,ZE91.12240,SD9.5616,--<No
Desc>
```

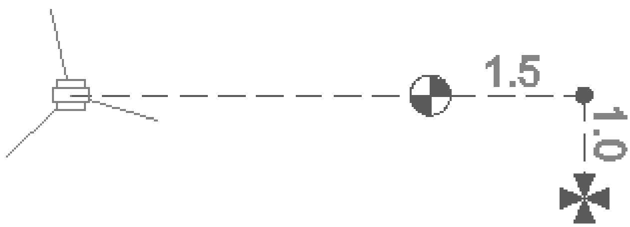
Distance Offset

Main Menu | Survey Methods | Distance Offset

FieldGenius allows you to do a distance offset to specify an offset forward or backward along the line of sight, left or right, and vertically up or down.

When you choose distance offset command and take a measurement, you will see the following screen:





From this screen you can specify if the offsets are with respect to the instrument or prism.

- Offset buttons act as toggles, which allow you to easily define the direction the offset should be applied.
- A negative offset will automatically be converted to a positive value.
- The elevation of the point will be computed from your shot. This elevation will remain unchanged unless you specify a vertical offset.
- The distance is assumed to be horizontal.

Forward / Back Offset

Enter the offset distance from the shot position to the new position.

Right / Left Offset

Enter the perpendicular offset distance from the shot position to the new position.

Up / Down Offset

Enter the vertical offset distance form the shot position to the new position.

Store Point

After you have entered your offsets you can press the **Store Point** button to save the point

Raw Record

A sideshot (SS) record will be computed to represent the shot. The new SS record will use the original observation plus any offsets defined in the distance offset screen.

```
OF,AR55.00000,ZE90.00000,SD12.0000
OF,HD1.5000,--Horizontal Distance Offset
OF,LR1.0000,--Left / Right Offset
OF,VD0.0000,--Elevation Offset
SS,OP1,FP6028,AR59.14110,ZE90.00000,SD13.5370,--
```

Note: Offsets that are to the left, back or down will be stored in the raw file with a negative value.

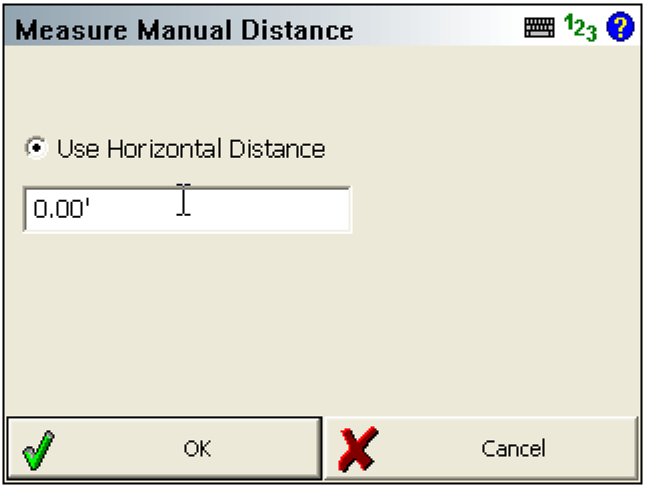
Manual Distance

Main Menu | Survey Methods | Manual Distance

Use this mode to shoot an observation where only the horizontal and zenith angles will be measured with the instrument. You will be then prompted to enter the distance.

When you set the measurement mode to manual distance and press the measure button the horizontal and vertical angles will be read from your total station. Since this is only measuring angles, you do not need to have a prism to shoot to.

Following this you will see a screen allowing you to enter a horizontal distance.



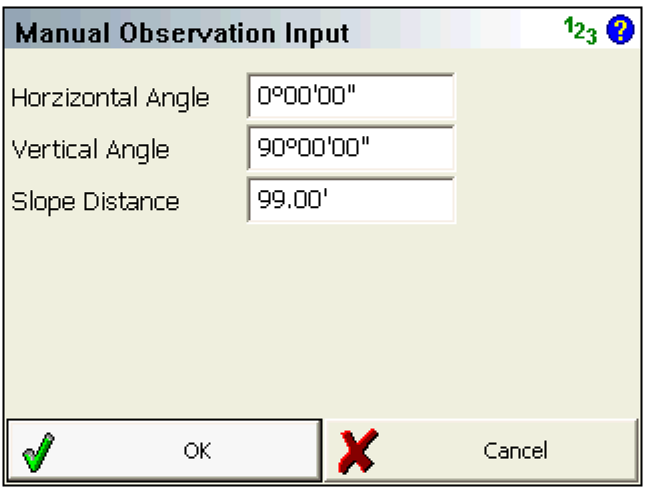
Press **OK** to save the point. You will now see the measurement info screen.

A regular sideshot or traverse record will be created in the raw file.

Manual Entry

Main Menu | Survey Methods | Manual Entry

When you set the measurement mode to manual entry on the instrument toolbar you will be required to manually input your measurements. When you press the measure button you will see the following screen:



Press **OK** to Store the point.

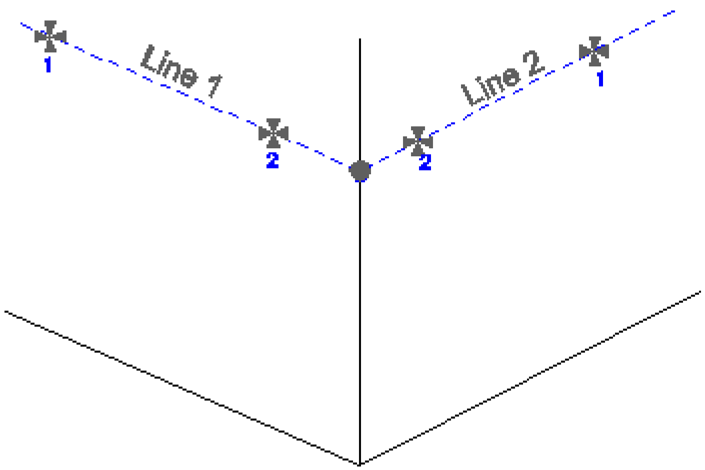
A normal sideshot or traverse record will be written to the raw file just as if you shot it with a total station.

> **Tip:**
> You can also use the Manual Entry mode for repeating your last shot. If you have previously taken a measurement, then the angle and distance values on this screen will default to those of your previous shot.

Two Line Intersection

Main Menu | Survey Methods | Two Line Intersection

The two line intersection command is used to locate the corner of an object, whose corner can not be directly measured. Two intersecting lines will be defined by four measurements, two shots on each line. The intersection of these two lines will define the corner of the object. This routine is intended to be used with a reflectorless total station.



Measure Points

When you start the two line intersection command, you will see an empty list. Each row represents a measurement to a point on one of the two lines needed to compute the intersection.

Highlight the row that you would like to make a measurement for and simply press the **Measure** button to begin the measuring process.

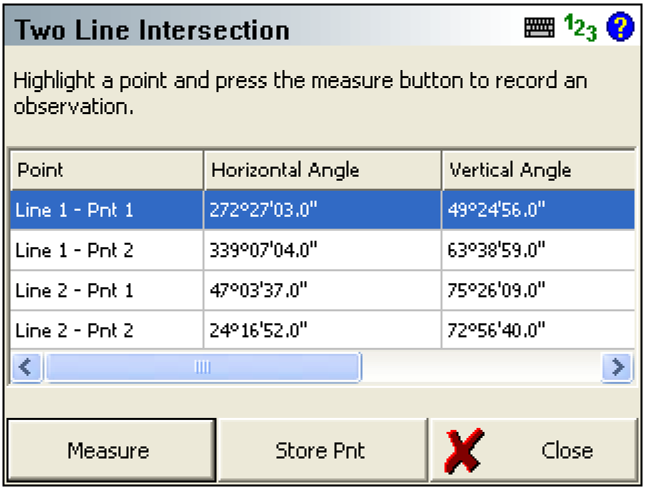
If you need to redo a measurement, simply highlight it in the list and press the measure button.

Notes:

1. You can shoot the points in any order you like, FieldGenius will determine what direction to go in to compute an intersection

2. The northing and easting values for the new point will be computed using the intersection of the two lines.

3. The two lines you define will rarely intersect at exactly the same point. The elevation of where the lines intersect will be averaged, and used as the z value for the new point.



Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Store the Point

Once you've made measurements to the four points that will define the two intersection lines, you can press the Store Point button. This will store a point in the map screen, store a point in the database as well as record information to the raw file.

Raw File

Everything about the intersection is stored in the raw file.

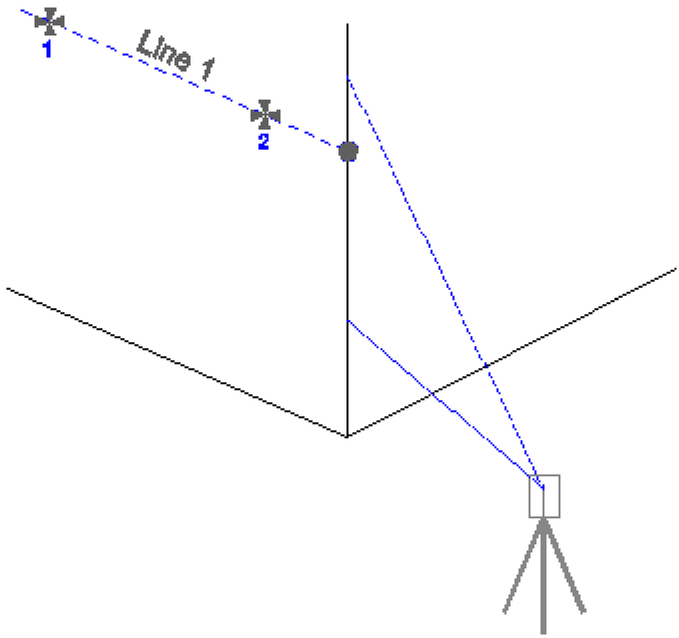
```
!--Two Line Intersection                                        !
```

```
--HI1.340,HR0.000,AR280.55220,ZE81.15170,SD6.8350,--
Pnt 1 of Line 1
--HI1.340,HR0.000,AR276.59380,ZE81.05590,SD6.4400,--
Pnt 2 of Line 1
--HI1.340,HR0.000,AR287.18580,ZE81.13350,SD6.7960,--
Pnt 1 of Line 2
--HI1.340,HR0.000,AR296.06280,ZE80.14520,SD6.0940,--
Pnt 2 of Line 2
SP,PN3,N -0.0039,E -0.0060,EL0.5325,--
```

Line - Angle Offset

Main Menu | Survey Methods | Line - Angle Offset

The line angle offset command is used to define two points that will be used to establish a reference line. Then allow you to measure an angle that intersects this reference line, and FieldGenius will automatically compute a new point at the intersecting point.



An example of where you might use this is to locate the corner wall of a building. Simply shoot two points on one of the walls, then turn the instrument so it is pointing anywhere along the corner of the building. This command is intended to be used with reflectorless total stations.

Measure Points

When you start line angle offset command, you will see an empty list.

Highlight the row that you would like to make a measurement for and simply press the **Measure** button to begin the measuring process.

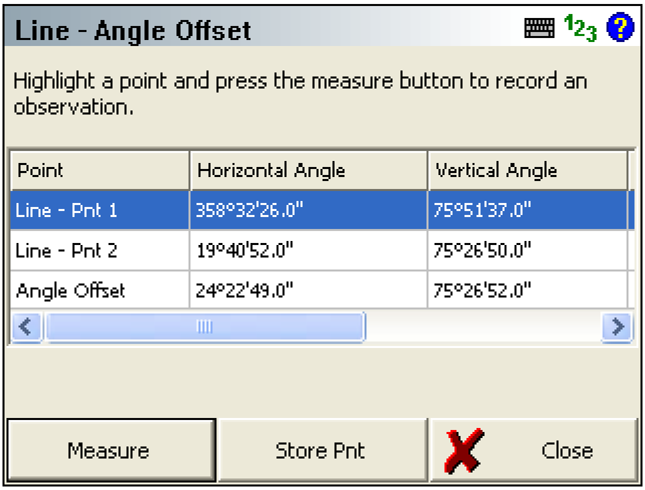
If you need to redo a measurement, simply highlight it in the list and press the measure button.

Notes:

1. You can shoot the points in any order you like, FieldGenius will determine what direction to go in to compute an intersection

2. The northing and easting values for the new point will be computed using the intersection of the line and the angle that was read.

3. The z value for the new point will be computed using the projected elevation along the reference line to the point where an intersection is computed.



Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Store the Point

Once you've made your measurements that will be used to compute the intersection, you can press the **Store Point** button.   This will store a point in the map screen, store a point in the database as well as record information to the raw file.

Raw File

Everything about the intersection is stored in the raw file.

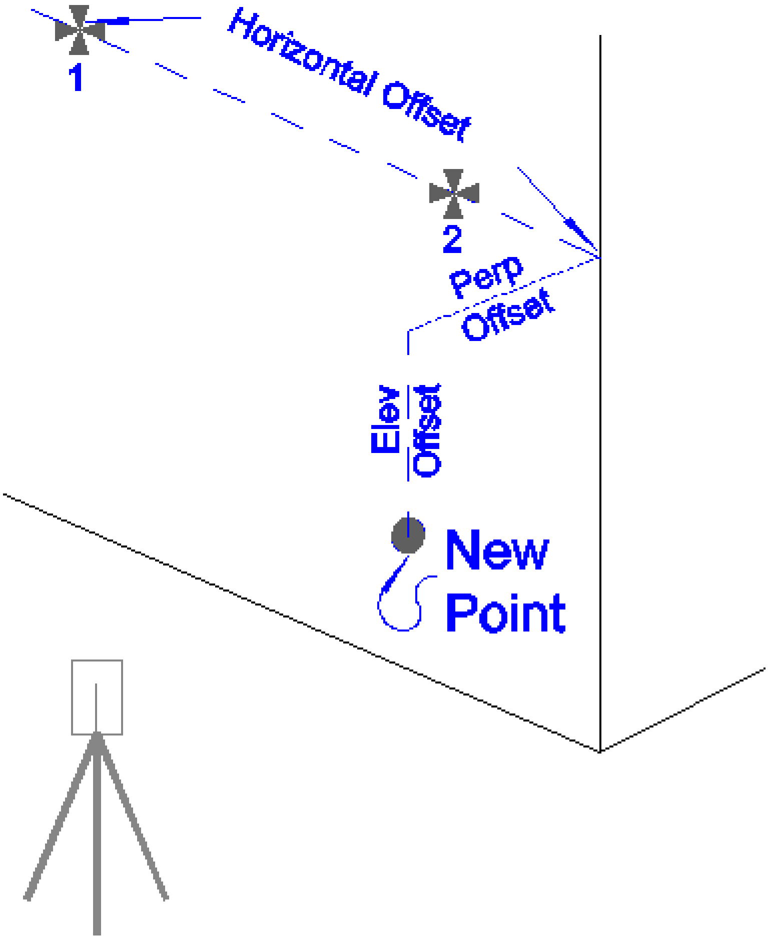
```
--Line - Angle Offset
--HI1.340,HR0.000,AR280.55530,ZE81.12550,SD6.8330,--
Pnt 1 of Line
--HI1.340,HR0.000,AR277.37420,ZE80.47010,SD6.5020,--
Pnt 2 of Line
--HI1.340,HR0.000,AR283.46460,ZE86.15500,--Angle
Offset
SP,PN4,N -0.0050,E 0.0051,EL0.5761,--
```

Line - Distance Offset

Main Menu | Survey Methods | Line - Distance Offset

The line distance offset command is used to define two points that will be used to establish a reference line. Once the reference line is established you can then specify offsets along the reference line to the new point.

This is a very powerful offsetting tool that can be used in a lot of different situations.



When you define your reference line, there are three types of offset that can be applied.

You can define a horizontal offset, a perpendicular offset and a vertical (elevation) offset. Each offset button is a toggle that allows you to toggle how the offset is to be applied in relation to the reference line.

When you define the offset direction, you can then enter in the value that you want to offset by.

If the horizontal offset remains set to zero, perpendicular or elevation offset will be applied in relation to point one on the reference line.

Offsets

Horizontal Offset

The horizontal offset can either be left or right of the first point on the reference line. From the total station's perspective, if the new point is to the right of point 1, then you would use the Horz Offset Right of Pnt 1. If it is to the left, then logically, it would be a left offset so you would use the Horz Offset Left of Pnt 1 setting.

Perpendicular Offset

The perpendicular offset is a horizontal distance applied perpendicular to the reference line. From the total station's perspective, when moving perpendicular from the reference line, if the new point ends up being closer to the total station, then you would set the perpendicular offset to Perp Offset Towards Inst. Alternatively, if the new point ends up being farther from the total station, then you would use the Perp Offset Away From Inst.

Elevation Offset

This is the vertical offset from the reference line to the new point. If the new point is above the reference line, then you would set this to Elev Offset Up. If the new point is below the reference line you would set it to Elev Offset Down.

Measure Points

When you start line angle offset command, you will see an empty list.

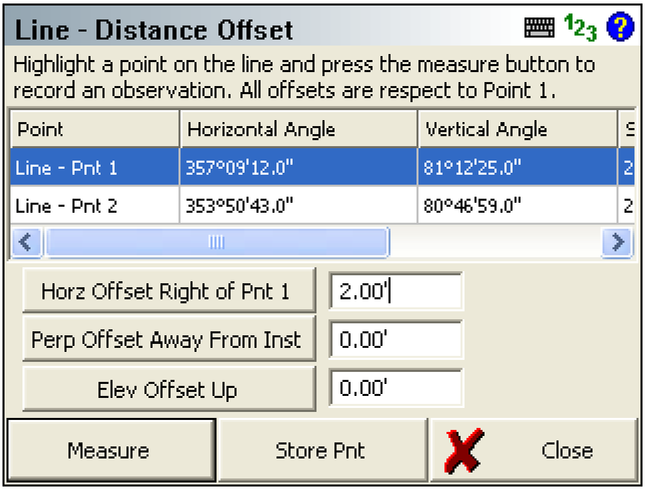
Highlight the row that you would like to make a measurement for and simply press the **Measure** button to begin the measuring process.

If you need to redo a measurement, simply highlight it in the list and press the measure button.

Notes:

1. The northing and easting values for the new point will be computed using the horizontal and perpendicular offsets defined by the user. These horizontal offset is referenced to point 1 on the reference line. The perpendicular offset is a perpendicular offset from the reference line.

2. The z value for the new point will be computed using the projected elevation along the reference line, plus or minus any elevation offsets defined by the user.



Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Store the Point

Once you've made your measurements that will be used to compute the intersection, you can press the **Store Point** button. This will store a point in the map screen, store a point in the database as well as record information to the raw file.

Raw File

Everything about the intersection is stored in the raw file.

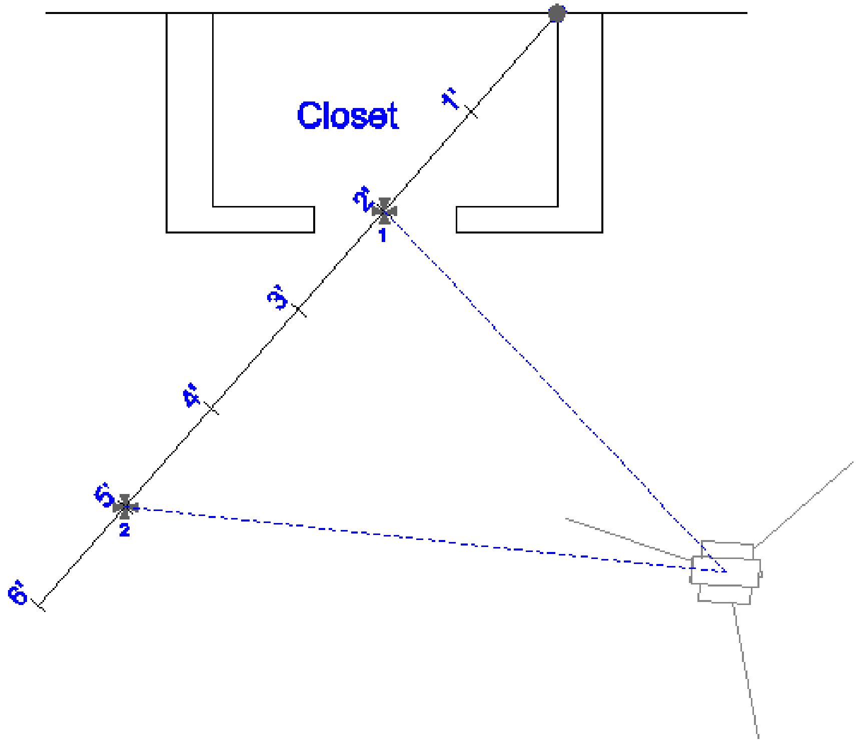
```
 --Line - Distance Offset
 --HI0.000,HR0.000,AR357.09120,ZE81.12250,SD22.4114,-
-Pnt 1 of Line
 --HI0.000,HR0.000,AR353.50430,ZE80.46590,SD21.3255,-
-Pnt 2 of Line
 --Horizontal Offset: 2.000
 --Perpendicular Offset: 0.000
 --Elevation Offset: 0.000
 SP,PN1018,N 123.5558,E 100.2931,EL103.4035,--EV2
```

Example

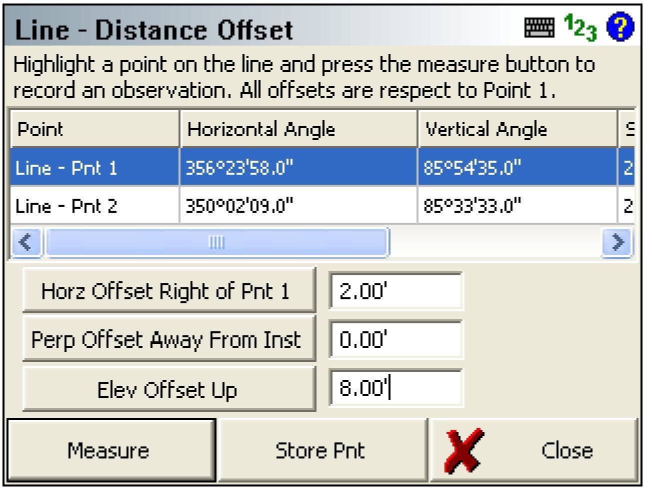
The top corner in a closet needs to be located, but it isn't visible from the total station.

So the user lays a hand tape on the floor, with the start of the tape located at the bottom corner of the closet, directly below the point that needs to be recorded. The direction of the tape is then laid out such that two measurements can be made on the tape.

Essentially, the tape now becomes the reference line. Two shots are taken, one at the 2 foot mark, and the other at the 5 foot mark.



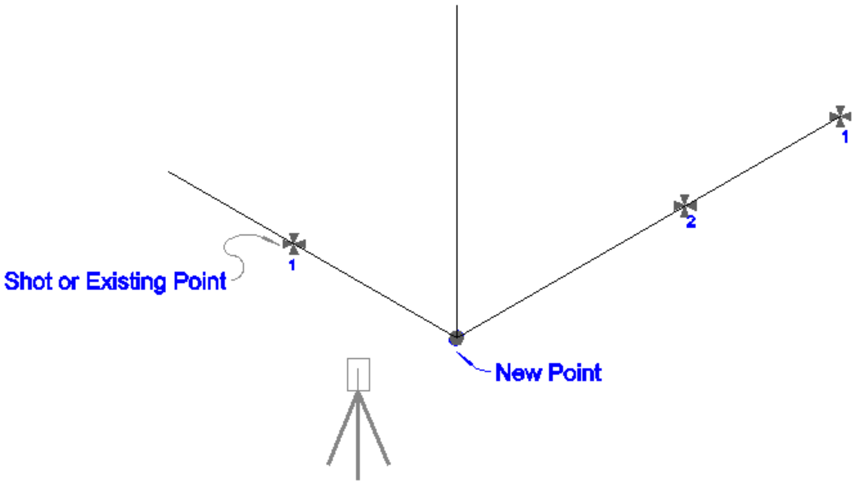
After you take your two measurements, all you need to define is the offset distances. In this example, the corner is two feet to the right of the first measurement (point 1), and 8' up from the floor. After you define the offset directions and offset amounts, you can press the **Store Pnt** button to store the new point.



Line - Perpendicular Point

Main Menu | Survey Methods | Line - Perpendicular Point

This offset command is used to define two points that will be used to establish a reference line. Once the reference line is established, you can specify a point that will be used to compute a perpendicular intersection from the point to the reference line. The point can either be shot or you can select an existing point from your scene database or map.



An example of where you could use this is to pick up the corner of a building, whose corner can not be scene from the total station. You could take two shots on one wall to define the reference line, and then take another shot on the intersecting wall. A perpendicular intersection will be computed, which in this case would be the corner of the building.

Measure Points

When you start the command, you will see an empty list.

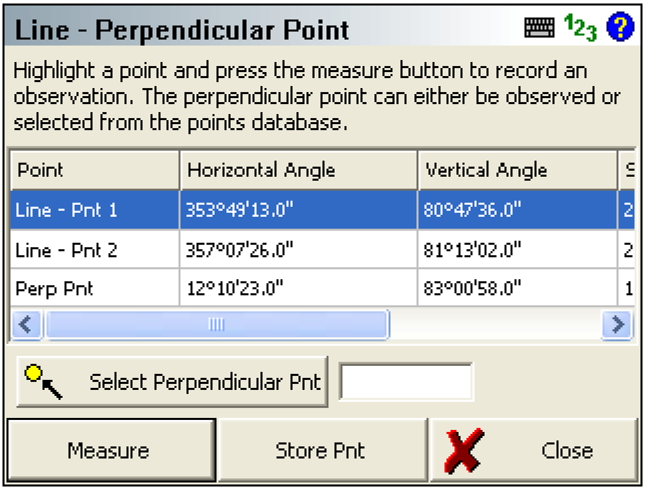
Highlight the row that you would like to make a measurement for and simply press the **Measure** button to begin the measuring process.

If you need to redo a measurement, simply highlight it in the list and press the measure button.

Notes:

1. The northing and easting values for the new point will be computed by computing a perpendicular intersection between the reference line and a point defined by the user.

2. The z value for the new point will be computed using the projected elevation along the reference line to the point where a perpendicular intersection occurs.



Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Select Perpendicular Point

You can define the perpendicular point one of two ways. The first is to simply take a measurement that will define the perpendicular point. The shot is only used to make an intersection, a point isn't stored at the measurement location.

The other method is to choose an existing point that exists in your scene. Press the Select Perpendicular Pnt button to select a point.

Store the Point

Once you've made your measurements and defined a perpendicular point that will be used to compute the intersection, you can press the Store Point button. This will store a point in the map screen, store a point in the database as well as record information to the raw file.

Raw File

Everything about the intersection is stored in the raw file. In the following example, if you shot the perpendicular point you will see a third shot that records the measurement.

```
 --Line - Perpendicular Point
 --HI1.340,HR0.000,AR353.49130,ZE80.47360,SD21.3386,-
-Pnt 1 of Line
 --HI1.340,HR0.000,AR357.07260,ZE81.13020,SD22.4245,-
-Pnt 2 of Line
 --HI1.340,HR0.000,AR12.10230,ZE83.00580,SD19.8819,--
Perpendicular Pnt
 SP,PN6,N 123.3028,E 100.0209,EL104.7737,--RM
```

If the perpendicular point exists in your scene and you selected it using the point chooser, then you will see a store point recorded as a note. The last store point is the new point that was computed.

```
 --Line - Perpendicular Point
 --HI1.340,HR0.000,AR353.49520,ZE80.46560,SD21.3419,-
-Pnt 1 of Line
 --HI1.340,HR0.000,AR357.07330,ZE81.12210,SD22.4147,-
-Pnt 2 of Line
 --SP,PN7,N 119.2906,E 104.1611,EL103.7580,--
Perpendicular Pnt
 SP,PN8,N 123.3107,E 100.0504,EL104.7751,--SCR
```

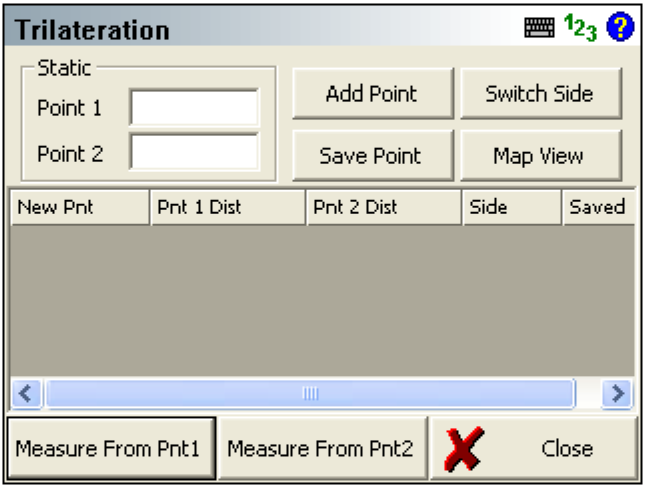
Trilateration

Main Menu | Survey Methods | Trilateration

This routine allows you to trilaterate the position of new points by observing their distances from two known positions. The two known points will make up a baseline, from which a distance-distance intersection will be calculated to determine the position of each new point.

The primary use of this routine is for GPS users so they can locate inaccessible points. They can locate two points with GPS, and then use the Trilateration routine to locate the inaccessible points.

This routine will also accept distances measured with the Leica Disto.

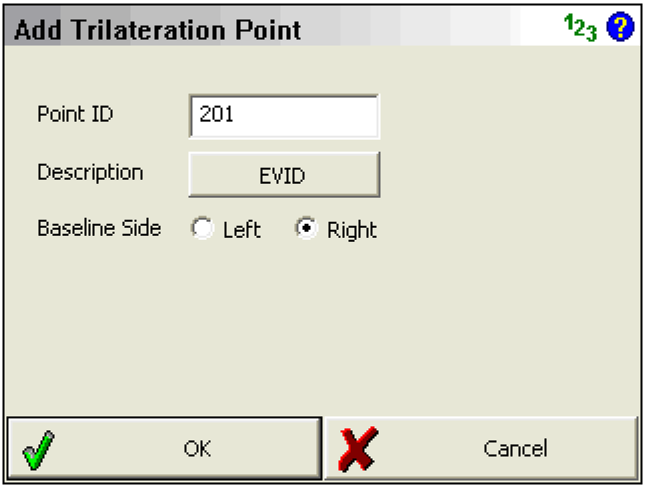


Static Points (Baseline)

Select your two baseline points, from which you will be observing the distances to the new points.

Add Point

Use this to add a new unknown point to solve for. When you press this, you will be prompted for the new point number and description, and whether it is on the left or right side of the baseline.



Save Point

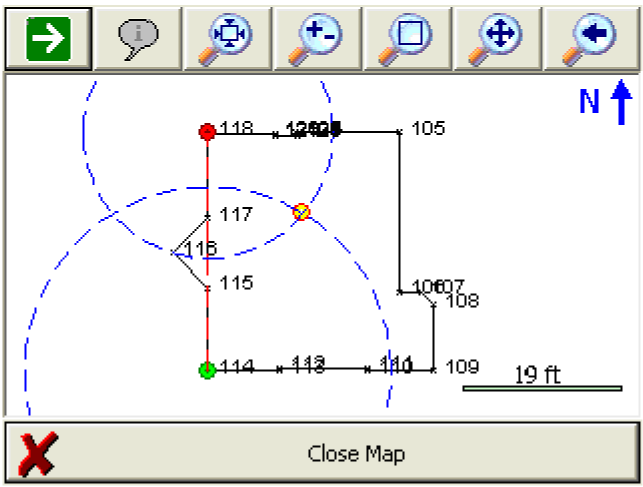
This saves the selected New Point into your project.

Switch Side

This toggles the selected New Point to the Left or Right side of the baseline.

Map View

This takes you to a map view showing your baseline, the distance measured from each point, and the calculated position of the new point.



If desired, you can press the World View button on the Display toolbar to hide unnecessary data.

Measure from Point 1

Press this to record the distance from Point 1 of your baseline to the selected New Point.

Measure from Point 2

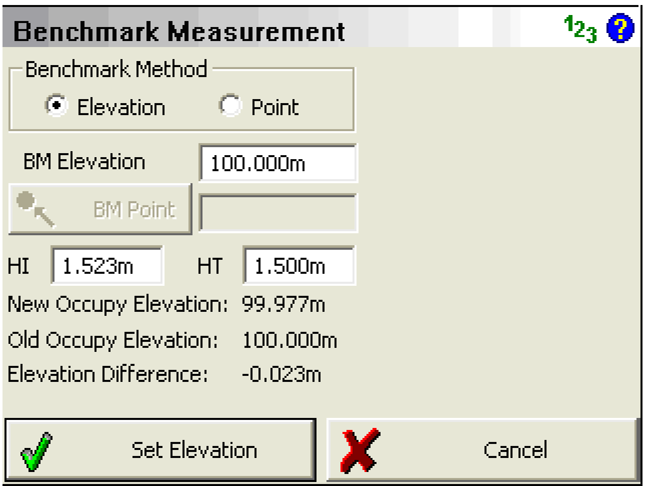
Press this to record the distance from Point 2 of your baseline to the selected New Point.

Observe Benchmark

Main Menu | Survey Methods | Observe Benchmark

Use this to check your current setup elevation or use it to establish an elevation for your setup. When you start the command you will be taken to the main interface and you will note that the measure mode will be set to **Benchmark.** If you need to cancel the operation you can do it by pressing the measure mode button and choose the **Cancel Benchmark** button.

When you're ready to record the shot press the **Measure** button on the instrument toolbar. You will then see the benchmark shot screen.



Calculating an Elevation

Benchmark Method: Elevation

Use this option if you want to manually enter the know elevation for the point you're basing your shot on. The elevation you enter will be used to calculate the elevation of the current setup. The difference in the current and calculated elevations will be displayed towards the bottom of the screen. You can enter in your know elevation in the **BM Elevation** field.

Benchmark Method: Point

Use this option if you want to base the calculated elevation on an existing point in your project. The elevation of the point you choose will be used to calculate the elevation of the current setup. The difference in the current and calculated elevations will be displayed towards the bottom of the screen. You can choose your point by using the point chooser button.

HI

This is where you would enter your height of instrument. Note this value will be used to compute the new instrument elevation.

HT

This is where you would enter your height of target. Note this value will be used to compute the new instrument elevation.

Set Elevation

Pressing this button will update your current setup elevation with the one calculated by the Benchmark Shot routine. You will be asked to confirm that you want to update the elevation. Two records will be written to the raw file, a remote elevation (RE) and a store point (SP) record.

```
RE,OP1,FE0.000,ZE90.00000,SD10.0000,--Remote elev
SP,PN1,N 5001.0000,E 4978.0000,EL0.0240,--
```

Cancel

This will exit the routine and not save any changes.

Add Invert

Main Menu | Survey Methods | Add Invert

If you've manually measured a distance to an invert, you can have FieldGenius compute a point with a computed invert elevation.

When you start the command you will see the Invert Toolbar appear towards the bottom of your main screen.

First you need to specify the point that will be referenced to compute the invert elevation. You can do this by using the point chooser button.

Now enter the measured distance to the inverse. For example if your measurement was 5.5', FieldGenius will subtract this from the reference point's elevation. Entering a negative value will cause it to be added.

Press **Store Point** to create and save a point with the calculated invert distance. This point will have the same northing and easting value as the reference point.

> **Note:**
> While the invert toolbar is open, you can continue entering invert measurements or choose different reference points.

Raw File

When you save the point, an offset and store point record will be created.

```
--OS,OP7,FP8,ND0.000,ED0.000,LD5.000
SP,PN8,N 935.976,E 1232.356,EL5.000,--<No Desc>
```

Vertical Plane Projection

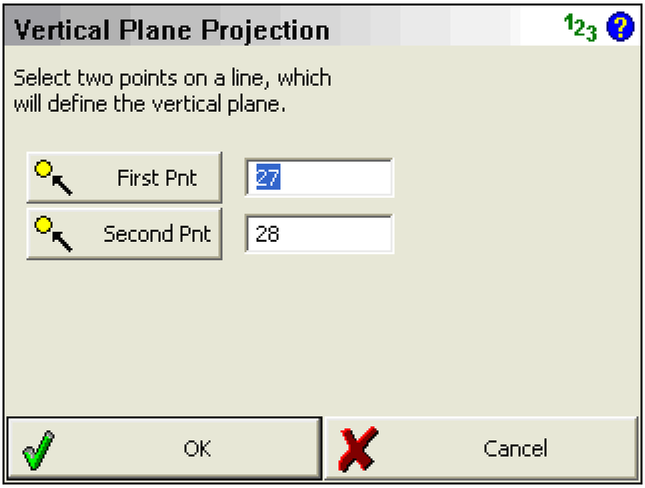
Main Menu | Survey Methods | Vertical Plane Projection

This function is for locating multiple points on a vertical place defined by two previously measured points. The program will calculate the distance for each shot taken to an un-measurable position so that coordinates can be generated for the shot.

An example of how you could use this would be to shoot two corners of a wall to define a vertical plane. Then you could sight four corners for window on the second floor and FieldGenius will use the HA and VA values and compute the intersection with the vertical plane. Once the intersection is computed, the point will be stored.

Function

When the command is started you will see a screen that will allow you to specify the points that will form the baseline for the vertical plane.



Note: You need to measure and store the points that will be used to define the vertical mapping plane, prior to starting the Vertical Scene Projection command.

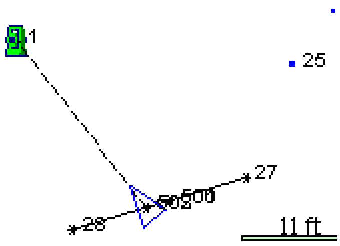
When ready to continue, press the **OK** button.

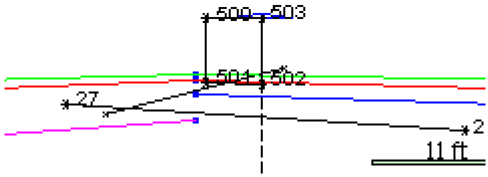
You will now be in the Vertical Plane projection mode which will be indicated by the measurement mode button on the instrument toolbar. To begin calculating points on the vertical plane, you need to point the total station at the new point you want to create. To complete the shot, press the measure button, and then store the point.

Note: You do not need to use a prism when measuring points on the vertical plane. Simply point the instrument at the point you want to create.

Since vertical planes represent 3D data, it is sometimes necessary to rotate your perspective of the project to help you see the point you're computing on the vertical plane.

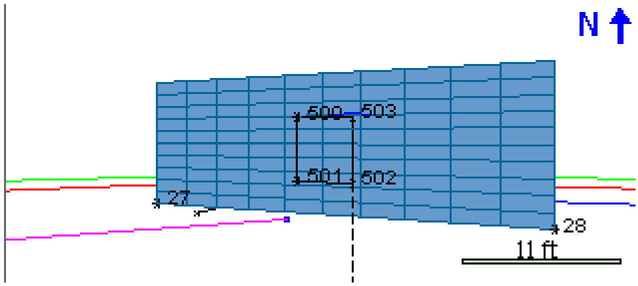
Press the 3D View button on the display toolbar which will open the 3D toolbar. If you press the Planar View button, your scene will be rotated so it matches your perspective. For example, a vertical plane was defined by points 27 and 28. When the planar view option is used, you can see your work in a 3D perspective. You can now see the 4 measurements (points 500 – 503) that were made to record the position of a window on the vertical plane.





Plan View 3D Perspective

You can also hide objects that are behind the vertical plane from viewing by pressing the **Vert Grid** button. In the example below, you will see that after this is turned on, some of the line work is hidden from view.



To exit this routine, simply switch to a different measurement mode.

Raw File

Each point that is computed on the vertical plane will also have a computed sideshot stored in the raw file.

```
 --VS,PA27,PB28
 SS,OP1,FP503,AR142.24510,ZE78.37170,SD17.8888,--
VERTICAL
```

For each vertical plane shot you record you will see a note before the shot in the raw file indicating which points were used to define the vertical plane.

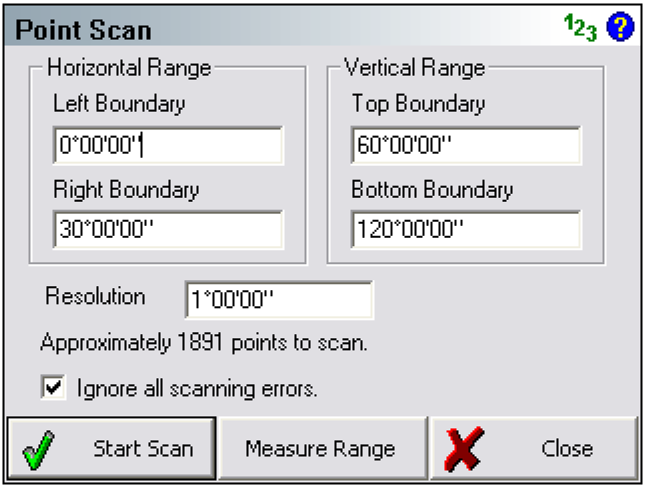
Special Notes

Vertical plane measurements will automatically be recognized by your MicroSurvey desktop software. Please refer to the MicroSurvey help file for more information regarding importing vertical scenes.

Point Scanning

Main Menu | Survey Methods | Point Scanning

FieldGenius supports point scanning which allows you to create a point cloud of data. To use this routine you need a reflectorless instrument that has servo motors.



To start, you will be asked to define a scan area by pressing the Measure Range button and pointing the instrument at the Bottom-Left and Top-Right corners of the area you want to confine the scanning to.

Once the scan area is defined, you can define the scan resolution by using an angular value. For example if you set it to 0°30'00", FieldGenius will create a pattern confined to the limits you defined, and scan at 30 minute intervals both horizontally and vertically. Once you've defined the scan area and resolution, FieldGenius will display an estimate of how many points will be stored.

You also can control how FieldGenius deals with measurement errors while scanning. If you turn on "**Ignore all scanning errors**", FieldGenius will ignore measurement errors and continue without interruption. If you don't turn this on, FieldGenius will stop and display a message allowing you to stop the scanning process, or continue on with the next measurement.

Press the **Start Scan** button to select the desired reflectorless EDM Mode and initiate scanning. FieldGenius will display an estimate of the time remaining for the scan to complete.

Points will be stored using the description defined in the map screen. The point number of the first point will be set to the "next available" id and will increment sequentially. The shots are stored in the raw file as sideshots so you have a record of the observations.

Upon completion, you will receive a summary showing the total number of successful measurements and errors received.

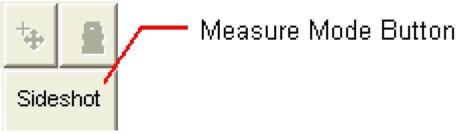
MAPPING METHODS MENU

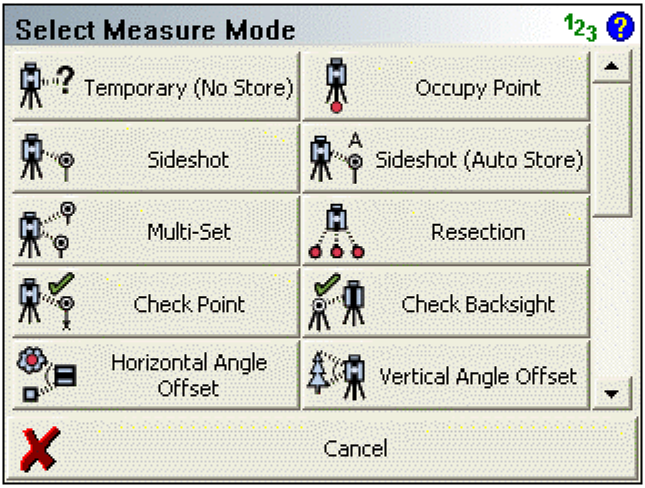
Survey Methods Menu

Main Menu | Survey Methods

Survey Methods are commands built into FieldGenius that will help you measure and map your points. Survey Methods need to be selected before you begin a measurement.

For a faster way to get to the Survey Methods screen, you can also press the measure mode button which is located on the instrument toolbar.





Use the Scroll Bar along the side to access additional measurement modes.

Note: Several of these modes will not be available until you have setup an occupy point and measured a backsight via the Occupy Point, Multi-Set, or Resection commands. Most of these modes will also not be available if you are using GPS.

Temporary (No Store)

This will allow you to take a measurement without storing it. Please see the Temporary (No Store) topic for more information.

Occupy Point

Use this to define an instrument setup. Please see the Occupy Point topic for more information.

Sideshot

This mode allows you to measure a point. After the measurement, it will allow you to review your measurement data and allow you to make changes to the point id and description before it is stored. Please see the Sideshot topic for more information.

Sideshot (Auto Store)

This mode allows you to measure a point, and FieldGenius will use the next available point, description and line toggles specified on the main map screen. Using this is a very fast method for recording your measurements. Please see the Sideshot (Auto Store) topic for more information.

Multi-Set

This will start the multi-set routine that will help you collect repeat observations to your backsight and a new foresight point. Please see the Multi-Set topic for more information.

Resection

This will start the multiple point resection routine to allow you to determine your current instrument position by measuring to known points. Please see the Resection topic for more information.

Check Point

Use this to display a check measurement to an existing point in your project. Please see the Check Shot topic for more information.

Check Backsight

Use this to compare your backsight to your previously measured values. Please see the Check Backsight topic for more information.

Horizontal Angle Offset

This will start the angle offset routine. Please see the Horizontal Angle Offset topic for more information.

Vertical Angle Offset

This will allow you to compute the height of an object. Please see the Vertical Angle Offset topic for more information.

Distance Offset

This will start the distance offset routine. Please see the Distance Offset topic for more information.

Manual Distance

This will record a HA and VA for a shot, but the user can manually enter the distance. Please see the Manual Distance topic for more information.

Manual Entry

This will allow you to manually enter in a shot including HA, VA and SD. Please see the Manual Entry topic for more information

Two Line Intersection

This allows you to measure two baselines and FieldGenius will compute the intersection point. Please see the Two Line Intersection topic for more information.

Line - Angle Offset

This allows you to measure two points to define a baseline, measure an angle, and FieldGenius will compute the intersection point. Please see the Line - Angle Offset topic for more information.

Line - Distance Offset

This allows you to measure two points to define a baseline, then manually enter measured distances. These distances will be used to compute a new point based on the baseline. Please see the Line - Distance Offset topic for more information.

Line - Perpendicular Point

This allows you to measure two points to define a baseline, then you can select an existing point which will be used to compute a perpendicular intersection. Please see the Line - Perpendicular Point topic for more information.

Trilateration

This will allow you to compute new points by observing their distances from two known existing points. Please see the Trilateration topic for more information.

Observe Benchmark

Use this to check your current setup elevation, or compute a new one based on a known elevation. Please see the Measure Benchmark topic for more information.

Add Invert

Use this to open the invert toolbar. You will then be able to record invert measurements. Please see the Add Invert topic for more information.

Vertical Plane Projection

This will allow you to compute points on a user defined vertical plane. Please see the Vertical Plane Projection topic for more information.

Point Scanning

Use this to activate Point Scanning with your motorized reflectorless instrument. Please see the Point Scanning topic for more information.

Temporary (No Store)

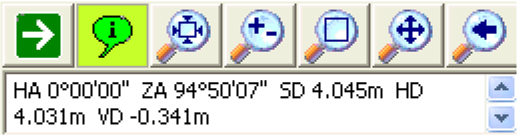
Main Menu | Survey Methods | Temporary (No Store)

The temporary mode will allow you to take a measurement with your instrument without establishing a setup. It also doesn't require you to store a point. It is the same as pressing the measure button on the instrument where all it does is report back to you the HA, ZA, SD, HD and VD.

When in this mode you will see the word **Temp** on the measure mode button.

No Setup Established

If you haven't established a setup and you use the temp mode, when you press the measure button you will see the results of your shot in the results toolbar as shown below.



Setup Established

If you have an instrument setup established when you use the temp mode and press the measure button you will see the measurement information as well as calculated coordinates in the results toolbar. The coordinates will be based on the current setup and the reading from the temporary shot.

Note:
When measuring in temp mode, nothing will be recorded in the RAW file.

Occupy Point

Main Menu | Survey Methods | Occupy Point

Use this command to specify the instrument location and orientation. You will be asked to specify the point your instrument is occupying, an instrument height and if you will be assuming a backsight direction or sighting an exiting point. After you have established your setup and backsight, FieldGenius will graphically show you your setup points.

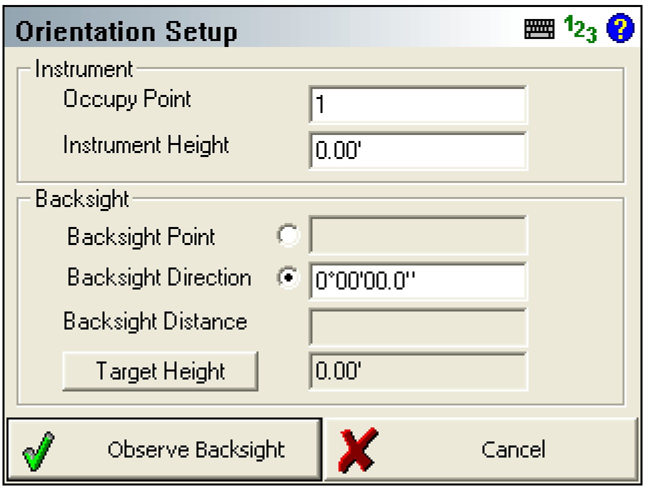
 Occupied Point Location

 Backsight Point Location

Backsight Method: Direction

With the backsight method set to Direction you will be able to specify the point you want to setup on and specify a backsight direction.

When you go to measure you have the option of recording an angle and distance to the backsight, or the option of just recording an angle. If a distance is measured to the backsight you will have the option of storing a point for the backsight after you press the measure button.



Occupy Point

Type in an existing point number, or double tap in this field to open the keypad or to select a point from the map. You will be able to create a new point, pick one from a list, or pick one from your drawing.

Instrument Height

Use this to enter your current instrument height.

Backsight Direction

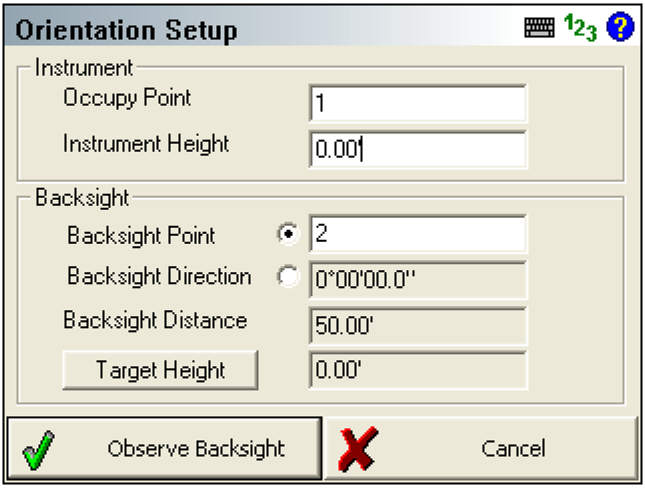
Use this to specify the direction that will be used by FieldGenius. You can enter an azimuth or a quadrant bearing.

Target Height

Use this to enter your current target height.

Backsight Method: Point

Use this method to specify the points that will be used for the current instrument location and backsight.



Occupy Point

Type in an existing point number, or double tap in this field to open the keypad or to select a point from the map. You will be able to create a new point, pick one from a list, or pick one from your drawing.

Instrument Height

Use this to enter your current instrument height.

Backsight Point

Type in an existing point number, or double tap in this field to open the keypad or to select a point from the map. You will be able to create a new point, pick one from a list, or pick one from your drawing.

Backsight Direction & Distance

When you enter in your points FieldGenius will display the inversed horizontal distance and direction between the points you entered.

Target Height

Use this to enter your current target height.

Measuring to the Backsight

Once you've established the backsight method, entered your points and instrument height you can move on to the next step by pressing the **Observe Backsight** button. You will be taken back to the map view where you will see the graphical position of your setup and backsight points. There are a few things you should take note of:

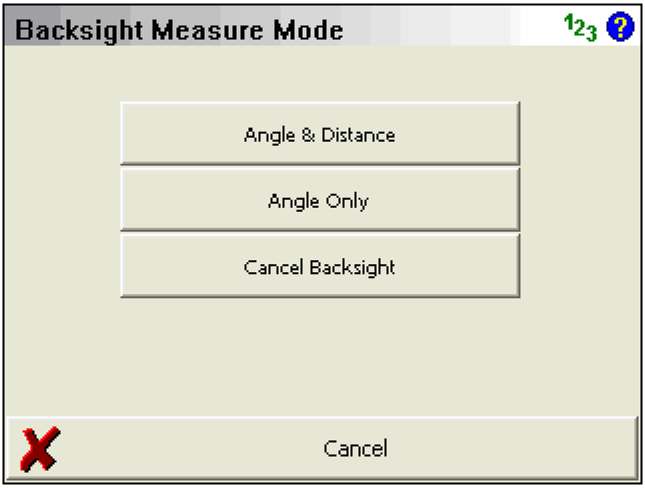
1. You can always tell what mode you're in by the "mode" text that appears near the top of your drawing. Since you're using the occupy point command you will see "Observe Backsight" near the top of the map area.
2. You have two measure modes available to you on the instrument toolbar. You can measure an angle and distance to the backsight, or measure only your current plate reading without measuring a distance. The two options are described in more detail in the Backsight Measure Mode topic.
3. You can cancel the setup by pressing the measure mode button and choosing "Cancel Backsight"
4. While in the backsight mode, you can use any of the controls from the information and display toolbar.
5. You can set the height of target by using the HT button on the instrument toolbar.
6. When you're ready to measure to the backsight, press the Measure button on the instrument toolbar.

Backsight Summary

After you have taken your measurement you will see a summary of your shot. From this screen you can choose to accept the shot or re-shoot it. You can also specify if you want the plate reading set to zero or a specific azimuth (if this is supported on your instrument). For more information see the Backsight Summary topic.

Backsight Measure Modes

Instrument Toolbar | Measurement Modes Button



When shooting to your backsight you have two options available and they can be accessed from the instrument toolbar using the measure mode button. The measure modes available are described as follows:

Angle and Distance

Specifying this will require you to measure a distance to the backsight either to a prism or reflectorlessly. It will also record the current plate reading on the instrument. Both the measure distance and plate reading will be used as the backsight reading in the raw file.

Angle Only

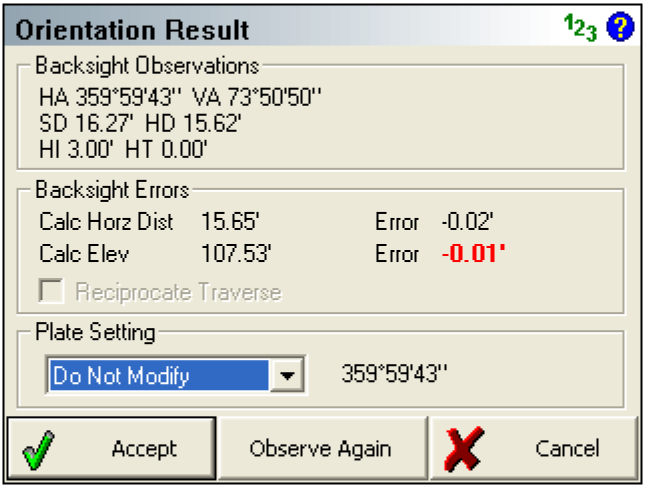
Specifying this will not require you to measure a distance to the backsight. All that will be recorded is the current plate reading on the instrument and this reading will be used as the backsight reading in the raw file.

Cancel Backsight

Use this to cancel your current backsight and occupy point command.

Backsight Summary

After you have taken your measurement you will see a summary of your shot. From this screen you can choose to accept the shot or re-shoot it. You can also specify if you want the plate reading set to zero or a specific azimuth.



Backsight Observations and Errors

If you specified the point backsight method you will see a comparison between what you measured and the theoretical inverse. If you used the measure angle only mode, or defined a backsight direction you will not see a comparison as there isn't enough information available to compute the inverse.

Reciprocate Traverse

This option can only be used if the point being occupied was previously measured and stored as a TR shot. If it was stored as a SS shot then this will be grayed out. This option will also be grayed out if the "Traverse Reciprocate" option in the Program Settings is unchecked.

If this option is turned on then when you measure the backsight, FieldGenius will compute a new elevation for the point being occupied, based on:

1. The measured elevation of the occupy point, based on its previously recorded TR traverse measurement.
2. The computed elevation of the occupy point, based on the backsight observation and the elevation of the backsight point.

These two elevations for the occupy point are averaged together, and a new traverse observation is computed for the occupy point, which will result in the occupy point having this new averaged elevation. This computed observation is written to the raw file as a new TR record, overriding the previous TR record to the occupy point.

Plate Setting

If your instrument supports uploading of angles, the Set To Direction and Set To Zero options will be available to you. If it doesn't support this then these options will be grayed out. These functions can be used to help you set your backsight plate angles on your instrument.

Do Not Modify

With this option selected, the plate reading on the instrument will not be modified by FieldGenius. You will see the current plate reading displayed beside the pull-down list.

Set To Direction

If your instrument supports uploading of angles, the Set To Direction option will be available to you. If it doesn't support this it will be grayed out. Beside the pull-down list you will see the direction field which will contain a value based on two factors:

1. If you specified a points for the occupy and backsight points, you will see the computed (inversed) direction.
2. If you specified a setup point and a direction to the backsight, you will see the direction that you previously entered.

When you press the **Accept** button, FieldGenius will upload the angle to your instrument and set it as the current plate reading. When you Accept the setup, this value will be used as the backsight plate reading in the raw file.

Set To Zero

If your instrument supports uploading of angles, the Set To Zero option will be available to you. If it doesn't support this it will be grayed out. You will see a direction value of zero displayed beside the pull-down list.

When you press the **Accept** button, FieldGenius will upload and set your circle plate reading to zero. When you Accept the setup, this value will be used as the backsight plate reading in the raw file.

Finishing the Setup Routine

Accept

Once you've reviewed your backsight information you can complete it by pressing the **Accept** button. This will write a record to the raw file and exit the setup routine.

If you specified the direction backsight method you will be prompted to "Store the point observed at the backsight?" Press **Yes** to store a point for the backsight, or **No** to complete the setup without creating a new point at the backsight.

Observe Again

If you're not satisfied with the results or made a mistake you can re-shoot the backsight by using this button. Doing so will take you back to the main display where you can take another shot on the backsight.

Occupy Point Raw Records

When you accept your occupy point, points will be stored in the database for the setup and backsight if applicable. Also, the following records will be written to the raw file:

```
SP,PN2,N 918.0848,E 1057.3576,EL0.0000,--
--Orientation
LS,HI5.000,HR5.000
OC,OP1,N 1000.0000,E 1000.0000,EL0.0000,--
BK,OP1,BP2,BS145.00000,BC0.00000
BR,OP1,BP2,AR145.00000,ZE90.00000,SD100.00000
-- Orientation Notes (several comment lines)
```

If the "Reciprocate Traverse" option was used, then the following records will be written to the raw file:

```
TR,OP1,FP3,AR45.00000,ZE90.00000,SD100.00000,--
 (Note: this is the previously measured record, not
part of the occupy routine)
--Reciprocate Traverse
LS,HI5.000,HR5.000
BK,OP1,BP2,BS0.00000,BC0.00000
TR,OP1,FP3,AR45.00000,ZE90.00150,SD100.0000,--
--Orientation
LS,HI5.000,HR5.000
OC,OP3,N 1070.7107,E 1070.7107,EL99.992,--
BK,OP3,BP1,BS225.00000,BC0.00000
BR,OP3,BP1,AR0.00000,ZE89.59300,SD100.01000
-- Orientation Notes (several comment lines)
```

Sideshot

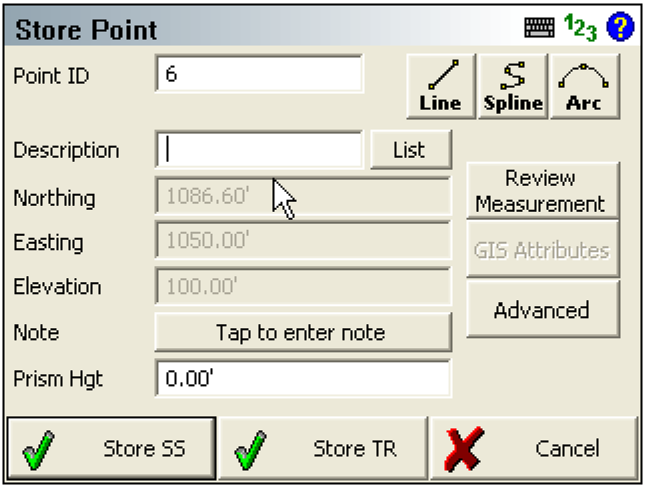
Main Menu | Survey Methods | Sideshot

If you like reviewing your shots prior to being stored in the database and raw file, then this is the mode you should use. When you press the measure button on the instrument toolbar, after the shot is measured you will see the store point screen prior to storing the point.

When you set this mode you will see the word **Sideshot** on the measurement mode button.

When you take a shot using the measure button you will see the Store/Edit Point screen.

You can also confirm or change the Prism Height used for this shot.



After reviewing the information you have three choices to make.

Store SS Button

Press the Store SS button if you want create a sideshot record (SS) in the raw file and store the coordinate in the database.

```
SS,OP350,FP3,AR0.00000,ZE94.50090,SD13.2700,--<No
Desc>
```

Store TR Button

Press the Store TR button if you want to create a traverse record (TR) in the raw file and store the coordinate in the database.

```
TR,OP350,FP4,AR0.00000,ZE94.50080,SD13.2700,--<No
Desc>
```

Traverse records are needed if you want to compute a traverse closure. If your last shot from a setup is recorded as a traverse record, when you use the occupy point routine it will automatically advance you. This is commonly referred to as "leap frogging" your traverse.

Cancel Button

Press the Cancel button cancel the shot and will not store anything.

Note: For more information on the other buttons found on the sideshot screen please read the Store / Edit Points topic.

Sideshot (Auto Store)

Main Menu | Survey Methods | Sideshot (Auto Store)

Use this when you have production in mind and you don't need to review your shots before they're recorded in the database and raw file. The measure mode allows you to press the measure button and it will store the point in the database and plot it in the drawing without asking you for any further information.

When in this mode you will see the words "**Sideshot (Auto)**" on the measure mode button.

It will use the following settings from the main interface when storing the point:

Next Point Number ID

The current point ID on the topo toolbar will be assigned to the point.

Description

The current description on the topo toolbar will be assigned to the point.

Height of Target

The current HT on the instrument toolbar will be used to compute the elevation of the point.

> **Note:**
> When measuring in the Auto Store mode, a SS record will be recorded in the raw file.

Resection

Main Menu | Survey Methods | Resection

FieldGenius has a multi-point resection routine that can be used to compute a point for a setup. It will use a least squares solution to determine the coordinates from the measurements you make to your points.

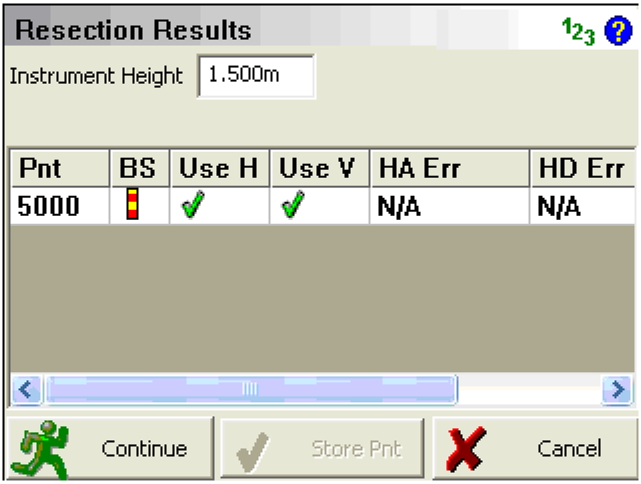
- As a minimum you need to have two points to resect to.

- You can shoot the resection point in the direct or reverse face.
- You can take multiple shots to the same resection point.
- There is no limit to the amount of points you can resect to.
- When you store your resection point, an occupy record will be created for you automatically.

Specify the Resection Points

First Shot

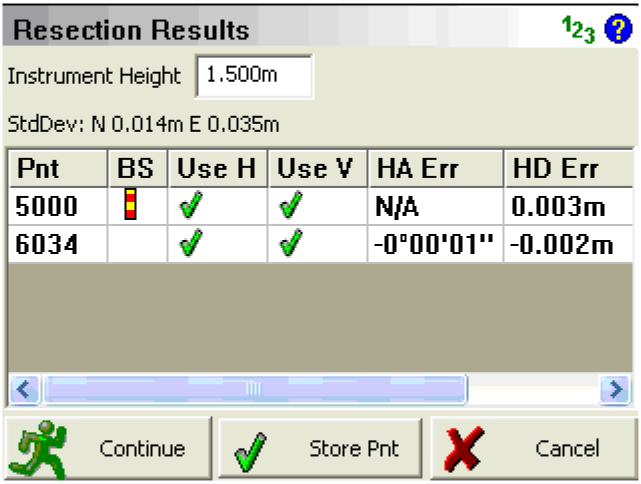
When you start the command you will see the point chooser. By default the first reference point you resect to will be used as the backsight shot, so you might want to ensure that this is the longest shot to increase your accuracy.



You will notice that since this was the first shot that there is a backsight icon next to the point number. Once you record other shots, you can select a different point for the backsight.

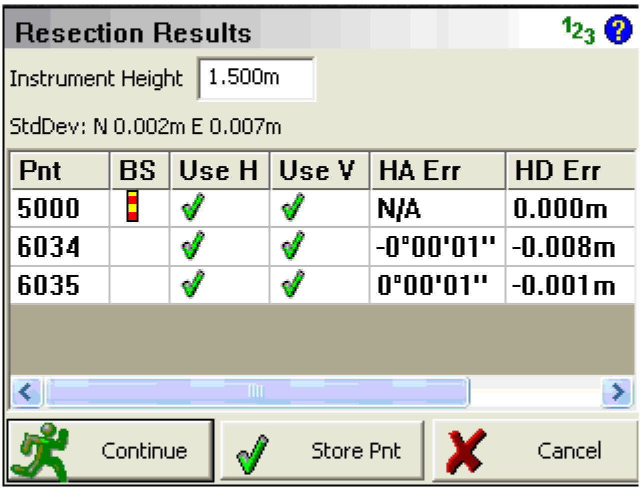
Second Shot

To record the second shot, simply sight the point now. Then press **Continue** to take you to the map screen. From here you can select the next reference point and then press the measure button to record the observation.



Third or More Shots

If you have more points to reference to you can continue measuring them using the same process as you did when you shot the second point. As you record more points you should notice that the standard deviations for the northing and easting will begin to get smaller.



Horizontal and Vertical Filters

You can determine how a shot to a reference point should be used to compute the resection point. By default each observation you make will be used to compute both the vertical and horizontal position for the resection solution. You can control what is used by tapping on any of the green "check marks" which will change them to a do not use state.

Use H	Use V	Result
✓	✓	The shot can be used to compute both the horizontal and vertical position.
✓	✕	The shot can be used to compute only the horizontal position.
✕	✓	The shot can be used to compute only the vertical position.
✕	✕	The shot is to be ignored in the computation.

HA, HD and VD Errors

As soon as you gather enough data, FieldGenius will compute a resection point.

HA Error

The horizontal angle error is computed as follows. Using the computed resection point and the measured horizontal angle, a theoretical direction is computed to the reference point. This direction is then compared to the direction measured (plate reading) and the difference is noted in the HA Err column.

HD Error

The horizontal distance error is computed as follows. An inverse is made between the resection point and the reference point. This inversed distance is then compared to the measured distance and the difference is noted in the HD Err column.

VD Error

The vertical distance error is computed as follows. Using the resection elevation, and the observation to the reference point, a new elevation is computed for the reference point. This computed elevation is then compared to the reference point's original elevation and the difference is noted in the VD column.

Standard Deviation

This is the computed precision for the resection point. Small errors indicate that the measured data "fits" very well with the geometry defined by the known points.

Large errors can indicate that bad measurements were recorded, either due to careless measurement practices such as not holding the prism pole straight or not carefully sighting the prism. Large errors can also happen if the geometry defined by the known points, is not "in the same place" as it was when the points were previously measured.

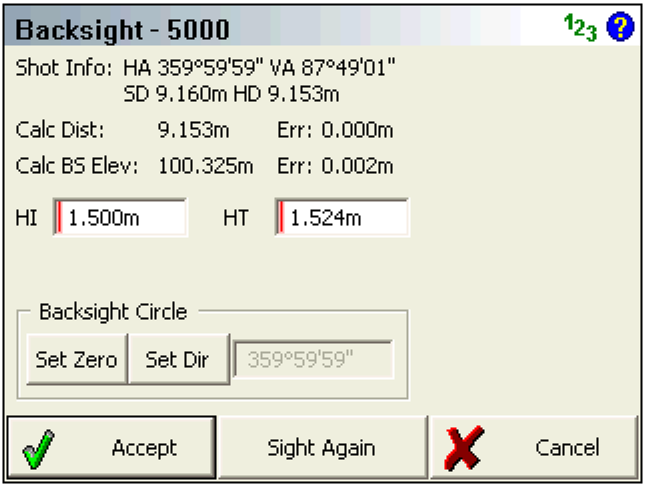
Resection Modes

At any time during the collection of your observations you can choose to shoot an **angle & distance** or **angles only** measurement. You can control this by pressing the measurement mode button on the instrument toolbar after you have started your resection.

Store the Resection Point

When you're satisfied with the resection point you can store its new position by pressing the **Store Pnt** button. This will then display the store / edit screen.

Finally you will see a backsight setup screen.



The backsight point that will be stored will be based on which point you set at the backsight point during the initial resection measurements. As described above, the backsight point is denoted by placing the backsight icon next to it in the reference point list. You do not need to take another measurement to the backsight as it has your original measurement you made. At this point you can do the following:

- Confirm the instrument and target heights.
- Decide if you want to set the plate reading on the instrument to zero or an azimuth.
- Decide if you would like to sight it again and take another measurement.

If you're satisfied with the backsight, you can store it by pressing the **Accept** button. If you're setting a plate reading on the instrument, you need to make sure it is pointing at the backsight point prior to pressing the Accept button. For example, if you want to set zero on the backsight point, you need to make sure that the instrument is pointing at the backsight point.

Raw File Record

After your store you point, several records will be written to the raw file.

```
--Resection
SP,PN5000,N 1009.1534,E 1000.0000,EL100.3244,--
SP,PN6034,N 1006.1995,E 1002.8319,EL99.7321,--FS
SP,PN6035,N 1001.4706,E 1004.8775,EL99.7361,--FS
RS,PN5000,CR359.59590,ZE87.49010,SD9.1600
RS,PN6034,CR24.33000,ZE92.03450,SD6.8280
RS,PN6035,CR73.13080,ZE92.43050,SD5.1010
SP,PN6036,N 999.9998,E 999.9998,EL100.0011,--
OC,OP6036,N 999.9998,E 999.9998,EL100.0011,--
SP,PN5000,N 1009.1534,E 1000.0000,EL100.3244,--
BK,OP6036,BP5000,BS0.00039,BC0.00000
--Occupy Check
-- Observed Values: HA 0°00'00.0" VA 87°49'22.0" SD
9.160m HD 9.153m
-- Distance Calculated: 9.154m
-- Distance Error: -0.000m
-- BS Elevation: 100.324m
-- BS Elevation Error: 0.001m
```

Check Point

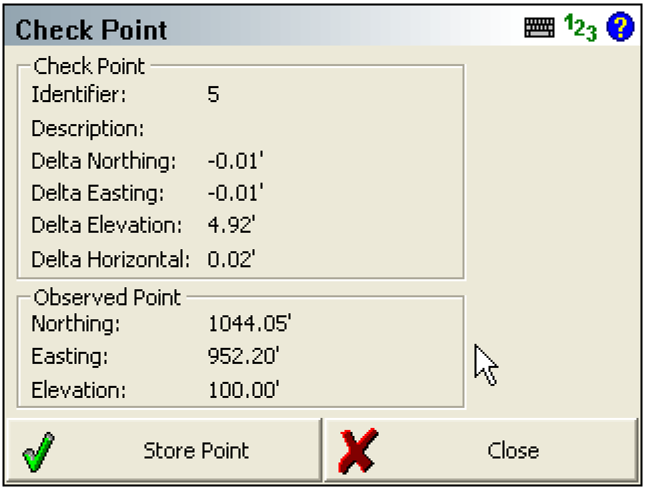
Main Menu | Survey Methods | Check Point

Use this to measure a check shot to an existing point. When you start the command you will see the point chooser appear where you can create a new point or pick an existing one from a list or from the screen. After you choose your point you will be ready to measure. You will note the measure mode will be set to **Check Pnt** and if you need to cancel the operation you can do it by pressing the measure mode button and choose to cancel it.

Check Shot Summary

When you're ready to record the shot press the **Measure** button on the instrument toolbar. You will be presented with a screen that compares your measured values to the ones that were computed for the check shot point.

The deltas that are displayed are computed by subtracting the shot coordinates from the known coordinates. In other works if you add the deltas to the shot point coordinates you will end up at the known point.



Store Point

Pressing this will exit the function and write several notes to the raw file summarizing your check shot, and allow you to store the shot using the Store/Edit Point screen.

```
--Check Point
--   Check Point ID:          110
--   Check Point dNorthing:   -4.59'
--   Check Point dEasting:    -1.82'
--   Check Point dElevation:  -4.96'
--   Check Point dHorizontal: 4.94'
--   Observed Values:         HA 45°00'00.0" VA
90°00'00.0" SD 23.00' HR 5.00'
--   Observed Point Northing: 5016.26'
--   Observed Point Easting:  5016.26'
```

```
¦ --   Observed Point Elevation: 95.00'                    ¦
```

Close

This will exit the check shot function and not write anything to the raw file or storing a new point.

Check Backsight

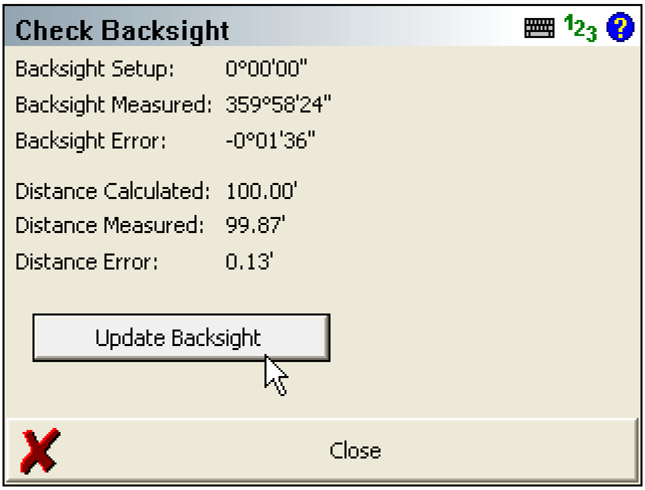
Main Menu | Survey Methods | Check Backsight

Use this to check your backsight. FieldGenius will compare your newly measured value to the one that was stored for your current setup. You will be able to review difference and optionally update your current setup with the new shot to the backsight.

When you start the command you will be taken back to the map screen and the measure mode will be set to **Check BS.** You have two measure modes available when taking a check shot to your backsight. Please see the Backsight Measure Mode topic for more information.

Check Backsight Summary

When you're ready to record the shot press the **Measure** button on the instrument toolbar. You will be presented with a screen that compares your measured values to the ones that were stored for the current backsight.



Update Backsight

Pressing this will create a record in the raw file updating your setup and backsight record with the shot information from your check shot. Several notes will also be written to the raw file summarizing your shot. When you choose to update the backsight, a new OC and BK record is saved as well as the shot information. You will also see the word (Updated) which indicates that the user selected the Update button.

```
OC,OP5,N 763.8748,E 1000.0000,EL0.0000,--
SP,PN1,N 1000.0000,E 1000.0000,EL100.0000,--start
BK,OP5,BP1,BS0.00000,BC0.00000
LS,HI0.000,HR5.000
--Backsight Check (Updated)
--  Observed Values:     HA 0°00'00.0" VA
90°00'00.0" SD 163.12'
--  Backsight Setup:     0°00'00"
--  Backsight Measured:  0°00'00"
--  Backsight Error:     0°00'00"
--  Distance Calculated: 236.13'
--  Distance Measured:   163.12'
--  Distance Error:      73.01'
```

Close

Pressing this will exit the function and write several notes to the raw file summarizing your check shot.

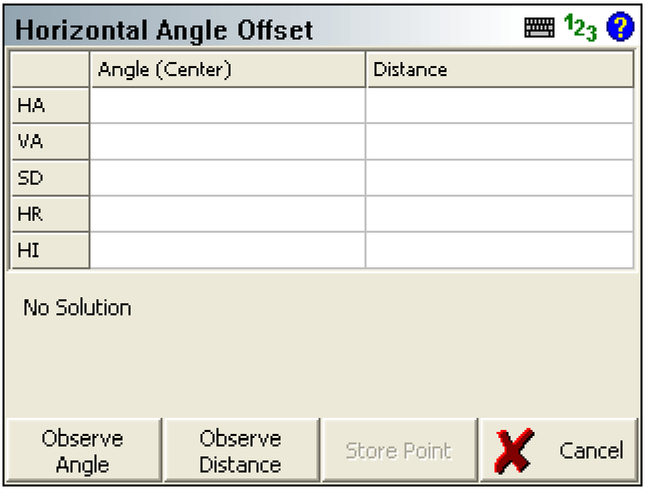
```
--Backsight Check (Not Updated)
--  Observed Values:     HA 0°00'00.0" VA
90°00'00.0" SD 236.10'
--  Backsight Setup:     0°00'00"
--  Backsight Measured:  0°00'00"
--  Backsight Error:     0°00'00"
--  Distance Calculated: 236.13'
--  Distance Measured:   236.10'
--  Distance Error:      0.03'
```

Horizontal Angle Offset

Main Menu | Survey Methods | Horizontal Angle Offset

FieldGenius includes a flexible angle offset routine. It allows you to shoot the angle and distance to a point that can not be occupied by the rod. An example of where you would use this is if you wanted to record the center of a large object, such as a tree.

When you choose the Horizontal Angle Offset measurement mode you will see the following screen.

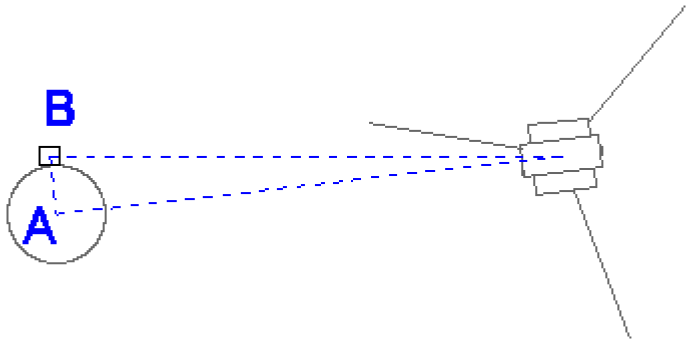


Two observations are required: one to record the angle to the center of the object, and a second to measure a distance perpendicular to the object's center.

On this screen you determine what order you will make these two measurements. All you need to do is press either the **Observe Angle** or **Observe Distance** button.

Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Note: The Quick Measure Modes option in the Options screen will affect what happens when you press the Observe buttons when you are using the offset routines. If Quick Measure Modes is on, a measurement will automatically be taken. If it is off, the Observe button doesn't actually trigger your total station to take a measurement; it simply takes you to the map screen where you can press the  measure button once you are ready to take the measurement.



Angle (Center)

This will record the total station's horizontal angle. When measuring the angle, you should point the total station towards the center of the new point that will be created. This would be measurement "A" in the diagram shown above.

Note: You do not need to sight a prism to record the angle, simply sight the new point and press the **Observe Angle** button.

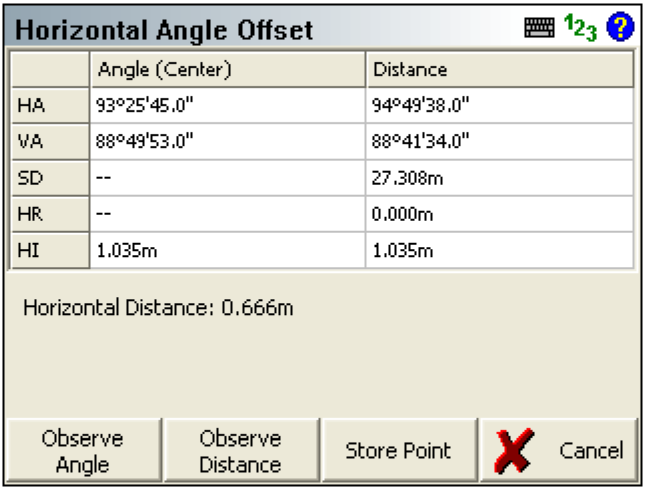
Distance

This will record a distance, measured to a prism which is located at the side of the object. You should try to locate the prism so that it is perpendicular to the center of the object and the line-of-sight from the total station. This is measurement "B" in the diagram shown above.

Note: The target height is important on this shot, because the new point will have the same elevation.

Storing the Shot

After you record your measurements you can store the new point by pressing the **Store Point** button.



After you store the point, you can continue using the offset command to record additional points, or exit it by pressing the **Cancel** button.

Raw File Record

In the raw file the OF records represent the measurements that were made and the SS record is derived using the two OF records

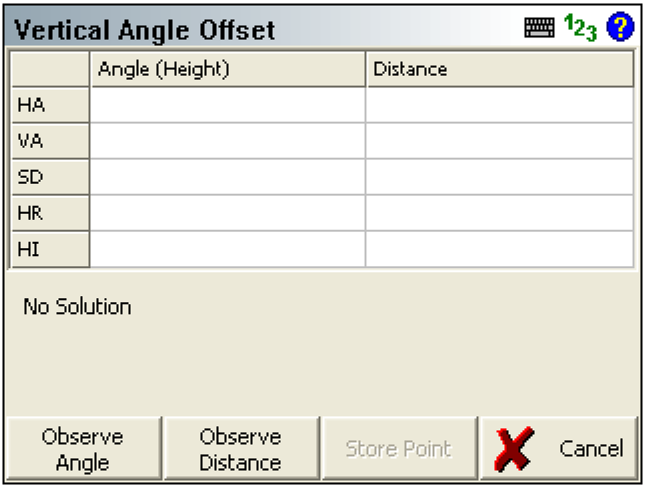
```
OF,AR94.49380,ZE88.41340,SD27.3163
OF,OL93.25450,--Right Angle Offset
SS,OP1,FP23,AR93.25450,ZE88.41340,SD27.3081,--ROAD
```

Vertical Angle Offset

Main Menu | Survey Methods | Vertical Angle Offset

When you begin the vertical angle offset routine, you will see the following screen.

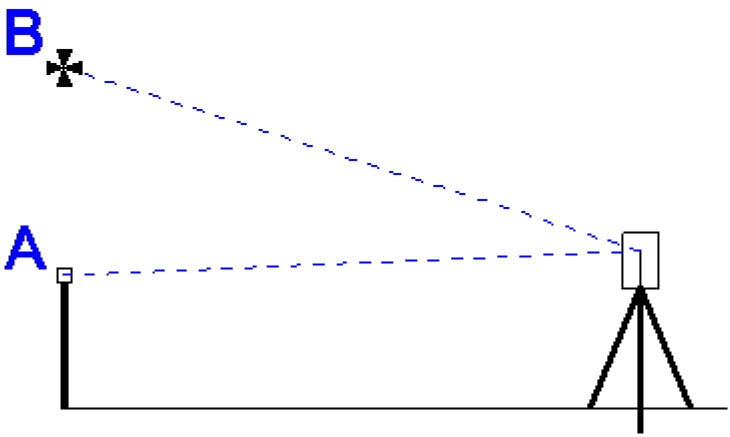
Two observations are required, one to record the top or bottom of the object, and a second to measure a distance that is directly underneath or above the new point.



On this screen you determine what order you will make these two measurements. All you need to do is press either the **Observe Angle** or **Observe Distance** button.

Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Note: The Quick Measure Modes option in the Options screen will affect what happens when you press the Measure button when you are using the offset routines. If Quick Measure Modes is on, a measurement will automatically be taken. If it is off, the measure button doesn't actually trigger your total station to take a measurement; it simply takes you to the map screen where you can press the  measure button once you are ready to take the measurement.



For example if point "B" was the bottom of an underpass, you could measure it's height. Usually it is easier if you position the prism so it is directly beneath the point you want to shoot. You would then record a distance observation to this location which will also be the horizontal position for the new point. Then without turning your instrument, you could rotate the scope vertically so it is sighted on the bottom of the overpass. You could then record this observation which will be used to compute the elevation for the new point.

Once you've recorded these two measurements, you will be able to store the new position.

Storing the Shot

After you make your measurements, you will be able to store the new point. Press the **Store Point** button to store the point.

Raw File Record

In the raw file the OF records represent the measurements that were made. The SS record is the record that was used to compute the coordinate point for the angle offset and will be a compilation of your two shots.

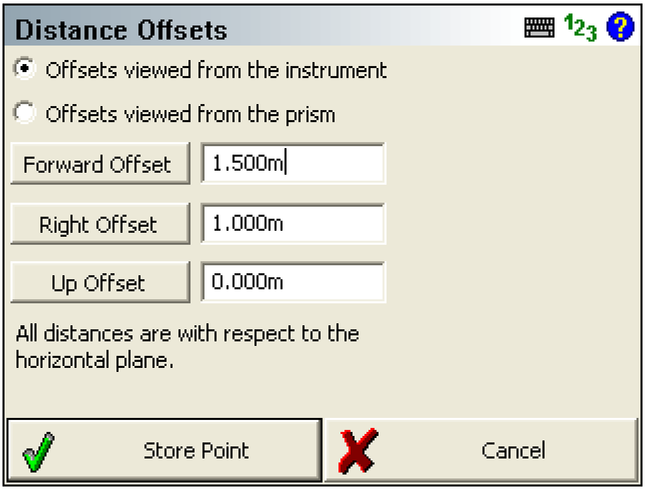
```
OF,AR52.53170,ZE91.12240,SD9.5616
OF,ZE91.12240,--Vert Angle Offset
SS,OP1,FP2,AR52.53170,ZE91.12240,SD9.5616,--<No
Desc>
```

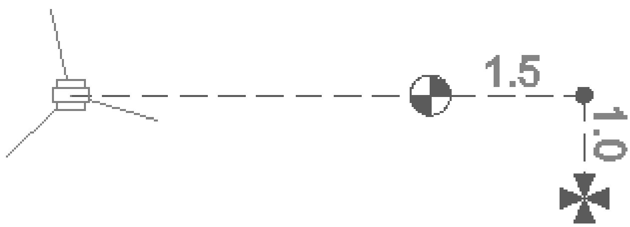
Distance Offset

Main Menu | Survey Methods | Distance Offset

FieldGenius allows you to do a distance offset to specify an offset forward or backward along the line of sight, left or right, and vertically up or down.

When you choose distance offset command and take a measurement, you will see the following screen:





From this screen you can specify if the offsets are with respect to the instrument or prism.

- Offset buttons act as toggles, which allow you to easily define the direction the offset should be applied.
- A negative offset will automatically be converted to a positive value.
- The elevation of the point will be computed from your shot. This elevation will remain unchanged unless you specify a vertical offset.
- The distance is assumed to be horizontal.

Forward / Back Offset

Enter the offset distance from the shot position to the new position.

Right / Left Offset

Enter the perpendicular offset distance from the shot position to the new position.

Up / Down Offset

Enter the vertical offset distance form the shot position to the new position.

Store Point

After you have entered your offsets you can press the **Store Point** button to save the point

Raw Record

A sideshot (SS) record will be computed to represent the shot. The new SS record will use the original observation plus any offsets defined in the distance offset screen.

```
OF,AR55.00000,ZE90.00000,SD12.0000
OF,HD1.5000,--Horizontal Distance Offset
OF,LR1.0000,--Left / Right Offset
OF,VD0.0000,--Elevation Offset
SS,OP1,FP6028,AR59.14110,ZE90.00000,SD13.5370,--
```

Note: Offsets that are to the left, back or down will be stored in the raw file with a negative value.

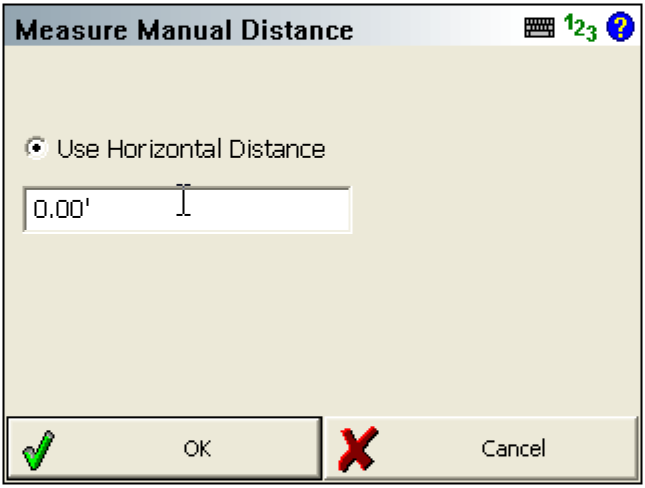
Manual Distance

Main Menu | Survey Methods | Manual Distance

Use this mode to shoot an observation where only the horizontal and zenith angles will be measured with the instrument. You will be then prompted to enter the distance.

When you set the measurement mode to manual distance and press the measure button the horizontal and vertical angles will be read from your total station. Since this is only measuring angles, you do not need to have a prism to shoot to.

Following this you will see a screen allowing you to enter a horizontal distance.



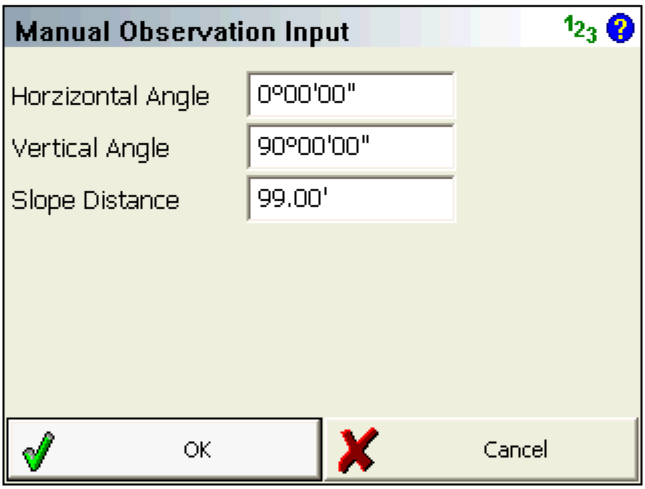
Press **OK** to save the point. You will now see the measurement info screen.

A regular sideshot or traverse record will be created in the raw file.

Manual Entry

Main Menu | Survey Methods | Manual Entry

When you set the measurement mode to manual entry on the instrument toolbar you will be required to manually input your measurements. When you press the measure button you will see the following screen:



Press **OK** to Store the point.

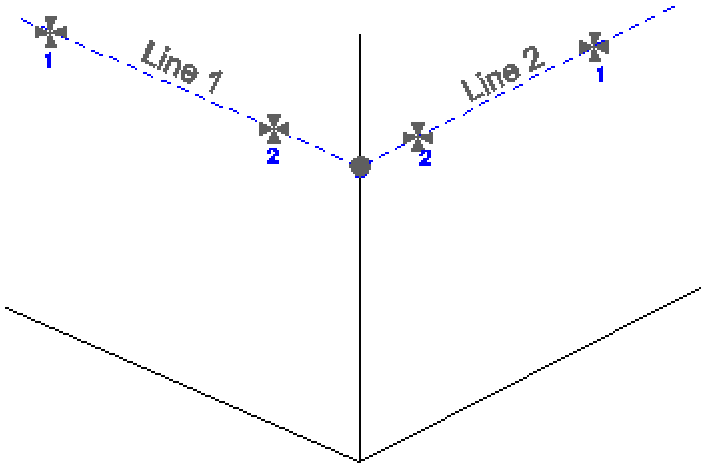
A normal sideshot or traverse record will be written to the raw file just as if you shot it with a total station.

> **Tip:**
> You can also use the Manual Entry mode for repeating your last shot. If you have previously taken a measurement, then the angle and distance values on this screen will default to those of your previous shot.

Two Line Intersection

Main Menu | Survey Methods | Two Line Intersection

The two line intersection command is used to locate the corner of an object, whose corner can not be directly measured. Two intersecting lines will be defined by four measurements, two shots on each line. The intersection of these two lines will define the corner of the object. This routine is intended to be used with a reflectorless total station.



Measure Points

When you start the two line intersection command, you will see an empty list. Each row represents a measurement to a point on one of the two lines needed to compute the intersection.

Highlight the row that you would like to make a measurement for and simply press the **Measure** button to begin the measuring process.

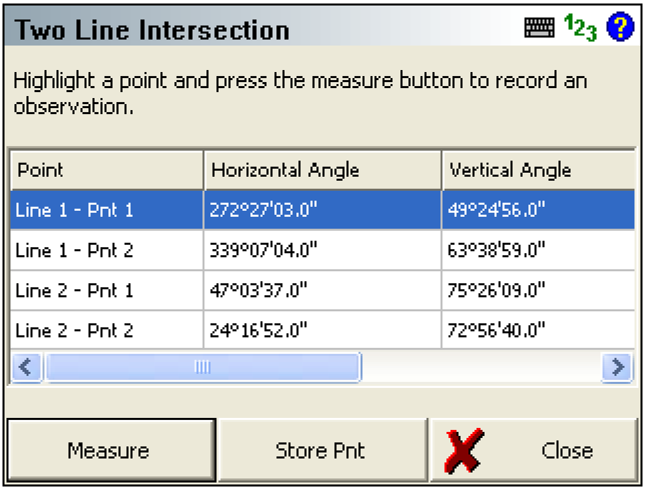
If you need to redo a measurement, simply highlight it in the list and press the measure button.

Notes:

1. You can shoot the points in any order you like, FieldGenius will determine what direction to go in to compute an intersection

2. The northing and easting values for the new point will be computed using the intersection of the two lines.

3. The two lines you define will rarely intersect at exactly the same point. The elevation of where the lines intersect will be averaged, and used as the z value for the new point.



Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Store the Point

Once you've made measurements to the four points that will define the two intersection lines, you can press the Store Point button. This will store a point in the map screen, store a point in the database as well as record information to the raw file.

Raw File

Everything about the intersection is stored in the raw file.

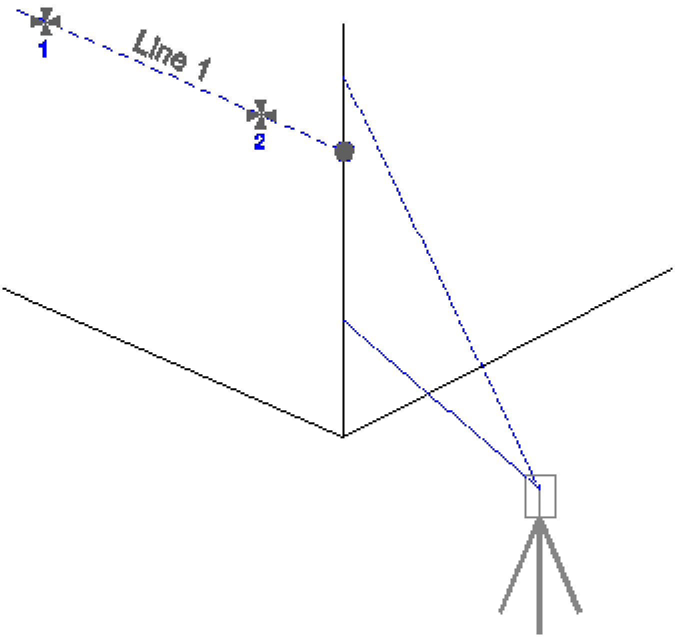
```
! --Two Line Intersection                                 !
```

```
 --HI1.340,HR0.000,AR280.55220,ZE81.15170,SD6.8350,--
Pnt 1 of Line 1
 --HI1.340,HR0.000,AR276.59380,ZE81.05590,SD6.4400,--
Pnt 2 of Line 1
 --HI1.340,HR0.000,AR287.18580,ZE81.13350,SD6.7960,--
Pnt 1 of Line 2
 --HI1.340,HR0.000,AR296.06280,ZE80.14520,SD6.0940,--
Pnt 2 of Line 2
 SP,PN3,N -0.0039,E -0.0060,EL0.5325,--
```

Line - Angle Offset

Main Menu | Survey Methods | Line - Angle Offset

The line angle offset command is used to define two points that will be used to establish a reference line. Then allow you to measure an angle that intersects this reference line, and FieldGenius will automatically compute a new point at the intersecting point.



An example of where you might use this is to locate the corner wall of a building. Simply shoot two points on one of the walls, then turn the instrument so it is pointing anywhere along the corner of the building. This command is intended to be used with reflectorless total stations.

Measure Points

When you start line angle offset command, you will see an empty list.

Highlight the row that you would like to make a measurement for and simply press the **Measure** button to begin the measuring process.

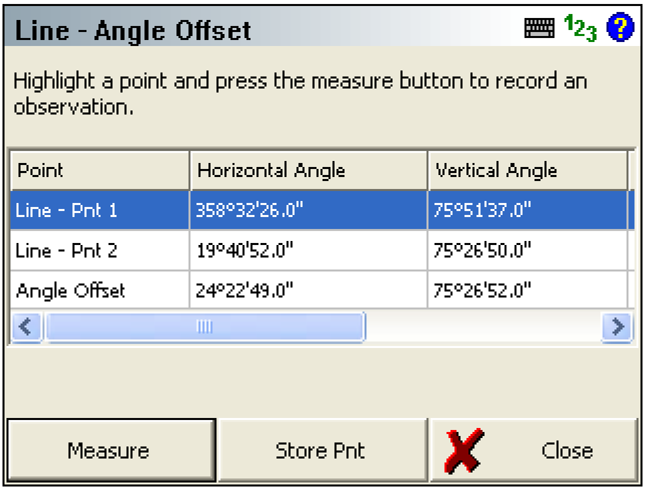
If you need to redo a measurement, simply highlight it in the list and press the measure button.

Notes:

1. You can shoot the points in any order you like, FieldGenius will determine what direction to go in to compute an intersection

2. The northing and easting values for the new point will be computed using the intersection of the line and the angle that was read.

3. The z value for the new point will be computed using the projected elevation along the reference line to the point where an intersection is computed.



Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Store the Point

Once you've made your measurements that will be used to compute the intersection, you can press the **Store Point** button. This will store a point in the map screen, store a point in the database as well as record information to the raw file.

Raw File

Everything about the intersection is stored in the raw file.

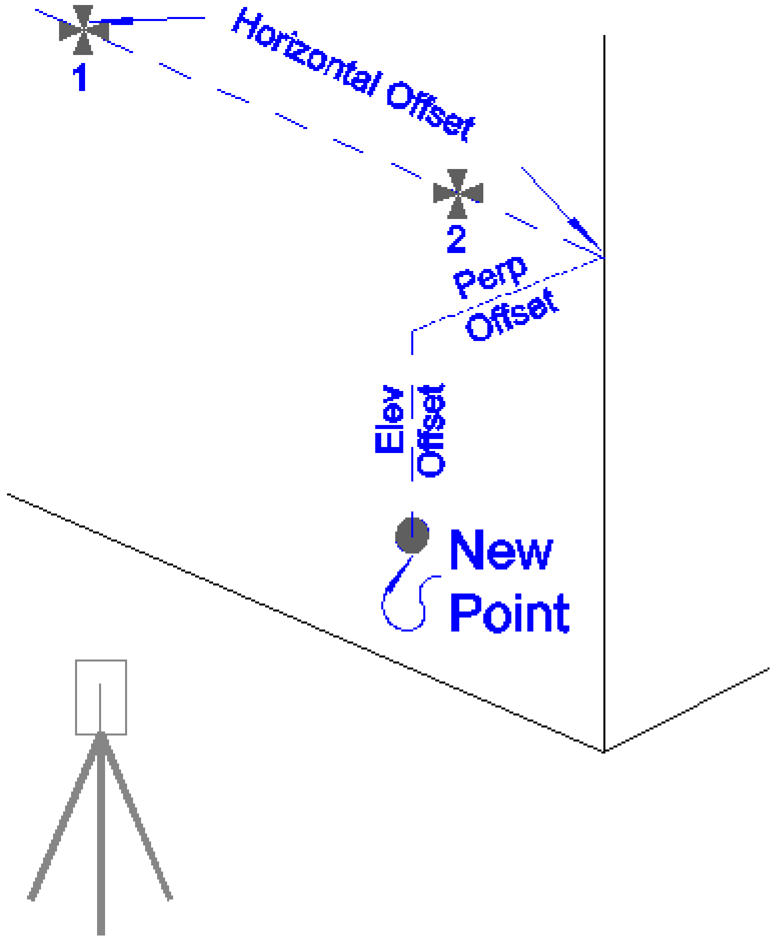
```
 --Line - Angle Offset
 --HI1.340,HR0.000,AR280.55530,ZE81.12550,SD6.8330,--
Pnt 1 of Line
 --HI1.340,HR0.000,AR277.37420,ZE80.47010,SD6.5020,--
Pnt 2 of Line
 --HI1.340,HR0.000,AR283.46460,ZE86.15500,--Angle
Offset
 SP,PN4,N -0.0050,E 0.0051,EL0.5761,--
```

Line - Distance Offset

Main Menu | Survey Methods | Line - Distance Offset

The line distance offset command is used to define two points that will be used to establish a reference line. Once the reference line is established you can then specify offsets along the reference line to the new point.

This is a very powerful offsetting tool that can be used in a lot of different situations.



When you define your reference line, there are three types of offset that can be applied.

You can define a horizontal offset, a perpendicular offset and a vertical (elevation) offset. Each offset button is a toggle that allows you to toggle how the offset is to be applied in relation to the reference line.

When you define the offset direction, you can then enter in the value that you want to offset by.

If the horizontal offset remains set to zero, perpendicular or elevation offset will be applied in relation to point one on the reference line.

Offsets

Horizontal Offset

The horizontal offset can either be left or right of the first point on the reference line. From the total station's perspective, if the new point is to the right of point 1, then you would use the Horz Offset Right of Pnt 1. If it is to the left, then logically, it would be a left offset so you would use the Horz Offset Left of Pnt 1 setting.

Perpendicular Offset

The perpendicular offset is a horizontal distance applied perpendicular to the reference line. From the total station's perspective, when moving perpendicular from the reference line, if the new point ends up being closer to the total station, then you would set the perpendicular offset to Perp Offset Towards Inst. Alternatively, if the new point ends up being farther from the total station, then you would use the Perp Offset Away From Inst.

Elevation Offset

This is the vertical offset from the reference line to the new point. If the new point is above the reference line, then you would set this to Elev Offset Up. If the new point is below the reference line you would set it to Elev Offset Down.

Measure Points

When you start line angle offset command, you will see an empty list.

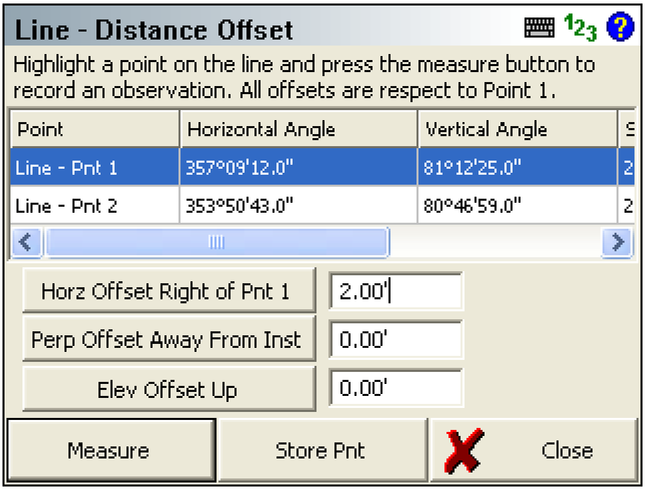
Highlight the row that you would like to make a measurement for and simply press the **Measure** button to begin the measuring process.

If you need to redo a measurement, simply highlight it in the list and press the measure button.

Notes:

1. The northing and easting values for the new point will be computed using the horizontal and perpendicular offsets defined by the user. These horizontal offset is referenced to point 1 on the reference line. The perpendicular offset is a perpendicular offset from the reference line.

2. The z value for the new point will be computed using the projected elevation along the reference line, plus or minus any elevation offsets defined by the user.



Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Store the Point

Once you've made your measurements that will be used to compute the intersection, you can press the **Store Point** button. This will store a point in the map screen, store a point in the database as well as record information to the raw file.

Raw File

Everything about the intersection is stored in the raw file.

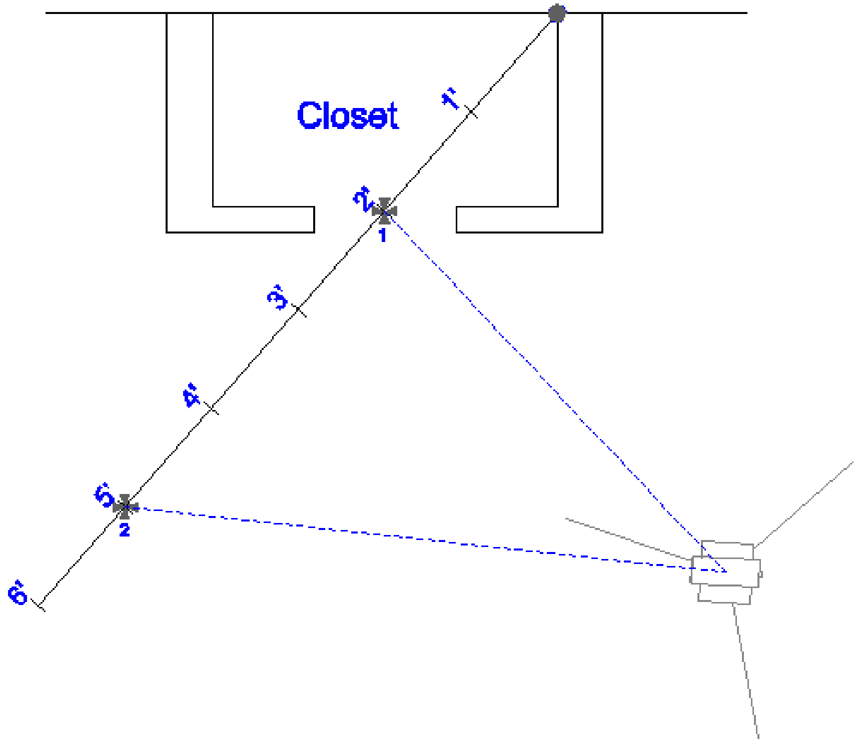
```
--Line - Distance Offset
--HI0.000,HR0.000,AR357.09120,ZE81.12250,SD22.4114,-
-Pnt 1 of Line
--HI0.000,HR0.000,AR353.50430,ZE80.46590,SD21.3255,-
-Pnt 2 of Line
--Horizontal Offset: 2.000
--Perpendicular Offset: 0.000
--Elevation Offset: 0.000
SP,PN1018,N 123.5558,E 100.2931,EL103.4035,--EV2
```

Example

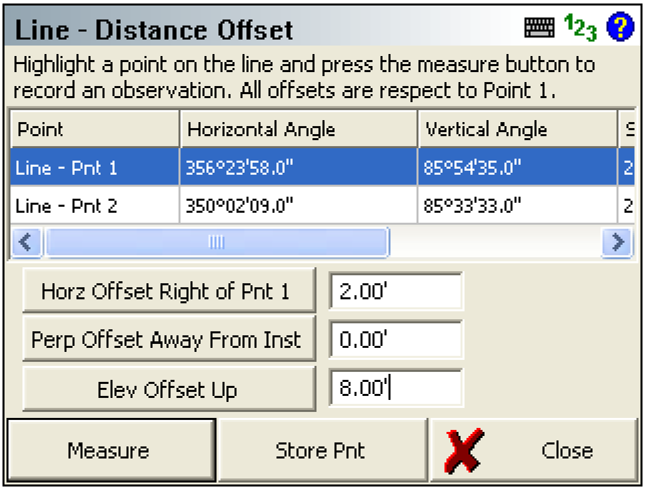
The top corner in a closet needs to be located, but it isn't visible from the total station.

So the user lays a hand tape on the floor, with the start of the tape located at the bottom corner of the closet, directly below the point that needs to be recorded. The direction of the tape is then laid out such that two measurements can be made on the tape.

Essentially, the tape now becomes the reference line. Two shots are taken, one at the 2 foot mark, and the other at the 5 foot mark.



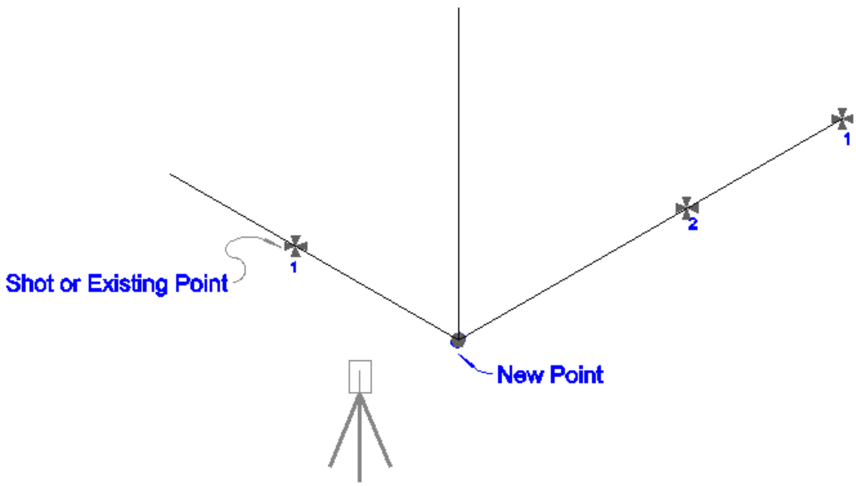
After you take your two measurements, all you need to define is the offset distances. In this example, the corner is two feet to the right of the first measurement (point 1), and 8' up from the floor. After you define the offset directions and offset amounts, you can press the **Store Pnt** button to store the new point.



Line - Perpendicular Point

Main Menu | Survey Methods | Line - Perpendicular Point

This offset command is used to define two points that will be used to establish a reference line. Once the reference line is established, you can specify a point that will be used to compute a perpendicular intersection from the point to the reference line. The point can either be shot or you can select an existing point from your scene database or map.



An example of where you could use this is to pick up the corner of a building, whose corner can not be scene from the total station. You could take two shots on one wall to define the reference line, and then take another shot on the intersecting wall. A perpendicular intersection will be computed, which in this case would be the corner of the building.

Measure Points

When you start the command, you will see an empty list.

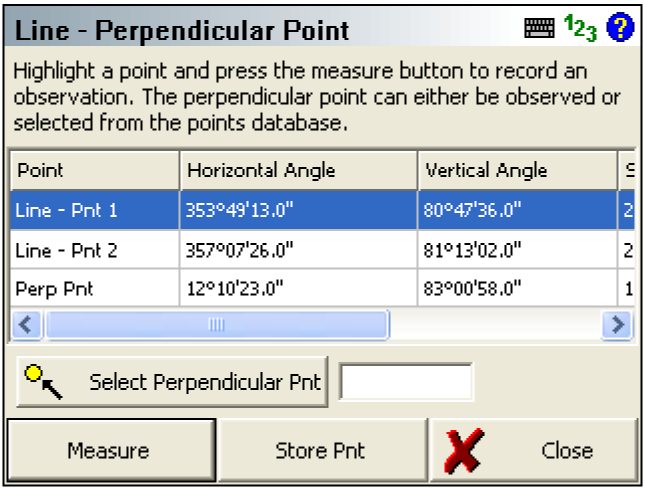
Highlight the row that you would like to make a measurement for and simply press the **Measure** button to begin the measuring process.

If you need to redo a measurement, simply highlight it in the list and press the measure button.

Notes:

1. The northing and easting values for the new point will be computed by computing a perpendicular intersection between the reference line and a point defined by the user.

2. The z value for the new point will be computed using the projected elevation along the reference line to the point where a perpendicular intersection occurs.



Note: You can increase the size of the text shown in the grid by setting the Text Size option in the Options screen.

Select Perpendicular Point

You can define the perpendicular point one of two ways. The first is to simply take a measurement that will define the perpendicular point. The shot is only used to make an intersection, a point isn't stored at the measurement location.

The other method is to choose an existing point that exists in your scene. Press the Select Perpendicular Pnt button to select a point.

Store the Point

Once you've made your measurements and defined a perpendicular point that will be used to compute the intersection, you can press the Store Point button. This will store a point in the map screen, store a point in the database as well as record information to the raw file.

Raw File

Everything about the intersection is stored in the raw file. In the following example, if you shot the perpendicular point you will see a third shot that records the measurement.

```
--Line - Perpendicular Point
--HI1.340,HR0.000,AR353.49130,ZE80.47360,SD21.3386,-
-Pnt 1 of Line
--HI1.340,HR0.000,AR357.07260,ZE81.13020,SD22.4245,-
-Pnt 2 of Line
--HI1.340,HR0.000,AR12.10230,ZE83.00580,SD19.8819,--
Perpendicular Pnt
SP,PN6,N 123.3028,E 100.0209,EL104.7737,--RM
```

If the perpendicular point exists in your scene and you selected it using the point chooser, then you will see a store point recorded as a note. The last store point is the new point that was computed.

```
--Line - Perpendicular Point
--HI1.340,HR0.000,AR353.49520,ZE80.46560,SD21.3419,-
-Pnt 1 of Line
--HI1.340,HR0.000,AR357.07330,ZE81.12210,SD22.4147,-
-Pnt 2 of Line
--SP,PN7,N 119.2906,E 104.1611,EL103.7580,--
Perpendicular Pnt
SP,PN8,N 123.3107,E 100.0504,EL104.7751,--SCR
```

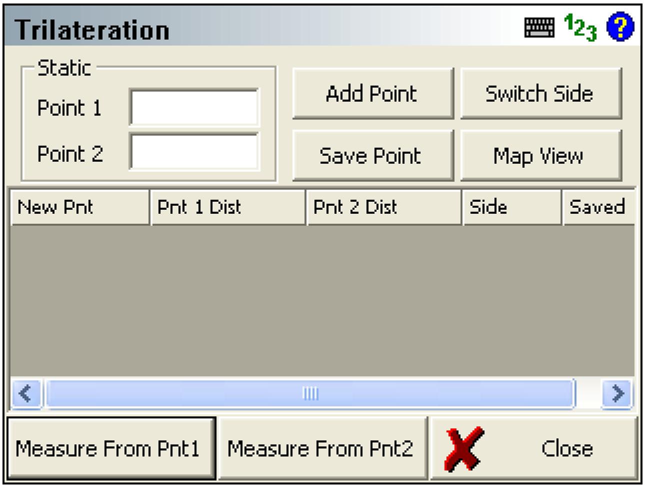
Trilateration

Main Menu | Survey Methods | Trilateration

This routine allows you to trilaterate the position of new points by observing their distances from two known positions. The two known points will make up a baseline, from which a distance-distance intersection will be calculated to determine the position of each new point.

The primary use of this routine is for GPS users so they can locate inaccessible points. They can locate two points with GPS, and then use the Trilateration routine to locate the inaccessible points.

This routine will also accept distances measured with the Leica Disto.

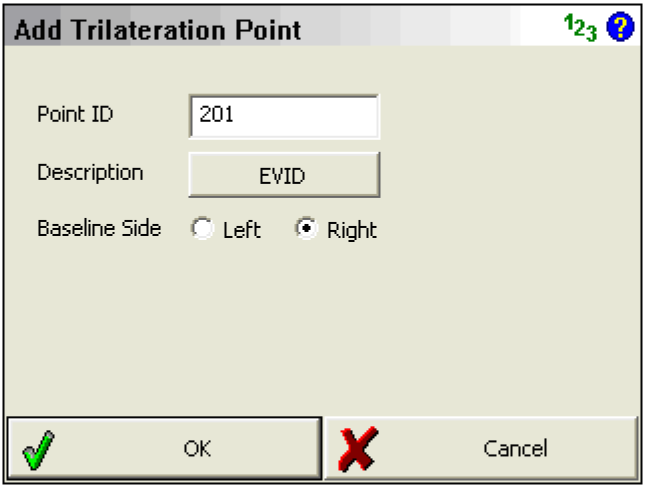


Static Points (Baseline)

Select your two baseline points, from which you will be observing the distances to the new points.

Add Point

Use this to add a new unknown point to solve for. When you press this, you will be prompted for the new point number and description, and whether it is on the left or right side of the baseline.



Save Point

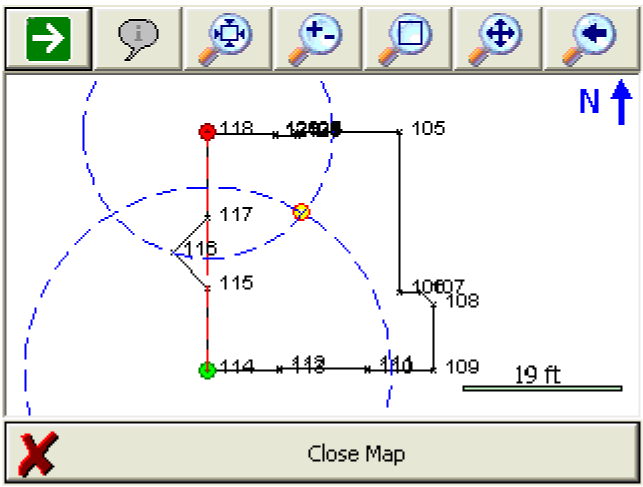
This saves the selected New Point into your project.

Switch Side

This toggles the selected New Point to the Left or Right side of the baseline.

Map View

This takes you to a map view showing your baseline, the distance measured from each point, and the calculated position of the new point.



If desired, you can press the World View button on the Display toolbar to hide unnecessary data.

Measure from Point 1

Press this to record the distance from Point 1 of your baseline to the selected New Point.

Measure from Point 2

Press this to record the distance from Point 2 of your baseline to the selected New Point.

Vertical Plane Projection

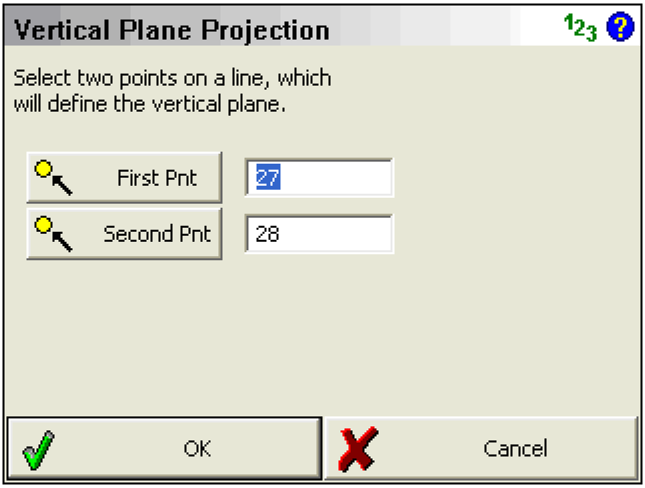
Main Menu | Survey Methods | Vertical Plane Projection

This function is for locating multiple points on a vertical place defined by two previously measured points. The program will calculate the distance for each shot taken to an un-measurable position so that coordinates can be generated for the shot.

An example of how you could use this would be to shoot two corners of a wall to define a vertical plane. Then you could sight four corners for window on the second floor and FieldGenius will use the HA and VA values and compute the intersection with the vertical plane. Once the intersection is computed, the point will be stored.

Function

When the command is started you will see a screen that will allow you to specify the points that will form the baseline for the vertical plane.



Note: You need to measure and store the points that will be used to define the vertical mapping plane, prior to starting the Vertical Scene Projection command.

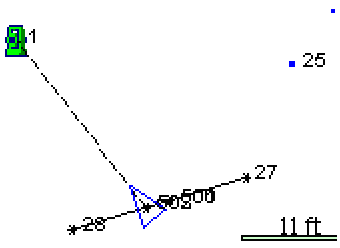
When ready to continue, press the **OK** button.

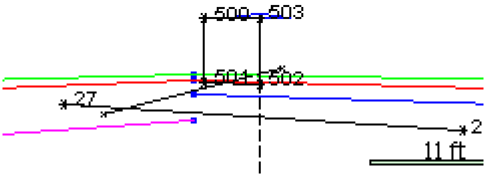
You will now be in the Vertical Plane projection mode which will be indicated by the measurement mode button on the instrument toolbar. To begin calculating points on the vertical plane, you need to point the total station at the new point you want to create. To complete the shot, press the measure button, and then store the point.

Note: You do not need to use a prism when measuring points on the vertical plane. Simply point the instrument at the point you want to create.

Since vertical planes represent 3D data, it is sometimes necessary to rotate your perspective of the project to help you see the point you're computing on the vertical plane.

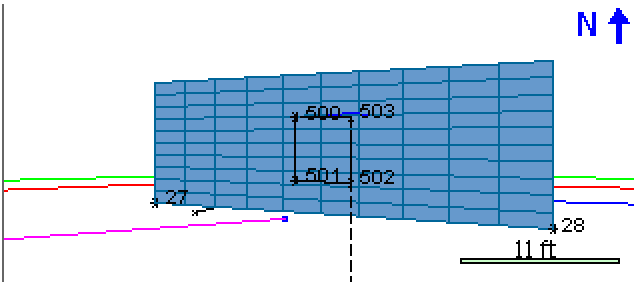
Press the 3D View button on the display toolbar which will open the 3D toolbar. If you press the Planar View button, your scene will be rotated so it matches your perspective. For example, a vertical plane was defined by points 27 and 28. When the planar view option is used, you can see your work in a 3D perspective. You can now see the 4 measurements (points 500 – 503) that were made to record the position of a window on the vertical plane.





Plan View 3D Perspective

You can also hide objects that are behind the vertical plane from viewing by pressing the **Vert Grid** button. In the example below, you will see that after this is turned on, some of the line work is hidden from view.



To exit this routine, simply switch to a different measurement mode.

Raw File

Each point that is computed on the vertical plane will also have a computed sideshot stored in the raw file.

```
--VS,PA27,PB28
SS,OP1,FP503,AR142.24510,ZE78.37170,SD17.8888,--
VERTICAL
```

For each vertical plane shot you record you will see a note before the shot in the raw file indicating which points were used to define the vertical plane.

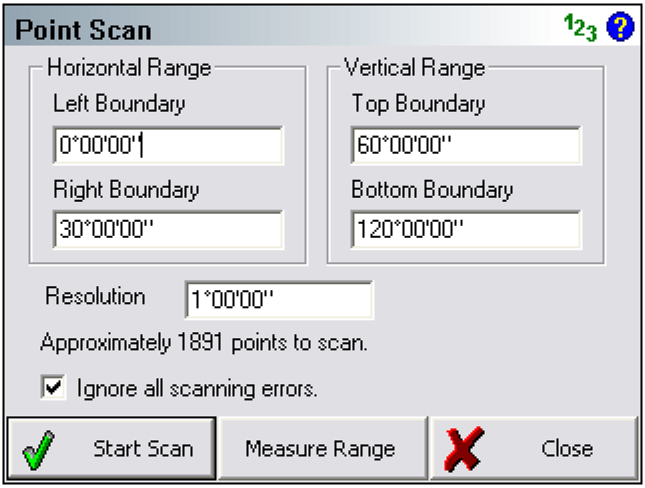
Special Notes

Vertical plane measurements will automatically be recognized by your MicroSurvey desktop software. Please refer to the MicroSurvey help file for more information regarding importing vertical scenes.

Point Scanning

Main Menu | Survey Methods | Point Scanning

FieldGenius supports point scanning which allows you to create a point cloud of data. To use this routine you need a reflectorless instrument that has servo motors.



To start, you will be asked to define a scan area by pressing the Measure Range button and pointing the instrument at the Bottom-Left and Top-Right corners of the area you want to confine the scanning to.

Once the scan area is defined, you can define the scan resolution by using an angular value. For example if you set it to 0°30'00", FieldGenius will create a pattern confined to the limits you defined, and scan at 30 minute intervals both horizontally and vertically. Once you've defined the scan area and resolution, FieldGenius will display an estimate of how many points will be stored.

You also can control how FieldGenius deals with measurement errors while scanning. If you turn on "**Ignore all scanning errors**", FieldGenius will ignore measurement errors and continue without interruption. If you don't turn this on, FieldGenius will stop and display a message allowing you to stop the scanning process, or continue on with the next measurement.

Press the **Start Scan** button to select the desired reflectorless EDM Mode and initiate scanning. FieldGenius will display an estimate of the time remaining for the scan to complete.

Points will be stored using the description defined in the map screen. The point number of the first point will be set to the "next available" id and will increment sequentially. The shots are stored in the raw file as sideshots so you have a record of the observations.

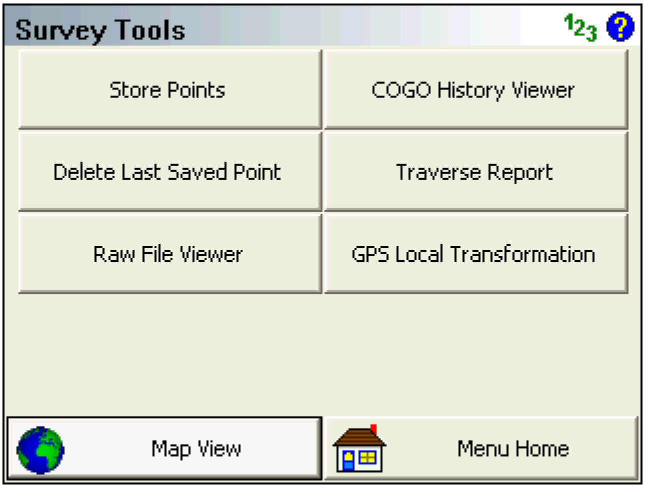
Upon completion, you will receive a summary showing the total number of successful measurements and errors received.

Survey Tools Menu

Survey Tools Menu

Main Menu | Survey Tools

This menu contains functions pertaining to the data in your project.



Store Points

Use this to enter new coordinates into your scene's database. Please see the Store Points topic for more information.

Delete Last Saved Point

Use this to "delete" up to ten of the last points that were saved. Please see the Delete Last Saved Point topic for more information.

Raw File Viewer

Use this to open a viewer that will display your current raw file. Please see the Raw File Viewer topic for more information.

COGO History Viewer

Use this to display the results that were computed using the COGO commands. Please see the COGO History Viewer topic for more information.

Traverse Report

Use this to generate a traverse closure report based on your traverse setups. Please see the Traverse Report topic for more information.

GPS Local Transformation

Use this to specify transformation parameters that can be used to localize GPS data or to perform a transformation on your points collected with conventional survey methods. Please see the Transformation Setup topic for more information.

Store / Edit Points

Main Menu | Survey Tools | Store Points

This is a multi use function that is used by many parts of the program. Essentially any time a point needs to be stored or edited, it will done via the store point screen. Depending on what it is you're doing, certain parts of the dialog will be disabled or not editable. Following is an explanation of what you should expect.

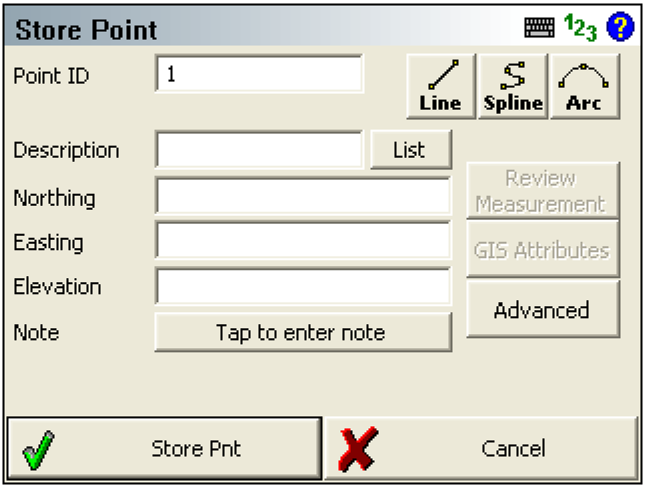
Measured or Calculated Points

Points measured with a total station, GPS, or computed via any of our commands will automatically have it's Survey Role set to **measured**. When these types of points are edited, only the description can be changed; the point id and coordinate values will be non editable. The reason we do this is so the coordinates don't accidentally get altered. You can check a point's survey role by pressing the Advanced button. You can override this by changing the survey role type to "null".

Certain commands in FieldGenius are allowed to ignore the measured survey role. Two commands that will do this is the Rotate/Translate/Scale command or the over write option that is triggered when you try to store a point using a point id that already exists in the project.

Manually Entered or Imported Points

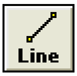
Point that have been manually entered or imported from an ASCII file for example, will have a Survey Role set to **null**. Points that have a Survey Role set to null can be edited except for the point id.



Point ID

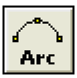
Enter in the point number you would like to assign to the point. Note that by default it will display the next available point number. If you're editing an existing point, this field will not be editable.

Line/Spline/Arc Buttons



This is used to toggle on and off the draw lines function. When turned on as you shoot your points in the drawing they will be connected with a line. This button can only be used if you're storing a point after a measurement.

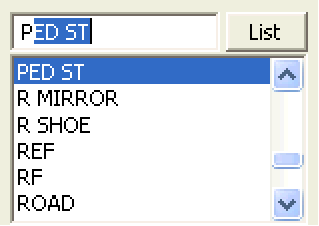
This is used to toggle on and off the draw curvy lines button. This function will draw a best-fit curve through your points as you shoot them. This button can only be used if you're storing a point after a measurement.



3-Point arcs can be started using the same method as for a Line or Curvy Line. This button can only be used if you're storing a point after a measurement.

Description

This is where you enter a description for your point. This field is associated with your Automap library so as soon as you start typing in descriptions, a list appears displaying descriptions that match what you've entered. Simply press your **Enter** Key to accept your entry. You can also have FieldGenius notify you when the description you've entered isn't in your Automap library. To do this you need to make sure you have the **"Prompt New Descriptions"** toggle turned on in the Options menu.



List Button

Press this to open the Automap Library screen. You will be able to choose the description that will be assigned to the point.

Northing, Easting, Elevation

Input your coordinate values in these fields.

Note Button

Press this to enter a note or record an audio note for the point. See the Notes topic for more information.

Prism Height / GPS Antenna Height

When storing a point measured by a total station, you can set the Prism Height. When storing a point measured by a GPS receiver, you can set the true or measured Antenna Height.

Review Measurement Button

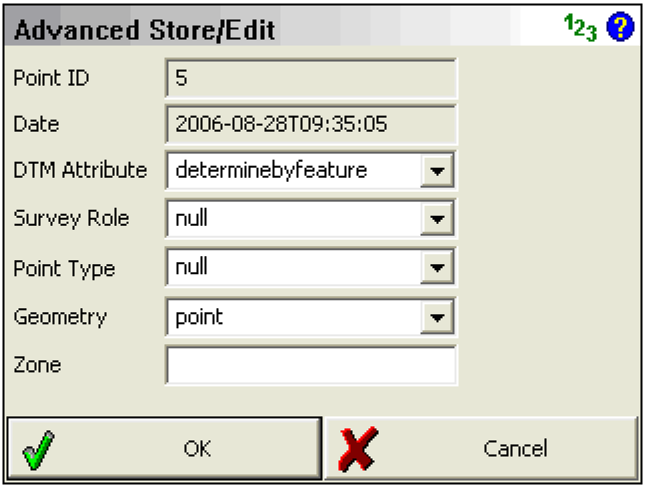
This button is available when you have taken a Sideshot measurement, and can be used to review the distance and angles measured.

GIS Attributes Button

If you loaded a feature list, then this button will be enabled. It allows you to access the your feature list so you can edit feature attributes.

Advanced Button

Use this button to add or edit advanced tags to your point. You will mainly use this to help you distinguish points that are exported when you use the XML export.



DTM Attribute: Use this to choose the DTM attribute that will be written to the database file. Ground is the default value, if you don't want the point used in FieldGenius's modeling commands, you can set the DTM value to DONOTINCLUDE. If you export an XML file, this information will be exported.

Survey Role: Use this to edit the survey role for the point. By default points that are measured will have a role of measured. Points with a measured role type are read only when they're viewed with the store and edit screen. If you export an XML file, this information will be exported.

Point Type: Use this to enter a point type that will be written to the database file. If you export an XML file, this information will be exported.

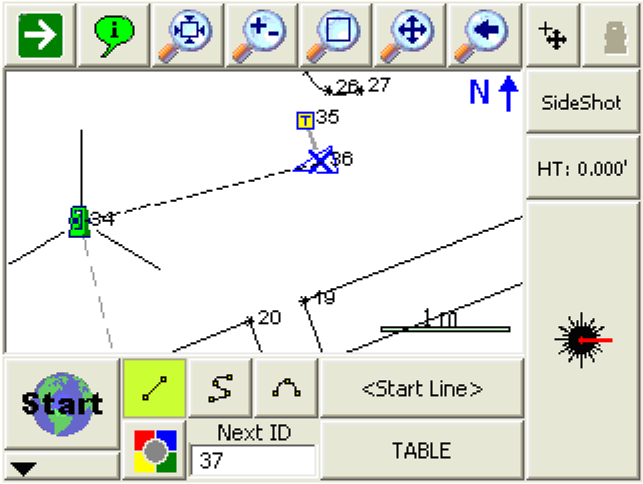
Geometry: Use this to enter a geometry type that will be written to the database file. If you export an XML file, this information will be exported.

Zone: Use this to enter a zone number that will be written to the database file. If you export an XML file, this information will be exported.

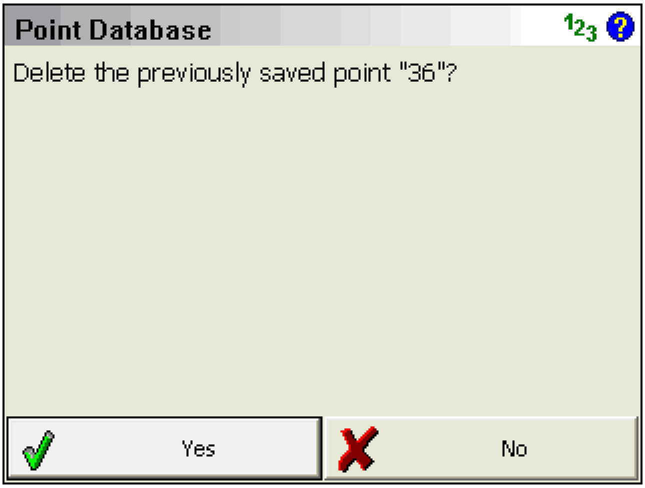
Delete Last Saved Point

Main Menu | Survey Tools | Delete Last Saved Point

Use this to delete the last point that was saved. When you delete a point, a record is written the raw file indicating which point was deleted by the user. You can delete only the last ten points that have been stored.



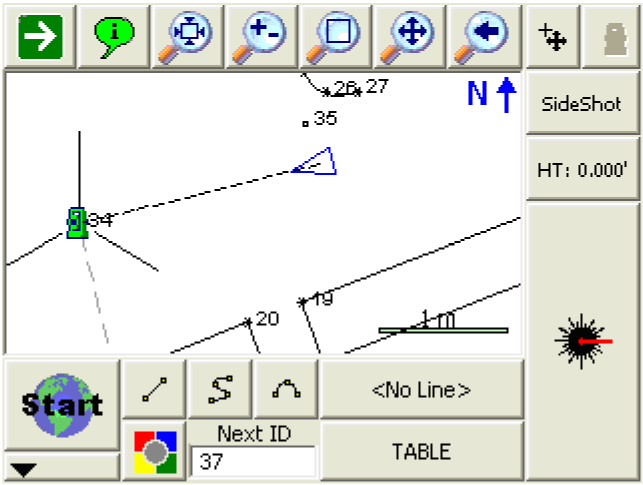
In this example, point 36 was shot in error, and because of this, the user would like to undo it.



When you select the undo command, you will be asked to confirm that you would like to undo the last saved point.

Press **Yes** to undo.

Press **No** to cancel.



Point 36 is now removed from the project's map and database, but the original measurement is saved in the raw file.

Raw File

Using the example from above, this is what you will see in the raw file.

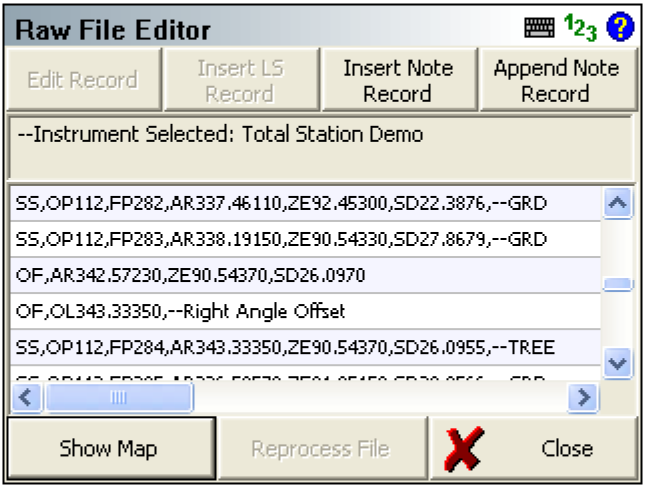
```
SS,OP34,FP36,AR270.00000,ZE121.16010,SD2.5060,--
TABLE
DP,PN36
```

The first line is the shot to point 36. The second line is a delete point record which is used to remove the point from the database.

Raw File Viewer

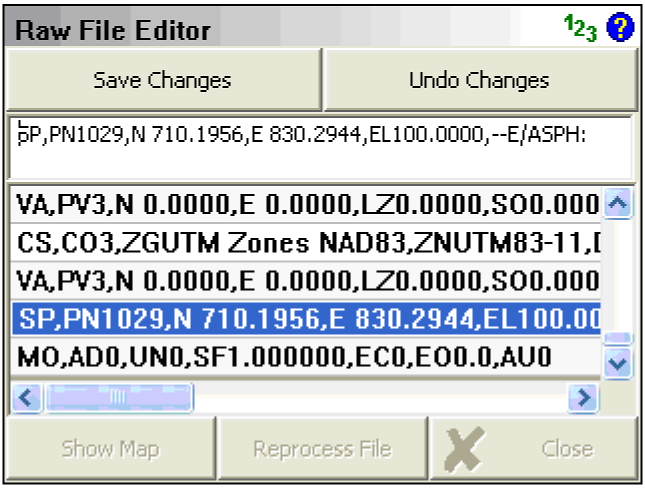
Main Menu | Survey Tools | Raw File Viewer

Use this button to open the raw file viewer. The raw file editor displays your scene's raw file and allows you to review it in an easy to read grid. For reference on the different raw file record types that FieldGenius uses you can refer to the Raw File Record Types topic for more information.



Edit Record

To edit a record simply tap the line in the raw file that has the record you want to edit. Then tap on the edit button to start editing the record.



Save Changes: When you press the Save Changes button you will see the Raw File Edit screen which shows you the changes that will be made when you press the Yes button. Press No to cancel.

After you press yes, the record will be changed and we will also write the original one to the raw file as a comment and it will be prefixed with the word "Edited".

Undo Changes: Undo will ignore your changes and return them to the original values.

Insert LS Record

The most common modification to the raw file is to insert a LS record. The LS record will be inserted above the highlighted row and a comment will be written as well to indicate that it was inserted.

Insert Note Record

This will allow you to enter a comment. The comment will be inserted above the current line you have highlighted in the grid.

Append Note Record

This will allow you to enter a comment. The comment will be appended to the end of the raw file.

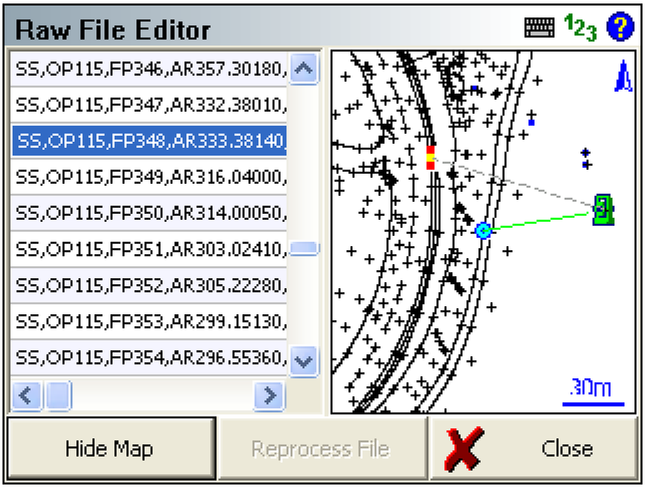
Reprocess File

After you have made your changes you can re-coordinate the raw file so the changes are displayed on the screen and saved in the project database.

> **Note:**
> When you re-coordinate the raw file it will process the whole file from beginning to end. This means if you have changed the coordinate information for a point there is a chance that it will be changed back to its original value if it was measured and recorded in the raw file.

Show Map

This will change the raw file viewer to a split-screen display with a map view of your scene on half of the screen. When certain raw file records are selected, you will be shown the reference and backsight points, and the selected measurement record will be highlighted on the map.



Raw File Backup

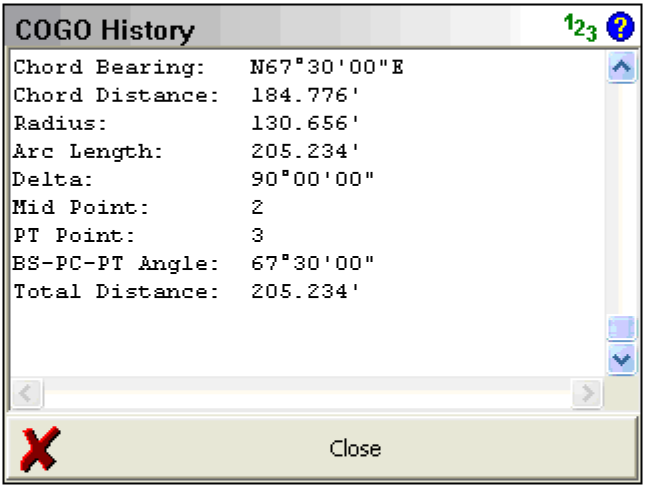
When you open the Raw File Editor a copy of the original raw file will automatically be made and saved in your project directory. The file will be named rawfile_bak#.raw, where the backup number increments with every backup file that is made. If you need to undo the changes you can close your project, re-open it and when the Review Project Files screen appears, use the raw file button to choose the backup file to load.

You can also exit FieldGenius and use a text editor to manually edit the names of the files.

COGO History Viewer

Main Menu | Survey Tools | COGO History Viewer

When you use the COGO history command a viewer will open displaying the results of your COGO calculations. This is a read only file and no changes can be made to it. The file is saved in your project directory and is saved as CogoCalcs.txt



Both the Traverse / Intersect and Inverse commands will save information to this file.

The size of the text can be set to normal or large using the "Use large info text" option in the program settings.

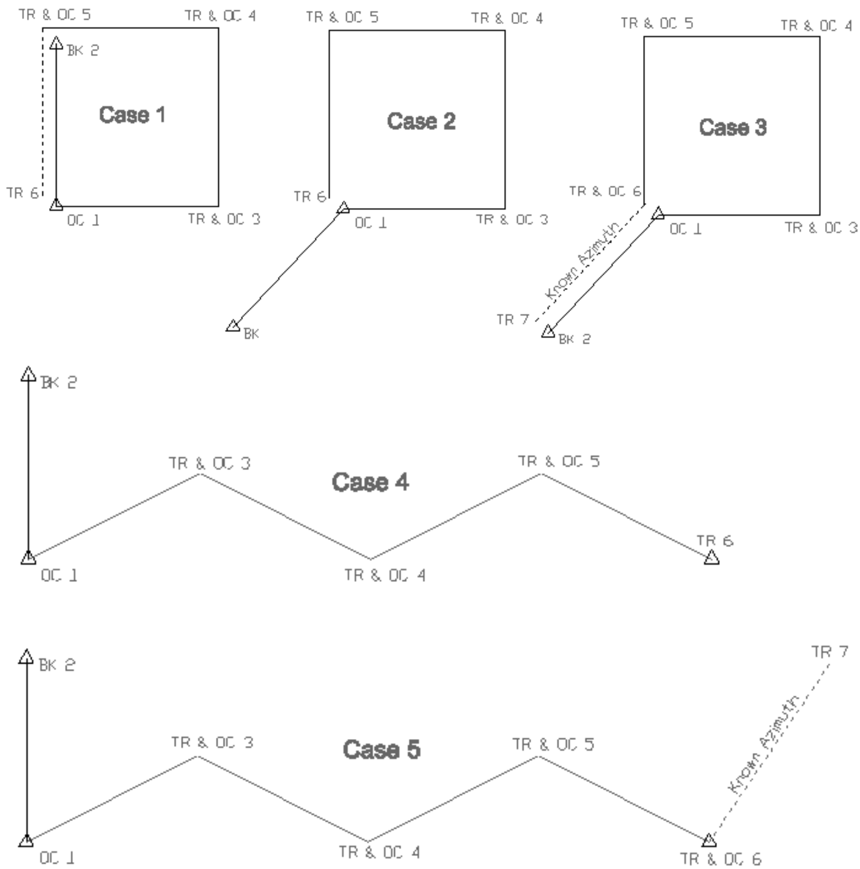
Traverse Report

Main Menu | Survey Tools | Traverse Report

Use this to compute a traverse closure based on traverse points you've measured and recorded. The traverse report scans your raw file for traverse records, which appear with a TR record type. You can save your shot as a TR record by choosing the TR button when the Measurement Info screen appears. TR records are also useful when you use the Setup Occupy Point function because your last TR shot will now become the current setup point and the BS point will be set to the last setup point for you automatically.

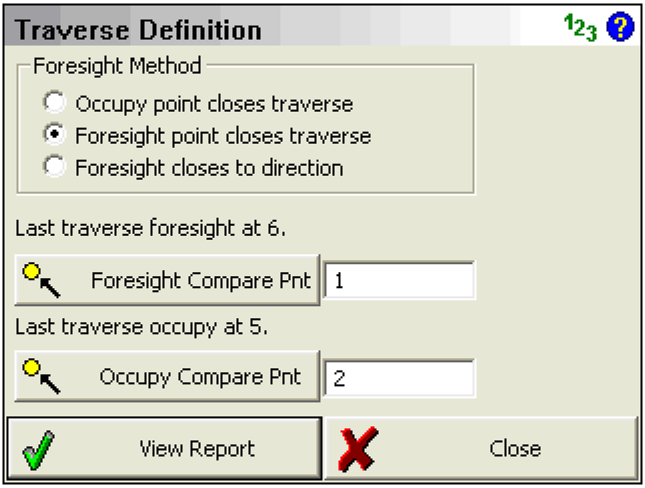
You can also balance your traverse using an angle, compass and vertical balance routine. See the Traverse Adjustment topic for more information.

The following examples will show you the traverse scenarios that FieldGenius supports. The open triangles depict known or computed points. TR records indicate all the foresight shots that were measured and recorded, and the OC record indicate the points that were occupied. Finally, the BK record indicates the point that was used for the initial backsight.



Traverse Definition (Foresight Method)

If we use CASE 1 as an example the user first setup on point 1 and backsighted point 2. He then foresighted and setup on points 3 to 5 and closed the traverse by recording one more TR record to point 6. To compute the traverse report you go to the Main Menu / Survey and choose the **Traverse Report** button. When selected, you will see the following screen.

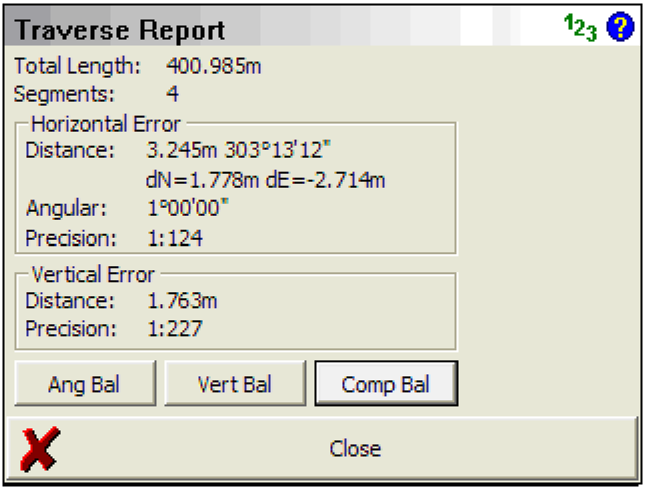


FieldGenius will automatically scan the raw file looking for the last TR foresight and the OC record that was used to measure the last foresight. It will then search for any point within a 3 meter radius and use it as the match or point that defines the original coordinates.

If more than one point is found in the 3 meter radius, it will use the one that is closest.

FieldGenius supports two closed traverse methods. Choose **Foresight Point Closes Traverse** if you want to do a "Text Book" traverse closure. If you choose the **Occupy Point Closes Traverse** method, FieldGenius will not use your last foresight observation and assumes that the original backsight and occupy points are fixed. Choosing this method will close the traverse on the original backsight point, not the original setup point.

When you press the **View Report** button you will see the traverse closure results.



Total length

This is the total unknown legs that were measured in the field.

Segments

This is the total length traversed. Only unknown traverse legs will be added.

Horizontal Error

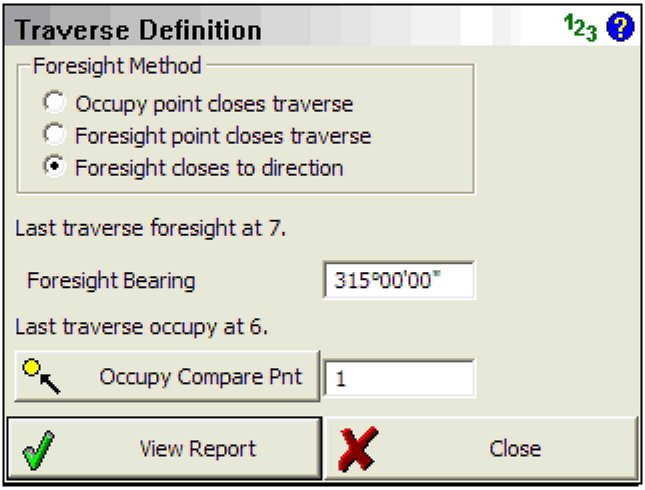
This is the horizontal closure and precision for your traverse. The closure direction is calculated from the known point to your measured point. If there isn't enough data to compute the angular error you will see the word "No Comparison" It also displays the delta northing and easting differences.

Vertical Error

This is the vertical error that is computed by comparing the elevations of the known point and measured closing point.

Traverse Definition (Foresight Method Bearing)

If we use CASE 3 as an example the user first setup on point 1 and backsighted point 2. He then foresighted and setup on points 3 to 6 and closed the traverse by recording one more TR record to point 7. To compute the traverse report you go to the Main Menu / Survey and choose the **Traverse Report** button. When selected, you will see the following screen.



FieldGenius will automatically scan the raw file looking for the last TR foresight and the OC record that was used to measure the last foresight. It will then search for any point within a 3 meter radius and use it as the match or point that defines the original coordinates. If more than one point is found in the 3 meter radius, it will use the one that is closest. In the **Foresight Bearing** field, enter in a known Bearing. When you press the **View Report** button you will see the traverse closure results.

Raw File

Several comments will be written to the raw file with the traverse report results for both Traverse Definition types.

```
--Traverse Report
-- Total Length: 600.10'
-- Segments: 3
-- Foresight control point: 1
-- Occupy control point: 2
-- Horizontal Distance Error: 0.10' 286°13'38"
-- Horizontal Angular Error: 0°00'30"
-- Horizontal Precision: 1:5762
-- Vertical Distance Error: 0.00'
-- Vertical Precision: No Error
```

Closing the Traverse (No Backsight Prism)

For closing the traverse, sometimes you may want to measure a closing angle and compare it to your previous backsight point or to a user entered bearing. For the traverse closure we need to store a TR record in the raw file and because of this a point needs to be computed. If you can't measure a distance to a prism you can use the Manual Distance measure mode which will record the plate reading from your instrument and prompt you to manually enter in a distance. Type in an arbitrary distance and a closing TR record will be computed.

Traverse Rules

- All measurement modes on the instrument toolbar,except for Sideshot (Auto Store), can be used to create TR records.
- The occupy point routine will be updated so the current setup is equal to your last TR shot, and backsight is equal to your last setup. You also need to do a setup directly after you shoot your TR record if you want to do "leap frog" traversing.
- You can have multiple traverses in the same raw file. To start a new traverse, you need to make sure the first setup point for the traverse isn't referenced in the raw file with a TR record. The most current traverse that you're working on will be used in the traverse computations.
- Only one TR record is allowed per setup.
- If you're importing your project into MicroSurvey CAD or inCAD we will automatically recognize your traverse points and create Station "traverse" setup for you in the MicroSurvey CAD or inCAD traverse file.

Traverse Adjustment

Main Menu | Survey Tools | Traverse Report

FieldGenius is capable of performing a traverse balance. You can adjust the traverse using a vertical, angle or compass balance. You can select any one of the three adjustment types or apply all three of them to the traverse.

The traverse routine uses traverse TR records in the raw file to define the traverse points that will be used for the adjustment. Please refer to the Traverse Report topic for more information on creating a traverse loop with FieldGenius.

When FieldGenius computes an adjustment it will write to the RAW file AP records with the new calculated coordinates for the traverse points.

FieldGenius will adjust the sideshots after you perform an adjustment. FieldGenius will scan the raw file from the beginning and re-process all setups (OC records) and sideshots (SS records).

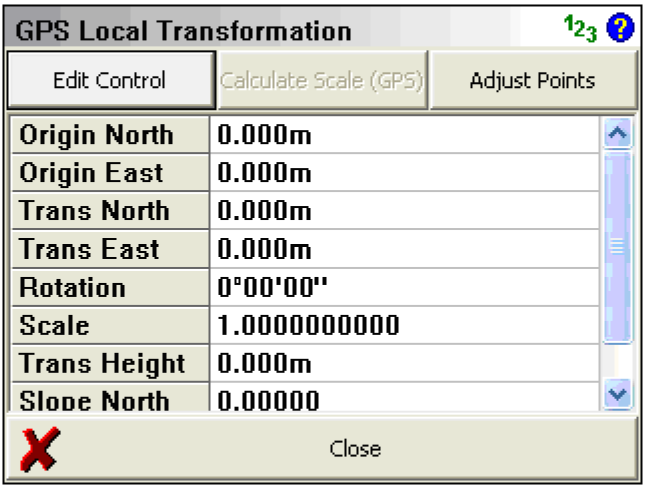
Once you have completed your traverse and you would like to adjust it you need to do the following.

1. Define the closing points using the Traverse Report screen.
2. Compute the closure by pressing the **View Report** button.
3. Review the closure report confirming its validity.
4. Apply an adjustment using the **Ang Bal**, **Vert Bal**, or **Comp Bal** adjustment buttons at the bottom of the traverse report screen.
5. When you choose one of the adjustment types, you will be asked to confirm that you want to go ahead with the adjustment.
6. If you press Yes in the step 5, FieldGenius will adjust the traverse points and create AP records in the raw file. It will then re-process the raw file to re-compute the sideshots.

GPS Local Transformation

Main Menu | Survey Tools | GPS Local Transformation

FieldGenius includes a flexible localization utility. The first thing you need to do is specify the points that will be constrained. You can do this by using the **Edit Control** button. Once you've specified your constrain points, you can press the Calculate Parameters button to compute transformation parameters. The parameters will then be saved to the raw file when the OK button is pressed.



Control Points

You can think of the control points as a "fixed" coordinate system that you are wanting to transform your measurement to. For example if you are using a GPS receiver and you want to localize to a local system, your local points would be considered control points for the constraining. The points you derive with GPS need to be transformed, so these are the measured points.

All you need to do is press the **Edit Control** button to display the constrain point screen. Using the Add and Edit Control buttons you can define what points you want to use for control. You can then specify what point you want to constrain the control to, and you can also select what component of the measured point to use, either it's horizontal position, vertical position or both. An "X" indicates that the particular component should not be used in the transformation calculation.

Delta values are shown to help you determine how well your points match up with one another. Once you specify your constrain points, you can press the Calculate Parameters button which will compute the transformation parameters. The deltas shown are the differences between the control points and the measured points if the transformation parameters were applied.

When you're satisfied with the transformation parameters, the control point pairs and transformation parameters will be saved to the raw file upon exit.

Transformation Settings

Calculate Parameters

Use this to compute the transformation parameters. You have to have constrain point pairs defined before you will see anything calculated.

Calculate Scale (GPS)

When this is used it will compute the combined scale factor at your current position. This can be used while you're connected to either a base or rover receiver. The combined scale factor is computed by multiplying the map scale by the ellipsoid scale factor. The combined factor can then be applied to grid distances to get ground distances.

While programming the base, if you use the one point localization option to help you localize into a user defined local system, FieldGenius will automatically compute a combined scale factor and a translation. For the most part, the scale factor will not change very much over the workable range of your RTK system. But if you want to update the combined scale factor you can.

Adjust Points

Use this to compute new coordinates for your GPS derived points. Each GPS observation you store is saved in the raw file as an EP record, which is essentially a WGS84 position. If you want FieldGenius to compute new Cartesian or local coordinates for the GPS observations, you can. Simply press the Calculate Params button and FieldGenius will scan your raw file and will recompute new coordinates using the EP records, and will apply your transformation parameters to the coordinates.

An example where this could be used is after you've measured some constrain points to help you localize to a user (local) coordinate system. After you compute your transformation parameters you will still have two coordinate systems, one with the local coordinates and one with the GPS (UTM or SPCS) coordinates. It is usually beneficial to transform the GPS derived constrain points so they are now in the local system.

Do Not Calculate Scale (Checkbox)

If this is checked, FieldGenius will not compute a scale factor and will force it to a value of 1.0.

Do Not Calculate Vertical Slopes (Checkbox)

If this is checked then FieldGenius will not compute any slope values.

Parameters

Origin North and East

This is the centroid of the measured coordinates, or simply the average northing and easting of your measured constrain points.

Trans North and East

If you move the measured points, so that the centroid of your measured points is equal with the origin of the local system. The translation north and east is the shift amount that needs to be applied to your measured points to move them into the local system.

Rotation

This is the rotation amount between your measured and local systems.

Scale

This is the scale difference between your measured and local systems.

If you turn on "Do not calculate scale" these values will be equal to 1.0.

Trans Height

This is the vertical shift that will be applied to the transformation. It is computed by averaging the elevation differences between your point pairs. Positive translation heights will be added while negative heights will be subtracted.

Slope North & Slope East

This is an indication of or much your measured system is inclined in the north and east directions. The value that is displayed is the slope of each direction. For example if the difference in elevation along the north axis of your measured system is 3 meters, and the length of it is 19 meters, the slope of the axis will be (rise over run) or 0.15789. Negative slopes indicate that it is inclined downward from the origin, and positive slopes are inclined upwards.

You should only use vertical slopes if you do not have a geoid model to use for your point's elevations. Use this feature with care as it can cause distortions in your elevations if it is used incorrectly.

You can force FieldGenius to not compute these values by turning on the "Do no calculate vertical slopes" toggle.

Impact on new measurements

Once the transformation parameters have been adequately determined, all future GPS measured coordinates will automatically be transformed. All constrained point pairs will be saved along with the transformation parameters for the current project upon exiting the utility and will be saved to the raw file.

Notes:

- Only use a local transformation if necessary.
- GPS heights should be applied with a suitable geoid model. If possible only use vertical bias (Trans Height) because solving for slope North and slope East with inadequate control can severely distort the parameters.
- Use redundancy for confirming parameters.

Raw File Information

Whenever you compute transformation parameters, they're automatically written to the raw file when you exit the command.

Once the parameters are saved, they will automatically be read in again if you use the Transformation Command. FieldGenius will always start at the top of your raw file and will process the calibration records as they're found.

The control points you define are saved as a CT record and will always have an associated RP record. RP records store the measured coordinate that you defined for the control point.

Following the calibration points are a HA and VA records which store the transformation parameters that were computed. Following is an example of what you might see in your raw file.

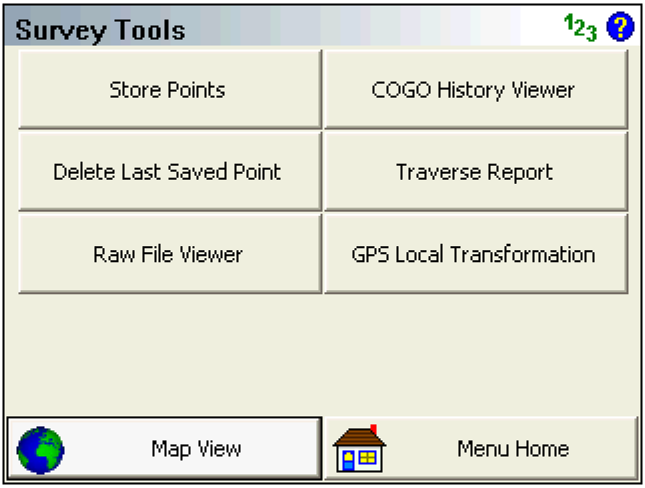
```
--Calibration Points
CT,PN15,DM4,RH6.708,RV0.000
RP,PN15,N 11.0000,E 30.0000,EL0.0000,--
CT,PN16,DM4,RH5.243,RV0.000
RP,PN16,N 30.0000,E 30.0000,EL0.0000,--
CT,PN17,DM4,RH6.708,RV0.000
RP,PN17,N 30.0000,E 11.0000,EL0.0000,--
HA,N 23.6667,E
23.6667,TH6.6667,TE6.6667,RT0.000000000,SC1.000000000
0
VA,PV3,N 23.6667,E
23.6667,LZ0.0000,SO0.00000,SA0.00000,GN
```

An important thing to remember is that if any of the original measured points you used in the calibration change, you need to go back into the transformation command and edit the corresponding control point. You need to re-define the measured coordinates for the control point, then press the **Calc Parameters** button to update the transformation parameters.

Survey Tools Menu

Main Menu | Survey Tools

This menu contains functions pertaining to the data in your project.



Store Points

Use this to enter new coordinates into your scene's database. Please see the Store Points topic for more information.

Delete Last Saved Point

Use this to "delete" up to ten of the last points that were saved. Please see the Delete Last Saved Point topic for more information.

Raw File Viewer

Use this to open a viewer that will display your current raw file. Please see the Raw File Viewer topic for more information.

COGO History Viewer

Use this to display the results that were computed using the COGO commands. Please see the COGO History Viewer topic for more information.

Traverse Report

Use this to generate a traverse closure report based on your traverse setups. Please see the Traverse Report topic for more information.

GPS Local Transformation

Use this to specify transformation parameters that can be used to localize GPS data or to perform a transformation on your points collected with conventional survey methods. Please see the Transformation Setup topic for more information.

Store / Edit Points

Main Menu | Survey Tools | Store Points

This is a multi use function that is used by many parts of the program. Essentially any time a point needs to be stored or edited, it will done via the store point screen. Depending on what it is you're doing, certain parts of the dialog will be disabled or not editable. Following is an explanation of what you should expect.

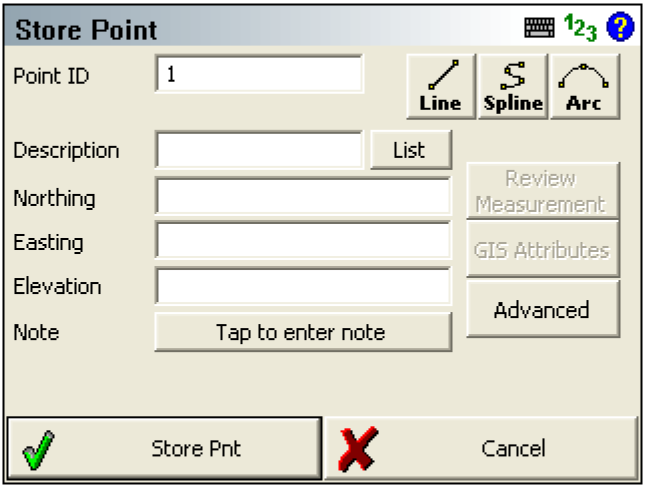
Measured or Calculated Points

Points measured with a total station, GPS, or computed via any of our commands will automatically have it's Survey Role set to **measured**. When these types of points are edited, only the description can be changed; the point id and coordinate values will be non editable. The reason we do this is so the coordinates don't accidentally get altered. You can check a point's survey role by pressing the Advanced button. You can override this by changing the survey role type to "null".

Certain commands in FieldGenius are allowed to ignore the measured survey role. Two commands that will do this is the Rotate/Translate/Scale command or the over write option that is triggered when you try to store a point using a point id that already exists in the project.

Manually Entered or Imported Points

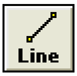
Point that have been manually entered or imported from an ASCII file for example, will have a Survey Role set to **null**. Points that have a Survey Role set to null can be edited except for the point id.



Point ID

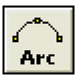
Enter in the point number you would like to assign to the point. Note that by default it will display the next available point number. If you're editing an existing point, this field will not be editable.

Line/Spline/Arc Buttons



This is used to toggle on and off the draw lines function. When turned on as you shoot your points in the drawing they will be connected with a line. This button can only be used if you're storing a point after a measurement.

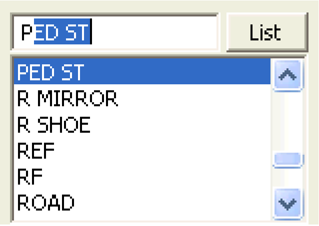
This is used to toggle on and off the draw curvy lines button. This function will draw a best-fit curve through your points as you shoot them. This button can only be used if you're storing a point after a measurement.



3-Point arcs can be started using the same method as for a Line or Curvy Line. This button can only be used if you're storing a point after a measurement.

Description

This is where you enter a description for your point. This field is associated with your Automap library so as soon as you start typing in descriptions, a list appears displaying descriptions that match what you've entered. Simply press your **Enter** Key to accept your entry. You can also have FieldGenius notify you when the description you've entered isn't in your Automap library. To do this you need to make sure you have the **"Prompt New Descriptions"** toggle turned on in the Options menu.



List Button

Press this to open the Automap Library screen. You will be able to choose the description that will be assigned to the point.

Northing, Easting, Elevation

Input your coordinate values in these fields.

Note Button

Press this to enter a note or record an audio note for the point. See the Notes topic for more information.

Prism Height / GPS Antenna Height

When storing a point measured by a total station, you can set the Prism Height. When storing a point measured by a GPS receiver, you can set the true or measured Antenna Height.

Review Measurement Button

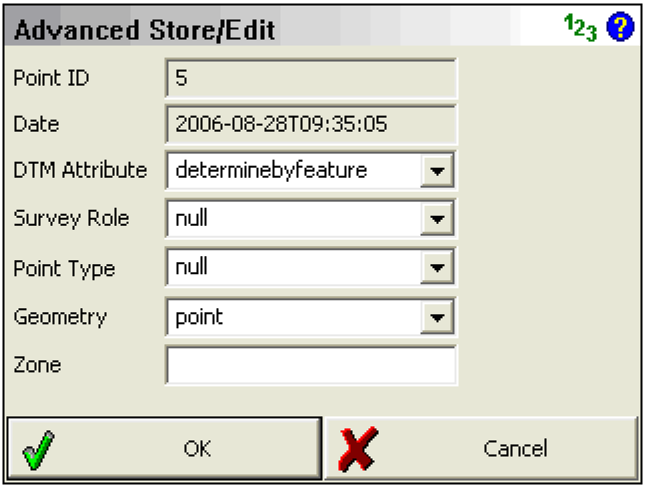
This button is available when you have taken a Sideshot measurement, and can be used to review the distance and angles measured.

GIS Attributes Button

If you loaded a feature list, then this button will be enabled. It allows you to access the your feature list so you can edit feature attributes.

Advanced Button

Use this button to add or edit advanced tags to your point. You will mainly use this to help you distinguish points that are exported when you use the XML export.



DTM Attribute: Use this to choose the DTM attribute that will be written to the database file. Ground is the default value, if you don't want the point used in FieldGenius's modeling commands, you can set the DTM value to DONOTINCLUDE. If you export an XML file, this information will be exported.

Survey Role: Use this to edit the survey role for the point. By default points that are measured will have a role of measured. Points with a measured role type are read only when they're viewed with the store and edit screen. If you export an XML file, this information will be exported.

Point Type: Use this to enter a point type that will be written to the database file. If you export an XML file, this information will be exported.

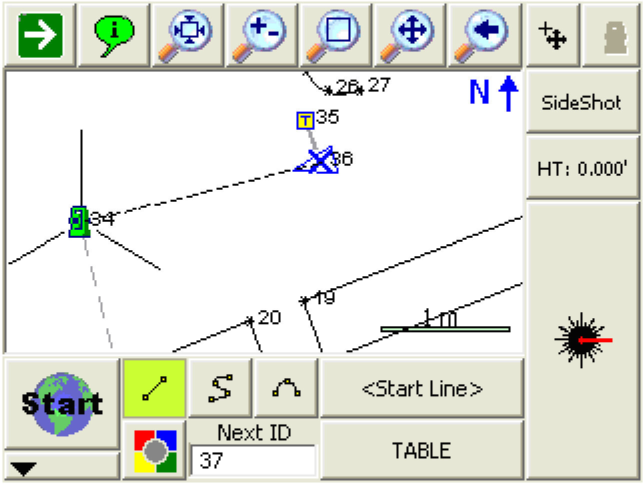
Geometry: Use this to enter a geometry type that will be written to the database file. If you export an XML file, this information will be exported.

Zone: Use this to enter a zone number that will be written to the database file. If you export an XML file, this information will be exported.

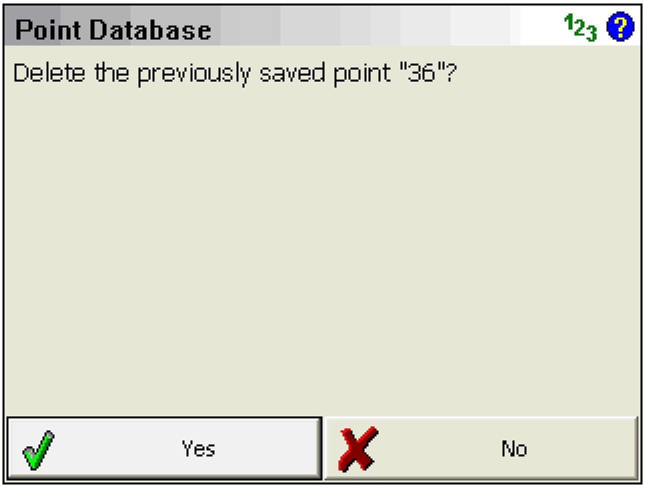
Delete Last Saved Point

Main Menu | Survey Tools | Delete Last Saved Point

Use this to delete the last point that was saved. When you delete a point, a record is written the raw file indicating which point was deleted by the user. You can delete only the last ten points that have been stored.



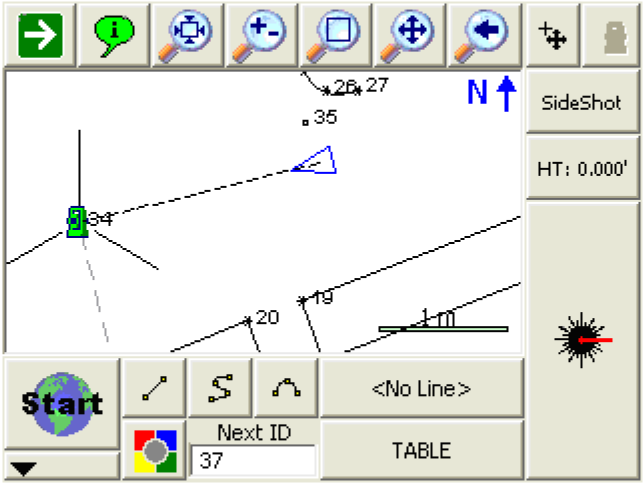
In this example, point 36 was shot in error, and because of this, the user would like to undo it.



When you select the undo command, you will be asked to confirm that you would like to undo the last saved point.

Press **Yes** to undo.

Press **No** to cancel.



Point 36 is now removed from the project's map and database, but the original measurement is saved in the raw file.

Raw File

Using the example from above, this is what you will see in the raw file.

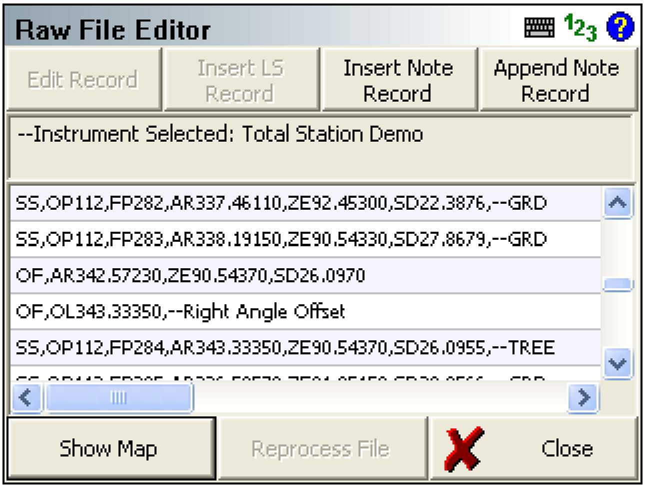
```
SS,OP34,FP36,AR270.00000,ZE121.16010,SD2.5060,--
TABLE
DP,PN36
```

The first line is the shot to point 36. The second line is a delete point record which is used to remove the point from the database.

Raw File Viewer

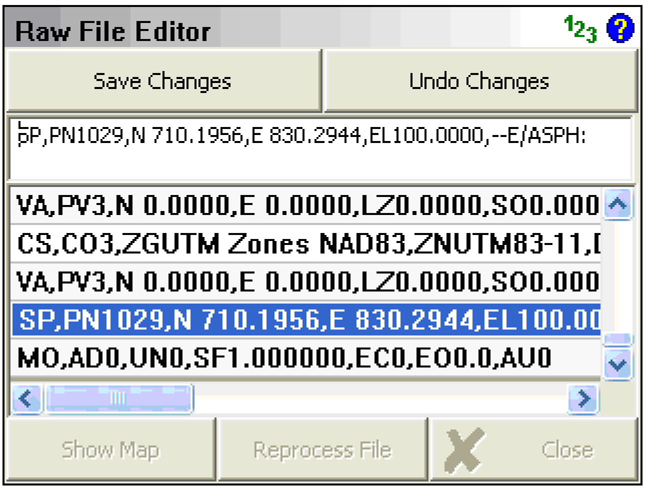
Main Menu | Survey Tools | Raw File Viewer

Use this button to open the raw file viewer. The raw file editor displays your scene's raw file and allows you to review it in an easy to read grid. For reference on the different raw file record types that FieldGenius uses you can refer to the Raw File Record Types topic for more information.



Edit Record

To edit a record simply tap the line in the raw file that has the record you want to edit. Then tap on the edit button to start editing the record.



Save Changes: When you press the Save Changes button you will see the Raw File Edit screen which shows you the changes that will be made when you press the Yes button. Press No to cancel.

After you press yes, the record will be changed and we will also write the original one to the raw file as a comment and it will be prefixed with the word "Edited".

Undo Changes: Undo will ignore your changes and return them to the original values.

Insert LS Record

The most common modification to the raw file is to insert a LS record. The LS record will be inserted above the highlighted row and a comment will be written as well to indicate that it was inserted.

Insert Note Record

This will allow you to enter a comment. The comment will be inserted above the current line you have highlighted in the grid.

Append Note Record

This will allow you to enter a comment. The comment will be appended to the end of the raw file.

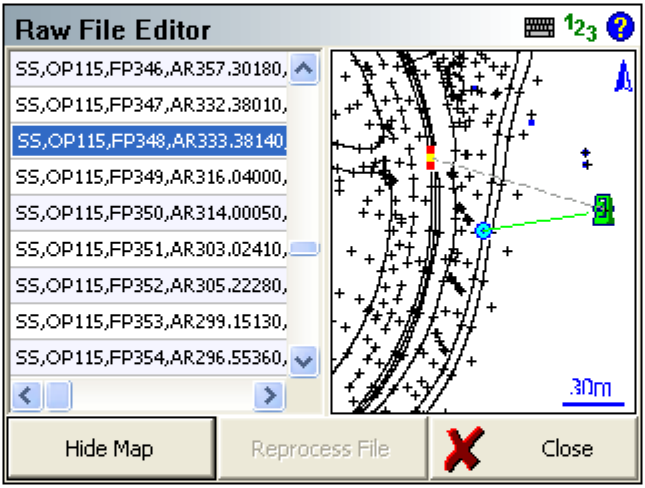
Reprocess File

After you have made your changes you can re-coordinate the raw file so the changes are displayed on the screen and saved in the project database.

> **Note:**
> When you re-coordinate the raw file it will process the whole file from beginning to end. This means if you have changed the coordinate information for a point there is a chance that it will be changed back to its original value if it was measured and recorded in the raw file.

Show Map

This will change the raw file viewer to a split-screen display with a map view of your scene on half of the screen. When certain raw file records are selected, you will be shown the reference and backsight points, and the selected measurement record will be highlighted on the map.



Raw File Backup

When you open the Raw File Editor a copy of the original raw file will automatically be made and saved in your project directory. The file will be named rawfile_bak#.raw, where the backup number increments with every backup file that is made. If you need to undo the changes you can close your project, re-open it and when the Review Project Files screen appears, use the raw file button to choose the backup file to load.

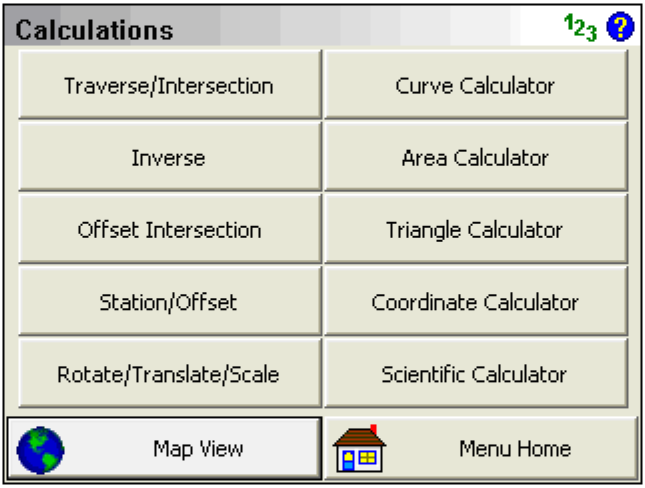
You can also exit FieldGenius and use a text editor to manually edit the names of the files.

CALCULATIONS MENU

Calculations Menu

Main Menu | Calculations

The calculation menu contains COGO based functions that can be used to compute points.



Traverse / Intersection

This will open the Traverse / Intersect toolbar. You can enter in directions and distances and perform common intersections such as bearing / bearing, distance/distance and many more. Please see the Traverse / Intersection topic for more information.

Inverse

Use this to inverse between points. Please see the Inverse topic for more information.

Offset Intersection

Use this to compute points that are located at computed intersections and offsets. This is essentially a bearing-bearing intersection, but you can specify offsets. Please see the Offset Intersection topic for more information.

Station / Offset

Use this to compute points at pre-defined stations and offsets. You can also use this to display the station and offset of existing points. Please see the Station / Offset topic for more information.

Rotate / Translate / Scale

Use this to compute coordinate shifts based on rotation, translation and scale parameters. Please see the RTS topic for more information.

Curve Calculator

Use this to open a curve calculator. You define the values that you know, enter them, and then the remaining unknowns will be computed. Once you compute these values you have the option of storing the PT and Center points. Please see the Curve Calculator topic for more information.

Area Calculator

Use this to compute areas using points or lines in your project. You can also use this to compute predetermined areas. Please see the Area Calculator topic for more information.

Triangle Calculator

Use this to compute a triangle solution using known angles or distances. Please refer to the Triangle Calculator topic for more information.

Coordinate Calculator

Use this tool to help you convert Geodetic coordinates to Cartesian coordinates. Please refer to the Coordinate Calculator topic for more information.

Scientific Calculator

Use this to display the MicroSurvey RPN calculator. Please see the Calculator topic for more information.

Traverse / Intersection

Main Menu | Calculations | Traverse / Intersection

FieldGenius includes a powerful COGO function that allows you to compute new points. The toolbar allows you to specify the solution type, point numbers, directions and distances. When you enter enough information to compute a solution it will be draw visually on the screen. Pressing the Store Pnt button will store the point that you just solved.

Input

You can type in the point ID, or select a point by tapping on the map screen.

The direction and distance fields support the direction and distance recall feature. To learn more about this, refer to these topics in the Calculating With FieldGenius section.

If you are measuring distances with a Leica Disto, just double tap in the distance field and choose the "Disto Observation" option.

Disto Distances

If you have a Leica Disto, you can send distances back to the distance edit fields. Simply double tap the distance field and select "Disto Observation" which will then set FieldGenius in a "waiting" mode. Take the measurement with the Disto, press the Bluetooth icon on the Disto, and the measured distance will be accepted by FieldGenius.

Calculator

You can open our calculator by double-tapping the Direction or Distance fields then pressing Calculator on the Keypad screen.

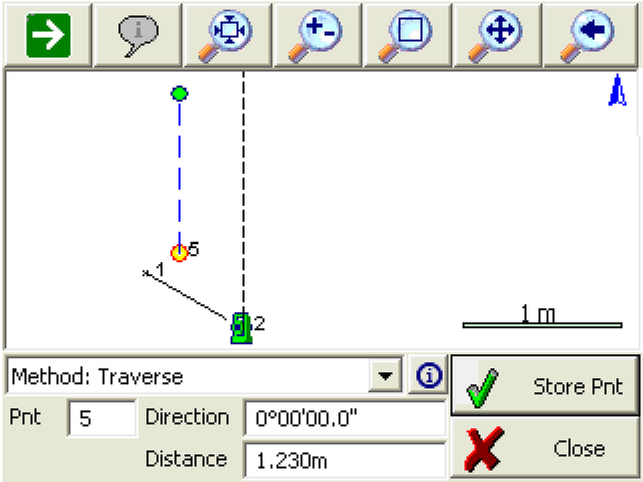
Information

You can review the results of your calculation by pressing the "i" information button. For intersections with multiple solutions, the results of both solutions will be displayed.

Solution Methods

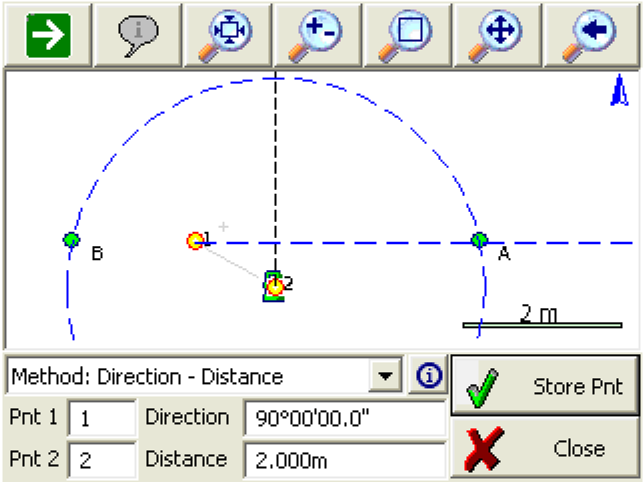
Method: Traverse

The traverse method allows you to define a direction and distance that you want to traverse. After you solve your point and store it, it will become the new start point.



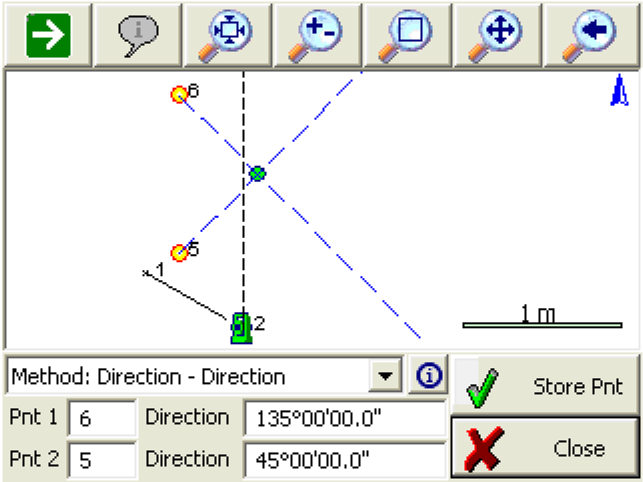
Method: Direction - Distance

This will compute two solutions based on the values you input. To store the solution, simply press the **Store Pnt** button which will ask you what solution to use, in this case either **A** or **B**.



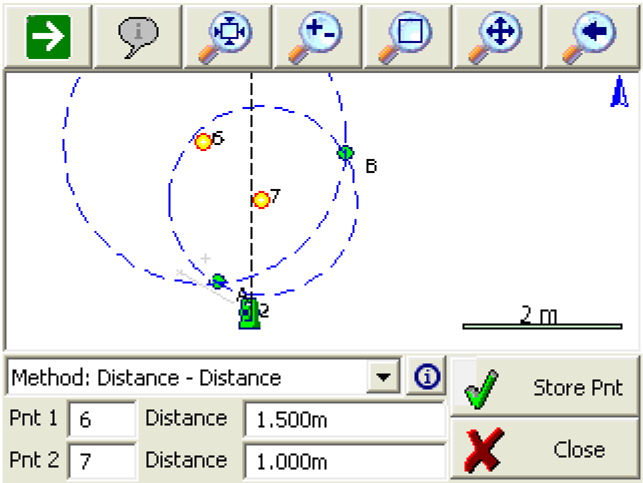
Method: Direction - Direction

Use this to compute a new point by computing an intersection using directions. After you enter your known values a solution will be displayed on the screen. To store the solution, simply press the **Store Pnt** button.



Method: Distance - Distance

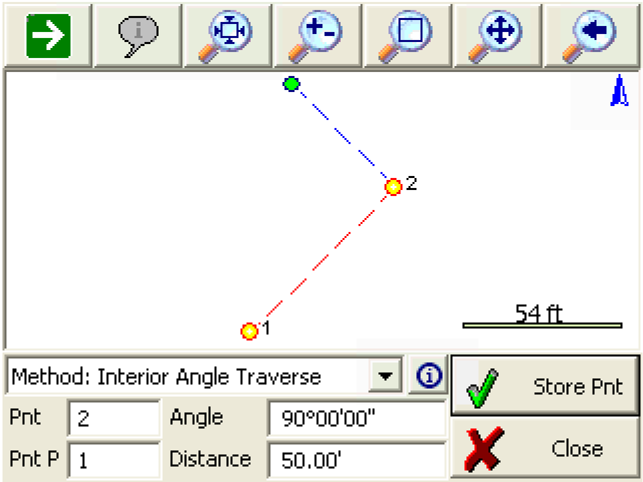
Use this to compute a new point by computing an intersection using distances. This will compute two solutions based on the values you input. To store the solution, simply press the **Store Pnt** button which will ask you what solution to use, in this case either A or B.



Method: Interior Angle Traverse

Use this to compute a new point by turning an angle from another point. Enter the current (setup) and previous (backsight) points, then the interior angle and the distance. Positive angles will be interpreted as angle right; if you want to turn an angle left, enter the angle as negative.

To store the solution, simply press the **Store Pnt** button. After the point is stored, the points will automatically leapfrog so you can continue traversing by just entering the next interior angle and distance.



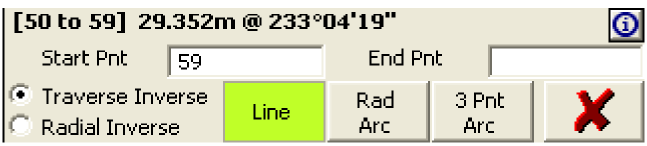
COGO Results

Every calculation you make is written to the file called CogoCalcs.txt located in your project folder. Please see the COGO History Viewer topic for more information.

Inverse

Main Menu | Calculations | Inverse

The inverse command will calculate for you the inverse information between two points. It will display the horizontal / slope distance, direction, vertical distance and slope of the inverse. You do not need to have a line drawn between the points to use the inverse command.



A large font can be set for the results toolbar and COGO results. Please refer to the Program Settings topic for more information.

All inverse information is saved in the COGO History file called CogoCalcs.txt located in your project folder. Please refer to the COGO History Viewer topic for more information.

Inverse Between Two Points

Function

1. Start the inverse command and make sure the **Traverse Inverse** and **Line** options are selected.
2. Enter or choose the 1st point to inverse from, and press your enter key to continue on to the next point.
3. Now you can choose or enter the second point and press your Enter button to compute an answer.
4. The inverse information will be displayed in the results toolbar.
5. In the COGO history you will see the following information for the two point you just inversed:

```
-------------------------------
INVERSE
-------------------------------
PNT 44 to 8 (HD 1352.84' @ NA 323°48'03.1")SD
1353.39' GR -2.85' VD -38.51'AR 323°48'03.1"
```

Your first inverse will calculate a right angle from north to the direction you inversed.

Multiple Inverses

After you have specified two points, you can continue inversing from point to point. You should notice that the point id previously in the 2nd point field will move to the 1st point field, and the cursor will remain in the 2nd point field allowing you to quickly enter in your next point.

If you continue to inverse from point to point, the angle right will not be referenced to north, but the last leg you inversed. Essentially this is computing a clockwise angle between the current and last legs you inversed.

Perimeter Distance and Area

When you inverse between points and close back to the first point, a perimeter distance and enclosed area will also be computed.

Radial Inverse

You can compute radial inverses from a point.

Function

1. Start the inverse command and make sure the **Radial Inverse** and **Line options are selected**.

2. Enter or choose the 1st point to inverse from, and press your enter key to continue on to the next point.
3. Now you can choose or enter the 2nd point and press your Enter button to compute an answer.
4. The inverse information will be displayed in the results toolbar.
5. You can now continue computing radial inverses. The 2nd point field will remain activated allowing you to continue entering point numbers.

Inverse Arc (PC, Radius Pnt and PT Known)

You can compute the curve information for an arc defined by three points, PC (start), Radius Point, and PT (End)

Function

1. Start the inverse command and make sure the **Rad Arc** button is turned on.
2. Enter or choose the starting point for the arc in the Start field, and press your enter key to continue on to the next point.
3. Enter or choose the radius point in the Arc field, and press your enter key to continue on to the next point.
4. Enter or choose the end point for the arc in the End field, and press your enter key to compute an answer.
5. The inverse information will be displayed in the results toolbar.

Inverse Arc (Three points on Arc)

You can compute the curve information for an arc defined by three points.

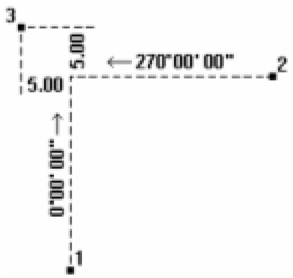
Function

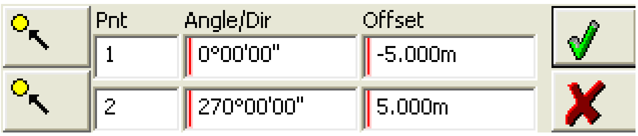
1. Start the inverse command and make sure the **3 Pt Arc** button is turned on.
2. Enter or choose the starting point for the arc in the Start field, and press your enter key to continue on to the next point.
3. Enter or choose the point that falls on the arc in the Arc field, and press your enter key to continue on to the next point.
4. Enter or choose the end point for the arc in the End field, and press your enter key to compute an answer.
5. The inverse information will be displayed in the results toolbar.

Offset Intersection

Main Menu | Calculations | Offset Intersection

Use this function to compute a point at specified offsets from an implied bearing-bearing intersection calculated from two existing points as shown.





When you start the command you will see the offset intersection toolbar appear towards the bottom of the main interface. Use the point chooser to select the points that you want to use to define your directions. Offsets are computed positive to the right and negative to the left looking in the direction of the bearing you entered. You can use angle and distance recall features to help you compute your answer.

Function

1. Use the point chooser to select a point or manually type one in that defines the beginning of the bearing.
2. Enter a direction in the Angle/Dir field.
3. Enter an offset if needed. You are not required to enter an offset so the field can be left blank.
4. Repeat for the second point the first three steps.
5. Press the green checkmark to save your point. It will save the point using the Store / Edit Points function.

Station / Offset

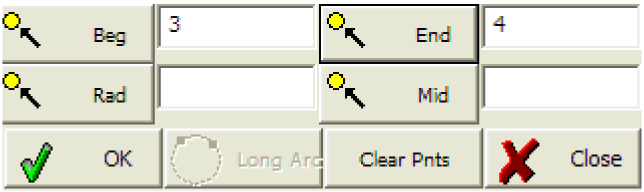
Main Menu | Calculations | Station/Offset

Use this function to define a baseline using an existing line or arc. You can also define the baseline by entering point numbers.

By default the station offset tool will use a starting station of zero which will be applied to the beginning of the baseline. You can change the start station value to any value. For example if you changed it to 1+00 and you entered a station of 1+15 – FieldGenius would compute a point 15 units down the baseline.

Define Baseline

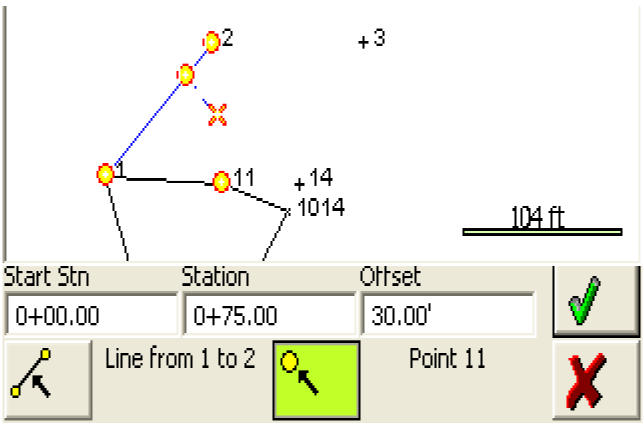
You can define a baseline from for the station offset toolbar using the Select Line button. This will open the select line toolbar.



You can manually type in the point numbers that define the baseline or use the point choosers to pick the points from the map. You can also select the line or arc in the drawing by tapping it.

Entering a Station and Offset

Once you've defined a baseline, you can manually enter a station and offset and FieldGenius will compute a point for you.

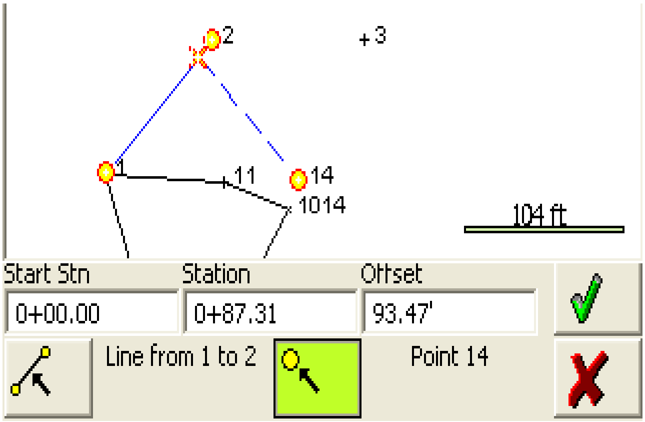


You will see that a orange cross is displayed in the drawing at the location defined by the station 0+75 and positive offset of 30m. Furthermore this point has an orange cross which indicates that this is the new point that has been computed.

You can press the green checkmark to save the point using the Store / Edit Points command.

Selecting an Offset using the point chooser

You can use the point chooser to select a point in the drawing that will be used to compute the station and offset.



You will see that I selected point 14 which is 87.31 units from point 1 on the baseline and to the right 93.47'. You will also notice that the orange cross is on the baseline meaning that if you press the green checkmark, a point at the perpendicular intersection on the baseline will be saved using the Store / Edit Points command.

Rotate/Translate/Scale Points

Main Menu | Calculations | Rotate/Translate/Scale

Use this to rotate, translate and scale a point or group of points. When this command is used notes will automatically be written to the raw file indicating what parameters were entered by the user. Coordinates that are updated with the RTS command will be recorded in the raw file with AP (Adjusted Points) records.

The RTS command has the three options located on separate screens. The user can specify more than one option at the same time, for example you could rotate a group of points by 45° CW, then translate them 25' east.   This can be done in one operation, instead of two separate ones.

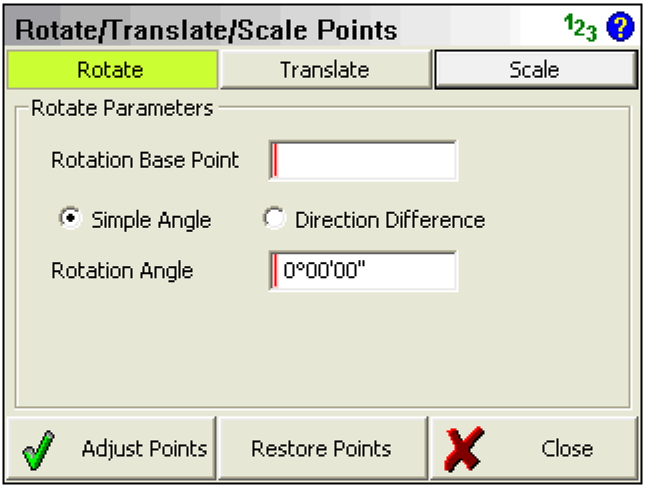
All of the fields have extended edit functionality. On the direction or distance fields, if you double tap them you will see a popup menu. From there you can start the calculator or use the inverse command.

When using the inverse option, simply type the two numbers for the inverse, then press the ESC key to automatically copy the value that was computed during the inverse.

The RTS function can also be accessed from the coordinate database. Accessing it from there allows you to select your points form the list which in some cases might be easier than entering a point range.

Rotate: Simple Angle

This is the simplest form of rotating your points. Specify the base point for the rotation, and a rotation angle.



Rotation Base Point

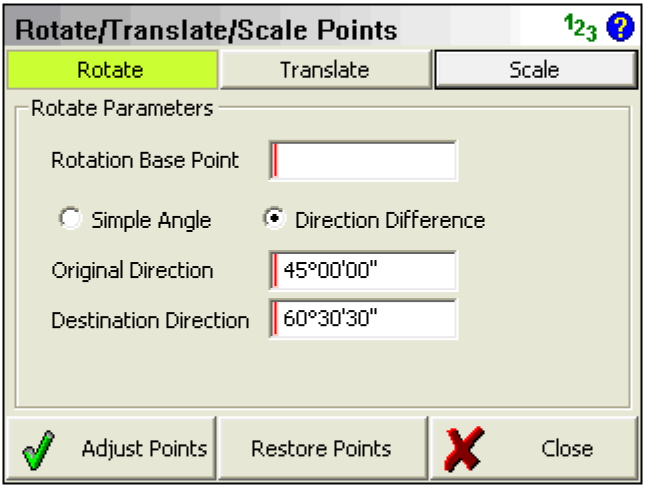
Use this to specify the pivot point for the rotation. You can select the point by double tapping in the edit field. Use the point chooser to select the point form the map, or simply enter the point number.

Rotation Angle

Specify the desired rotation in degrees, minutes seconds (or whatever your project units are set to). You can also use the direction recall feature and enter #..# to inverse between two point numbers.

Rotate: Azimuth Difference

This allows you to define two azimuths, usually used to compute the angle needed to rotate a group of points to match a field azimuth to one from a plan.



Rotation Base Point

Use this to specify the pivot point for the rotation. You can select the point by double tapping in the edit field. Use the point chooser to select the point form the map, or simply enter the point number.

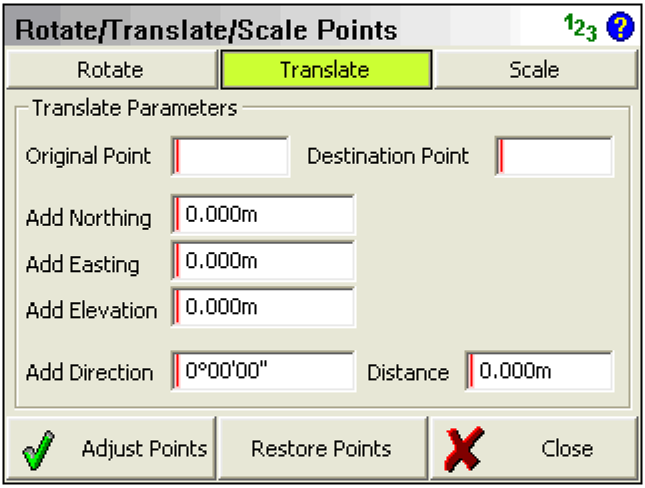
Original & Destination Direction

Specify the desired rotation in degrees, minutes seconds. Depending on your project units, you will be entering either a bearing or an azimuth. You can not use the direction recall feature such as #..#. Instead use the inverse command that appears when you double tap the field.

Translate

Use this option to specify a shift to a point or group of points. The translation is separated into three groups, shift from point to point, shift by coordinate change and shift by direction and distance. In most circumstances you will only need to use one of the three types, but you can use them in conjunction with on another if you need to.

For example, you could specify that the points are to be shifted by coordinate difference between points 10 and 20, then shifted again to the east by 50 feet.



Original & Destination Points

These work in conjunction with one another. The difference in coordinates to get from one point to the other is calculated and added to all points. You can use the point chooser to select your points or simply type the points in the fields. The horizontal differences in the northing and easting is computed and applied to the points being transformed. The elevation of the points will remain unchanged.

Add Northing, Easting, Elevation

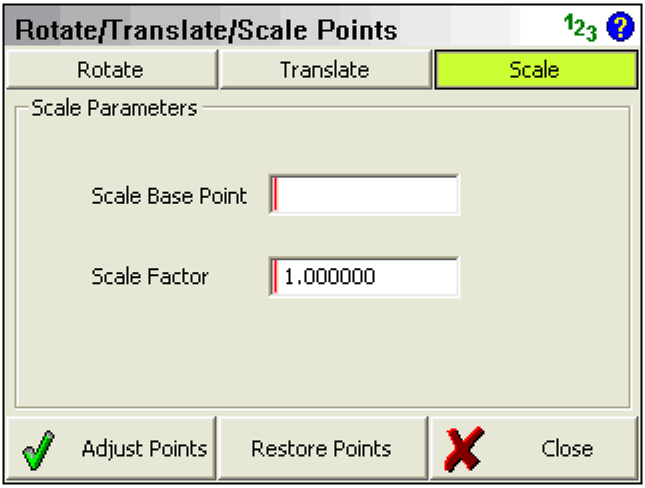
Any one or combination of these shifts can be applied. Simply input the value for each shift in the appropriate fields. Both negative and positive values are valid.

Add Direction and Distance

Define the shift by direction and distance. The coordinate shift in Northing and Easting will be calculated using the direction and distance you enter in the fields. If desired you may apply two shift components at the same time. For example, shift your selection of points by Direction and Distance, but also add 100.00 to the elevation. You can use angle and distance recall features to help you compute your answer.

Scale

You can scale a group of points using the scale option.



Scale Base Point

This will be the base point for the scaling and all points selected will be scaled from this point. You can enter the point number in the field or use the point chooser to select the scale point.

Scale Factor

Use this to specify the scale to apply to your selection.

Adjust Points

Once you've specified your options and parameters, press the Adjust Points button to apply to your coordinates. Once you press it, you will see a screen that will allow you to specify which points you want to apply the calculation to.

Restore Points

After you adjust a group of points with the RTS command, you have the option of undoing your changes and restore the points back to their previous coordinate values. You can only undo the last operation that was done. Also if you close FieldGenius, the restore coordinate values are not saved.

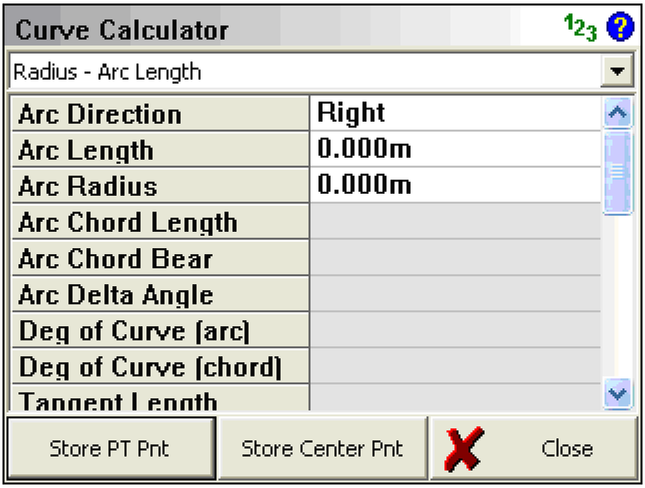
Reset All Parameters

After the RTS command is used, if you start the command you will see a message "Reset All Parameters?" If you choose yes, then FieldGenius will restore all the RTS fields back to their default settings. If you choose no, then your previously inputted data is retained.

Curve Calculator

Main Menu | Calculations | Curve Calculator

FieldGenius includes a curve calculator that can be used to check curve data and also compute and curve points.



Define Known Data

You first have to define what known information you want to use to compute the curve. If you click on the drop down list you will see a list of all the options that can be used to compute the unknown values.

Enter the Known Data

Once you define the known data format, you will see grayed out fields which indicate they can't be edited. White areas indicate fields that can be edited, and these fields will match what you defined in the first step.

1. You always have to define the direction for the curve, either right or left.
2. Enter your know values.
3. If you want to store points, you need to define the PC point. You can enter the point id or use the point chooser.
4. You also need to define the PC Tangent direction, so FieldGenius knows the orientation of the curve.

Store Points

Once you have computed your curve data, you have the option of storing the PT and Center points. When you press either button you will see the store and edit screen.

Area Calculator

Main Menu | Calculations | Area Calculator

The area calculator is used to compute areas as well as predetermined areas.

When defining the boundary area, you can select points, lines and arcs from the map, or type the point numbers in manually. Lines and points from DXF files are also valid and can be selected using the Define Area toolbar.

Defining an Area

Define Area Toolbar (Points)

Select Point

The define area toolbar is used to help you define an area. If the first button is set to **Select Point**, the toolbar is in "point selection" mode and will only accept points picked from the map or point numbers that are typed in. This button acts as a toggle and will toggle between Select Point and Select Line.

Line

If you are defining a straight segment, then you should leave the **Line** button turned on. Simply select two points from the map, or enter the point numbers manually.

Rad Arc

Use this to define a curved segment where you know the start, radius, and end points. You need to first pick the start of the arc, then press the **Rad Arc** button to define the radius point. After doing so, the program will automatically switch back to the Line segment type which at that time you should select the end of the arc.

3 Pnt Arc

Use this to define a curved segment where you know three points on the arc. You need to first pick the start of the arc, then press the **3 Pnt Arc** button which will allow you to define two more points on the arc for a total of three points. The program will automatically switch back to the Line segment type after the third point is selected.

Remove Previous

Use this to remove segments that were defined for the area boundary. This will remove the segments one at a time starting with the last segment that was defined.

Define Area Toolbar (Line)

Select Line

The define area toolbar is used to help you define an area. If the first button is set to **Select Line**, the toolbar is in "line selection" mode and will only accept lines picked from the map. This button acts as a toggle and will toggle between Select Point and Select Line.

Switch Direction

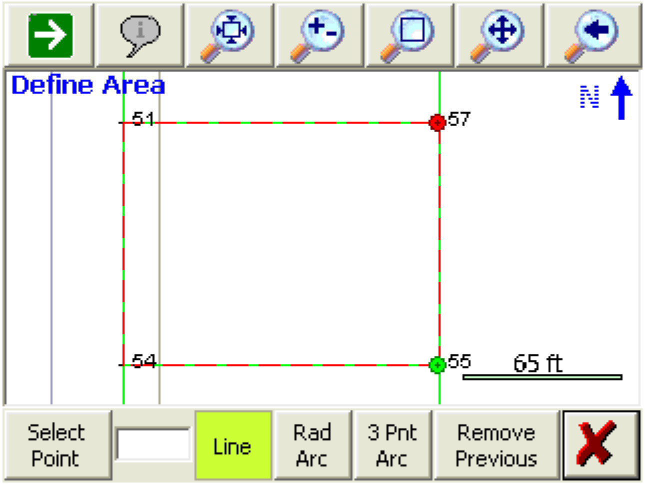
Since this routine accepts FieldGenius figures as well as DXF entities, at times you need to switch the direction of a DXF line so that it matches the direction that you are traversing around to define the area boundary. As you select lines from the map you will see a red marker appear at the end of the line.

Remove Previous

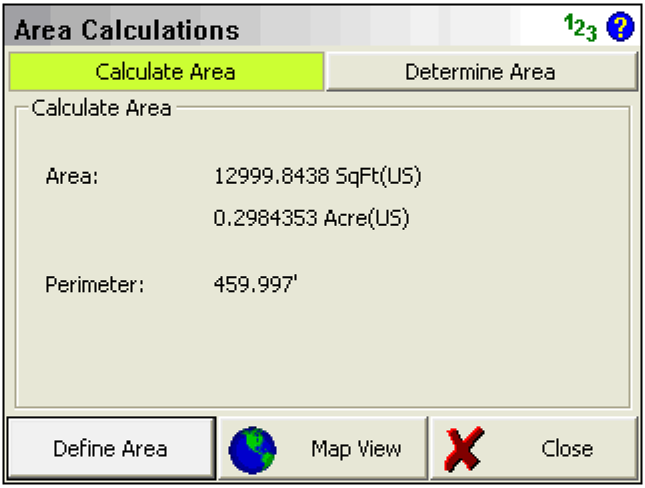
Use this to remove segments that were defined for the area boundary. This will remove the segments one at a time starting with the last segment that was defined.

Enclosed Area Calculation

To compute an area you need to make sure you have the **Calculate Area** tab selected. You can then press the **Define Area** button to define the boundary that will outline the area perimeter. It is important to note that you are not required to "close" the area by selecting the original starting point.



The green marker indicates the start of the area perimeter, where as the red marker indicates the last point on the perimeter. When ready to compute the area, simple press the exit button (red X) on the Define Area toolbar.



Determine Area (Predetermined)

FieldGenius can compute predetermined areas using the **Hinge** or **Parallel** Methods.

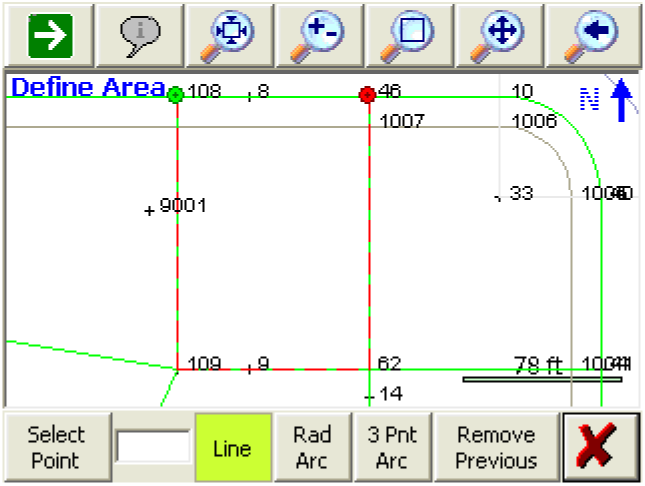
The Hinge Method allows you to specify a fixed point that the new boundary should hinge from.

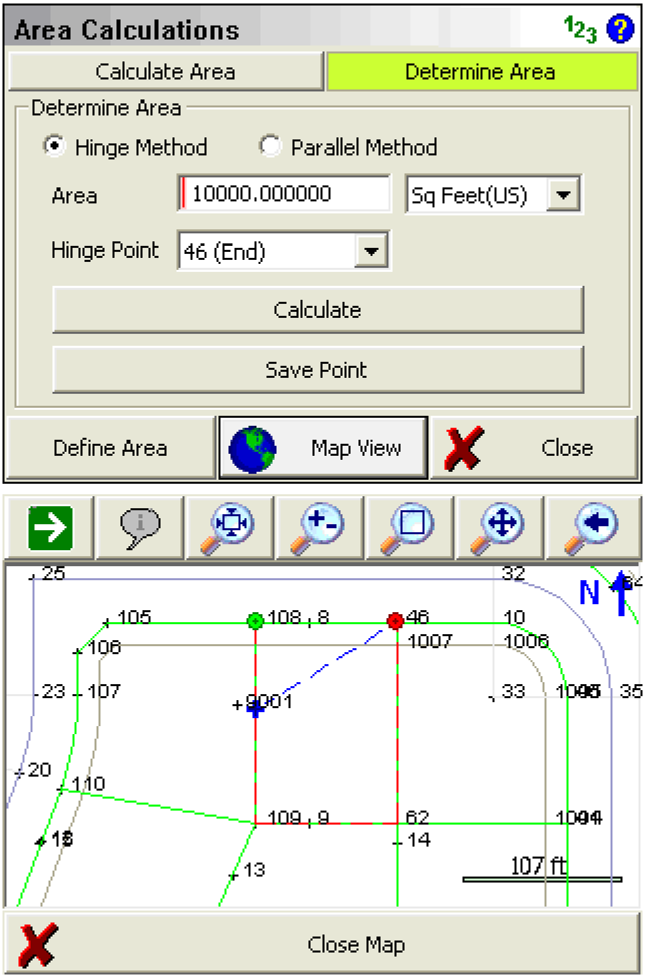
The Parallel Method helps you compute the location of a new boundary using a user entered direction, usually parallel to one of the fixed sides.

Hinge Method

The first thing you need to do when using the hinge method is define the fixed sides of your boundary. Once you do this, on the determine area screen you can enter the predetermined area amount you want to compute a solution for, plus define what point is fixed and is to be used as the hinge point.

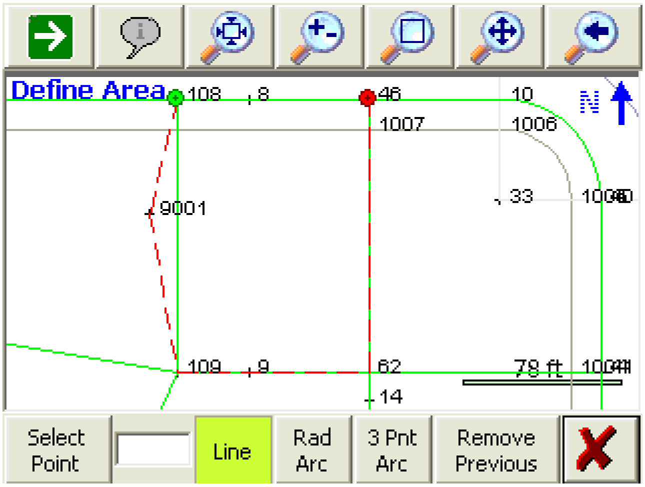
The start and finish points (markers) are represented using a green and red circle marker. You can always press world button on the Display toolbar which will place text labels next to the start and finish points.



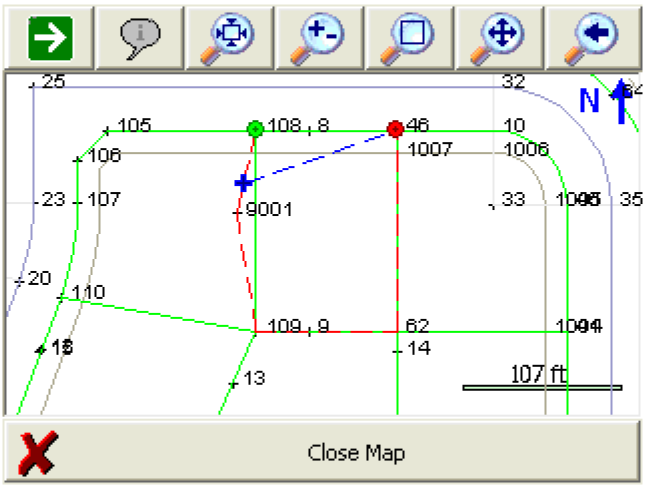


FieldGenius will compute the new boundary so that it intersects the boundary segments connected to the <u>start and finish</u> points that were defined.

In the example below, the original left side of the lot now has two segments that define it. In this example, the solution would have to intersect the boundary segments from (108 - 9001). If we use the same predetermined area parameters as above, FieldGenius will not be able to compute a solution because the solution does not intersect the segment between (108 - 9001). It actually would intersect the line from (9001 – 109).



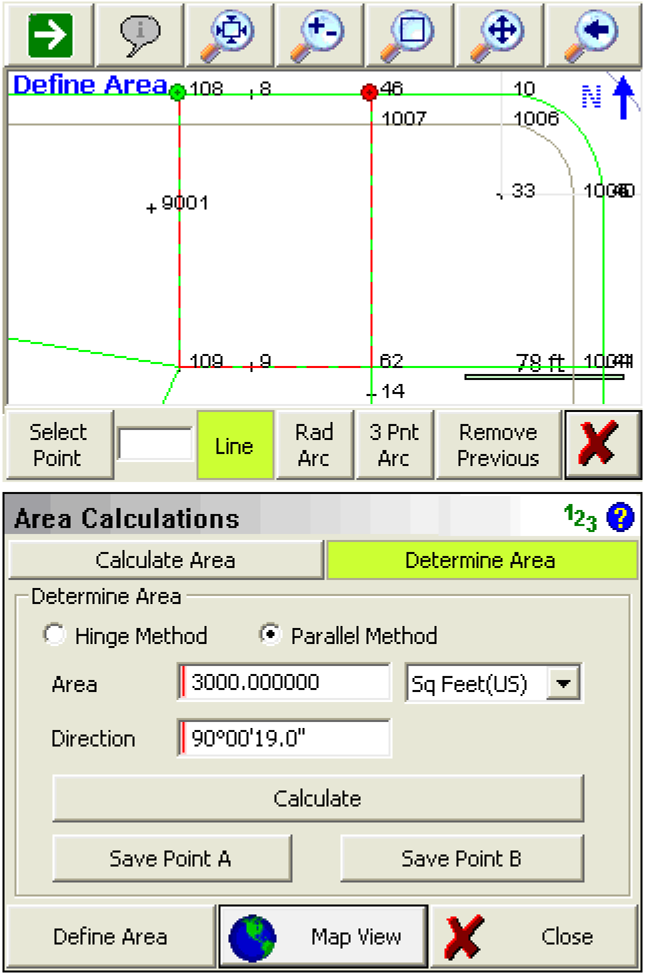
However if we increase the predetermined area amount from 10000 to 12000, a solution can be computed because the solution can now intersect the segment between point 108 and 9001. If you did want to use an amount of 10000, all you would need to do is change the start point from 108 to 9001.



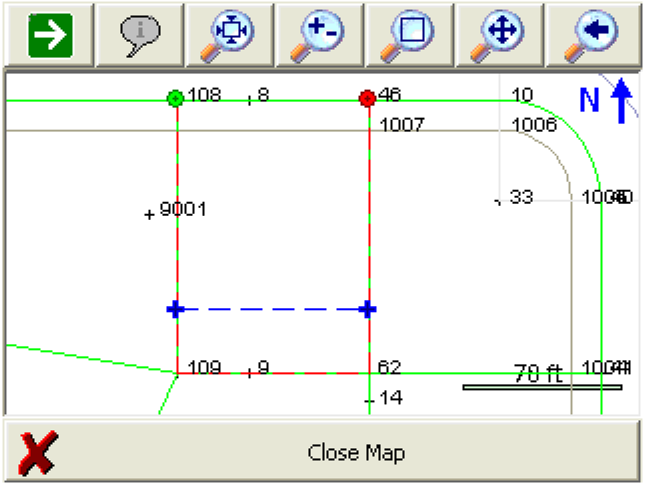
Parallel Method

The first thing you need to do is define the fixed sides for your area. It is important to note that FieldGenius will try to compute the new boundary so that it intersects the segments connected to the start and finish points that you define.

The start and finish points (markers) are represented using a green and red circle marker. You can always press world button on the Display toolbar which will place text labels next to the start and finish points.

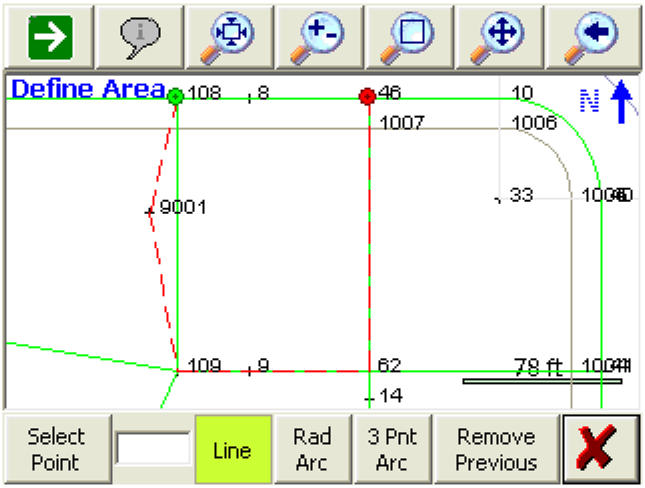


Once a solution has been found you can always preview it by pressing the **Map View** button.

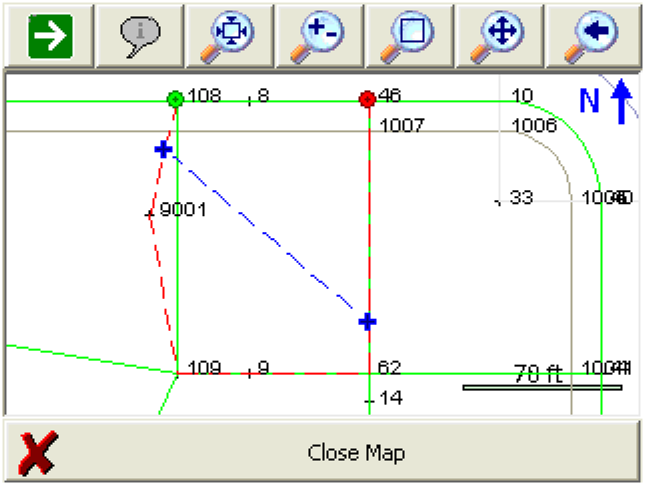


As mentioned above, **FieldGenius will compute the new boundary so that it intersects the boundary lines connected to the start and finish points that were defined.**

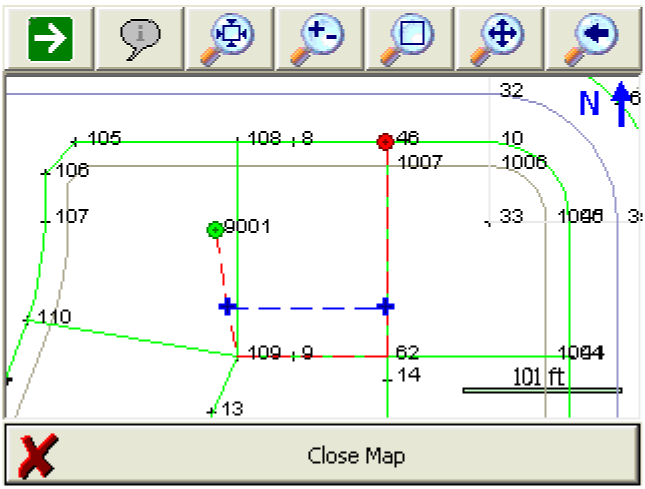
In the example below, the original left side of the lot now has two segments that define it. In this example, the solution would have to intersect the boundary segments from (108 - 9001) and from (46 - 62). If we use the same predetermine area parameters as above, FieldGenius will not be able to compute a solution because the solution does not intersect the two segments.



However if the direction for the boundary is changed to 130°, and the area amount changed to 7000, a solution can be computed because the solution intersects the two segments connected to the start and finish points.

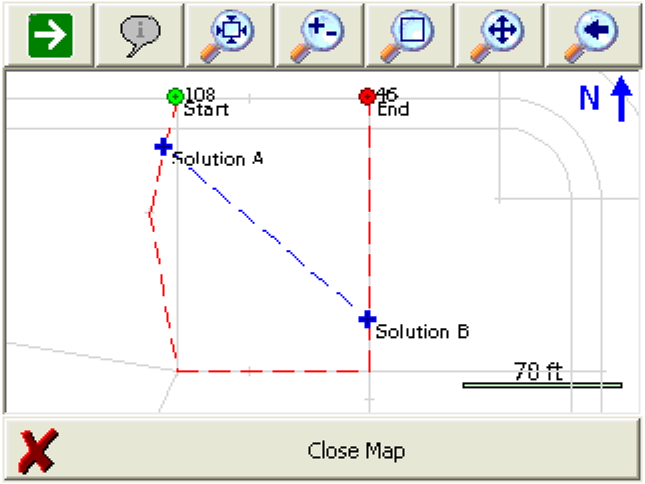


If you did want to keep the same area amount and direction, all you would need to do is change the starting point.



Storing a Solution

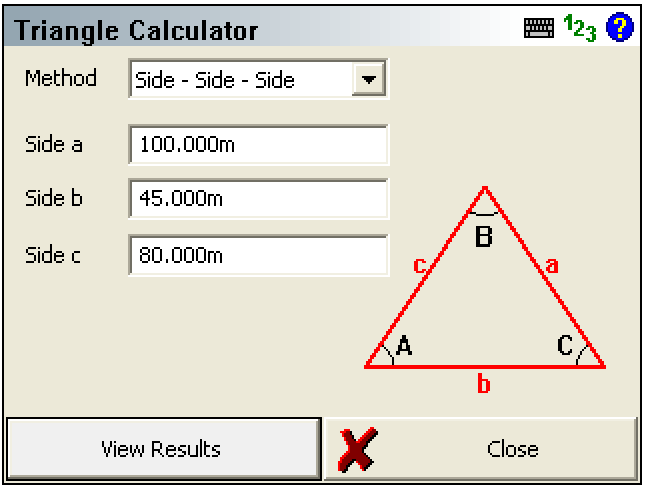
When you have a solution that you want to store simply press the **Save Point** button or buttons depending on the solution method you used. If you used the parallel method you will have two solutions to choose from. You can switch to the **Map** view and turn the **World** button off if you want to see some temporary text labels next to the computed solution points.



Triangle Calculator

Main Menu | Calculations | Triangle Calculator

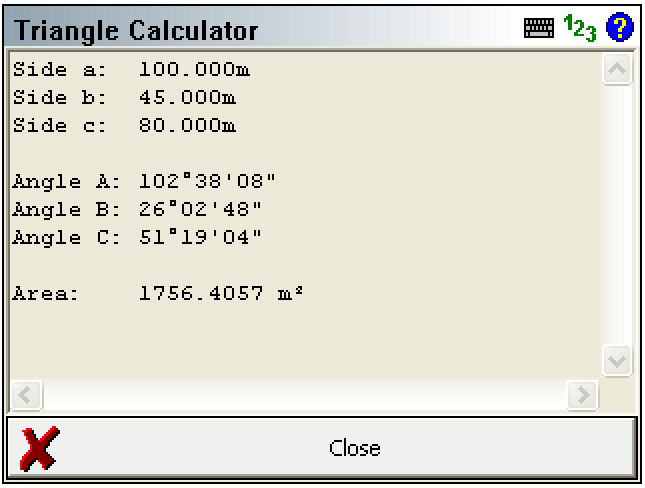
The triangle calculator can be used to solve unknown sides or angle of a triangle given three know components.



You first need to select a Method for the triangle calculation. There are 5 methods available to choose from and you can decide what method to use based on your known triangle components.

- **Side-Side-Side**: Use this when you know the length of the three sides of a triangle.
- **Angle-Side-Angle**: Use this when you know two angles and the distance between them.
- **Side-Angle-Angle**: Use this when you know two angles and one side. The know side must not lie in between the two known angles.
- **Side-Angle-Side**: Use this when two sides and the angle between them are known.
- **Side-Side-Angle**: Use this when two sides and one angle that is not between the known sides are known. This method will produce two solutions.

After you choose the solution method and enter the known components of the triangle, press the **View Results** button to complete the calculation.

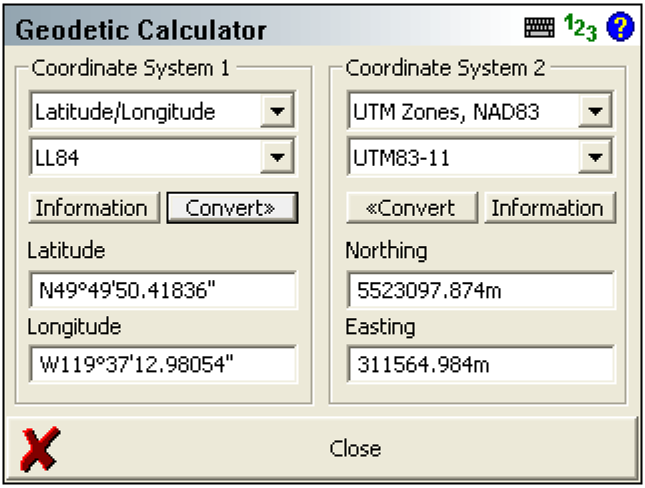


Coordinate Calculator

Main Menu | Calculations | Coordinate Calculator

The coordinate calculator is used to convert Geodetic coordinates to Cartesian coordinates and vice versa.

Simply set the coordinate systems to match the systems that you want to convert between. In the example below, WGS 84 Latitude and Longitude coordinates are being converted to UTM Zone 11 Northing and Easting values.



Scientific Calculator

Main Menu | Calculations | Scientific Calculator

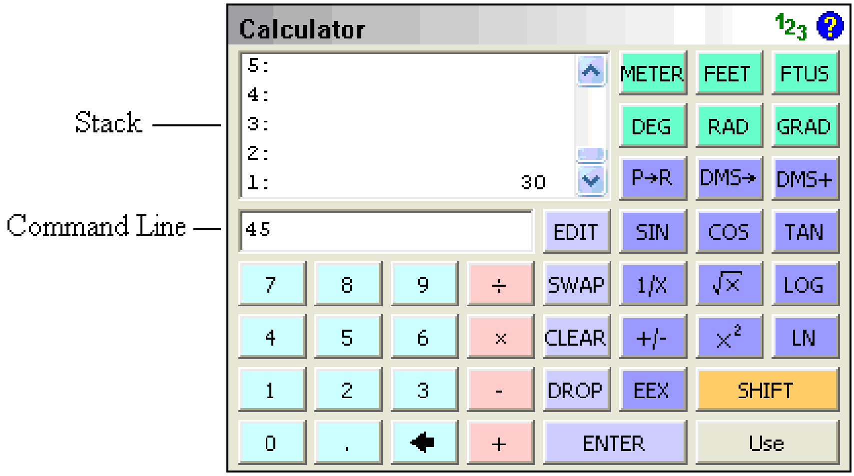
FieldGenius includes an RPN (Reverse Polish Notation) Calculator. RPN Calculators (such as the HP48) are stack based, where values are popped from a stack, and the results of the calculation are pushed back onto the stack. This type of calculator may seem foreign at first, so several examples of its use are included below.

The calculator can be launched several ways:

1. By tapping inside certain numeric entry fields to directly open the Calculator. This will copy whatever value is currently in that entry field into the calculator's command line, and the calculated value can then be automatically copied back into the field which the calculator was launched from.
2. By tapping inside most text and numeric entry fields to open the keypad, and then tapping the "Calculator" button on the keypad. This will copy whatever value was currently in that entry field first into the keypad and then into the calculator's command line. The calculated value can then be automatically copied back into

the keypad and then to the field which the calculator was launched from.

3. It can be launched from the map screen using its Keyboard Shortcut (default is the F key).
4. Or it can be launched through the menu system, by going to **Main Menu | Calculations | Scientific Calculator**.



The Stack

The stack is a series of memory storage locations for numeric data. Each location in the stack is called a Level. There are a maximum of 20 Levels available in the Stack.

As you push new values on the stack, the stack grows to accommodate them: the new data moves into level 1, and older data is pushed to a higher level. Data in level 1 will move to level 2, data in level 2 to level 3, and so on. Any data in level 20 will be bumped off the stack if new data is added, and is unrecoverable. As you pop data off of the stack, the number of levels decrease as data is automatically bumped down to lower levels.

The stack display always shows levels 1 to 5, and you can use the scroll bar to view the other levels up to level 20.

The Command Line

The command line is where you enter or edit data. You can enter up to 20 characters in the command line.

The command line is closely tied to the stack. You use it to enter or edit data and then process it, and the results are pushed onto level 1 of the stack.

Function

Numeric Entry

You can enter values using the keys provided on the calculator or use the numeric keys on your keyboard.

[0] - [9] - Types numeric data into the command line

[<--] - Types a backspace into the command line. You can also use the Backspace key on your keyboard.

Stack Operations

Functions are available to help you manipulate data that is currently stored in the stack.

[EDIT] - Pops data from level 1 of the stack into the command line, bumping all other data down one level.

[SWAP] - Switches positions of the data in levels 1 and 2 of the stack. Or you can highlight a level on the stack and pressing the Swap button will move the value to level 1.

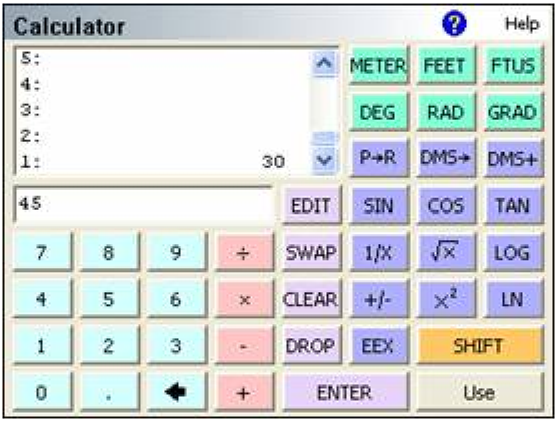
[CLEAR] - Deletes all data from the stack.

[DROP] - Deletes the data in level 1 of the stack, bumping all other data down one level.

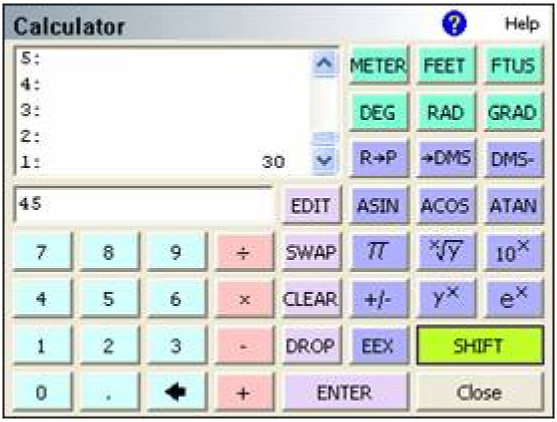
[ENTER] - Pushes data from the command line into level 1 of the stack, bumping all other data up one level. You can also use your keyboard's Enter key.

The Shift Button

[SHIFT] - This is used to show the reverse functions of each operation.



When the shift key highlighted in yellow, it Indicates that the shift key is currently depressed, press it again to un-shift



The OK/Cancel button

[OK] copies the value in level 1 of the stack back into the either the keypad or the numeric entry field which was double-tapped to launch the calculator, and closes the calculator.

[Cancel] closes the calculator, without copying the data anywhere

> ***Note:***
> All data will remain on the Stack, and will be available the next time the calculator is re-started. On Exiting from FieldGenius, all data on the stack is written out to a file called CalcStack.bin and will be automatically re-loaded when FieldGenius is re-started.

Converting Units

[METER] , [FEET] , [FTUS]

Assigns a linear unit to the data in the Command Line, and places it on the Stack. If the Command Line is empty, then the unit is applied to the data currently in Level 1 of the Stack.

[DEG] , [RAD] , [GRAD]

Assigns an angular unit to the data in the Command Line, and places it on the Stack. If the Command Line is empty, then the unit is applied to the data currently in Level 1 of the Stack.

> **Note:**
> You do not need to press enter before pressing a unit button, it will automatically move whatever data is in the Command Line into Level 1 of the Stack.

Example: determine the metric equivalent of 15 feet:

[1][5] [FEET] [METER]

```
1:      4.572_m
```

Example: determine the gradient equivalent of 45 degrees:

[4][5] [DEG] [GRAD]

```
1:      50_grad
```

Basic Mathematical Operations

[+] , [-] , [x] , [/]

Performs a mathematical operation on the data in Level 1 and Level 2 of the Stack, or on Level 1 and the Command Line.

> ***Note:***
> You do not need to press [ENTER] before pressing a math button, it will automatically move whatever data is in the Command Line into Level 1 of the Stack.

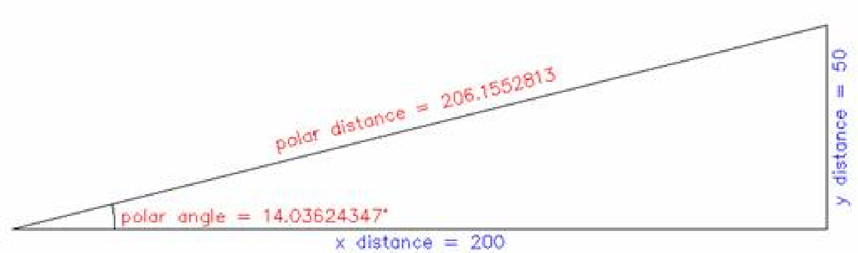
Example: determine the sum of 2 + 3

```
[2] [ENTER] [3] [+]
1:     5
```

Advanced Mathematical Operations

> ***Note:***
> You do not need to press [ENTER] before pressing a math button, it will automatically move whatever data is in the Command Line into Level 1 of the Stack.

Convert data between Polar and Rectangular notation

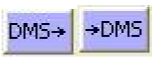


Example: Convert 206 feet at 14° to Rectangular components.

```
[2][0][6] [ENTER] [1][4] [P->R]
2:      199.8809196
1:      49.83591049
```

Example: Convert x=200, y=50 to Polar components.

```
[2][0][0] [ENTER] [5][0] [SHIFT] [R->P]
2:      206.1552813
1:      14.03624347_°
```



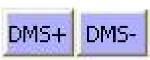
Converts data between Degrees/Minutes/Seconds and Decimal Degrees

Example: Convert from 12° 34' 56" to decimal degrees

```
[1][2][.][3][4][5][6] [DMS->]
1:      12.58222222_°
```

Example: Convert from 12.3456° to degrees, minutes, seconds

```
[1][2][.][3][4][5][6] [SHIFT] [->DMS]
1:      12.204416
```



Add or subtract DMS angles

Example: 12° 34' 56" + 1° 2' 3"

```
[1][2][.][3][4][5][6] [ENTER] [1][.][0][2][0][3]
[DMS+]
1:     13.3659
```

Trigonometric calculations

Example: Cosine of 12.3456°

```
[1][2][.][3][4][5][6] [COS]
1:     0.9768757205
```

Example: Cosine of 12° 34' 56"

```
[1][2][.][3][4][5][6] [DMS->] [COS]
1:        0.9759844006
```

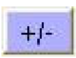
Example: Arc Cosine of 0.3456°

```
[0][.][3][4][5][6] [SHIFT] [ACOS]
1:     69.78157371
```

Inverse of X. Example: 1/4 = [4] [1/X] = 0.25

Square Root of X. Example: ROOT(9) = [9] [√x] = 3

Logarithm (Base 10). Example: LOG(1000) = [1][0][0][0] [LOG] = 4



Change Sign. Example: [3] [ENTER] [+/-] = -3

X Squared. Example: 3^2 = [3] [x^2] = 9

Natural Logarithm. Example: LN(148) = [1][4][8] [LN] = 4.997212274

Scientific Notation. Example: 3x10^4 = [3] [EEX] [4] = 30,000

Pushes pi onto the stack. Example: [SHIFT] [pi] = 3.141592654

X'th root of Y. Example: 3ROOT(8)= [8] [ENTER] [3] [SHIFT] [x√y] = 2

10 to the X. Example: 10^3 = [3] [SHIFT] [10^x] = 1000

Y to the X. Example: 2^3 = [2] [ENTER] [3] [SHIFT] [y^x] = 8

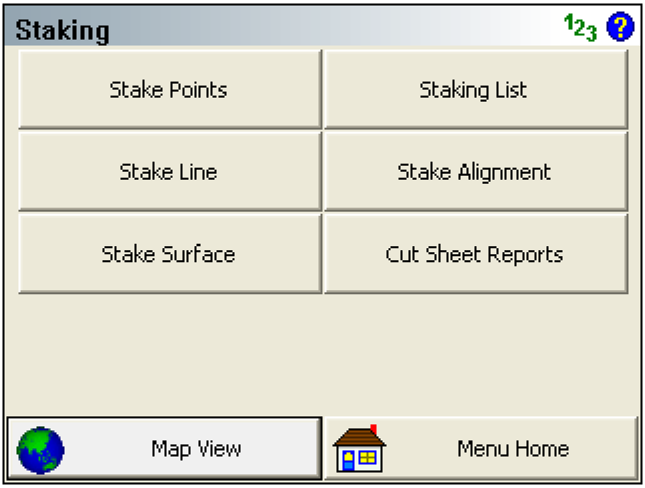
Exponent of X. Example: e^1 = [1] [ENTER] [SHIFT] [e^x] = 2.718281828

STAKING MENU

Staking Menu

Main Menu | Staking Menu

This menu contains staking related functions.



On the staking menu, pressing any of the buttons will take you to its sub-menu.

Stake Points

Use this to stake points from a list or from a screen pick. Please see the Stake Points topic for more information.

Stake Line

Use this to open the stake line toolbar. Please see the Stake Line topic for more information.

Stake Surface

Use this to stake to a DTM surface. Please see the Stake Surface topic for more information.

Staking List

Use this to define a staking list that can be used for staking. Please see the Staking List topic for more information.

Stake Alignment

Use this to open the alignment tools screen. Please see the Stake Alignment topic for more information.

Cut Sheet Reports

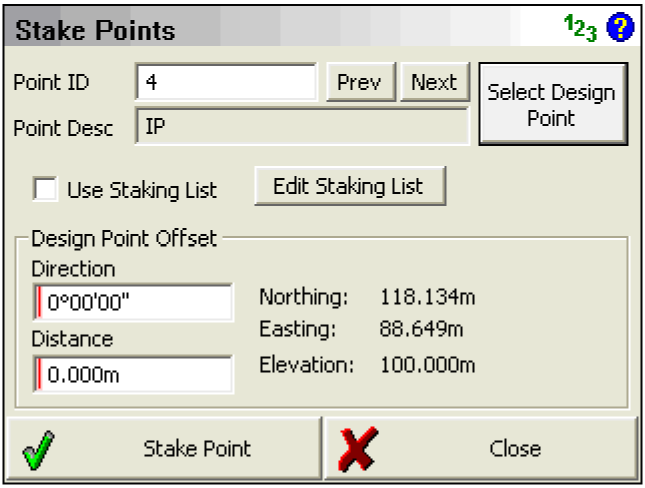
Use this to open the Cut Sheet Reports screen. Please see the Cut Sheet Reports topic for more information.

Stake Points

Main Menu | Staking | Stake Point

Stake Points - Screen 1

When you start the stake points command you will be able to pick a point from the map, enter a point id in the point id field, or use a staking list by turning on the "Use Staking List" toggle. You can also access this screen by tapping an existing point in the drawing and press the Stake Icon on the point toolbar.



Point ID field:

This allows you to manually enter in the point you would like to stake.

Point Desc field:

This shows the description of the current stake point.

Previous and Next buttons:

Use this to automatically advance to the next or previous point in your database. Note that you need to have a value entered in the point number field.

If you have a staking list defined, using these buttons will advance to the next or previous point sequence in the staking list.

Select Design Point button:

This will open the point chooser toolbar and allow you to select a point to stake from the map.

Use Staking List toggle:

Use this to force the staking routine to use you staking list you created using the staking list command. If you haven't created a staking list yet, you can press the Edit List button which will take you to the staking list editor.

Edit Staking List button:

Use this to open the staking list editor. Please see the Staking List topic for more information.

Design Point Offset - Direction & Distance fields:

Use this to compute an offset from your design point. If you leave the distance field set to zero, an offset will not be computed. You can use angle and distance recall features to help you compute your values.

Northing and Easting fields:

These two fields will display the design coordinates for the point listed in the point number field. If you specify an offset, then the coordinates will display new coordinates based on the offset you entered.

Elevation field:

This will display the elevation of the point listed in the point number field. This elevation can be changed by the user prior to staking.

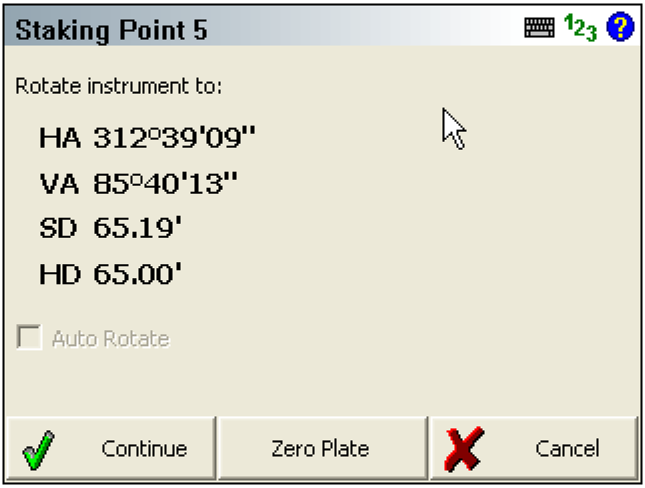
Stake Point button:

When this is pressed it will take you to "turn to" screen.

If you're using a non robotic instrument, you will see a screen displaying the angle and distance you need to measure to stake the point if you're using a non robotic instrument.

ID de Punto

Stake Points - Screen 2



Note:
If you're using a robotic instrument and have the Robotic Staking option enabled, it will skip this screen and take you directly to the map screen where you will see our point staking toolbar.

Rotate instrument to:

From this screen you will see what angle and distance you need to turn to on your instrument to stake your point.

At this point you can turn your instrument to match the angles and when ready to start staking, press the Continue button. The Turn To information is available on the next screen in case you need it.

Note: Your target height is used to determine the vertical angle for the stake point.

Auto Rotate

If your instrument has servo motors and FieldGenius supports your instrument, this option will be available. It will be on by default and will automatically turn to match both the horizontal and vertical angles needed to set out the point. The instrument will begin to turn when you press the Continue button.

Zero Circle

This is used to modify plate reading on your instrument in such a way that if you manually turn to zero you will be facing towards the point you want to stake.

When you do so, you will see a message "Zero the plate circle to the design point and update the backsight setup?" Press Yes to continue, or No to Cancel. After you press Yes, a new backsight reading is set on the instrument and a BK record is written to the raw file.

You will also note that the turn to angle will now display zero, which is the angle you now need to turn to on the instrument.

You can continue using this for any other points you want to stake. Since the plate reading is changing a lot, you will want to check the backsight frequently to make certain you the error meets your tolerances.

Continue

Press this button to continue. You will now see the map screen and the point staking toolbar.

Stake Line/Arc

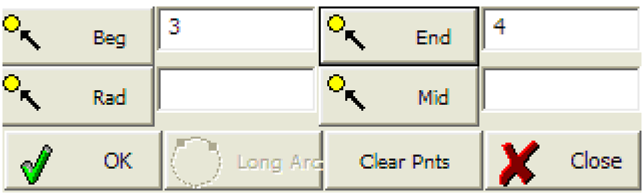
Main Menu | Staking | Stake Line

Stake Line

In FieldGenius you can stake a line by selecting points in the drawing, an existing figure or a DXF line.

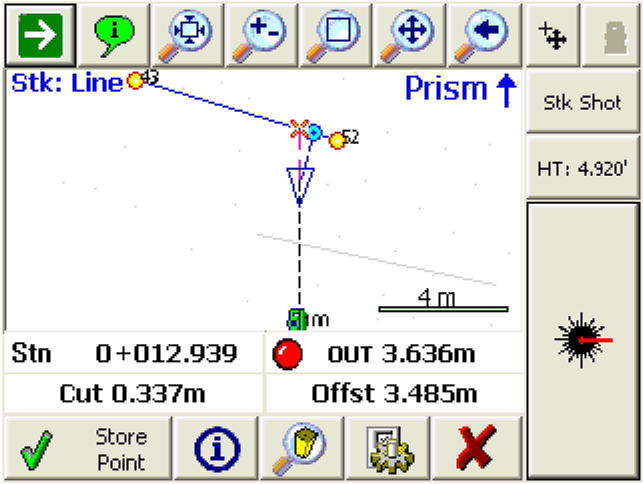
When you start the command from the Staking screen you will see the stake line toolbar. With this toolbar you can specify the points you want to use to define the stake line or arc.

In this example I choose to start the baseline at point 3 and end it at 4.



To continue on to stake the line you need to press the OK button which will display the Station Offset toolbar. If you want to stake the line, press the **Stake Line** button which will display the stake line toolbar.

When this toolbar opens you have to take a shot before any information will appear on the toolbar.



Station - This station is the perpendicular intersection from the current rod position back to the baseline. If your line of sight does not intersect the baseline, it will be extended in either direction in order to compute an intersection. In this example the perpendicular intersection is 12.939 meters from point 43 and is also indicated by a blue circle.

In / Out – This is the distance you need to move in or out to get to the baseline. This distance is measured along the line of sight and represents the projected intersection. This intersection will be shown in the map with a cross symbol.

Left / Right – This is the distance you need to move left or right to get to the baseline. This distance is measured perpendicular to the line of sight and represents the projected intersection. This intersection will be shown in the map with a cross symbol.

You can force FieldGenius to display either In/Out or Left/Right distances by changing the Line Mode option in the Staking Settings.

Cut / Fill – The stake line command will calculate and interpret an elevation along the baseline. A cut represents that the rod is higher than the projected elevation, and a fill represent that the rod is lower than the projected elevation.

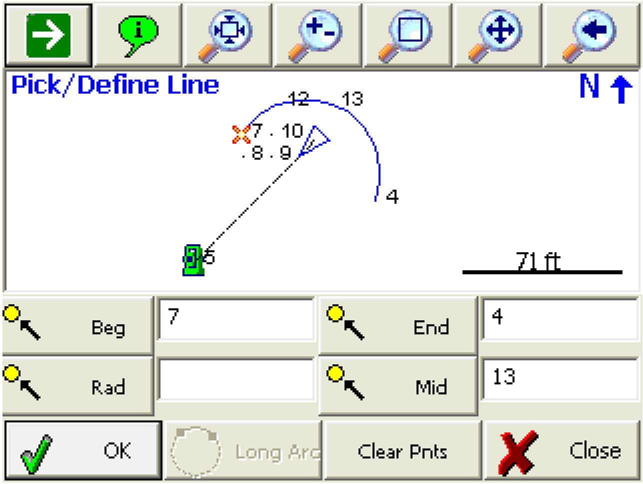
The cut / fill value will represent the difference between the current rod position and the perpendicular intersection.

You can toggle between the computed Cut/Fill values or the current rod Elevation by tapping on the Cut/Fill field.

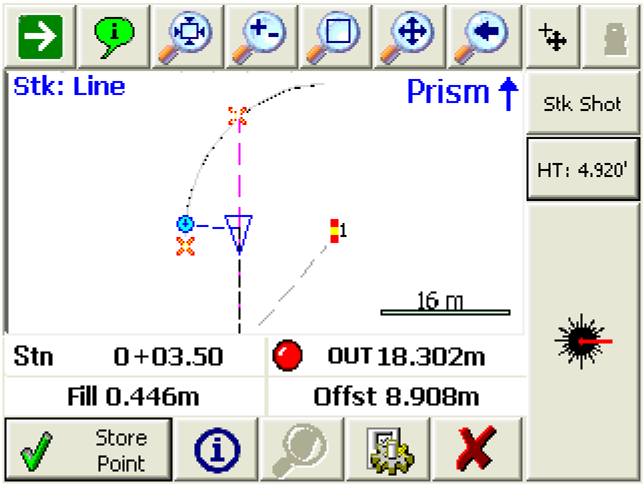
Offset - This will always display the perpendicular offset to the line, or the radial distance to an arc.

Stake Arc

This is very similar to staking a line, only difference is you select an existing arc in the drawing or define one using the stake line toolbar.



When you continue on to staking the arc you will see the staking toolbar.



This toolbar will display the station on the arc computed radially from the current position of the prism. This is the blue circle.

You will also see the in or out distance required to move onto the line. This distance is measured along the line of sight and an intersection with the arc. In our example, we need to move out by 18.302m.

You will also see the radial offset distance from the rod to the arc. In our example, we need to move towards the arc by 8.908m

Finally, the fill or cut value will be displayed. Cut value indicate that the rod is higher than the arc, fill indicates that it is lower.

Store Points

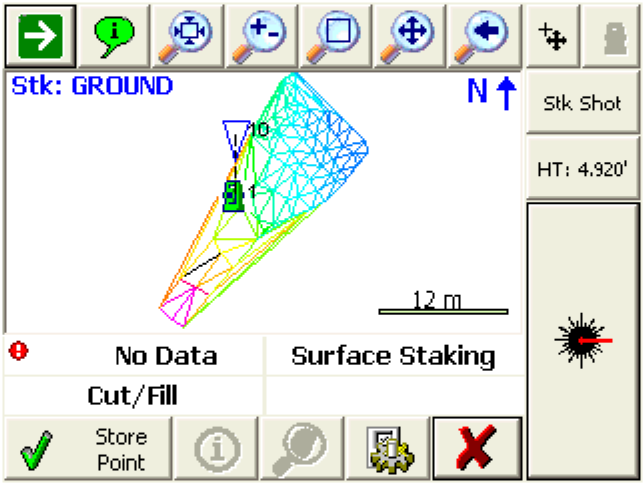
When you store the shot while staking a line or arc a point will be stored and some records will be written to the raw file. Currently a SP and SK records will be stored in the raw file.

Stake Surface

Main Menu | Staking | Stake Surface

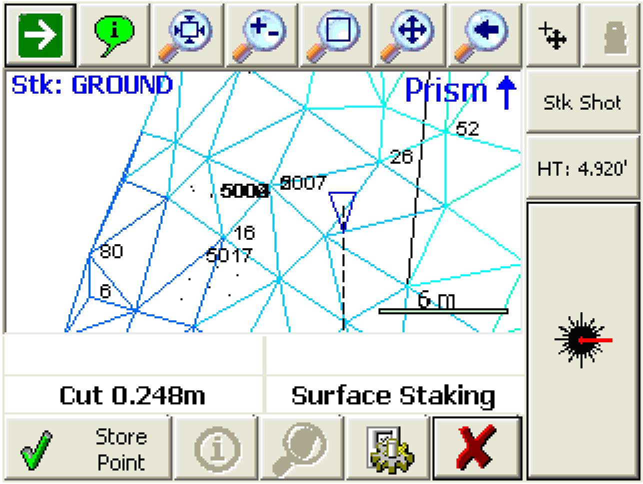
The stake to surface command allows you to take a shot any where on a surface and a cut or fill value will be computed. The current northing and easting position of the rod is based on the measurement, but the Z value is computed by intersecting the surface at the rod location.

> **Notes:**
> - To stake to a surface in real time you first need to import one. Please refer to the Surface Sets topic for more information on how to load a surface.
> - If you see a message indicating that you have to select a surface before staking to one, you will need to go into the stake settings screen and select a surface to stake to. Also make certain you turn on "stake surface".



When you first see the surface staking toolbar you may see the words "No Data" which means you need to take a measurement first so it can calculate the current position of the rod. Press the measure button if you're using a conventional instrument, or turn on the tracking button if using a robot or GPS.

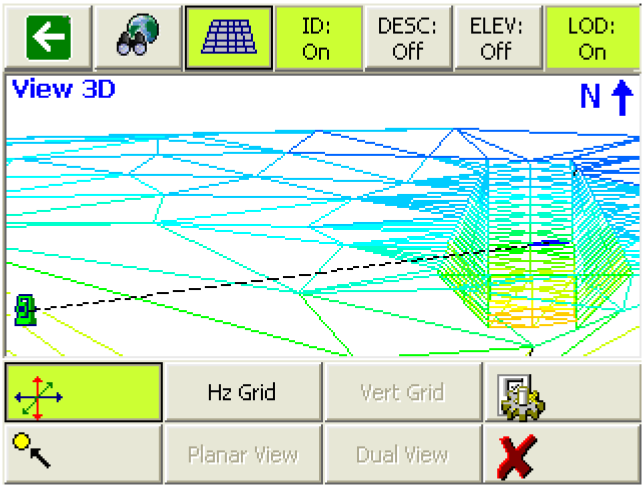
You will also see this if your current position isn't on the surface.



Once you take a shot you will see the CUT or FILL value at your current rod position. In our example the current position is higher than the DTM by 0.248m. Tap on this field to toggle between Cut/Fill and Elevation values.

To help you visualize where your shot is in relation to the surface you can always use our 3D view capabilities.

Below is an example of this functionality.



Cut/Fill values

The first row contains two sections that display the current Cut or Fill from the bottom of the rod to the surface. A fill value means the rod is higher than the current surface, cut indicates it is lower. If your current position is right on the surface you will see the word Grade. Tap on the Cut/Fill field to toggle between Cut/Fill and Elevation values.

Store Point button

When this is pressed the Store / Edit Points screen will appear so you can store the position that was staked. Also a raw record will be written to the raw file.

Information button

This isn't applicable when staking to a surface and will be grayed out.

Zoom button

This isn't applicable when staking to a surface and will be grayed out.

Settings button

This will open the Staking Settings screen which allows you to setup parameters that will be used during the staking process.

Conventional Total Station

If you're using a conventional total station you need to press the measure button on the instrument toolbar before the navigate distances are displayed.

To help with navigating, set your map orientation to prism in the staking settings screen.

Robotic Total Station

If you're using a robotic instrument you need to turn on the cursor tracking button on instrument toolbar before the navigate distances are displayed. Note that with a robotic instrument, there is no need to press the measure button as the cursor tracking provides real-time positions to the staking toolbar.

However, when you want to store your point you can turn off the cursor tracking button and use the measure button to record the position of the rod prior to storing the stake location. The cursor tracking mode uses the tracking mode on the instrument which is typically suitable for rough measurements, but may not be suitable for control or precise stakeouts.

To help with navigating, set your map orientation to gun in the staking settings screen.

Raw File

When you store your stake point several records are written to the raw file. Following is an example of a point that was staked out:

```
SP,PN1400,N 715346.319,E 2381454.812,EL1.009,--
CF,EL1.0087,GD1.0000
DE,PN342,N 715346.319,E 2381454.770,EL1.000,--
SD,ND-0.000,ED-0.042,LD-0.009
SK,OP251,FP1400,AR180.00000,ZE89.05000,SD63.0500,--
Design Point: 342
```

The SP record is the point that was recorded when you pressed the Store Point button.

The CF record displays the measured elevation versus design.

The DE record displays the design coordinates for the point to be staked.

The SD record displays the delta values of the staked point. This is the DE record - SP record.

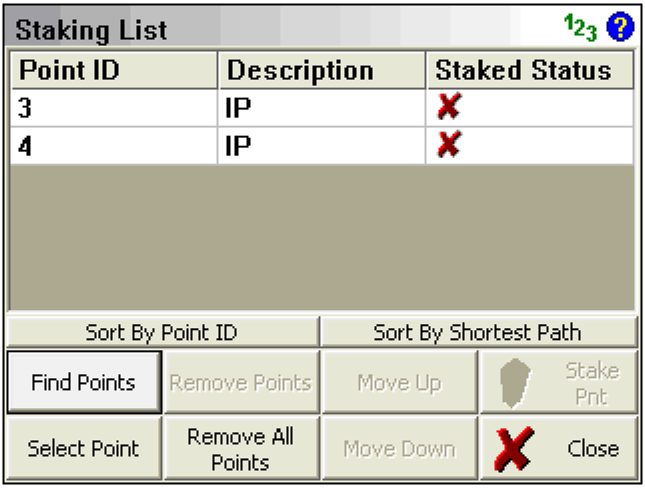
The SK record is the recorded raw observation used to compute the store point (SP) record.

Staking List

Main Menu | Staking | Staking List

Use a staking list to stake points from a predetermined list of points. You can specify the points to stake by entering a point range.

When you start the command you will see the staking list screen and it will be empty if you haven't previously created one.



Sort By Point ID button:

Use this to sort the staking list by Point ID.

Sort By Shortest Path button:

Select the first point you want to stake, then use this to sort the staking list by shortest path distance.

Find Points button:

Use this to find points that will be added to the list. You can find points based on the Point ID, Coordinate, or Description.

Select Point button:

Use this to pick a point from the map. Points will be added to the list in the order they're selected.

Remove Points button:

Use this to delete a single row or multiple rows. This will only remove the points from the list and will not delete the points from the database.

Remove All Points button:

Use this to clear the current list.

Move Up button:

This will move the currently highlighted point up one row.

Move Down button:

This will move the currently highlighted point down one row.

Stake Pnt button:

This will take you to the staking toolbar to stake out the point that is currently highlighted in the list.

Staking Status

If the point in your staking list has not been staked yet, it will have a red "x" displayed in the Staked Status column. You will see a stake icon if the point has been staked.

Point ID	Description	Staked Status
3	IP	
4	IP	

As you can see point 3 has been staked, and point 4 hasn't.

Staking from the List

To stake from the list simply highlight the point you want to stake and press the **Stake Pnt** button which will begin the staking process. Please see the Point Staking Toolbar topic for more information. Since you started the staking from the staking list, it will automatically turn on the **"Use Staking List"** checkbox in the Stake Points screen.

When you store your stake point, the staking point command will automatically go to the next point in the list.

Survey Role Setting

The status of a point is controlled by the Survey Role type in the project database. You can view the role by using the Coordinate Database viewer. If the point is pending, it will have a survey role type of "to stake out" (point 4 in the screenshot below). If it has been staked, it will have a survey role of "staked out" (point 3 in the screenshot below).

3	106.783m	71.397m	100.000m
4	118.134m	88.649m	100.000m

Stake Alignment

Main Menu | Staking | Stake Alignment

When this is selected, the Alignment Staking screen will be displayed. Note you first need to define an alignment in the Road Manager screen. Use this to quickly continue staking your alignment.

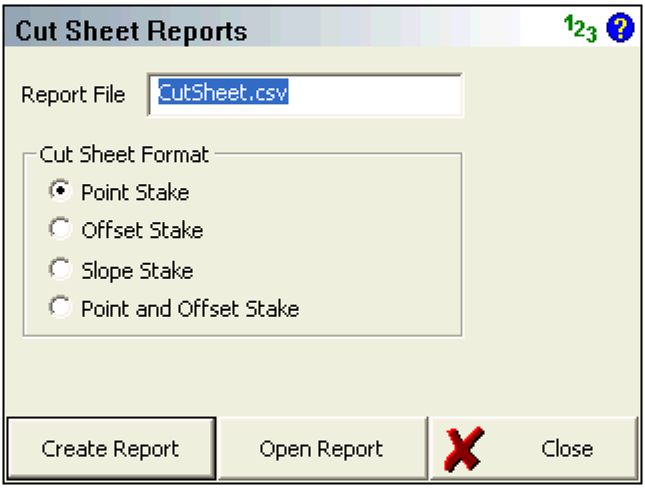
Please see the Road Reference section for more detailed information about creating and defining alignments.

Tell me more about ...
Road Settings
Manua Entry - Alignment C/L
Manual Entry - Vertical Profile
Manual Entry - Template
LandXML Cross Sections
Alignment DTM Surface
Alignment Staking - Part 1
Alignment Staking - Part 2
Alignment Slope Staking

Cut Sheet Reports

Main Menu | Staking | Cut Sheet Reports

FieldGenius includes a cut sheet generator. When you stake points or stake alignments, cut sheet records are recorded in the raw file.



The different cut sheet formats will be described below. To create a cut sheet, you simply enter a file name, then select the cut sheet format, then press the **Create Report** button. If you've already created a cut sheet and want to open it to review it, press the **Open Report** button.

FieldGenius automatically creates a (.CSV) comma separated value file for each cut sheet format you create. This file can be read into Excel, which will allow you to format it and print it. The records stored during staking follow the RW5 format so cut sheet records can be created using software packages that support this format.

Point Stake Format

If you've staked points using the Stake Point command you will be able to create a stake point cut sheet report.

Design Pt	As Built Pt	Cut(-)/Fill(+)	Design N	Design E	Design El	Delta N	Delta E	Design Desc	As Built Desc
17	5005	0	5007.202	5003.499	100.202	0	0	GRD	Design Pnt 17
19	5006	0	5006.076	5001.161	100.119	-0.007	0	GRD	Design Pnt 19
20	5007	0	5008.335	4998.831	100.061	-0.007	0	GRD	Design Pnt 20
51	5009	-0.001	5006.573	4992.566	99.815	-0.001	-0.001	GRD	Design Pnt 51
51	5010	-0.001	5006.573	4992.566	99.815	-0.001	-0.001	GRD	Design Pnt 51
30	5011	-0.425	4997.663	4996.693	99.815	-6.249	14.371	E/ASPH	Design Pnt 30
31	5012	-0.739	4996.107	4991.625	99.502	-7.805	9.302	E/ASPH	Design Pnt 31

Offset Stakes Format

If you've staked points using the stake alignment command, you can create a cut sheet report for your station and offset stakes.

Station	Offset	Offset Length	Cut(-)/Fill(+)	Elevation	Grade	Description
1	Left	1.002	0	100.1662	100.1665	0+01.00 L 1.000
2	Left	0.984	0	100.0624	100.0619	0+02.00 L 1.000
2	Center	0.001	-0.001	100.0629	100.0619	0+02.00 C 0.000
2	Right	1.005	0	100.0622	100.0619	0+02.00 R 1.000
3	Left	1.001	-0.007	99.9643	99.9574	0+03.00 L 1.000
3	Right	0.006	-0.014	99.9715	99.9574	0+03.00 C 0.000
3	Right	1.002	-0.005	99.9619	99.9574	0+03.00 R 1.000

Slope Stake Format

If you've staked points using the slope stake alignment command, you can create a cut sheet report for your slope stakes.

Station	Offset Direction	Cut/Fill	Design Slope	Offset Length	Pt Name	Actual El	Design El	Ahead On Station	HD to Hinge Pt	VD to Hinge Pt	HD to Center Line	VD to Center Line	Observed Slope	Description
12	Left	Cut	1.00:1	N/A	81	99.984	100.24	-0.032	1.011	0.968	2.011	0.968	1.04:1	CP 0+012.000 L 1.000
6	Left	Cut	1.00:1	N/A	5000	100.15	100.15	-0.013	0.507	0.501	1.507	0.501	1.01:1	CP 0+06.00 L 1.000
6	Left	Cut	1.00:1	N/A	5001	100.15	100.15	-0.002	0.498	0.501	1.498	0.501	0.99:1	CP 0+06.00 L 1.000
6	Left	Cut	1.00:1	N/A	5002	100.14	100.18	0.017	0.521	0.501	1.52	0.501	1.04:1	CP 0+06.00 L 1.000
6	Left	Cut	1.00:1	1	5003	101.53	100.14	0.017	1.513	0.501	2.513	0.501	1.04:1	REF CP 0+06.00 L 2.000
6	Left	Cut	1.00:1	N/A	5004	100.14	100.14	-0.002	0.498	0.501	1.498	0.501	0.99:1	CP 0+06.00 L 1.000
6	Left	Cut	1.00:1	1	82	102.28	100.14	-0.002	1.39	0.501	2.387	0.501	0.99:1	REF CP 0+06.00 L 2.000

Point and Offset Stake Format

This type of report will display the same records as the Point Stake and Offset Stake reports, but combine them into a single report.

Formato de Replanteo de Punto y Desfase

Este tipo de reporte desplegará los mismos registros que el reporte que replanteo de Punto y Replanteo de Desfase, pero los combina en un solo reporte.

Station	Offset	Offset Length	Design Pt	As Built Pt	Design N	Design E	Design El	As Built El	Cut(-)/Fill(+)	Delta N	Delta E	Design Desc	As Built Desc
			17	5005	5007.202	5003.499	100.202	100.2018	0	0	0	GRD	Design Pnt 17
			19	5006	5006.076	5001.161	100.119	100.1191	0	-0.007	0	GRD	Design Pnt 19
			20	5007	5008.335	4998.831	100.061	100.0615	0	-0.007	0	GRD	Design Pnt 20
1	Left	1.002		5008	5011.787	5004.505	100.166	100.1662	0	0.001	-0.001		0+01.00 L 1.000
			51	5009	5006.573	4992.566	99.815	99.8163	-0.001	-0.001	-0.001	GRD	Design Pnt 51
			51	5010	5006.573	4992.566	99.815	99.8163	-0.001	-0.001	-0.001	GRD	Design Pnt 51
			30	5011	4997.663	4996.693	99.815	100.2405	-0.425	-6.249	14.371	E/ASPH	Design Pnt 30
			31	5012	4996.107	4991.625	99.502	100.2405	-0.739	-7.805	9.302	E/ASPH	Design Pnt 31
2	Left	0.984		5014	5011.047	5003.832	100.062	100.0624	0	-0.018	0.005		0+02.00 L 1.000
2	Center	0.001		5015	5011.719	5003.092	100.062	100.0629	-0.001	-0.001	0		0+02.00 C 0.000
2	Right	1.005		5016	5012.391	5002.352	100.062	100.0622	0	-0.006	0.001		0+02.00 R 1.000
3	Left	1.001		5017	5010.306	5003.16	99.957	99.9643	-0.007	0	-0.001		0+03.00 L 1.000
3	Right	0.006		5018	5010.978	5002.42	99.957	99.9715	-0.014	-0.007	0.002		0+03.00 C 0.000
3	Right	1.002		5019	5011.651	5001.68	99.957	99.9619	-0.005	-0.004	-0.001		0+03.00 R 1.000

Roads Manager Menu

Roads Manager Menu

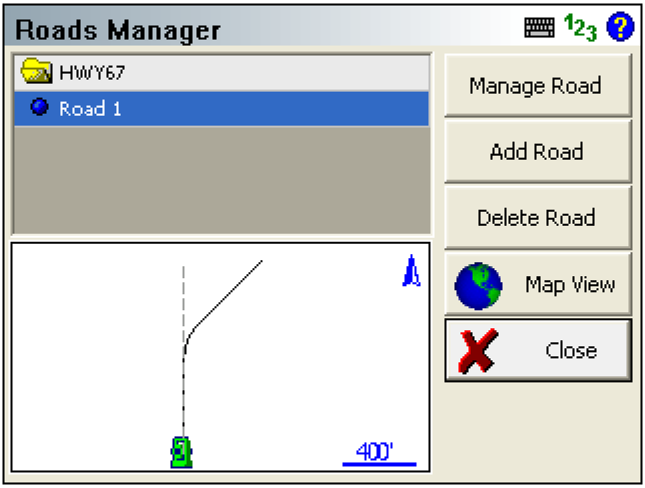
Main Menu | Roads Manager

To stake an alignment you first need to define the geometry that defines the horizontal and vertical element. You can also define a template that will be used to define cross sections at specific stations along the alignment.

FieldGenius can use the following three methods to define an alignment.

1. Manual Entry – You can manually enter the data to define the alignment.
2. Import XML – You can import a LandXML file that contains your alignment data.

To open the road editor go to **Main Menu | Roads.** This will open the Roads Manager screen.



By default you will see an alignment in the list with the current project name. In this example the project name is Hwy67. An alignment can contain multiple roads, and each road can contain the following elements.

- **Horizontal Element:** This can contain straight tangents, curves and spirals.

- **Vertical Element:** This can contain grade breaks, parabolic curves and non-symmetrical curves.
- **Templates:** Template can contain horizontal and vertical offsets, as well as widening and super elevation data.
- **XML Cross Sections:** XML cross sections define specific stations along an alignment. These sections contain horizontal, vertical and template data. XML cross sections are created using desktop software which is then imported into FieldGenius.

Manage Road

This option is only available once you've created a road using the New Road button or imported an XML file. To input or review alignment data, press the Manage Road button to access the Road Settings screen.

If you imported a LandXML file, or manually inputted a road you can stake it by pressing this button. As a minimum you need to have the following before the stake command will continue.

- XML Cross sections

- Horizontal C/L, Vertical Profile and template.

- Horizontal C/L and DTM Surface

Add Road

Use this button to create a new road. You can create as many roads as needed and they will be stored in an XML file that will reside is the project directory.

Delete Road

Use this to delete a road. You first need to highlight the road you want to delete, and then press the button to remove the road from the alignment. This road will be permanently deleted and can not be undone.

Map View

Use this button to display the map view. From this view you can use the zoom controls to zoom around your drawing so you can find important or relevant data for your alignment such as a POB point. Press the Close View button to return back to the Roads Manager.

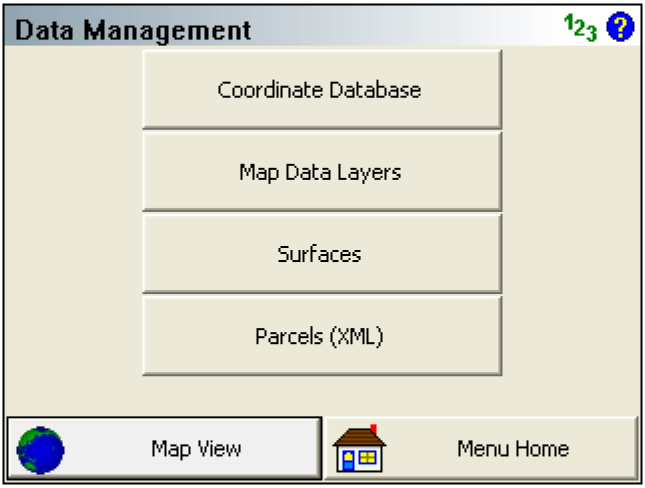
Tell me more about ...
Road Settings
Manua Entry - Alignment C/L
Manual Entry - Vertical Profile
Manual Entry - Template
LandXML Cross Sections

DATA MANAGER MENU

Data Manager Menu

Main Menu | Data Manager

This menu allows you to organize, manipulate and view the different data types that may be associated with your FieldGenius projects.



Coordinate Database

Use this to open the points database. From here you will find numerous tools that can be used to edit your points. Please see the Coordinate Database topic for more information.

Map Data Layers

Use this to import DXF, LandXML, and georeferenced raster image files into your project, and to control the visibility of database layers and any files that you may have associated with your project. Please see the Map Data Layers topic for more information.

Surfaces

Use this to import DTM surface files into your project, view and edit your DTM surfaces, and perform volume calculations. Please see the Surfaces topic for more information.

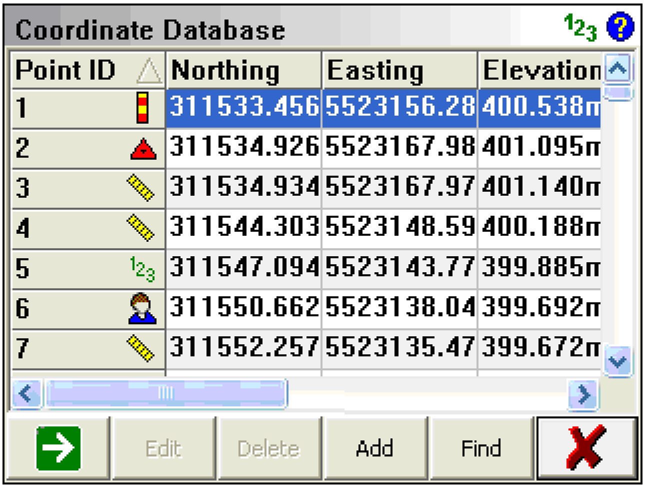
Parcels (XML)

Use this to edit and view your XML parcels that are associated with your project. Please see the Parcels (XML) topic for more information.

Coordinate Database

Main Menu | Data Manager | Coordinate Database

The coordinate database dialog is used to edit and manipulate your coordinates in your project database. The list will display all coordinates currently stored in the database and the data can be sorted by pressing the column headers.



Point ID (Survey Role) Icons

 The instrument icon indicates your current occupied point.

 The rod icon indicates your current backsight point.

 The stake icon indicates points that are to be staked.

 The checked stake icon indicates points that have been staked out.

 The hub icon indicates control points, they can not be edited under any circumstances.

 The user icon indicates user entered points, the coordinate can be edited.

The ruler icon indicates measured points, the coordinate can not be edited.

The 123 icon indicates calculated points, the coordinate can not be edited.

> **Note:**
> To edit the coordinate of a measured or calculated point, you must first change its survey role to user entered.

Next/Previous

Use the green arrow buttons to display the next or previous button sets, for more options.

Edit

Use this to edit the coordinates of a point that is highlighted in the list using the Store/Edit Points tool.

Delete

Use this to delete the current point or selection in the list. **Note: There is no undelete point option in FieldGenius. If you delete points from the coordinate database they can not be restored without editing and reprocessing your raw file.**

Add

Use this to open the Store Point screen to manually enter a new point.

Find

Use this to select multiple points, based on a single point ID, a point ID range, a point coordinate range, or point descriptions.

RTS (Rotate/Translate/Scale)

Use this to rotate or translate your points that are currently selected in the coordinate list. When you press the button you will see the Rotate / Translate / Scale Points screen. Please refer to the Rotate / Translate / Scale topic for more information.

Local Transform

Use this to apply a coordinate transformation to a point or selection in the coordinate list. You need to have calculated the transformation parameters prior to pressing this button. See the

Statistics

Use this to display statistics of the coordinate database, including the total number of points, bounding minimum and maximum coordinate values, and point ID's in use, and point ID's not in use.

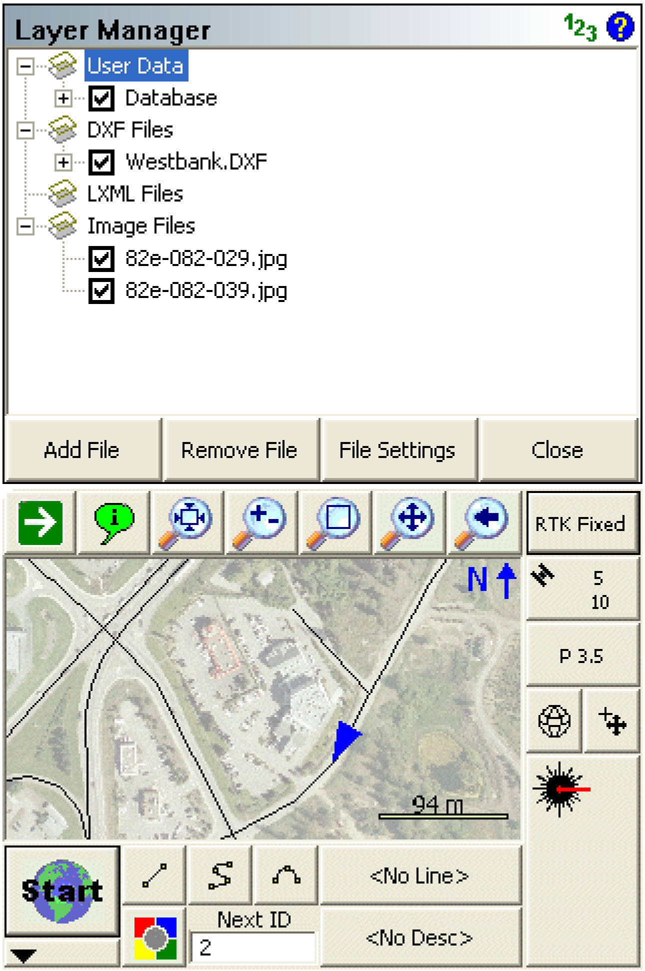
Map View

Use this to display the currently highlighted points on the screen.

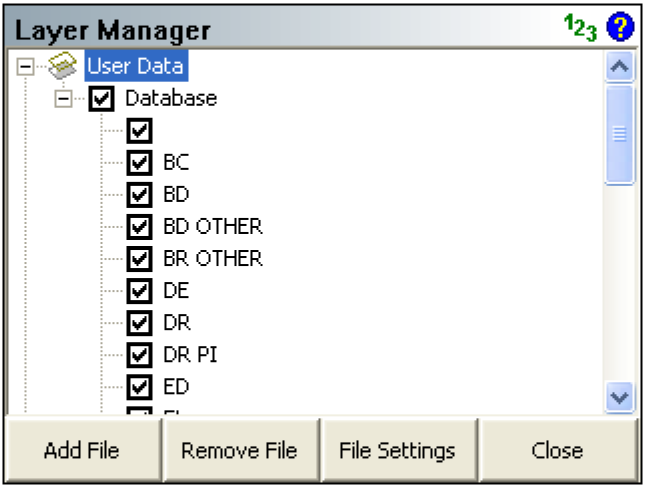
Map Data Layers Manager

Main Menu | Data Manager | Map Data Layers

Use this to load, unload, and control the visibility of DXF files, LandXML files, and JPG or TIFF raster image files that are associated with your project, and to control the visibility of your database layers.


Layer Manager
User Data
Database
DXF Files
Westbank.DXF
LXML Files
Image Files
82e-082-029.jpg
82e-082-039.jpg
Add File
Remove File
File Settings
Close
RTK Fixed
N
5
10
P 3.5
94 m
Start
<No Line>
Next ID
2
<No Desc>

User Data



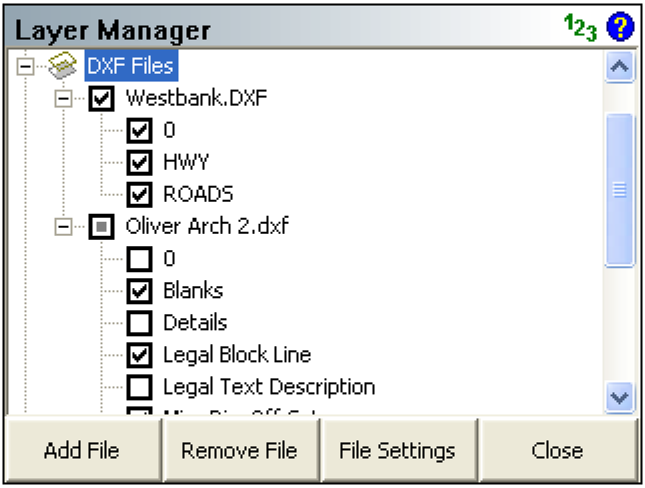
FieldGenius uses the layer names specified in the Automap library to control the visibility of points and figures by their description.

You can control the visibility of the entire database (both points and figures) by checking or unchecking the Database option under the User Data section of the tree. If the box is checked, then the database is turned on and all of its layers will be visible; if unchecked, then the file and all of its layers is turned off and it will not be visible. If the box has another smaller square inside it, this means that some of its layers are turned on and other layers are turned off.

You can control the visibility of individual layers by expanding Database option under the User Data section of the tree, and checking or unchecking the box beside the name of the layer. If the box is checked, then the layer is turned on and entities on that layer will be visible; if unchecked, then the layer is turned off and entities on it will not be visible.

When you close the project, the layer status will be saved so that the next time the project is opened, the layer visibility will automatically be set the same as you had left it, so layers that were turned off will remain turned off the next time the project is opened up.

DXF Files



You can load multiple DXF files into your FieldGenius project, and control the visibility of each of their layers independently from the others.

You can control the visibility of the entire DXF file by checking or unchecking the box beside the name of the DXF file, under the DXF Files section of the tree. If the box is checked, then the file is turned on and all of its layers will be visible; if unchecked, then the file and all of its layers is turned off and it will not be visible. If the box has another smaller square inside it, this means that some of its layers are turned on and other layers are turned off.

You can control the visibility of individual layers by expanding the name of the DXF file under the DXF Files section of the tree, and checking or unchecking the box beside the name of the layer. If the box is checked, then the layer is turned on and entities on that layer will be visible; if unchecked, then the layer is turned off and entities on it will not be visible.

When you close the project, the layer status will be saved so that the next time the project is opened, the layer visibility will automatically be set the same as you had left it, so files that were turned off will remain turned off the next time the project is opened up.

Add File

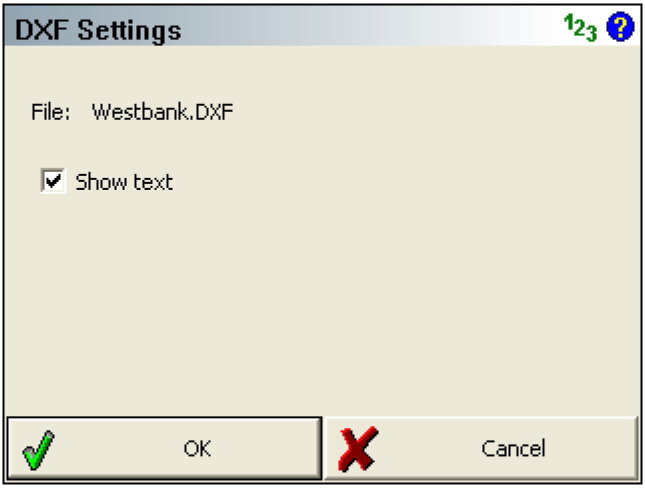
Press the Add File button to select a DXF file that you want to load into your project. You will be able to browse to and select any DXF file. Please see the Import DXF File topic for more information.

Remove File

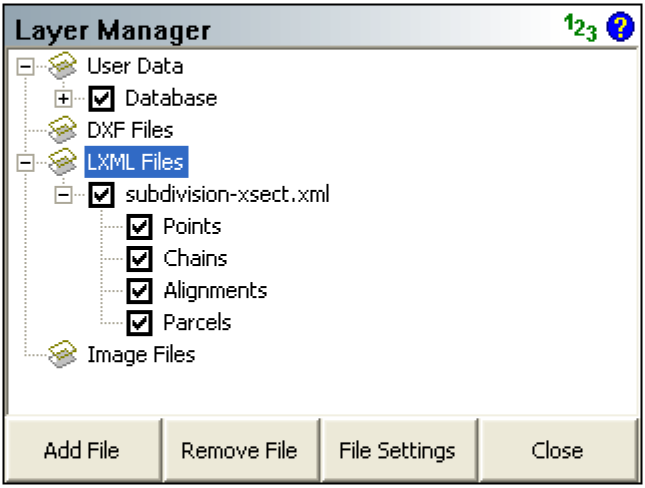
Highlight the DXF file that you want to remove from your project, then press the Remove File button. If a file is not highlighted, you will be reminded that a file must first be selected from the tree. This will turn off all layers from the selected file in your FieldGenius project and disassociate the DXF file. It does not delete the DXF file.

File Settings

Highlight the DXF file that you wish to change the settings for, then press the File Settings button. You can enable or disable the display of text in the selected file. If your DXF file contains text, turning this off will improve performance of FieldGenius. Pressing the OK or Cancel buttons will return you to the Layer Manager screen.



LandXML Files



You can load one LandXML file into your FieldGenius project at a time, and control the visibility of its layers (points, chains, alignments, and parcels).

You can control the visibility of the entire XML file by checking or unchecking the name of the XML file, under the LXML Files section of the tree. If the box is checked, then the file is turned on and all of its contents will be visible; if unchecked, then the file and all of its layers is turned off and it will not be visible. If the box has another smaller square inside it, this means that some of its layers are turned on and other layers are turned off.

You can control the visibility of individual layers by expanding the name of the XML file under the LXML Files section of the tree, and checking or unchecking the box beside the name of the layer. If the box is checked, then the layer is turned on and entities on that layer will be visible; if unchecked, then the layer is turned off and entities on it will not be visible.

When you close the project, the layer status will be saved so that the next time the project is opened, the layer visibility will automatically be set the same as you had left it, so layers that were turned off will remain turned off the next time the project is opened up.

Add File

Press the Add File button to select a LandXML file that you want to load into your project. You will be able to browse to and select any XML file. Please see the Import LandXML File topic for more information. Note, you must first unload the currently loaded XML file before loading a different one.

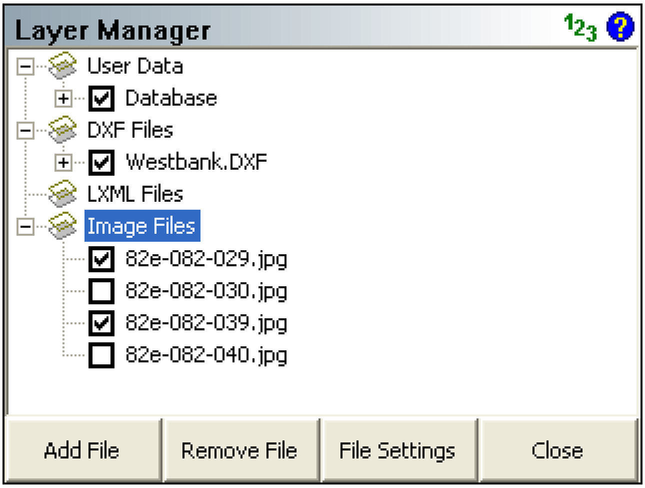
Remove File

Highlight the XML file that you want to remove from your project, then press the Remove File button. If a file is not highlighted, you will be reminded that a file must first be selected from the tree. This will turn off all components of the selected file in your FieldGenius project and disassociate the XML file. It does not delete the XML file.

File Settings

The File Settings button does not apply to LandXML files.

Image Files



You can load multiple georeferenced JPG or TIFF images into your FieldGenius project, and control the visibility of each of them independently from the others.

You can control the visibility of your images by checking or unchecking the box beside the name of the image file, under the Image Files section of the tree. If the box is checked, then the image is turned on and it will be visible; if unchecked, then the image is turned off and it will not be visible.

When you close the project, the visibility and opacity status of each image file will be saved so that the next time the project is opened, the image visibility will automatically be set the same as you had left it.

Add File

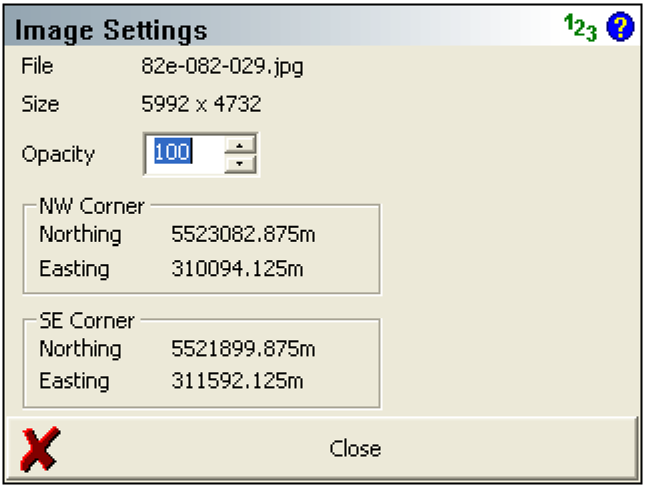
Press the Add File button to select an image (or DXF) file to load into your project. You will be able to browse to and select any JPG or TIF file. JPG files must have a corresponding JGW world file, and TIF files must have a corresponding TFW world file; these world files contain the georeferenced positioning information. The world file must have the same file name as the image file (just with the appropriate extension), and it will be automatically used to position the image.

Remove File

Highlight the image (or DXF) file you want to remove from your project, then press the Remove File button. If a file is not highlighted, you will be reminded that a file must first be selected from the tree. This will turn off the selected image in your FieldGenius project and disassociate the image file.

File Settings

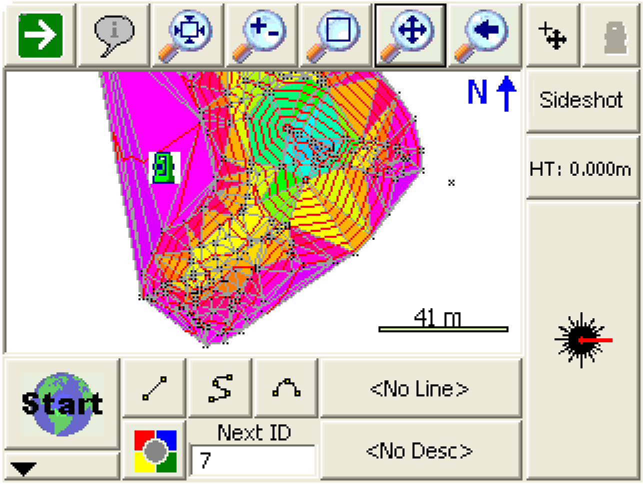
Highlight the image file you want to view or change the display settings for, then press the File Settings button. You will see the file's name, size, and position information. You can also adjust the opacity of the image. The default value of 100 will cause the image to be displayed normally, and reducing this value will make it appear fainter on the screen. This is useful if the image file being displayed makes your other FieldGenius data too hard to see over top of the image. Pressing the Close button will return you to the Layer Manager screen.



Surfaces

Main Menu | Data Manager | Surfaces

FieldGenius allows you to display a 3D surface representation of the points and lines in your project. This is done by turning on the Point Database surface.



Supported DTM Files

You can import surface information into FieldGenius. Currently you can import a surface from an XML or QSB file.

LandXML Surface

FieldGenius can import surface definitions from XML data sets. These surfaces can be used to display a TIN, shaded surface or contours on the screen. The surface can also be used to perform real-time DTM staking.

To import a LandXML file, go to Map Data Layers and use the **Add File** command. Please see the LandXML Import topic for more information.

QSB Surface

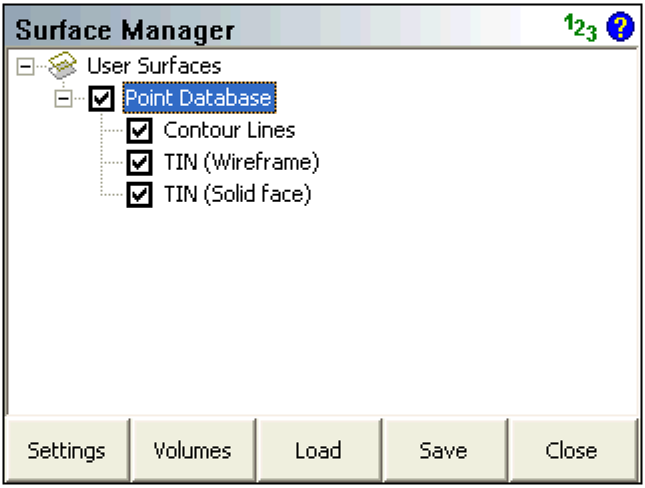
Surfaces created and saved in MicroSurvey CAD or inCAD desktop products will have a QSB extension. These QSB files can be imported into FieldGenius and used to display a TIN, shaded surface or contours on the screen. The surface can also be used to perform real-time DTM staking.

To import a QSB file, use the Load button at the bottom of the Surface Manager screen. Please see the DTM Surface File Import (QSB) topic for more information.

DTM Surface Manager

The surface called Point Database represents the Realtime DTM Surface made up from points and lines that are in your project. If you have imported any other surfaces from a QSB or LandXML file they will also appear in this list.

To use a surface you first need to load it into memory by checking inside the box before the name of the surface in the list. A surface is loaded if there is a checkmark shown before it. If you expand the surface you can control whether it is drawn as Contour Lines, a wireframe TIN, a solid TIN, or any combination of these.



Settings

Surface settings allow you to specify settings that affect the surfaces or contours that are drawn. Please see the Surface Settings topic for more information.

Volumes

Use this button to calculate a volume. Please see the Volume Calculation topic for more information.

Load

Use this button to load a .QSB surface file into your project. Please see the Import DTM Surface File topic for more information.

Save

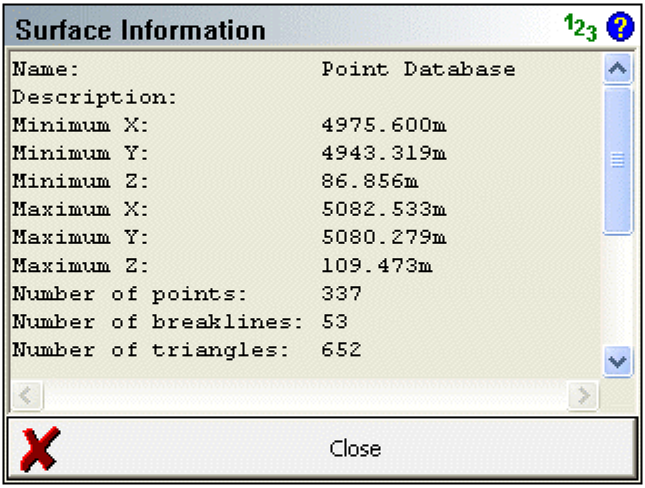
Use this button to save the selected surface as a .QSB file which can be imported into your MicroSurvey CAD or inCAD desktop software or into another FieldGenius project.

Close

If you close the surfaces screen and return back to the map screen you will see the loaded surface drawn as a wireframe, solid, and/or with contours depending on what is set in the Settings screen.

Surface Information

You can see additional statistics about the surface by double clicking on its name in the list. This will show the minimum and maximum bounding coordinates, the number of points, breaklines, and triangles in the surface, the minimum and maximum slopes in the surface, the plan and surface area, the positive and negative volumes calculated from a datum elevation of 0, and the amount of memory that the surface is using.



Point Database Surface

This can be used at any time and doesn't require a surface to be imported. When this is turned on, all the points and lines in your project will be used to create a real-time DTM surface. This can be used while you're taking shots.

Please refer the Realtime DTM Surface topic for more information on FieldGenius DTM surfaces.

Realtime DTM Surface

FieldGenius creates and manipulates a 3D surface from data collected in the field or from data imported through LandXML, QSB or ASCII point files. A FieldGenius surface is a mathematical description of a surface that exactly honors all input 3D data points and lines.

A Surface represents the existing topography of a job site. Surfaces contain one or more parts such as points, break lines, triangulated irregular networks (TIN), or triangulated grids (TGRID).

A surface is not a drawing entity, rather it is a mathematical description held in the data collectors memory. Representations of a surface, such as contours, TGRIDS or TINS may be drawn into your diagram as polylines and polyface entities.

Creating a Realtime DTM in FieldGenius

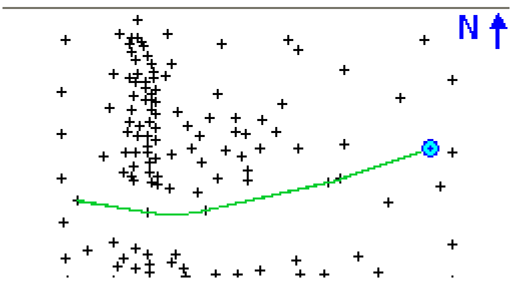
FieldGenius will compute a DTM model from points collected, staked, or imported from any ASCII file and from any existing FieldGenius project. There are no limits to the number of points that are used to create the DTM. The Automap Library controls what points and/ or lines are included or excluded from the DTM surface. The DTM is created in real time and can be appended as additional points are picked up.

To create a DTM, follow the instructions below:

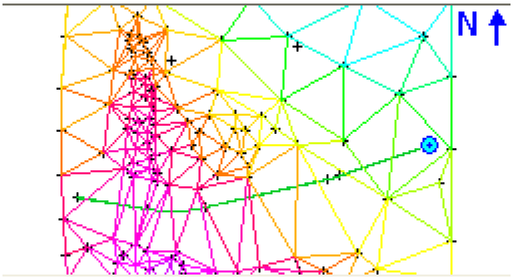
From Main Menu | Data Manager | Surfaces you can turn on the **Realtime DTM Surface** by placing a checkmark in the box before the "Point Database" surface. Expanding the tree will allow you to define whether it is displayed as Contour Lines, Solid Faces, and/or Triangle Edges.

The surface can be viewed or used in volume computations immediately.

Before turning on the Point Database surface:



After turning on the Point Database surface:

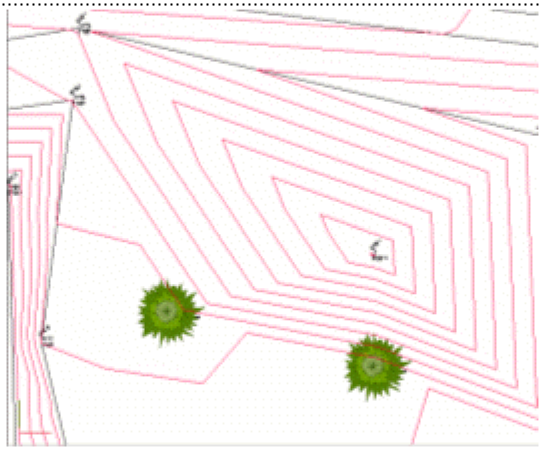


Each point in the database has an attribute called "DTM Attribute". This can be set to "donotinclude". If you set a point to this value, you will see that the surface no longer includes this point. This only applies to the current surface that is computed in FieldGenius. It does not apply to surfaces imported from a QSB or LandXML file.

What is the difference between a TIN and a TGRID?

The user should become familiar with both options and decide which option is best suited for their project.

TIN honors breaklines but may be too restrictive for contours to follow the natural flow of the terrain. Contours around small hills may look jagged if too few data points were collected.



TGRD honors breaklines and allows the contours to follow the natural flow of the terrain. Contours around small hills will look better if the TGRD option is used.

Generally, the **TGRD** is for cases where you want curvature introduced between your data points and you have break lines. This is most easily shown with an example:

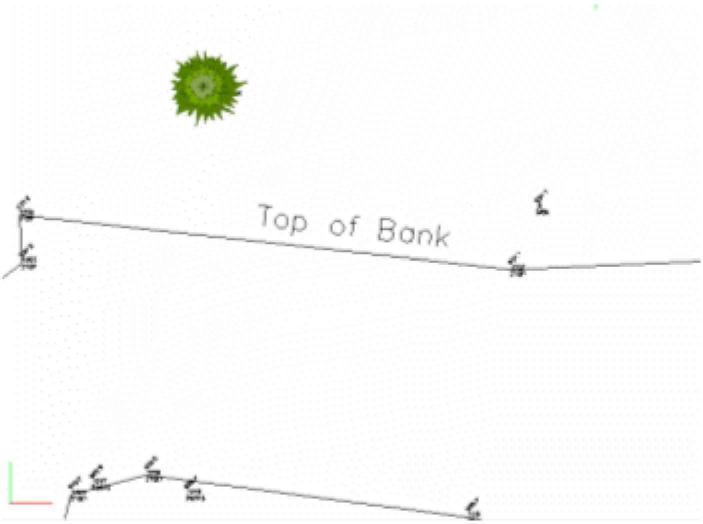
Adding Breaklines to a Surface

If a break in the slope continuity is desired, the user **MUST ALWAYS** use the TIN or TGRD (Triangulated Grid) in conjunction with break lines. When modeling a surface containing break lines, a TIN or TGRD honors break lines exactly.

What happens when you add break lines?

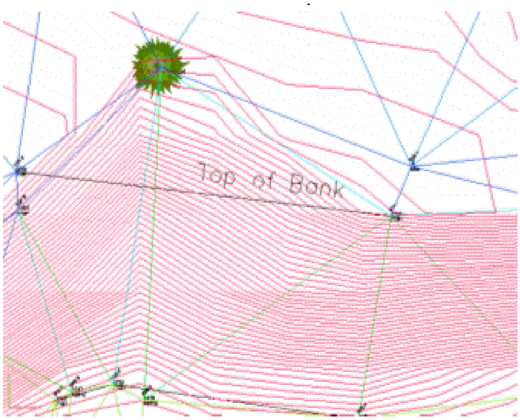
Break lines represent 3D continuous traces in space (think of them as a 3D polyline) which:

1. Define the surface elevation
2. Force slopes to be different on either side of the break line



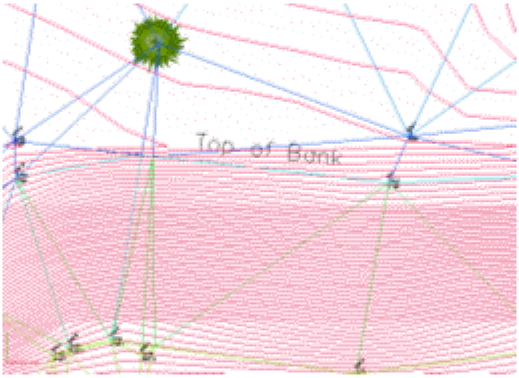
This line represents a location an the site where the slope changes from a steep hill to a relatively flat area.

Contours Generated without use of Top of Bank breakline:



Without a breakline, the contours "flow" over the top of the bank and the contours do not look correct.

Contours generated with use of Top of Bank breakline:



With a breakline, the contours are forced to honor the line, as a change in slope that helps the contours to look correct.

Breakline Control

The user would want to use a figure as a break line in the triangle formation process (TIN) for the edge of pavement, but probably not for a line connecting points that are not related to the surface features. An example of this might be a chain connecting legal boundaries as they might cross over roads or creeks without consideration for the existing topography.

Breaklines are used in the creation of the DTM by forcing the triangulation to follow them. Triangles created in the DTM cannot cross a breakline. The edges of the triangles will always follow the breakline. When necessary, FieldGenius will automatically densify the DTM along the breakline to create triangles that conform to the breaklines. This helps with the creation of accurate surface models and contours. FieldGenius contains the exact same functions for surface modeling, contouring, and volumes as MicroSurvey CAD or inCAD.

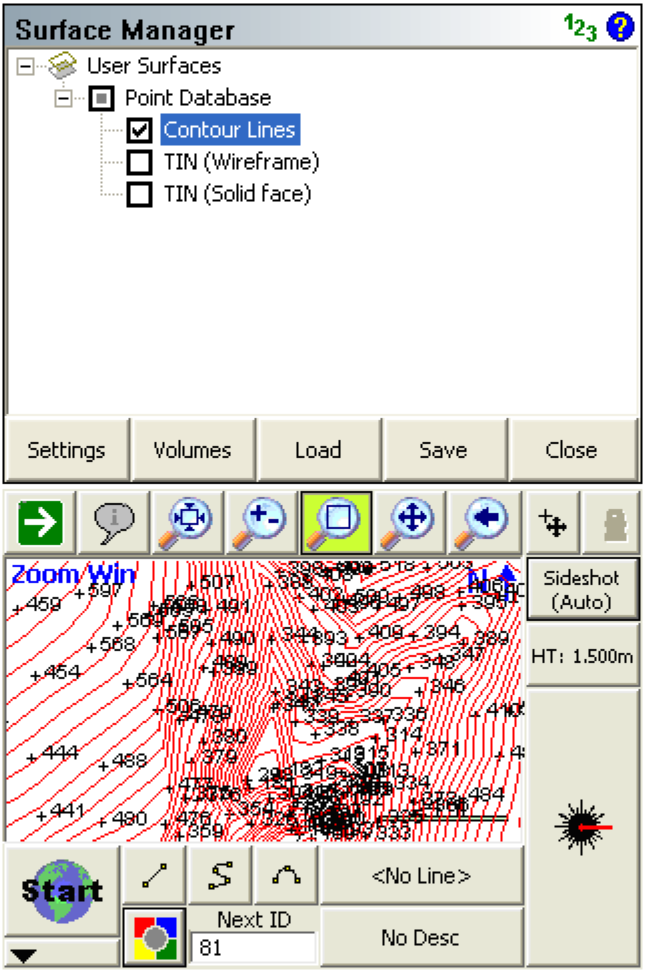
Contouring

Creating contours in FieldGenius is a simple as choosing the desired DTM surface from the dialog and checking the contour option:

The procedures for contouring a DTM surface are outlined below:

1. Open the Surface Settings by going to **Main Menu | Data Manager | Surfaces | Settings**
2. Type in the appropriate **Contour Interval**. The default interval is every 2 units.

3. You can control the **Minimum Elevation**. This is useful if you have some data that is displayed at a zero elevation (example: alignment point data that is horizontal) and you want to exclude these points.
4. If you want to create a TGRID, then turn on the Gridded TIN option, or leave this off to create a TIN. The Grid Size is a ground unit value that will determine the spacing of the grid lines.
5. Press **OK** to return to the Surface Manager screen.
6. Finally, turn on the contours by expanding the Point Database surface and selecting the Contour Lines option to display them.
7. Close the Surface Manager and return to the map screen to see your contours.

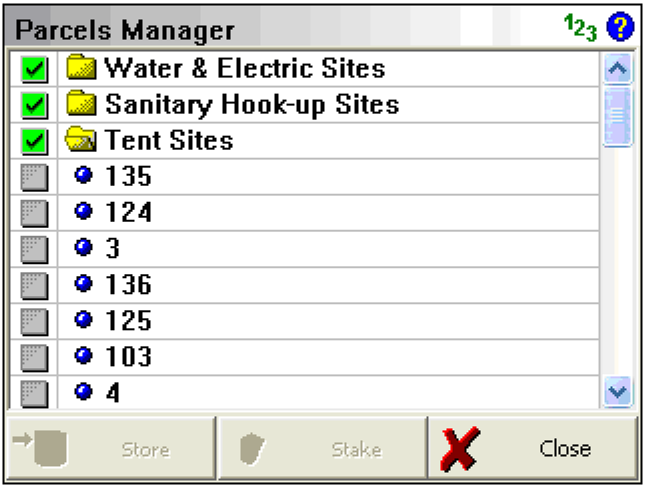


Parcels Manager (XML)

Main Menu | Data Manager | Parcels (XML)

When a LandXML file is imported into a FieldGenius project, if there is parcel information it can be viewed in the Parcels Manager.

By default all Parcels will be visible in the map screen but you can turn them off by deselecting the green check mark next to the parcel group.



Store

If you highlight a parcel in the list, pressing the Store button will compute and store coordinates at the corners of your parcel.

Stake

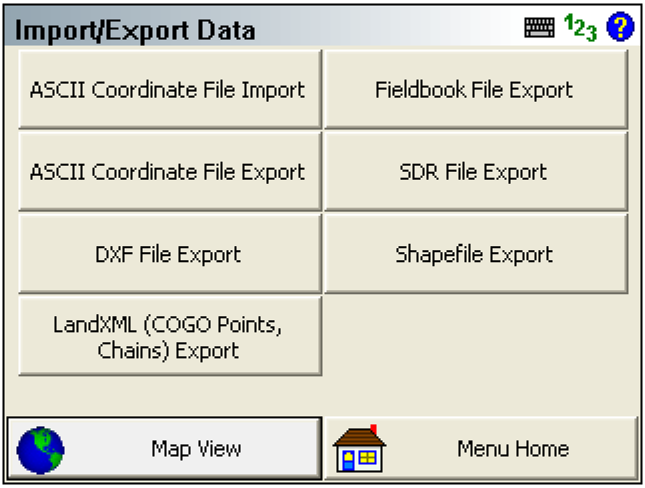
If you press this it will open the line staking toolbar. Note: you have to press close to exit the parcel manager.

IMPORT/EXPORT MENU

Import/Export Menu

Main Menu | Import/Export

Use this menu to display different options for importing data into or exporting data out of your project.



ASCII Coordinate File Import

Use this to import an ASCII file into your project. Please see the ASCII Coordinate File Import topic for more information.

ASCII Coordinate File Export

Use this to export an ASCII file of your points. Please see the ASCII Coordinate File Export topic for more information.

DXF File Export

Use this to export a DXF file of your current project. The DXF file will contain drawing entities of your points and lines. Please see the DXF File Export topic for more information.

LandXML File (COGO Points, Chains) Export

Use this to export a LandXML file containing CgPoints and Chains. The file will be saved in your current project directory. Please see the LandXML File Export topic for more information.

Fieldbook File Export

Use this to export a Softdesk FBK file that will contain you coordinates, raw observations and figure information. Please see the Fieldbook File Export topic for more information.

SDR File Export

The SDR Export in FieldGenius will convert the existing raw file into a SDR 33 compatible format. Please see the SDR File Export topic for more information.

Shapefile Export

Use this to export an ESRI shapefile. Please see the Shapefile Export topic for more information.

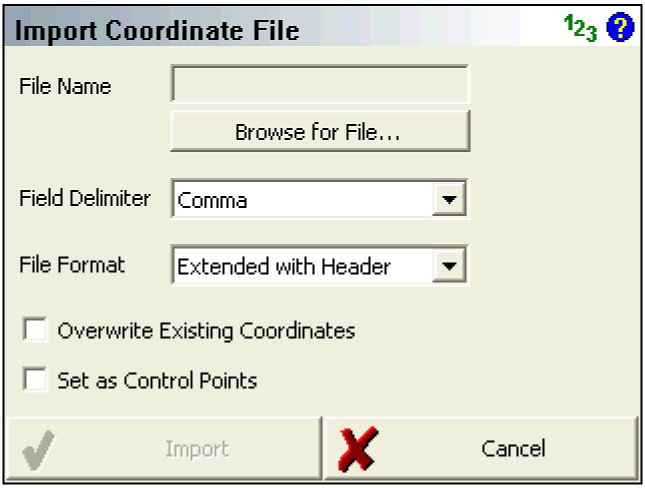
Notes:

- For importing DXF, LandXML, and raster image files, please see the Map Data Layers topic in the Data Manager menu.
- For importing DTM surface files, please see the Surfaces topic in the Data Manager menu.

ASCII Coordinate File Import

Main Menu | Import/Export | ASCII Coordinate File Import

Use this option to import a list of coordinates to the current project.



This may be required if a separate coordinate file is uploaded to the device by itself (not as part of a project with linework). This is also useful for transfer of points from one file to another.

Supported Formats

Both space and comma delimited files are supported.

Function

1. Select **ASCII Coordinate File Import** from the Import/Export menu.
2. Click on the "Browse for File..." button to go and select your file.
3. Choose the field delimiter, either Comma or Space.
4. Choose the file format. See below for more information regarding file format. If you are uncertain, use the **Standard** format.
5. **Overwrite Existing Coordinates** - allows you to control whether points will be overwritten during the import.
6. **Set as Control Points** – will set a flag in the database that will prevent these points from being edited or changed in FieldGenius (under any circumstances!)
7. Choose **OK** to import the coordinates, **Cancel** to abort the import.
8. You will be shown a confirmation of how many points were imported to the current project.

Field Format

Standard: ID,Northing,Easting,Elevation,Description:Note

This format expects the file to be in a standard ASCII format. If your descriptions have a colon in them, then FieldGenius will store everything before the colon as a description, everything after the colon will be considered to be a note.

Standard with Header: Same as the standard format, but the first row is ignored.

Extended: ID, Northing, Easting, Elevation, Description, Note, Latitude, Longitude, EllipsoidalHeight, LatitudeStdDev, LongitudeStdDev, HeightStdDev

This format is different than the standard such that notes are separate from descriptions. Also if you collected GPS data, the WGS 84 information can also be included and imported along with other information related to the GPS point.

Extended with Header: Same as the extended format, but the first row is ignored.

More about the Extended Format

If you import a FieldGenius extended file format ASCII file, FieldGenius will create EP and GS records in the raw file. Also, the coordinates will be imported and stored in the database. Importing this type of file is useful for seeding points when using the OmniStar GPS system or to create a list of geodetic and cartesian points that you can select while programming a GPS base receiver.

ID	Northing	Easting	Elevation	Description	Note	Latitude	Longitude	EllipsoidalHeight	LatitudeStdDev	LongitudeStdDev	HeightStdDev
100	5523097.874	311564.984	399.387	CONTROL		49.83067177	-119.6202724	383.133			
101	5523168.871	311529.912	401.188	CONTROL		49.83129864	-119.620794	384.936			
102	5523164.192	311507.476	400.85	CONTROL		49.83124955	-119.6211034	384.598			
103	5523135.07	311511.185	399.795	CONTROL		49.83098906	-119.6210377	383.543			
104	5523099.336	311521.81	399.552	CONTROL		49.83067133	-119.6208728	383.299			
105	5523074.024	311506.919	399.233	CONTROL		49.83043923	-119.6210673	382.98			
106	5523046.282	311521.379	398.049	CONTROL		49.83019451	-119.620853	381.795			
201	5523161.883	311526.004	400.632	CONTROL		49.83123463	-119.6208449	384.38			
202	5523159.786	311530.386	400.665	CONTROL		49.83121716	-119.620783	384.413			
203	5523167.28	311538.864	401.095	CONTROL		49.83128716	-119.6206689	384.843			
204	5523165.261	311551.194	400.946	CONTROL		49.8312729	-119.6204967	384.693			
205	5523172.776	311493.661	401.686	CONTROL		49.83132233	-119.6212995	385.435			

Importing Cartesian and Geodetic Coordinates

Below is an example of aFieldGenius Extended ASCII file. For the format to work correctly, each point should include Cartesian and Geodetic coordinates for each point. The standard deviations are not needed unless the point is going to be used to "seed" a position for use with the OmniStar VBS system. **The Latitude and Longitude values are required to be stored in decimal degrees.**

So if this type of file is imported into FieldGenius the following will occur:

- A point is stored in the project database using the Cartesian Coordinates.
- A GS record is written in the raw file using the Cartesian Coordinates as a reference.
- An EP record is written to the raw file using the Geodetic Coordinates as a reference.

Importing Geodetic Coordinates Only

You can create an Extended ASCII Point file that only contains a point number, description, note and Geodetic coordinates. Upon import FieldGenius will use the Geodetic coordinates and your defined coordinate system in your GPS Profile to compute Cartesian coordinates to be stored in the database.

So if this type of file is imported into FieldGenius the following will occur:

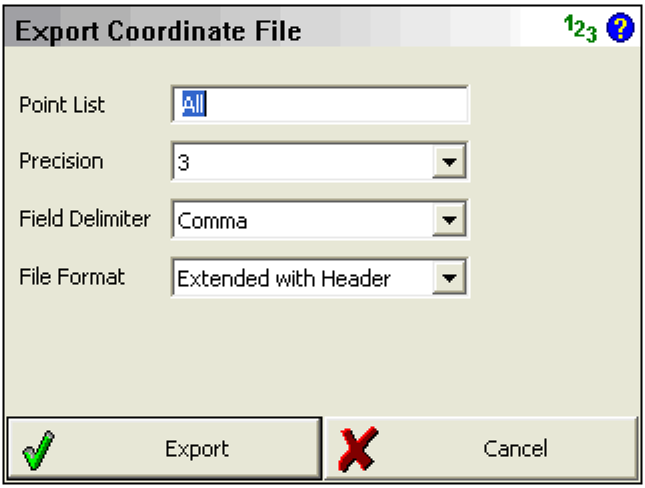
- Using the horizontal and Vertical datum settings you've defined in your GPS profile, FieldGenius will compute a Cartesian coordinate for each point using the Geodetic values imported from the ASCII file.
- A point is stored in the project database using the Cartesian Coordinates that was computed. The point will be assigned the point number that was imported from the ASCII file.
- A GS record is written in the raw file using the Cartesian Coordinates as a reference.
- An EP record is written to the raw file using the Geodetic Coordinates as a reference.

ASCII Coordinate File Export

Main Menu | Import/Export | ASCII Coordinate File Export

Use this option to export a coordinate list from the current file.

This is useful for transfer of points from one file to another.



Function

1. Select **ASCII Coordinate File Export** from the Import/Export menu
2. Specify a range of point to export in the form **#..#**. Accept default of **All** if desired.

3. Specify number of decimal places to carry on the export. (maximum=6)
4. Specify if you want to export them with either a space or comma delimiter.
5. Choose the file format type that you want to use. See below for more details about the different file formats. If you are uncertain, use the **Standard** format.
6. Choose **Export** to export the coordinates, or **Cancel** to abort the export.
7. Browse to the folder where you want to save the file, enter a filename including an extension, then press **Save File.** FieldGenius will not add any extension to the filename you enter.
8. You will be shown a confirmation of how many points were exported.

File Format

Standard: ID,Northing,Easting,Elevation,Description:Note

This format will append any notes you have to your description separated by a colon.

Standard with Header: Same as the standard format, but the first row will contain the item headers.

Extended: ID, Northing, Easting, Elevation, Description, Note, Latitude, Longitude, EllipsoidalHeight, LatitudeStdDev, LongitudeStdDev, HeightStdDev

This format is different than the standard such that notes are separated from descriptions. Also if you collected GPS data, the WGS 84 information will also be exported along with other information related to the GPS point. The WGS 84 information will be extracted from your GS records in the raw file.

Extended with Header: Same as the extended format, but the first row will contain the item headers.

More about the Extended Format

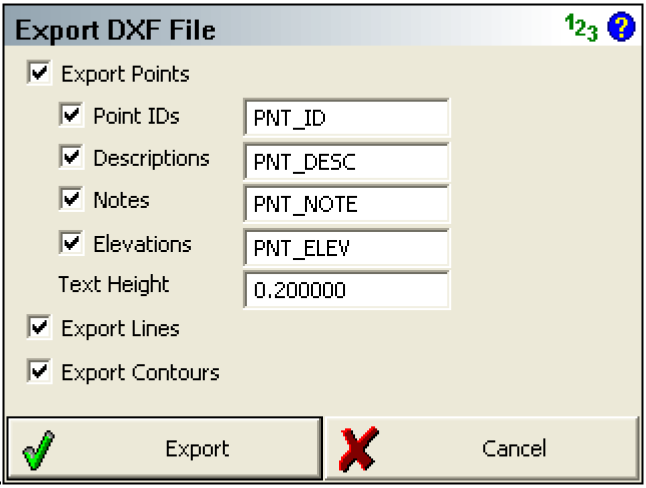
If you import aFieldGenius extended file format ASCII file, we will create EP and GS records in the raw file. Also, the coordinates will be imported and stored in the database. Importing this type of file is useful for seeding points when using the OmniStar GPS system.

There is more detailed information about the extended format in the ASCII Coordinate File Import topic.

DXF File Export

Main Menu | Import/Export | DXF File Export

Use this to export your current FieldGenius drawing as a DXF file. This allows for easy import of linework and nodes into most cad or graphic systems



Function

1. Select **DXF File Export** from the Import/Export menu.
2. Select the options for your DXF file.

   Export Points: If this is checked, your coordinate point nodes will be exported to the DXF file. You can also specify what layer you want the labels to go on and a default text height.

   Export Lines: If this is checked, all figures (lines, arcs, and splines) will be exported to the DXF file.

   Export Contours: If this is checked, all contour lines drawn using the Surface Manager will be exported to the DXF file.
3. Click **Export.**
4. Browse to the folder where you want to save the file, enter a filename, then press Save File. FieldGenius will add a .dxf extension to the filename if you did not include it.

5. The DXF file is created and you can copy it to your desktop computer.

Notes about DXF files:

- Upon export, FieldGenius will compare the figure name to see if it has a match in the AutoMap file. If it does, FieldGenius will draw the points along the figure, as well as draw the figure on the layer specified in the AutoMap library.
- Points that are exported will match the point color settings set in the Automap library.
- Figures that don't have a match in the Automap library will be drawn on a layer named "Default". Color setting will be set to 256.
- Points or nodes will be 2D or 3D depending on the Z value.
- Lines will be 2D or 3D depending on the Z values of the end points.
- Figures will be drawn as polylines.
- Curvy lines or arcs will be drawn as segmented polylines. FieldGenius will automatically interpolate an elevation along the arc or curved section of the figure at 1° intervals.
- Contours will be drawn as polylines and will be 3D based on the contour elevation.
- Points or nodes will appear as an "X" marker in the DXF file because the PDMODE variable is being set to 3 in the DXF file. In most desktop CAD programs you can change this marker type by typing PDMODE.

LandXML File Export

Main Menu | Import/Export | LandXML (COGO Points, Chains) Export

When this is used a LandXML file will be created. All the points in the current project will be exported as CgPoints and all the figures will be converted into Chains.

Function

1. Select **LandXML (COGO Points, Chains) Export** from the **Import/Export** menu

2. Browse to the folder where you want to save the file, enter a filename, then press Save File. FieldGenius will add a .xml extension to the filename if you did not include it.

Fieldbook File Export

Main Menu | Import/Export | Fieldbook File Export

Use this option to export FieldGenius database points and figure information from the current project in a Fieldbook (.FBK) format for import into non-MicroSurvey desktop software such as AutoCAD's Land Development Desktop.

FieldGenius users who have MicroSurvey CAD or inCAD Desktop software will not need to use this function as our products import standard FieldGenius raw data.

This function is designed for post processing so is best used after all fieldwork is complete. The raw file observations are not included in the FBK file, you can read the FieldGenius raw file into Survey Link included with LDD. You can then make your edits to the raw file and import it to LDD.

Function

1. Complete your survey project with FieldGenius.
2. Select **Fieldbook File Export** from the Import/Export menu.
3. Browse to the folder where you want to save the file, enter a filename, then press **Save File**. FieldGenius will add a .fbk extension to the filename if you did not include it.

Importing into LDD

To import the FBK file into LDD you will need to use the Import Field Book from the Data Collection / Input menu.

If you haven't already done so you will want to edit your Description Key list and Figure Prefix Library in LDD so the points and figures will be automatically layered for you.

SDR File Export

Main Menu | Import/Export | SDR File Export

The SDR Export in FieldGenius will convert the existing raw file into a SDR 33 compatible format. It is important to note that as of October 24, 2008, not all existing raw records types are exported through the SDR export.

Currently the following types are exported:

- Store Points
- Job Info
- Units
- Notes / Comments
- Occupy Setups
- Sideshots
- Stakeout shots
- Target Heights
- Resection measurements are not exported, but computed resection point exported as Store Point.
- The resulting SS or TR shot for multisets will be exported as a sideshot.
- The resulting SS or TR shot for angle or distance offsets will be exported as a sideshot.
- Calculated points will be stored as a Store Point
- Adjusted Points are exported as Store Points

The following record types are not currently exported:

- GPS Datum Settings
- GPS Transformation Parameters
- GPS Measurements

Function

1. Select **SDR File Export** from the Import/Export menu.
2. Browse to the folder where you want to save the file, enter a filename, then press Save File. FieldGenius will add a .sdr extension to the filename if you did not include it.

Shapefile Export

Main Menu | Import/Export | Shapefile Export

Use this to export your points and linework in a shape file format. This can then be imported into products that support shape files. This export will create a DBF, SHP and a SHX file for the linework and points in your project.

For example, if your project name was FG Sample, the following files will be created for the linework.

FG Sample_POLYLINE.shx

FG Sample_POLYLINE.shp

FG Sample_POLYLINE.dbf

For the points in your project, FieldGenius already stores points in a DBF file (FG Sample.dbf) so only two other files will be created.

FG Sample.shx

FG Sample.shp

Function

1. Select **Shapefile Export** from the Import/Export menu.
2. You will see a message indicating "Shapefile export complete."

Importing into ESRI or other application

To open these files in a compatible product you need to ensure you have all six file saved in the same directory.

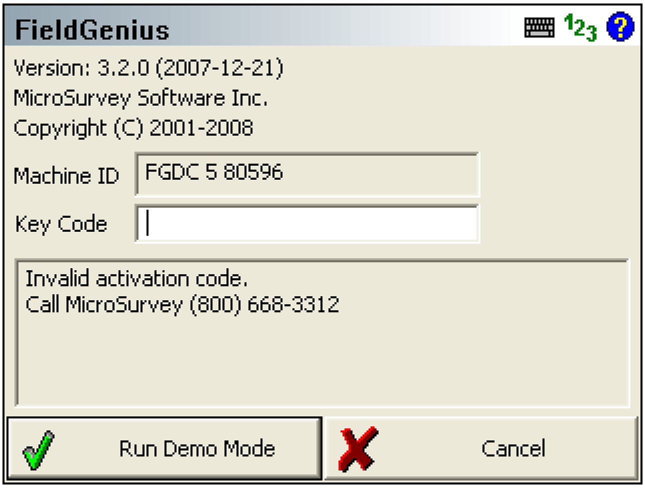
For more information on shape files, visit www.esri.com

About Menu

About FieldGenius

Main Menu | About

Use this to display information about the FieldGenius version you have installed or view what modules you have registered.



You will also see you Machine ID and a field where you can input your Key Code you received from MicroSurvey.

You will see an area that will show you the modules that you currently have licensed. If you want to use FieldGenius in demo mode, press the **Run Demo Mode** button.

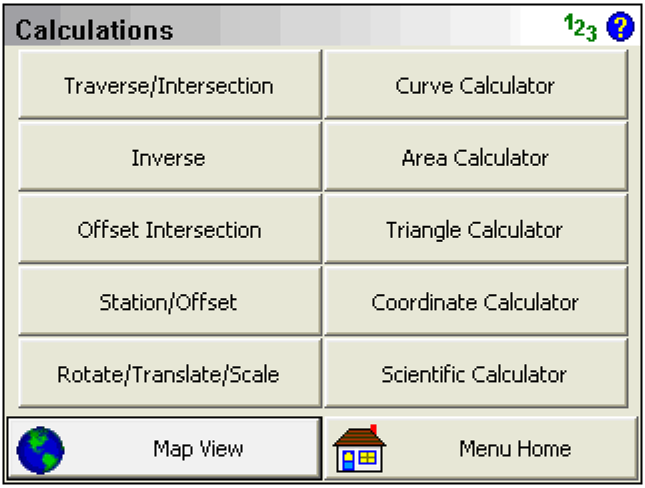
Please refer to the Registration & Demo Mode topic for further information.

Calculations Reference

Calculations Menu

Main Menu | Calculations

The calculation menu contains COGO based functions that can be used to compute points.



Traverse / Intersection

This will open the Traverse / Intersect toolbar. You can enter in directions and distances and perform common intersections such as bearing / bearing, distance/distance and many more. Please see the Traverse / Intersection topic for more information.

Inverse

Use this to inverse between points. Please see the Inverse topic for more information.

Offset Intersection

Use this to compute points that are located at computed intersections and offsets. This is essentially a bearing-bearing intersection, but you can specify offsets. Please see the Offset Intersection topic for more information.

Station / Offset

Use this to compute points at pre-defined stations and offsets. You can also use this to display the station and offset of existing points. Please see the Station / Offset topic for more information.

Rotate / Translate / Scale

Use this to compute coordinate shifts based on rotation, translation and scale parameters. Please see the RTS topic for more information.

Curve Calculator

Use this to open a curve calculator. You define the values that you know, enter them, and then the remaining unknowns will be computed. Once you compute these values you have the option of storing the PT and Center points. Please see the Curve Calculator topic for more information.

Area Calculator

Use this to compute areas using points or lines in your project. You can also use this to compute predetermined areas. Please see the Area Calculator topic for more information.

Triangle Calculator

Use this to compute a triangle solution using known angles or distances. Please refer to the Triangle Calculator topic for more information.

Coordinate Calculator

Use this tool to help you convert Geodetic coordinates to Cartesian coordinates. Please refer to the Coordinate Calculator topic for more information.

Scientific Calculator

Use this to display the MicroSurvey RPN calculator. Please see the Calculator topic for more information.

Distance Entry & Recall

Distance Entry

You can customize FieldGenius to work with the direction input of your choice. See the **Main menu | Settings | Units & Scale for details.**

The number you enter is assumed to be in the same units as your project, unless a unit modifier is specified (see below). So 5.25 would be interpreted as 5.25 feet, or 5.25 meters depending on your project's unit setting.

Distance Recall

You can recall the distance between two points, by inputting in the form: <firstID>..<otherID> Example: 26..84 will be recognized as the distance computed between points 26 and 84. The distance will be returned in whichever format your units settings is set to.

Unit Modifiers

Recognition of the unit symbols m, ', ft, usft, ftus are supported, and can be used to override the project's unit settings.

Meters

You can specify that a distance is in meters by entering "m" after the value, for example 100m means 100 Meters, even if your project is in Feet.

Feet (International or US Survey)

The ' symbol will be interpreted as either International Feet or US Survey Feet, whichever units the current project is in. For example, entering 1000' will match the feet units that your project is in, so it can mean either 1000 International Feet or 1000 US Survey Feet. If your project is in meters, then the ' symbol is interpreted as International Feet.

Fractional Feet

When entering distances in a fractional format, use a ' symbol or a space between the feet and inches values to separate them. An " symbol is not required. For example, you can enter 10'6 or 10 6 which both mean 10'6". You can enter fractional inches by placing a space between the whole and fractional inches, and using a / symbol in the fraction. For example, 10'6 1/2 or 10 6 1/2 both mean 10'6.5". You can also enter decimal values, such as 10.5' to mean 10'6" or 10'6.5 (or just 10 6.5) to mean 10'6 ½".

International Feet

You can specify that a distance is in International Feet by entering ”r;ft” after the value, for example 1000ft means 1000 International Feet.

US Survey Feet

You can specify that a distance is in US Survey Feet by entering ”r;usft” or ”r;ftus” after the value, for example 1000usft and 1000ftus both mean 1000 US Survey Feet.

Distance Entry Examples

Project Units:	International Feet	
Format:	Decimal	
User Entered Value:	**Interpreted As:**	**Result (always matches project units):**
1000.23	1000.23 in project units	1000.23'
1000.23'	1000.23 in project units	1000.23'
1000.23usft 1000.23 usft 1000.23ftus 1000.23 ftus	1000.23 US Survey Feet	1000.25'
20.117m 20.117 m	20.117 meters	66.00'
10000m 10000 m	10000 meters	32808.40'
10 6 10'6 10'6"	10 feet 6 inches	10.50'
10 6 1/2 10'6 1/2	10 feet 6.5 inches	10.54'

Project Units:	US Survey Feet

Format:	Decimal	
User Entered Value:	**Interpreted As:**	**Result (always matches project units):**
1000.23	1000.23 in project units	1000.23'
1000.23'	1000.23 in project units	1000.23'
10000.23usft 10000.23 usft 10000.23ftus 10000.23 ftus	10000.23 US Survey Feet	10000.23'
10000.23ft 10000.23 ft	10000.23 International Feet	10000.21'
20.117m 20.117 m	20.117 meters	66.00'
10000m 10000 m	10000 meters	32808.33'
10 6 10'6 10'6"	10 feet 6 inches	10.50'
10 6 1/2 10'6 1/2	10 feet 6.5 inches	10.54'

Project Units:	Meters

Format:	Decimal	
User Entered Value:	**Interpreted As:**	**Result (always matches project units):**
1000.23	1000.23 in project units	1000.23m
1000.23'	1000.23 International Feet	304.870m
10000.23usft 10000.23 usft 10000.23ftus 10000.23 ftus	10000.23 US Survey Feet	3048.076m
10000.23ft 10000.23 ft	10000.23 International Feet	3048.070m
20.117m 20.117 m	20.117 meters	20.117m
10'6	10 feet 6 inches	3.200m
10'6 1/2	10 feet 6 1/2 inches	3.213m
10 6	Not allowed, must enter units for feet such as 10ft 6, or 10usft 6.	
10 6 1/2	Not allowed,	

	must enter units for feet such as 10ft 6 ½, or 10usft 6 ½ .	

Using Math Operations

You can use the RPN Calculator to further manipulate distance values. For example, if you want to find the distance halfway between points 1 and 2, enter 1..2 into the distance field to recall that distance. Then double tap on that extended edit field to pull that recalled distance into the calculator, where you can divide the distance by 2 (or perform any other calculations with it). Then press the "**Use**" button in the calculator to copy the result back into the field you started from.

Note: You can not perform advanced distance recall functions that include math operators directly in a distance field. For example, 3..4+2 is not a valid entry. All math operations must be done using the RPN calculator. Please refer to the Calculator section for more information on performing specific math operations.

Direction Entry & Recall

Direction Entry

You can customize FieldGenius to work with the direction input of your choice. See the **Main menu | Settings | Units & Scale for details.**

To enter an angle using the format selected in your units settings, simply enter the angle. For example, 120.4530 means 120°45'30" if your project is in Degrees/Minutes/Seconds, 120°45.3' if your project is in Degrees/Minutes, or 120.453° if your project is in decimal degrees.

Direction Recall

You can recall the direction between two points, by inputting in the form: <firstID>..<otherID> Example: 26..84 will be recognized as the direction computed between points 26 and 84. The angle will be returned in whichever format your units settings is set to.

Unit Modifiers

You can always override your project's units setting by entering the bearing with the cardinal quadrant indicated before or after the angle. If there is no quadrant specified, then the input angle will be interpreted as an Azimuth.

Decimal Degrees

You can always specify that an angle is in decimal degrees by entering "d" after the value, for example 45.5083d means 45.5083° or 45°30'30".

Degrees, Decimal Minutes

You can always specify that an angle is in degrees and decimal minutes by entering "dm" after the value, for example 45.305dm means 45°30.5' or 45°30'30".

Degrees, Minutes, Decimal Seconds

You can always specify that an angle is in degrees, minutes, and decimal seconds by entering "dms" after the value, for example 45.3030dms means 45°30'30".

Bearings

To enter a bearing, use the cardinal quadrant letters (N, E, S, and W) before or after the angle. For example: NE60.4530, 60.4530NE, or N60.4530E means NE 60°45'30" if your project is in DMS, NE 60°45.3' if your project is in DM, or NE 60.453° if your project is in decimal degrees. It does not matter if you have spaces between the quadrant designation and the angle. You can also separate the degrees, minutes, and seconds values with a space. For example, N 60 45 30 E or N60.4530E both mean NE 60°45'30". You can of course also use any of the "d", "dm", or "dms" (or "g" or "r", see below) designators with a bearing entry, such as NE45.305dm to mean N 45°30'30" E.

Gons (Gradients)

You can specify that an angle is in Gons/Gradients by entering "g" after the value, for example 100g means 100 Gradients (equals 90 degrees).

Radians

You can specify that an angle is in Radians by entering "r" after the value, for example 1.57r and means 1.57 Radians (approximately 90 degrees).

Direction Entry Examples

Angle Units:	Degrees
Format:	DDD°MM'SS.s"

Format:	Azimuth	
User Entered Value:	**Interpreted As:**	**Result (always matches project units):**
90.5016	90 degrees, 50 minutes, 16 seconds	90°50'16"
NE45.3030 NE 45.3030 N45.3030E N 45.3030 E 45.3030NE 45.3030 NE	North East quadrant, 45 degrees, 30 minutes, 30 seconds	45°30'30"
SE45.3030 SE 45.3030 S45.3030E S 45.3030 E 45.3030SE 45.3030 SE	South East quadrant, 45 degrees, 30 minutes, 30 seconds	134°29'30"
SW45.3030 SW 45.3030 S45.3030W S 45.303 W 45.3030SW 45.3030 SW	South West quadrant, 45 degrees, 30 minutes, 30 seconds	225°30'30"

90.5016dm 90.5016 dm	90 degrees, 50.16 minutes	90°50'10"
90.5016d 90.5016 d	90.5016 degrees	90°30'06"
100g 100 g	100 gradians	90°00'00"
100.2345g 100.2345 g	100.2345 gradians	90°12'40"
3.141593r 3.141593 r	3.141593 radians	180°00'00"

Angle Units:	Degrees	
Format:	DDD°MM'SS.s"	
Format:	Bearing	
User Entered Value:	**Interpreted As:**	**Result (always matches project units):**
90.5016	90 degrees, 50 minutes, 16 seconds azimuth	S89°09'44"E
NE45.3030 NE 45.3030 N45.3030E N 45.3030	North East quadrant, 45 degrees, 30 minutes, 30 seconds	N45°30'30"E

E 45.3030NE 45.3030 NE		
SE45.3030 SE 45.3030 S45.3030E S 45.3030 E 45.3030SE 45.3030 SE	South East quadrant, 45 degrees, 30 minutes, 30 seconds	S45°30'30"E
SW45.3030 SW 45.3030 S45.3030W S 45.303 W 45.3030SW 45.3030 SW	South West quadrant, 45 degrees, 30 minutes, 30 seconds	S45°30'30"W
90.5016dm 90.5016 dm	90 degrees, 50.16 minutes azimuth	S89°09'50"E
90.5016d 90.5016 d	90.5016 degrees azimuth	S89°29'54"E
100g 100 g	100 gradians	S90°00'00"E
100.2345g 100.2345 g	100.2345 gradians	S89°47'20"E
3.141593r	3.141593	S0°00'00"W

3.141593 r	radians	

Using Math Operations

You can then use the calculator to further manipulate the angle. For example, if you want to determine 1..2 then add 90 degrees, enter 1..2 to recall that angle. Then double tap in the extended edit field to pull that recalled angle into the calculator, where you can add 90 to it (or perform any other calculations with it).

Note: You can not perform advanced direction recall functions that include math operators directly in a direction field. For example, 1..2+90 is not a valid entry. All math operations must be done using the RPN calculator. Please refer to the Calculator section for more information on performing specific math operations.

Rotate/Translate/Scale Points

Main Menu | Calculations | Rotate/Translate/Scale

Use this to rotate, translate and scale a point or group of points. When this command is used notes will automatically be written to the raw file indicating what parameters were entered by the user. Coordinates that are updated with the RTS command will be recorded in the raw file with AP (Adjusted Points) records.

The RTS command has the three options located on separate screens. The user can specify more than one option at the same time, for example you could rotate a group of points by 45° CW, then translate them 25' east. This can be done in one operation, instead of two separate ones.

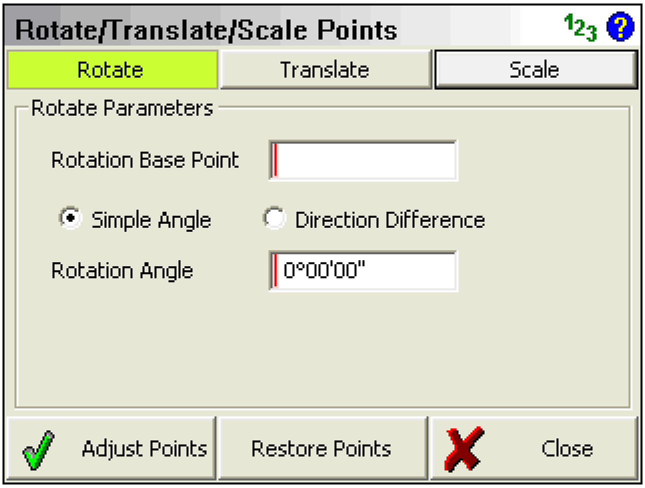
All of the fields have extended edit functionality. On the direction or distance fields, if you double tap them you will see a popup menu. From there you can start the calculator or use the inverse command.

When using the inverse option, simply type the two numbers for the inverse, then press the ESC key to automatically copy the value that was computed during the inverse.

The RTS function can also be accessed from the coordinate database. Accessing it from there allows you to select your points form the list which in some cases might be easier than entering a point range.

Rotate: Simple Angle

This is the simplest form of rotating your points. Specify the base point for the rotation, and a rotation angle.



Rotation Base Point

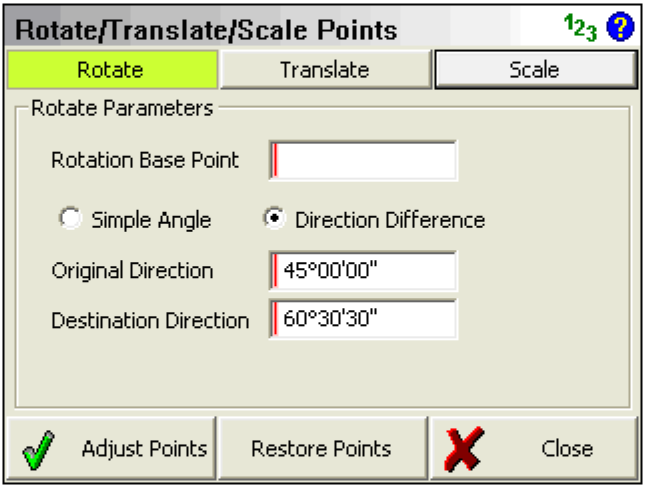
Use this to specify the pivot point for the rotation. You can select the point by double tapping in the edit field. Use the point chooser to select the point form the map, or simply enter the point number.

Rotation Angle

Specify the desired rotation in degrees, minutes seconds (or whatever your project units are set to). You can also use the direction recall feature and enter #..# to inverse between two point numbers.

Rotate: Azimuth Difference

This allows you to define two azimuths, usually used to compute the angle needed to rotate a group of points to match a field azimuth to one from a plan.



Rotation Base Point

Use this to specify the pivot point for the rotation. You can select the point by double tapping in the edit field. Use the point chooser to select the point form the map, or simply enter the point number.

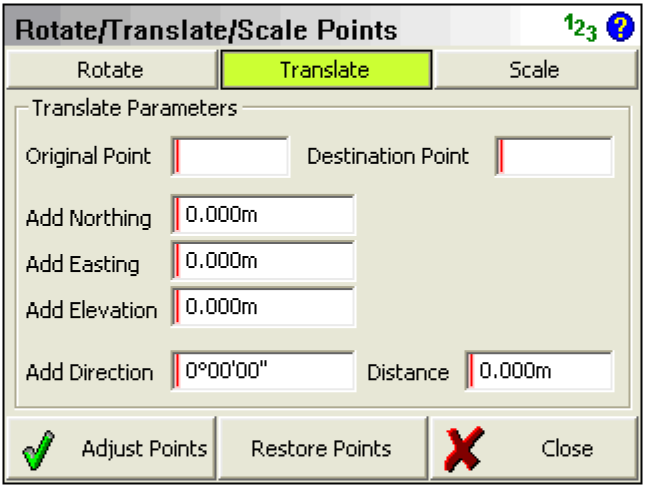
Original & Destination Direction

Specify the desired rotation in degrees, minutes seconds. Depending on your project units, you will be entering either a bearing or an azimuth. You can not use the direction recall feature such as #..#. Instead use the inverse command that appears when you double tap the field.

Translate

Use this option to specify a shift to a point or group of points. The translation is separated into three groups, shift from point to point, shift by coordinate change and shift by direction and distance. In most circumstances you will only need to use one of the three types, but you can use them in conjunction with on another if you need to.

For example, you could specify that the points are to be shifted by coordinate difference between points 10 and 20, then shifted again to the east by 50 feet.



Original & Destination Points

These work in conjunction with one another. The difference in coordinates to get from one point to the other is calculated and added to all points. You can use the point chooser to select your points or simply type the points in the fields. The horizontal differences in the northing and easting is computed and applied to the points being transformed. The elevation of the points will remain unchanged.

Add Northing, Easting, Elevation

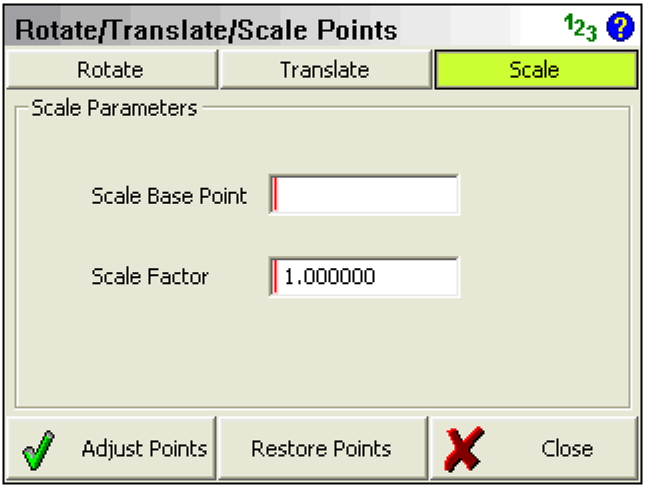
Any one or combination of these shifts can be applied. Simply input the value for each shift in the appropriate fields. Both negative and positive values are valid.

Add Direction and Distance

Define the shift by direction and distance. The coordinate shift in Northing and Easting will be calculated using the direction and distance you enter in the fields. If desired you may apply two shift components at the same time. For example, shift your selection of points by Direction and Distance, but also add 100.00 to the elevation. You can use angle and distance recall features to help you compute your answer.

Scale

You can scale a group of points using the scale option.



Scale Base Point

This will be the base point for the scaling and all points selected will be scaled from this point. You can enter the point number in the field or use the point chooser to select the scale point.

Scale Factor

Use this to specify the scale to apply to your selection.

Adjust Points

Once you've specified your options and parameters, press the Adjust Points button to apply to your coordinates. Once you press it, you will see a screen that will allow you to specify which points you want to apply the calculation to.

Restore Points

After you adjust a group of points with the RTS command, you have the option of undoing your changes and restore the points back to their previous coordinate values. You can only undo the last operation that was done. Also if you close FieldGenius, the restore coordinate values are not saved.

Reset All Parameters

After the RTS command is used, if you start the command you will see a message "Reset All Parameters?" If you choose yes, then FieldGenius will restore all the RTS fields back to their default settings. If you choose no, then your previously inputted data is retained.

Transform Points - Helmerts Transformation

Main Menu | Settings | GPS Local Transformation

The Transform Points command provides a "many point" Helmerts Transformation that can be used for many different purposes. We use this for the GPS localization, but you can also use it to rotate and translate measured points to fit known coordinates. Before using the Transform command, you need to setup the Transformation Settings.

The 3D Transformation included in FieldGenius is a powerful tool that can be used for a variety of coordinate transformations. With the Transformation, you are able to rotate, shift and scale unlimited points. The best way to describe this command for basic fitting of coordinate pairs is to give an example.

Procedure

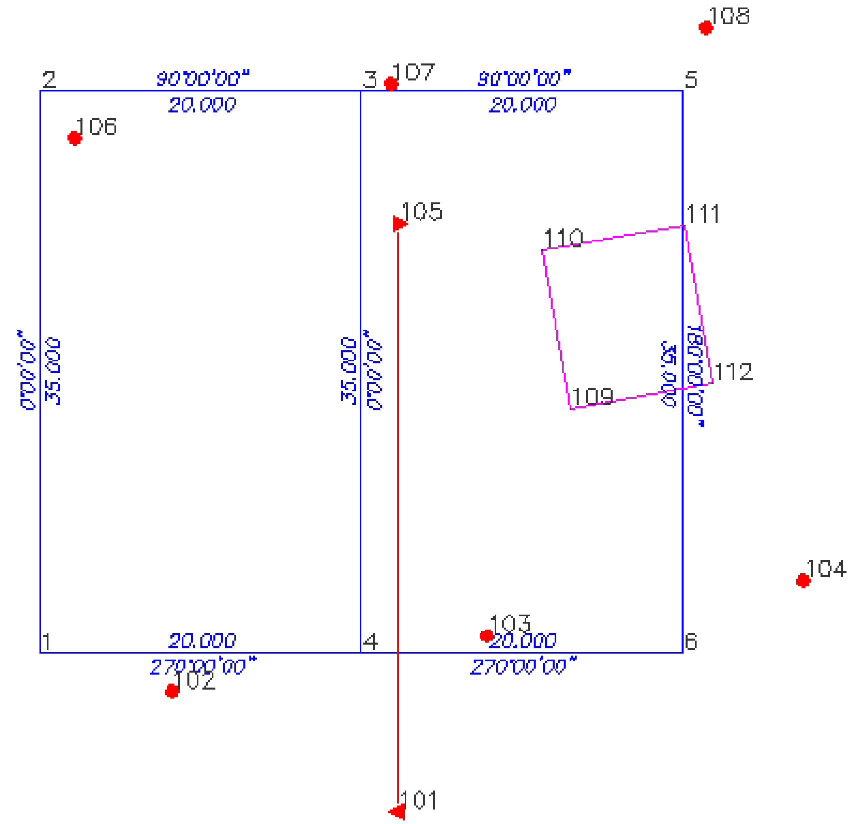
The program assumes the following:

1. The coordinates of the "control" system are considered fixed and error free.
2. Equal weighting is applied to all "measured" coordinates used to calculate the solution

A minimum of two points common in both the Plan and Local systems are needed to be able to solve the four unknown transformation parameters. This gives what is known as a unique solution (only one possible set of transformation parameters can be solved for). When more than two points are common in each system, redundancy exists and a Least Squares method is used to determine the optimum (best-fit) transformation parameters.

We'll work through an example as we explain the function of the Helmerts Transformation routine.

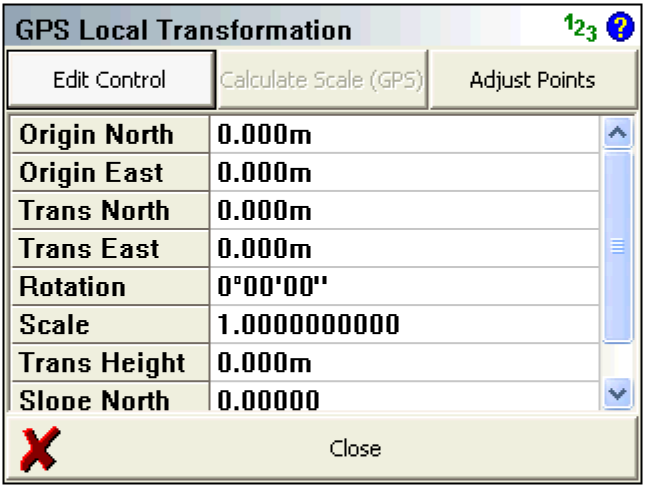
In the example below, you'll see a plan of 2 simple lots with lot corner point numbers 1 through 6. These will be our **Control** (fixed) points. You will also see our **Measured** ties (Local points) for all six corners and 4 points on a simple building. Points 101 and 105 are traverse points, points 102-104 and 106-108 are corner ties and 109-112 represent ties to the building.



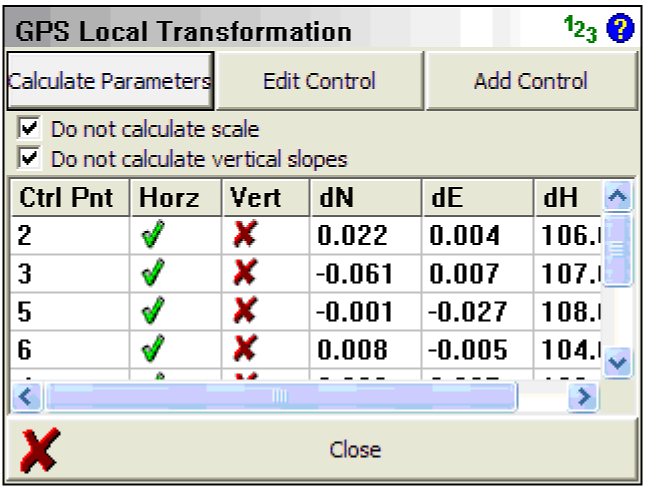
The objective here is to transform our local field survey into the plan system and, at the same time, check to see if the corner posts tied are located where the previous surveyors plan says they are!

Program Function

The first dialog box you will see when you run the program is the input listing dialog. When you first run the program in a specific job, it will display showing no entries.

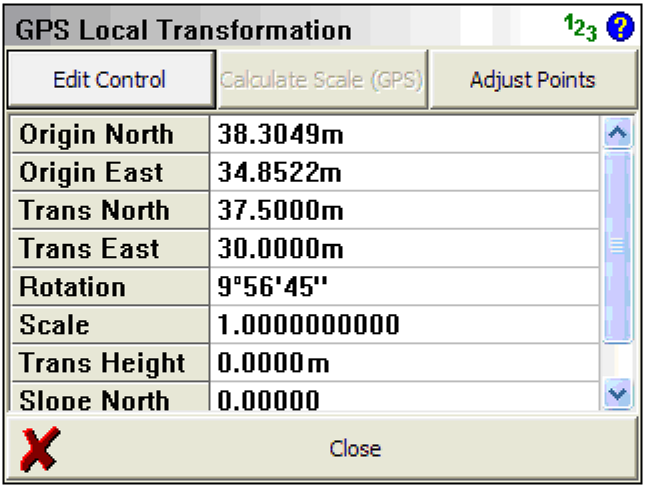


You now have to define the coordinate pairs to use in the solution. Press the **Edit Control** button to enter all of the common point sets that you have in your data but be careful to not confuse control points with measured points. Remember that the control points are considered fixed and the measured points are going to be rotated, shifted and possibly scaled.



When you finish entering all of your point pairs, it will display the delta differences between the coordinate pairs you defined. We're not concerned about the 3D position of the points, so we will turn these off. You now have to go and calculate the solution so press **OK** so you're taken back to the Local Transformation page.

Press the **Calculate Parameters** button to compute the transformation solution. For our example we want the measured point to retain their geometry so we will turn on the "do not calculate scale" option. This will set the scale value = 1.0. Furthermore, since we're not doing a localization for GPS derived coordinates, turn on "Do not calculate vertical slopes."



Residuals

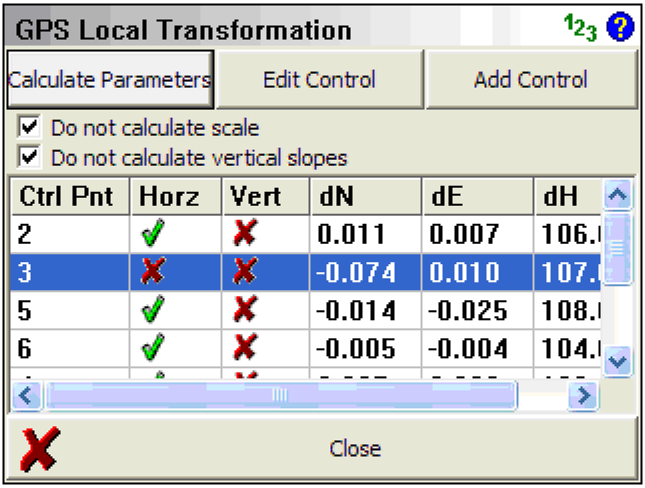
If you edit the control again you can take a look at the pair residuals to make sure they meet your tolerances.

In our example you will see a large delta in the northing at point pair 3:107. Let's remove this point by pressing the green checkmark. You have to go back and compute the solution again and then you will see the residuals are now more acceptable.

The summary of residuals illustrates the displacement between the plan coordinates and the proposed, transformed coordinates of the corresponding local point. This is presented as northing displacement, easting displacement and total distance displacement and direction. The units listed represent actual drawing units used in the drawing. The example shown is in meters.

Review the residuals carefully. Be sure that all of the pairs used in calculating the solution have residuals within your expected limits. If any one pair has residual values significantly larger than the rest, click on Cancel. This will return you to the Input dialog where you will be able to delete the erroneous pair and re-compute the solution.

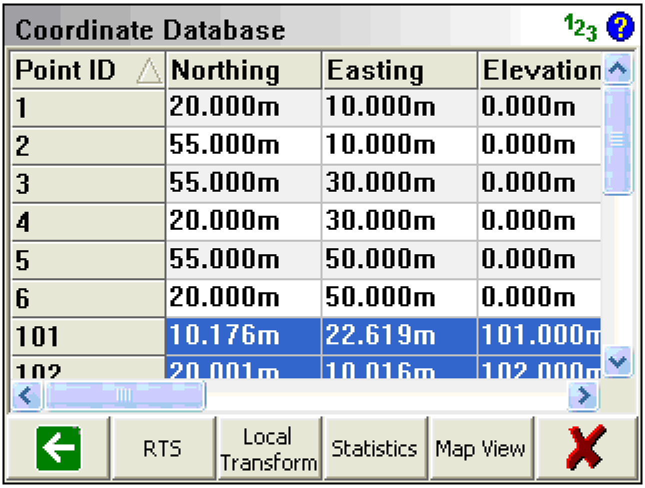
You can now close the transformation setup screen and move on to the next step.



Transform Points

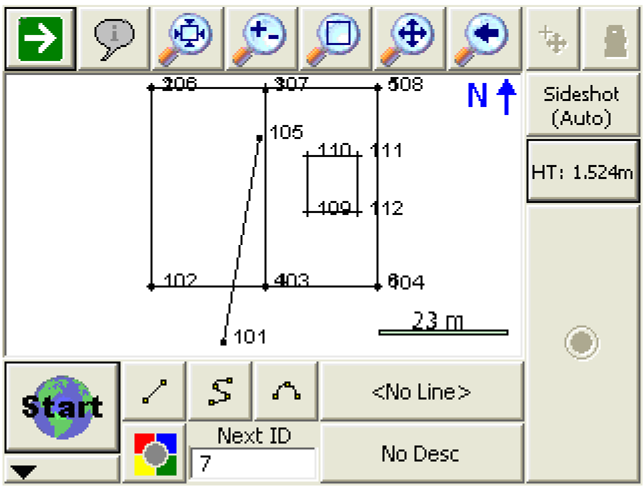
Once you are happy with the results of the computation, you can consider transformation of the Local points into the Plan system.

To apply the transformation parameters that you calculated to points in your project you need to press the Main Menu button, then Data Manager and finally press Point Database button. This will open the Coordinate Database screen where you can select the points that you want the transformation applied to. In the example we will use the Find command to select a range of 101-115. Now if you scroll through the list you should see that these points are highlighted in blue.



To complete the transformation, press the **Local Transformation** button and then you will see a screen asking you to confirm that you want to apply the transformation, press **Yes** to apply. You will then see the local transformation screen just so you can confirm that the correct values were used.

When you return to the map screen, you will see that the points were transformed successfully.



TOTAL STATION REFERENCE

Conventional Total Station

When connecting to a conventional total station there are a few things you need to confirm before connecting to FieldGenius.

You need to know what the communication parameters are set to on the instrument. Please take the time to find what the following settings are set to on the instrument: Baud Rate, Data Bits, Stop Bits and Parity.

Because of all the different instruments available, we can not provide help on retrieving these settings from your instrument. Please refer to your owner's manual or contact technical support from your equipment manufacturer.

Total Station Profile

Once you know the settings, you can connect FieldGenius to the instrument. If you just installed FieldGenius you can start the program and follow the prompts until you get to the Instrument Selection screen. From there, select **Total Station** as the Instrument Type, and then press the **Add** button to create a new Instrument Profile. Name the profile for your instrument, and then press the **Edit** button to access the Total Station Configuration screen to configure your profile. From there choose the **Model and Communication** button to configure FieldGenius.

You can also access this screen by going to the **Main Menu | Settings | Instrument Selection** and choose total station.

Select Make and Model

FieldGenius uses a smart driver that will poll the instrument to see what commands it supports. Because of this you will see that in the Model section we don't list every instrument built by the manufacturer. If you're unsure of what make and model to choose visit our website and use the online helpdesk support center to do a search for your instrument.

Communication Settings

Confirm the settings so they match the settings from your instrument. If you don't know what the settings on the instrument are, you can always try the **Default Comm Settings** button.

Other Settings

On the Total Station Configuration screen, you can review the other options to set some additional parameters for your instrument.

Connect to Instrument

If you're not connected to the instrument you will see a status of "**Not Connected**" displayed above the Connect to Instrument button. When you're ready to connect make sure you have done the following:

1. Powered on the instrument
2. Leveled the instrument
3. Compensated the instrument.
4. Connected the data cable from the instrument to your data collector.

Once you have done all four steps, you can press the **Connect to Instrument** button. If you see a status of "**Connected**" displayed above the Connect to Instrument button then you have successfully connected.

Getting Started

To start taking measurement you need to exit out the Total Station Configuration screen by pressing close button. Depending on the instrument you connected to you will have different options available. Please review the Instrument Toolbar topic for more information.

Tip: You can use the enter key on your device to take a measurement. For example, if your measurement mode is set to Sideshot and you press the enter key, your instrument will take a measurement.

Robotic Total Station

When connecting to a robotic total station there are a few things you need to confirm before connecting to FieldGenius.

You need to know what the communication parameters are set to on the instrument. Please take the time to find what the following settings are set to on the instrument: Baud Rate, Data Bits, Stop Bits and Parity.

Because of all the different instruments available, we can not provide help on retrieving these settings from your instrument. Please refer to your owner's manual or contact technical support from your equipment manufacturer.

Create Total Station Profile

Once you know the settings, you can connect FieldGenius to the instrument. If you just installed FieldGenius you can start the program and follow the prompts until you get to the Instrument Selection screen. From there, select **Total Station** as the Instrument Type, and then press the **Add** button to create a new Instrument Profile. Name the profile for your instrument, and then press the **Edit** button to access the Total Station Configuration screen to configure your profile. From there choose the **Model and Communication** button to configure FieldGenius.

You can also access this screen by going to the **Main Menu | Settings | Instrument Selection** and choose total station.

Select Make and Model

FieldGenius uses a smart driver that will poll the instrument to see what commands it supports. Because of this you will see that in the Model section we don't list every instrument built by the manufacturer. If you're unsure of what model and make to choose visit our website and use the online helpdesk support center to do a search for your instrument.

Communication Settings

Confirm the settings so they match the settings from your instrument. If you don't know what the settings on the instrument are, you can always try the **Default Comm Settings** button.

Other Settings

On the Total Station Configuration screen, you can review the other options to set some additional parameters for your instrument.

Connect to Instrument

If you're not connected to the instrument you will see a status of "**Not Connected**" displayed above the Connect to Instrument button. When you're ready to connect make sure you have done the following:

1. Powered on the instrument and radios
2. Leveled the instrument
3. Compensated the instrument.
4. Connected the data cable from the instrument to one radio, and your data collector to the other radio.

Once you have done all four steps, you can press the **Connect to Instrument** button. If you see a status of "**Connected**" displayed above the Connect to Instrument button then you have successfully connected.

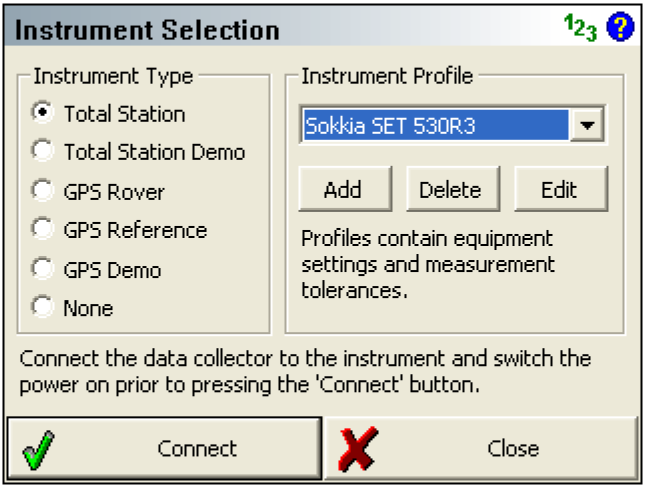
Getting Started

To start taking measurement you need to exit out the Total Station Configuration screen by pressing the Connect button. Depending on the instrument you connected to you will have different options available. Please review the Robotic Instrument Toolbar topic for more information.

Instrument Selection

Main Menu | Settings | Instrument Selection

The Instrument Selection screen allows you to choose the type of equipment you will be connecting to FieldGenius. An Instrument Profile can be created for each different instrument you will be working with, to make changing between different hardware a breeze. Once you have setup a profile for each different instrument you will be using, switching between them is a simple matter of selecting the appropriate profile and pressing **Connect**.



For all future projects you create with FieldGenius, when you create a new or open an existing project you will see the Instrument Selection screen with the profiles you have already created. It will default to the last Profile you used, so if you are using the same instrument just press Connect. If you are using different equipment, just select the appropriate Instrument Type and Profile (or add a new profile if one does not yet exist for it), then press **Connect**.

Total Station

When you select Total Station mode, you will be able to Add, Delete, or Edit a profile to setup parameters for connecting to your conventional and robotic total stations, as well as laser devices. See the Total Station Configuration topic for more details about configuration for your total station.

Your Total Station profiles are stored in the file ...\MicroSurvey FieldGenius\Programs\msurvey.ini so once you have set up the total station profiles on one data collector, you can simply copy this file onto your other data collectors to make the profiles available on them.

For more information on connecting to your instrument please refer to the Conventional Total Station and Robotic Total Station topics.

Total Station Demo

If you choose this you will have to manually enter your shots. Manually entered shots are recorded in the raw file and points are computed based on the values you enter. A profile is not needed for this mode, just press Connect to begin using the Total Station Demo mode.

GPS Rover / GPS Reference

When you set it to GPS Rover or GPS Reference you will be able to Add, Delete, or Edit a profile for your rover or reference receiver. When you edit a GPS Rover or GPS Reference profile, you will see the Configure Rover or Configure Reference screens. For more information about using FieldGenius for GPS surveying, you should review the Starting GPS topic.

Your GPS Rover and GPS Reference profiles are stored in the file ...\MicroSurvey FieldGenius\Programs\GPSPROF4.DBF so once you have set up the profiles on one data collector, you can simply copy this file onto your other data collectors to make the profiles available on them.

If you have not purchased the GPS module for FieldGenius, then you will not have access to the GPS commands and you will see a "Requires GPS module license" message.

GPS Demo

When you set it to GPS Demo you will be able to Edit and Connect to a profile for a simulated rover receiver. When you edit the RTK Demo profile, you will see the Configure Rover screen. Feel free to play with the Tolerance Mode settings, but please do not change the Model and Communications settings. For more information about using FieldGenius for GPS surveying, you should review the Starting GPS topic.

The GPS Demo will simulate connecting FieldGenius to a GPS Rover receiver. The coordinates in the GPS Demo are located outside our office in Westbank, British Columbia, Canada, so to use the GPS Demo mode you need to set your Coordinate System Settings to UTM Zones, NAD83, UTM83-11, Ellipsoidal.

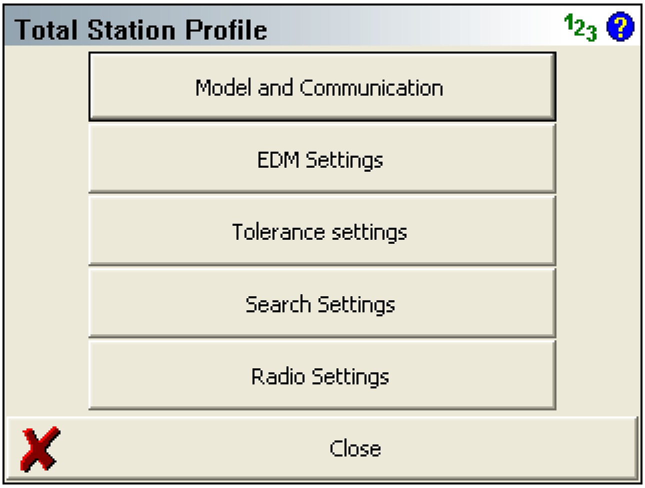
None

Use this option if you're not connecting anything to FieldGenius and also don't need to manually enter any shot information. With this mode, the instrument toolbar will not be displayed in the map screen.

Total Station Profile

Main Menu | Settings | Instrument Selection | Total Station | Edit

This screen will help you configure your total stating settings such as the make and model of instrument you plan on using and set any desired parameters you may need to use with your instrument. This option will only be available if you specified **Total Station** in the Instrument Selection screen and then **Edit** a profile.



Model and Communication

This allows you to specify the make and model of instrument that will be connected to FieldGenius. You can also specify the communication settings such as baud rate and com port. See the Model and Communication topic for more information.

EDM Settings

This allows you to specify if you will be using prism offsets in FieldGenius and allows you to specify tolerances that will be used to ensure your EDM measurement meet your criteria. See the EDM Settings topic for more information.

Tolerance Settings

This allows you to specify angular distance tolerances that will be used by the traverse routines. See the Measurement Tolerance topic for more information.

Search Settings

When using a robotic instrument, you can specify search window parameters. See the Search Settings topic for more information.

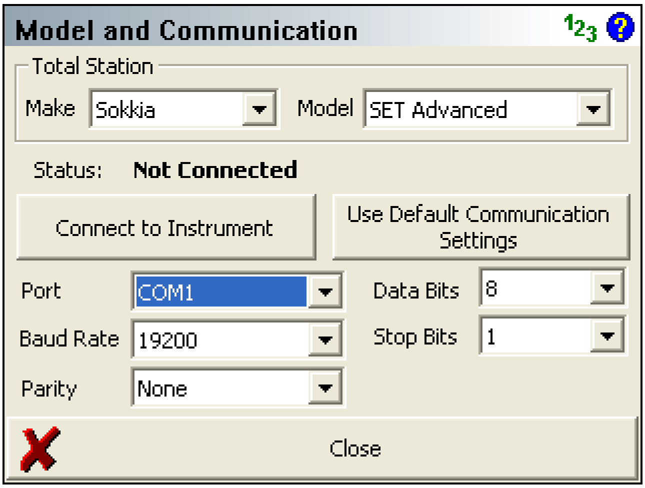
Radio Settings

When using a robotic instrument, you can use this to specify certain radio settings. You can also use it to specify a direct connection to FieldGenius instead of using radios. See the Radio Settings topic for more information.

Model and Communication

Main Menu | Settings | Instrument Selection | Edit Total Station Profile | Model and Communication

This is where you can specify the make and model of instrument you will be connecting to, as well as specify your communication parameters.



Total Station Make

Use this to select the make of your instrument.

Total Station Model

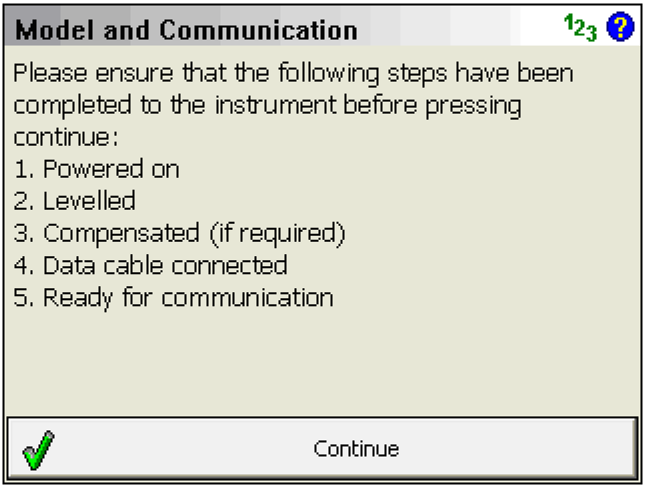
Use this to select the model of your instrument.

Status

This indicates whether FieldGenius is Connected or Not Connected to your instrument.

Connect to Instrument

Use this to connect to your instrument after you have specified your communication settings. After pressing the button FieldGenius will display a reminder screen on items you should check before continuing.



When you press continue on the screen and you see the following message, "No communication with instrument. Check settings, cables and power." read the No Communication topic for possible causes.

FieldGenius connects successfully, the Status will change to "Connected", and if your instrument supports graphical representation of the level bubble, you will see the Check Level screen.

Use Default Communication Settings

Use this to set the communication parameters to the defaults specified by the instrument manufacturer.

Port, Baud Rate, Data / Stop Bits, and Parity

If you know the settings of your instrument you can set them here in FieldGenius. They have to match exactly the ones on your instrument or you will get a communications error when you try to connect.

It is important to confirm these settings on your instrument when you're trying to connect FieldGenius for the first time! Most connection problems occur because the user has specified parameters that don't match the ones on their instrument.

Make and Model Settings

FieldGenius uses a smart driver that will query the instrument to see what commands it supports. Because of this you will see that in the Model section we don't list every instrument built by the manufacturer. Below you will find a list of instruments that we have tested with and had successful communication. Most instruments share common functionality; so even though your instrument might not be listed, just choose the model that most closely resembles your instrument.

Geodimeter	
Make	**Model**
400	Auto Trigger v1
440	Manual Trigger
510	Auto Trigger v1
600	Auto Trigger v2
600 Servo	** Use Trimble 5600 Robot
600 Robot	** Use Trimble 5600 Robot

Leica	
Make	**Model**
T 1600	Wild Series (GSI-8)
TC 1010	TPS Series (GSI-8)
TC 1610	TPS Series (GSI-8)
TC 500	TPS Series (GSI-8)
TC 600	TPS Series (GSI-8)

TC 805L	TPS Series (GSI-8)
TCR 1103	TPS Robot (GeoCOM)
TCR 305	TPS Series (GSI-8)
TCR 405	TPS Series (GSI-8)
TCR 705 Auto	TPS Series (GSI-8)
TPS 1100	TPS Robot (GeoCOM)
TPS 1200	TPS Robot (GeoCOM)
TPS Series 300	TPS Series (GSI-8)
TPS Series 700	TPS Series (GSI-8)
T 1010	TPS Series (GSI-8)
Disto A6	Disto A6

LTI	
Make	**Model**
Impulse CR400	Impulse (CR400)
Angle Encoder	Angle Encoder (SET)

Nikon	
Make	**Model**
DTM A20	Nikon Old
DTM 352	Nikon New

DTM 420	** Use Sokkia Set Basic
DTM 520	Nikon New
DTM 550	Nikon New
DTM 750	** Use Sokkia Set Basic
NPL 350	Nikon New

Pentax	
Make	**Model**
R-322 N	All Models
323	All Models
PCS 325	All Models

Sokkia	
Make	**Model**
SET 3B	Set Basic @ 1200 Baud
SET 4	Set Basic
SET 5B	Set Basic @ 1200 Baud
SET 6	Set Basic
E-Z Station	Set Basic
SET 230	** Use Sokkia Set Basic
SET 330	Set Advanced
SET 530	Set Advanced
SET 630	Set Advanced

Remotocatcher	Set Advanced (Note: no motorized servo controls are available.)
SRX	SRX

South	
Make	**Model**
NTS 325	NTS

Topcon	
Make	**Model**
APL-1A	APL-1A
GTS 212	Topcon Non-Robotic
GTS 230 W	Topcon Non-Robotic
GTS 300	Topcon Non-Robotic (Delay)
GTS 304	Topcon Non-Robotic
GTS 312	Topcon Non-Robotic
GTS 3B	Topcon Non-Robotic
GTS 4	Topcon Non-Robotic
GTS 800	Topcon Non-Robotic
GTS 800 Robot	Topcon Robot
GTS 8000	Topcon Robot
GPT 2004	Topcon Non-Robotic
GPT 3007 W	Topcon Non-Robotic

GPT 2003	Topcon Non-Robotic
GPT 9000	Topcon Robot

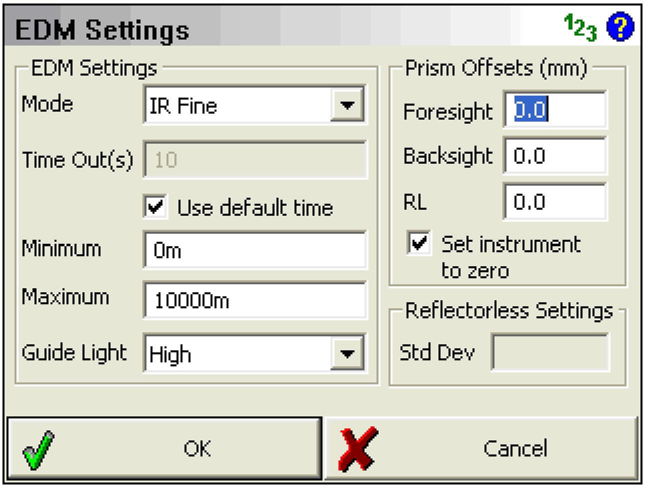
Trimble	
Make	**Model**
5600 Servo	5600
5600 Robot	5600 Robot

Zeiss	
Make	**Model**
ELTA R50	Elta R Series

EDM Settings

Main Menu | Settings | Instrument Selection | Edit Total Station Profile | EDM Settings

From here you can specify EDM settings such as prism offsets and measurement modes.



EDM Settings

Mode

This list will display all the measurement modes supported by your instrument. These will be the same as the ones you're used to using and you can refer to your owner manual for more information on their specifications.

Time Out (s)

Use this to specify the length of time FieldGenius will try to receive a measurement from your instrument. You may need to set this to a higher number if you're trying to receive measurement in wooded areas or long sights.

Use Default Time Out

If this is checked on FieldGenius will use a default time out value. If you would like to change it you need to uncheck it and update the **Time Out** field.

Minimum and Maximum

You can specify the minimum and maximum distance that FieldGenius will accept as being valid. Example is if you set this the minimum to 10 feet and you measure 5 feet, FieldGenius will not record the measurement and will display a "Distance out of range" error in the status toolbar.

Guide Light

If your instrument has guide lights you will be able to set their intensity modes here. Please refer to your owners manual for more information on the different intensities.

Prism Offsets

Foresight Prism Offset

Use this if you want FieldGenius to control your prism offsets for your foresight shots. The values must be entered in millimeters. A positive value will be added to the distance that is measured, whereas a negative value will be subtracted.

All measurements other than the measurements to your backsight (reference measurement) are considered to be a foresight shot.

Note: If you specify a prism offset here, you need to make sure the prism offsets are set to zero on your instrument. Otherwise a double offset could be applied to your measurement which will produce incorrect answers.

When you first configure FieldGenius with your instrument, you should take the time to confirm that the distances being measured are correct. You can do this by first measuring a precise distance between your current occupy point and a point that you can easily reference and take a measurement to. When you compare the distance measured by FieldGenius to your manually measured distance, they should agree very closely.

Backsight Prism Offset

Use this if you want FieldGenius to control your backsight prism offsets. The values must be entered in millimeters. A positive value will be added to the distance that is measured, whereas a negative value will be subtracted.

Under normal circumstances, you will set the backsight prism offset to be equal to what you defined for the foresight prism offset. The only time these would be different is in situations where you're using different prisms that have different prism offsets. This is very common with robotic total stations where a permanent prism might be setup on the backsight, and a 360° prism is used at the pole. Typically these two configurations require different offsets be applied at the backsight and foresight shots. If you're unsure about your prism offsets, refer to your instrument's owners manual, or the dealer who sold you the instrument.

Note: If you specify a prism offset here, you need to make sure the prism offsets are set to zero on your instrument. Otherwise a double offset could be applied to your measurement which will produce incorrect answers.

When you first configure FieldGenius with your instrument, you should take the time to confirm that the distances being measured are correct. You can do this by first measuring a precise distance between your current occupy point and a point that you can easily reference and take a measurement to. When you compare the distance measured by FieldGenius to your manually measured distance, they should agree very closely.

RL (Reflectorless) Prism Offset

Most instruments when shooting reflectorlessly apply a zero offset to the measurement. Depending on the type of material you're measuring to, some materials require an offset be applied even though you're using a reflectorless EDM mode. For example, some reflective tapes used for these types of measurement require a small offset be applied. In this case you can specify this offset and FieldGenius will automatically apply it during reflectorless measurements.

Note: If you specify a prism offset here, you need to make sure the prism offsets are set to zero on your instrument. Otherwise a double offset could be applied to your measurement which will produce incorrect answers.

Set Instrument to zero

If this is turned on, a prism constant of zero will be uploaded to your instrument. The offsets specified in the foresight, backsight and RL fields will be applied to the measurements when received by FieldGenius. Turn this off if you don't want FieldGenius to modify your instrument's prism offset. **Not all instruments support this feature.**

When you connect your instrument to FieldGenius, special notes are recorded in the raw file regarding prism offsets.

If you have the ”r;Set Instrument” toggle turned on and your instrument supports this feature, FieldGenius will set your instrument's prism offset to zero so no correction will be applied to the measurement. Then once FieldGenius receives this uncorrected measurement, it will use the values you specified in the prism offset fields and adjust the distance accordingly. For example, if you specified an offset of 30mm, FieldGenius will upload an offset of zero to your instrument and apply the 30 mm offset to the measurement after it is received. In your raw file you will see the following note:

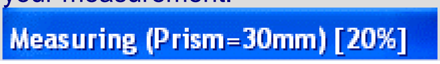
```
--FieldGenius Prism: 30mm Instrument Prism: 0mm
```

Most prism offset are specified in millimeters. FieldGenius will make the necessary conversions so the proper adjustment is applied.

If FieldGenius can't set the prism offset on your instrument, it usually can't read it either. Since a prism offset wasn't uploaded, we don't know what prism offset is set on the instrument. So we indicate this by writing to the raw file that the instrument prism offset is "unknown".

```
¦--FieldGenius Prism: 30mm Instrument Prism: Unknown ¦
```

When this happens you will usually want to confirm what offset are currently configured on your instrument in regards to prism offsets.

> **Special Notes:**
> - When using instruments that don't support uploading of prism constants, be sure not to double up your prism offsets by applying it in the instrument and FieldGenius at the same time.
> - Since prism offsets are so important, on the measurement progress meter you will see what offset is being applied to your measurement.
>
> 
>

Reflectorless Settings

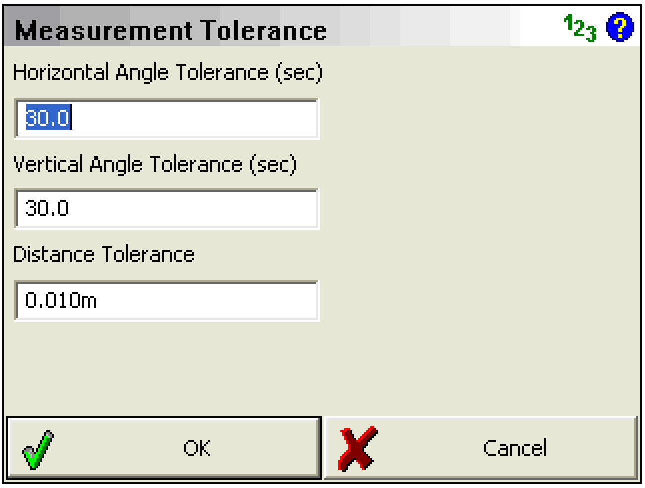
Std Dev:

This applies only to Trimble instruments. See your instrument guide for information on how the standard deviation affects your reflectorless measurements.

Measurement Tolerance

Main Menu | Settings | Instrument Selection | Edit Total Station Profile | Tolerance Settings

Use this to set tolerances that are used when you're using the multi-set collection function in FieldGenius.



Horizontal Angle Tolerance (sec)

Use this to specify the tolerance for your horizontal angles in seconds. When you store your multi-set point, if the Standard Deviation exceeds this value you will be notified when you store the point.

Vertical Angle Tolerance (sec)

Use this to specify the tolerance for your vertical angles in seconds. When you store your multi-set point, if the Standard Deviation exceeds this value you will be notified when you store the point.

Distance Tolerance

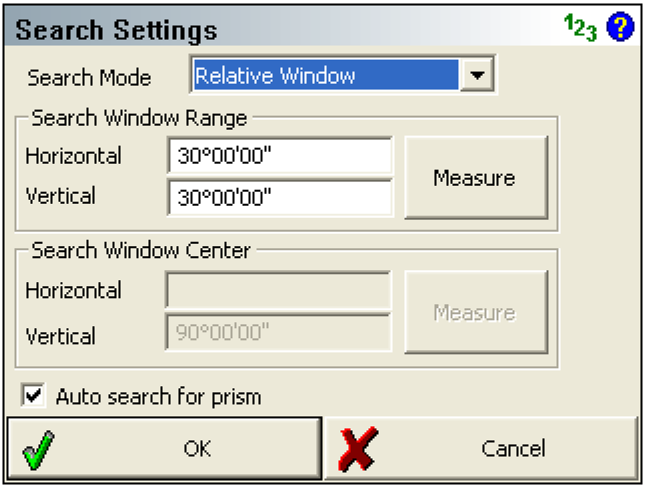
Use this to specify the tolerance for your measured distances. When you store your multi-set point, if the Standard Deviation exceeds this value you will be notified when you store the point.

Please refer to the Muti-Set topic for more information on how to record a set.

Search Settings

Main Menu | Settings | Instrument Selection | Edit Total Station Profile | Search Settings

When using a robotic instrument you can specify search settings for your instrument.



Search Modes

Some of FieldGenius's search modes are common to all robotic instruments, but there are a few model specific ones. The modes available are:

Relative Window

This allows you to specify a "window" defined by measuring a point at the top right and bottom left corners. If you press the search button, the search limits will be relative to the direction the instrument is currently pointing. In other words if your **search window ranges** are 30° horizontal and 30° vertical, it will apply this to your current direction. So the search will be limited to an area 15° left, right, up and down from your current direction.

Absolute Window

This allows you to specify an absolute search "center" for your search window. This forces FieldGenius to search in an absolute area defined by the angles set in the **search window center** fields. Furthermore, the search window range parameters apply to the search window center. For example, let's assume you defined 180° as the horizontal search window center, and the horizontal search window range is 30°. Your instrument will be forced to search in an area 15° left and right of the 180° plate reading. So if your prism is situated at a circle reading of 210°, it would never find you as the instrument would never go past a circle reading of 195° (180+15) when searching.

RC-2 Fast Track

If you're using a Topcon instrument, you can set the search mode to RC-2. This will force the instrument to use the RC-2 system for the search.

PS Next (CW)

This setting will appear if your instrument has the power search system. Settings it to this will force the instrument to search in a clockwise direction.

PS Next (CCW)

This setting will appear if your instrument has the power search system. Settings it to this will force the instrument to search in a counter-clockwise direction.

PS Absolute Window

This setting will appear if your instrument has the power search system. This will force the power search system to do a relative search based on the **search window range**.

RC-PR3

If you're using a Sokkia SRX, you can set the search mode to RC-PR3. This will force the instrument to use the RC-PR3 system for the search.

Search Window Range

Use this to define the upper right corner and lower left corner of your search window. Pressing the measure button will step you through the procedure and it will calculate the horizontal and vertical search range. This range will be applied to the instrument's current direction when the user presses the search button.

Search Window Center

Use this to set an absolute center for your search window. The search window range parameters will be applied to the search window values that were measured. Pressing the measure button will step you through the procedure and it will calculate the horizontal and vertical search range.

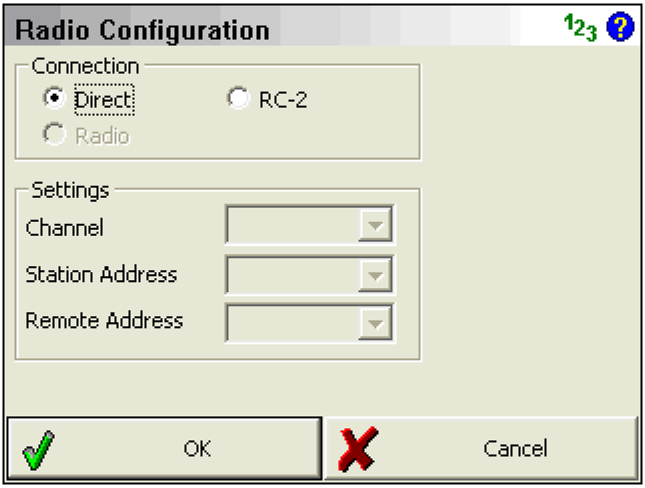
Auto search for prism

If this is checked, then if your instrument has lost its lock on the prism, FieldGenius will automatically initiate a search for the prism when the measure button is pressed. You will see the word "Search" on the lock button at the top of the robotic instrument toolbar while a search is in progress.

Radio Configuration

Main Menu | Settings | Instrument Selection | Edit Total Station Profile | Radio Settings

Use this to specify if you want to connect to your robotic instrument using a direct connection or through the instrument's radios. If you're using a Topcon, you can specify your RC-2 unit as the communication device.



Connection

Direct

This will allow you to connect directly to your instrument through an instrument cable.

Radio

This will allow you to connect to your instrument using external radios.

Note: If you are using Radios with your instrument but this option is disabled, then pick the Direct option instead.

RC-2

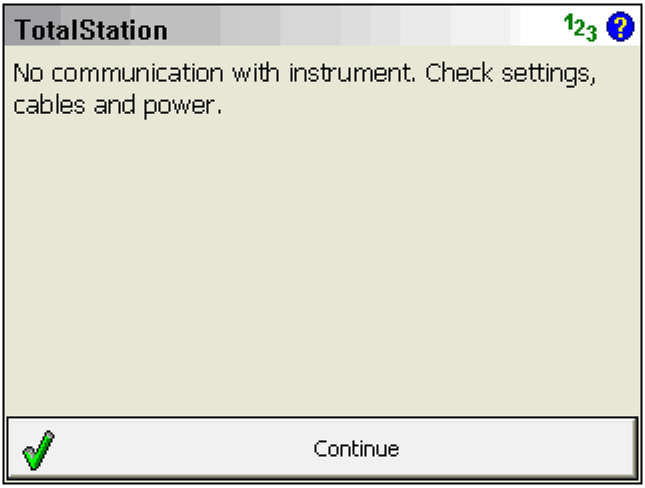
This will allow FieldGenius and your instrument to communicate through the RC-2 unit.

Settings

If you're using a Trimble or Geodimeter total station you will be able to specify the radio settings required to communicate with your instrument.

No Communication

When trying to communicate with your instrument you will see the following screen if FieldGenius can't make a connection with your instrument.



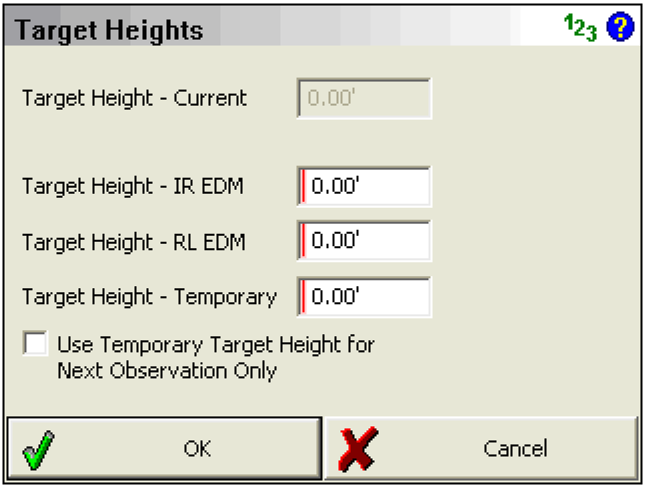
Usually this happens when your communication parameters are not the same on the instrument and in FieldGenius. You need to check these settings again to make sure they're correct.

This can also happen if you have a bad cable. If you're using a robotic instrument you might have setup your radios incorrectly.

Target Height

Instrument Toolbar | HT Button

You can access this function by pressing the **HT** button on the instrument toolbar.



Target Height – Current

This is the current target height.

Target Height – IR EDM

Enter the target height that you will be using for measurement to a prism. When you select an IR edm mode, FieldGenius will automatically switch to this target height during the measurement.

Target Height – RL EDM

Enter the target height that you will be using for your reflectorless measurements. When you select any RL edm mode, FieldGenius will automatically switch to this target height during the measurement. Since most reflectorless shots require a zero target height, FieldGenius defaults this field to zero and can be altered by the user if needed.

Target Height - Temporary

Use this to specify a one time only target height. In other words after you take your measurement it will revert back to the the previous target height automatically.

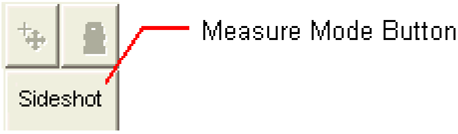
> **Note:**
> When the user changes the current target height a LS record will be written to the raw file.

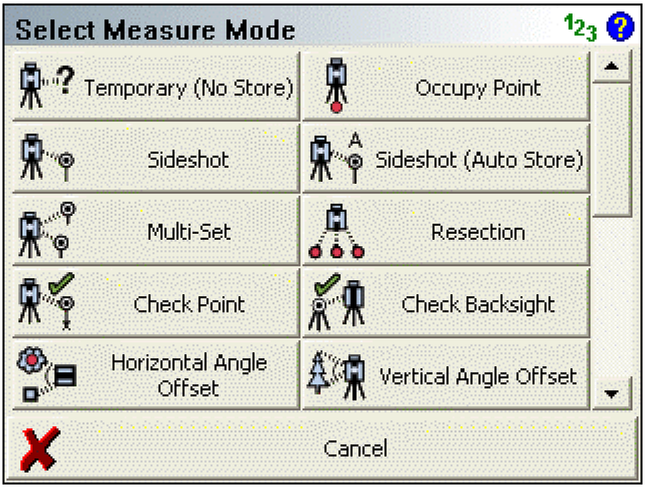
Survey Methods Menu

Main Menu | Survey Methods

Survey Methods are commands built into FieldGenius that will help you measure and map your points. Survey Methods need to be selected before you begin a measurement.

For a faster way to get to the Survey Methods screen, you can also press the measure mode button which is located on the instrument toolbar.





Use the Scroll Bar along the side to access additional measurement modes.

Note: Several of these modes will not be available until you have setup an occupy point and measured a backsight via the Occupy Point, Multi-Set, or Resection commands. Most of these modes will also not be available if you are using GPS.

Temporary (No Store)

This will allow you to take a measurement without storing it. Please see the Temporary (No Store) topic for more information.

Occupy Point

Use this to define an instrument setup. Please see the Occupy Point topic for more information.

Sideshot

This mode allows you to measure a point. After the measurement, it will allow you to review your measurement data and allow you to make changes to the point id and description before it is stored. Please see the Sideshot topic for more information.

Sideshot (Auto Store)

This mode allows you to measure a point, and FieldGenius will use the next available point, description and line toggles specified on the main map screen. Using this is a very fast method for recording your measurements. Please see the Sideshot (Auto Store) topic for more information.

Multi-Set

This will start the multi-set routine that will help you collect repeat observations to your backsight and a new foresight point. Please see the Multi-Set topic for more information.

Resection

This will start the multiple point resection routine to allow you to determine your current instrument position by measuring to known points. Please see the Resection topic for more information.

Check Point

Use this to display a check measurement to an existing point in your project. Please see the Check Shot topic for more information.

Check Backsight

Use this to compare your backsight to your previously measured values. Please see the Check Backsight topic for more information.

Horizontal Angle Offset

This will start the angle offset routine. Please see the Horizontal Angle Offset topic for more information.

Vertical Angle Offset

This will allow you to compute the height of an object. Please see the Vertical Angle Offset topic for more information.

Distance Offset

This will start the distance offset routine. Please see the Distance Offset topic for more information.

Manual Distance

This will record a HA and VA for a shot, but the user can manually enter the distance. Please see the Manual Distance topic for more information.

Manual Entry

This will allow you to manually enter in a shot including HA, VA and SD. Please see the Manual Entry topic for more information

Two Line Intersection

This allows you to measure two baselines and FieldGenius will compute the intersection point. Please see the Two Line Intersection topic for more information.

Line - Angle Offset

This allows you to measure two points to define a baseline, measure an angle, and FieldGenius will compute the intersection point. Please see the Line - Angle Offset topic for more information.

Line - Distance Offset

This allows you to measure two points to define a baseline, then manually enter measured distances. These distances will be used to compute a new point based on the baseline. Please see the Line - Distance Offset topic for more information.

Line - Perpendicular Point

This allows you to measure two points to define a baseline, then you can select an existing point which will be used to compute a perpendicular intersection. Please see the Line - Perpendicular Point topic for more information.

Trilateration

This will allow you to compute new points by observing their distances from two known existing points. Please see the Trilateration topic for more information.

Observe Benchmark

Use this to check your current setup elevation, or compute a new one based on a known elevation. Please see the Measure Benchmark topic for more information.

Add Invert

Use this to open the invert toolbar. You will then be able to record invert measurements. Please see the Add Invert topic for more information.

Vertical Plane Projection

This will allow you to compute points on a user defined vertical plane. Please see the Vertical Plane Projection topic for more information.

Point Scanning

Use this to activate Point Scanning with your motorized reflectorless instrument. Please see the Point Scanning topic for more information.

GPS Reference

Starting GPS

Before you can start your RTK survey, there are a few things you need to do.

Profile and Datum Files

- Using the Datum Grid Editor, create datum files that cover the area you will be surveying in. Once you create the files, you can copy them to FieldGenius. These grid file are used to convert your RTK position (Latitude, Longitude, Ellipsoid Height) to grid coordinates.
- Create a profile for your reference (base) and rover receivers. Profiles contain receiver settings such as baud rates and tolerance masks that are used by FieldGenius. Refer to the Reference Configuration and Rover Configuration topics for more information.

Reference (Base) Connection Procedure

1. Main Menu | Settings | Instrument Selection
2. Choose **GPS Reference** as the type of instrument.
3. If you have not already done so, you need to create a profile for your reference receiver. If you have a profile already defined, select it now and then press **Connect**.
4. If your profile is configured properly, you will see a message, "Press the measure button at any time to configure the reference receiver with a position and to enable the transmission of corrections." Select **Continue**.
5. You will now see the map screen. On the GPS Toolbar you can review information about receiver, sky plot list, display current position, and review DOP values.
6. When you're ready to program a position into the base receiver, all you need to do is press the **Measure** button on the GPS Toolbar. There are several different options you can use to program the position and they're described in more detail in the Program Reference Receiver topic.
7. After you program the receiver with a position you will be able to physically disconnect the data collector.

Rover Connection Procedure

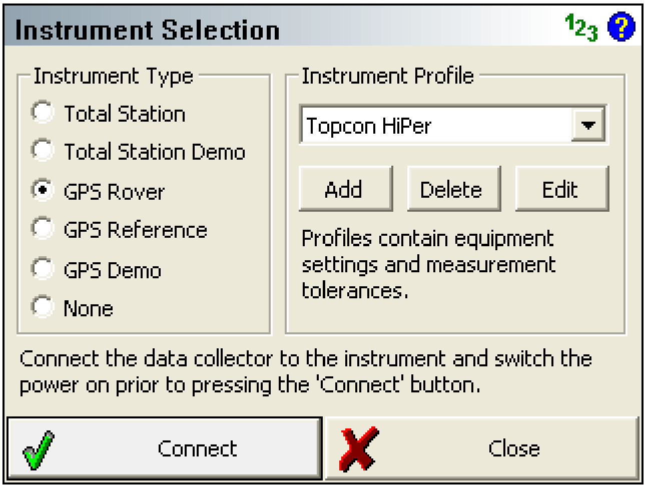
1. Main Menu | Settings | Instrument Selection
2. Choose **GPS Rover** as the type of instrument.
3. If you have not already done so, you need to create a profile for your rover receiver. If you have a profile already defined, select it now and then press **Connect**.
4. Press the **Control** button then select **Modem On** to turn on your radio or modem to begin receiving corrections.
5. With a successful connection you will see the map screen. The Measure button might say **"No Link"** to begin with, then switch to **"RTK Float"** and finally to **"RTK Fixed"**.
6. To record a position, simply press the **Measure** button on the GPS toolbar. Refer to the GPS Measurement topic for more information.

Select GPS Profile

This is where you can create a new profile for each rover/base receiver you will be using.

There are two ways to get to this screen.

1. You can open the profile screen for your rover or base by going to Main Menu | Settings | Instrument Selection. This will display the Instrument Selection screen which contains the GPS Rover and GPS Reference profiles.
2. If you already have your instrument type set to GPS and you're currently in the map view, you can press the **Start GPS** button on the GPS toolbar. This will display the Instrument Selection screen which contains the GPS Rover and GPS Reference profiles.



Editing Profiles

On the Add Profile screen you can enter any name you wish for the profile. Profiles can be copied from one data collector to another, so you can have a "Master" profile file that is sent to all crews so they can quickly set up systems.

The profile information is stored in a file called GPSPROF4.DBF in the directory.

When you're ready to edit the settings for the profile you have selected, press the **Edit** button. This will display the GPS configuration screen for the selected rover or reference profile.

Refer to the GPS Configuration (Reference) or GPS Configuration (Rover) topics for more information on the settings available for your profiles.

Using Profiles for Connection

Once you've created your profiles, you can use them to connect to your receiver. Simply select the correct GPS Mode, either GPS Rover or GPS Reference, then select the profile you want to use in the profile list.

When you've physically connected the your data collector to your receiver, press the **Connect** button to start the connection process.

If it isn't successful you will see the following message "Could not detect GPS receiver! Please check configuration, cable and power." You can then press the Auto Detect Baud Rate button to force FieldGenius to automatically try different baud rate settings. If this doesn't work you should review your profile settings and ensure that you have the correct

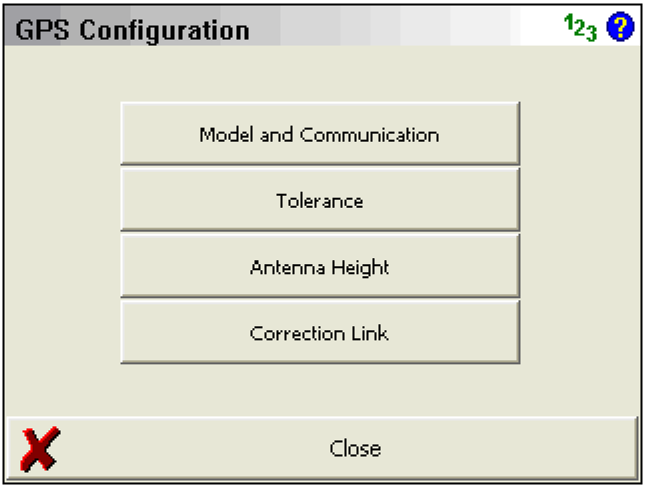
COM port selected and that you have your data collector connected to the correct port on the GPS receiver.

GPS Demo

The GPS Demo Mode contains a profile called "RTK Demo" which can be used to explore the GPS Capabilities of FieldGenius without being connected to a receiver.

GPS Reference Profile

The GPS Configuration for your reference unit is accessed from the Instrument Selection screen by selecting GPS Reference as the Instrument Type, then pressing the **Edit** button to configure your selected GPS Reference Profile.



Model and Communication

This is used to select the Make and Model of receiver, the port that the data collector is connected to and the mode that the current receiver will play in the RTK process. Please see the GPS Model and Communication topic for more information.

Tolerance

This is used to enter information about the location of the reference (base) station. Please see the GPS Tolerance (Reference) topic for more information.

Antenna Height

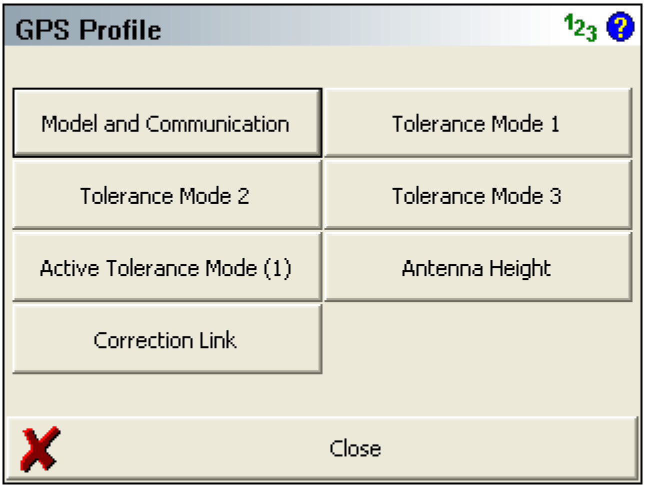
The antenna settings are used to calculate or enter the height of the antenna phase center above the ground. Please see the GPS Antenna Configuration topic for more information.

Correction Link

The link settings are used to configure the radio or GSM link from the reference station to the rover. Please see the GPS Correction Link topic for more information.

GPS Rover Profile

The GPS Configuration for your rover unit is accessed from the Instrument Selection screen by selecting GPS Rover as the Instrument Type, then pressing the **Edit** button to configure your selected GPS Rover Profile.



Model and Communication

This is used to select the Make and Model of receiver, the port that the data collector is connected to and the mode that the current receiver will play in the RTK process. Please see the GPS Model and Communication topic for more information.

Tolerance Modes 1-3

The tolerance modes are used to enter information used in computing the position of the rover once the RTK session has begun. Please see the GPS Tolerance Modes (Rover) topic for more information.

Active Tolerance Mode

This displays the current tolerance mode. This can be changed at anytime during your survey by selecting the GPS Control button in the GPS toolbar.

Antenna Height

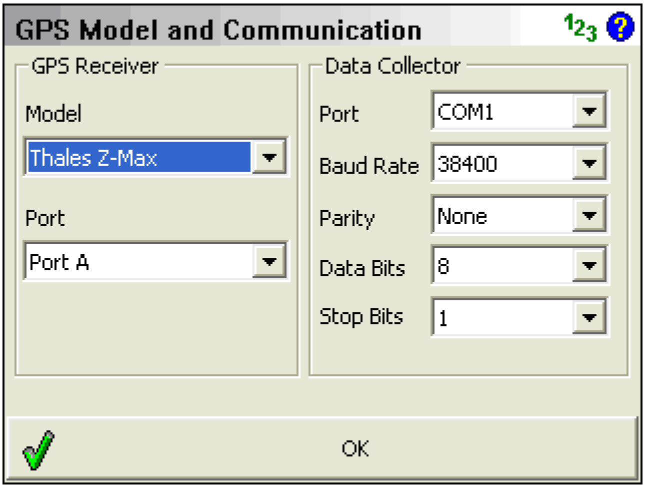
The antenna settings are used to calculate or enter the height of the antenna phase center above the ground. Please see the GPS Antenna Configuration topic for more information.

Correction Link

The link settings are used to configure the radio or GSM link from the reference station to the rover. Please see the GPS Correction Link topic for more information.

GPS Model and Communication

The Model and Communication settings are used to select the Make and Model of receiver, the port that the data collector is connected to.



GPS Receiver

Specify the make and model of receiver you are connecting to. Next specify the port on the receiver that the data collector will be connected to.

Data Collector

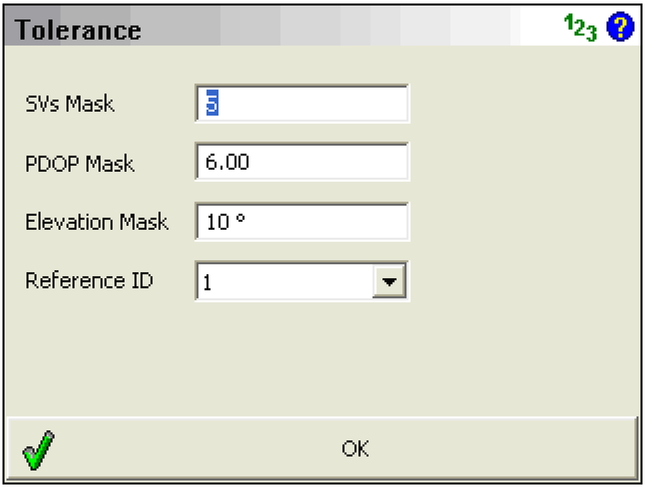
Specify the port on your data collector (usually Com 1) that you will connect a cable between your receiver and this port.

If you're unsure of what baud rate your receiver is set to you might want to set the baud rate to Auto Detect. This will force FieldGenius to check for communication using all the baud rate settings and if successful, it will set this baud rate in the profile.

Special Notes about Bluetooth

Under the data collector section, you need to specify the virtual COM port your Bluetooth device is using for a serial port.

GPS Tolerance (Reference)



SVs Mask

The SVs Mask setting is used to establish the minimum number of satellites that are necessary to produce a solution with a valid position. The SVs must also pass the elevation mask test to be included in this number for the calculation of the rover position.

PDOP Mask

The PDOP mask is used to control the acceptable geometry of the satellites used to compute the RTK position. If the PDOP value exceeds this number, the user will not be eligible to collect an RTK position.

Elevation Mask

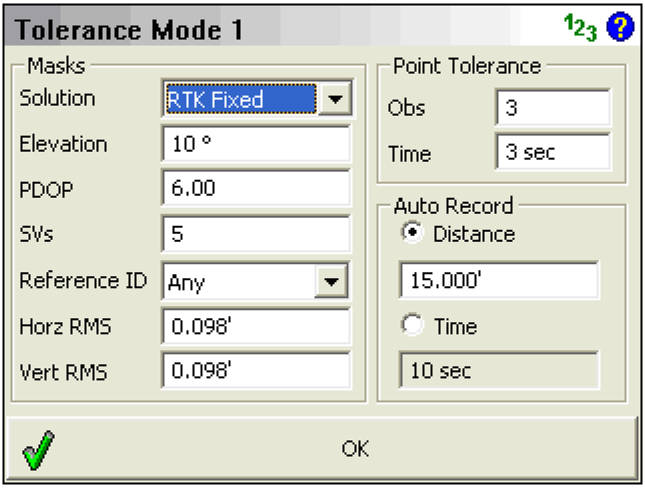
The Elevation Mask is used to determine which satellites to use in computing the differential corrections to broadcast to the rover(s). Satellites below this value will not be used in the solution. Elevation mask angles are typically equal or less than the elevation mask set for the rover system.

Reference ID

The Reference ID will be used by the rover to determine which differential corrections it is receiving (if you have more that one reference station in use). This is useful information to know if one of the base stations goes down or experiences problems during an RTK session.

GPS Tolerance Modes (Rover)

The tolerances modes are used to enter information used in computing the position of the rover once the RTK session has begun.



You can define three different tolerance modes that can be selected from the GPS Control menu while your surveying. Tolerance modes are used to ensure that certain criteria are being met every time you take a measurement. The reason for three different settings is to allow you to specify different tolerances for different types of measurements you might need to make. For example, control points would need to be measured more precisely then those used for topographic measurements.

This can be broken into 3 sections:

- Masks
- Point Tolerance
- Auto Record

Masks

Masks are used to filter data such that the user can determine the quality of the raw observations the rover receiver gets for use in the computations of the RTK position. Before a measurement will be allowed to proceed, FieldGenius will check to make sure the masks you specify are met. If any one of the following isn't met, then the measurement will not be allowed to continue.

Solution

The user can select from several Solution modes depending on your receiver make and model, these can be:

- Autonomous
- WAAS
- DGPS (differential code solution)
- RTK Float (differential carrier solution)
- RTK Fixed (differential carrier solution)

Please refer to your GPS manufacturer's documentation for the solutions' respective positional accuracy.

Elevation Mask

The elevation mask is used to filter out satellites that are close to the horizon and are, thus, unreliable. Typical elevation mask angles can range between 10º and 20º.

PDOP

The PDOP mask is used to control the acceptable geometry of the satellites used to compute the RTK position. If the PDOP value exceeds this number, the user will not be eligible to collect an RTK position.

SVs

The SVs setting is used to establish the minimum number of satellites that are necessary to produce a solution with a valid position. The SVs must also pass the elevation mask test to be included in this number for the calculation of the rover position.

Reference ID

The Reference ID is used to tell the Rover which reference station (base) to use for the differential corrections. If ANY is selected, it will use the first correction set identified for all future position solutions.

Horizontal and Vertical RMS

FieldGenius will use the estimated RMS values that your receiver is outputting to determine if the measurement can proceed. If the RMS values are equal to or less then the RMS values you've specified, then the measurement can proceed. Once this happens, FieldGenius will start averaging the measurements and will display an averaged RMS value.

Point Tolerance

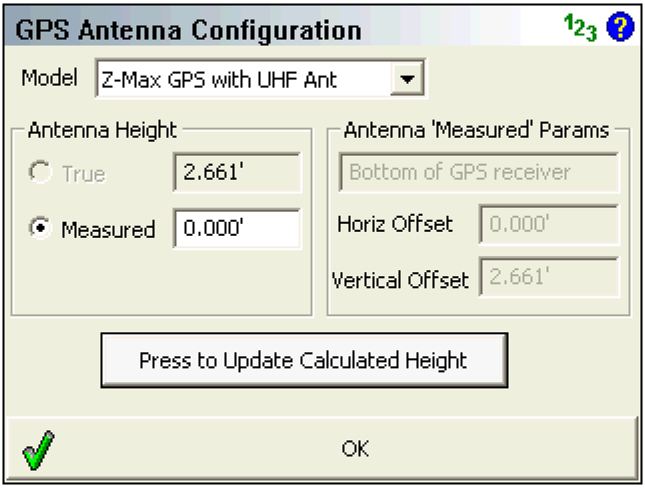
The point tolerance values are minimum requirement to generate a "static" position. The position solution must be comprised of, at a minimum, the values shown here. That is to say, the position will not be calculated until all of these tolerances have been exceeded. The user must use discretion in selecting appropriate tolerance values for the related solution mask. These values must also reflect project accuracy requirements.

Auto Record

The real time settings are used when collecting data in a "Kinematic" mode. The receiver can automatically log a point every X distance or Y seconds. The user simply selects what option they prefer to use for logging Kinematic data and start the survey. Keep in mind while collecting data at higher velocities that FieldGenius receives position updates from the GPS at a maximum rate of once per second.

GPS Antenna Configuration

The antenna settings are used to calculate or enter the height of the antenna phase center above the ground. You can enter the true height (if it is known) or enter the measured height and any horizontal or vertical offsets and have FieldGenius calculate the antenna height for you.



Depending on the model you've selected, manufacturer specific antenna offsets will be listed. For more detailed information about these offsets, refer to you users guide for your receiver.

The Model name is just for your use to identify the antenna in use. It is not a pull down list. Enter any value you wish in this edit field to identify the Antenna type. This edit field is for information purposes only.

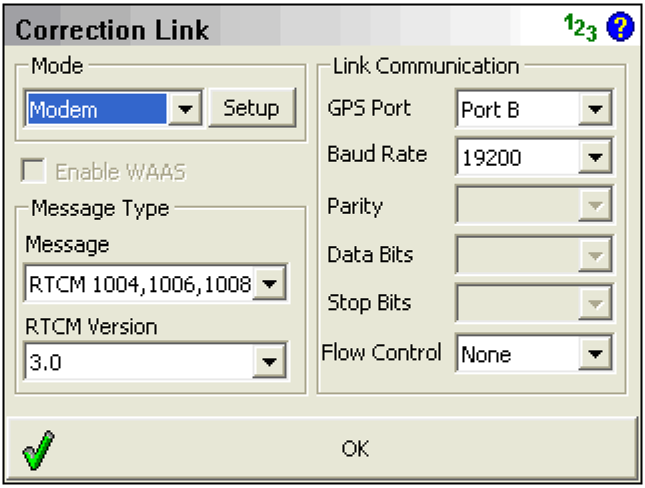
The true height is simply computed by the use of Pythagoras' theorem:

$$\text{TrueHeight} = \text{VerticalOffset} + \text{sqrt}((\text{MeasuredHeight})^2 - (\text{HorizontalOffset})^2)$$

You can change the true or measured antenna height at any time, on the Store Point screen when storing your GPS shots.

GPS Correction Link

The link settings are used to configure the radio or GSM link from the reference station to the rover. The mode will vary depending on your receiver type. The Setup button allows the user to go into further device details including channels and frequencies for radios and AT commands for GSM.



Mode

Select the appropriate Correction Link mode, such as Radio, Modem, or None.

Setup

When you press the Setup button on the dialog above, the Radio Setup or Modem Setup screen will appear. Choose the radio make and model from the pulldown and set the channel or frequency, the radio will be programmed by FieldGenius to the channel or frequency selected (on some models). If you are using an NTRIP or GPRS server, enter your internet and server credentials here.

Enable WAAS Option

The option to enable WAAS solution is available depending on your receiver type. FieldGenius will indicate if WAAS is available for the selected receiver type.

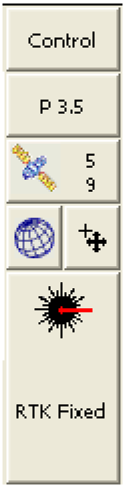
Message Type

The message type is used in determining what data streams are sent from the reference station to the rover. They can be RTCM, CMR or a proprietary format.

Communication Parameters

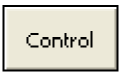
The communication parameters are used for interaction between the receiver and the modem communication device. Refer to the communication device's documentation for additional instructions and setting.

GPS Toolbar



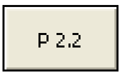
Once the user has selected a GPS receiver and communication has been established, a GPS toolbar will appear.

NOTE: You will only see the GPS toolbar if you selected GPS as your instrument type.



GPS Control Button (GPS Tasks)

If you press this button while you're connected you will see the Select GPS Task screen. At any time this button can be used to stop a GPS survey.



DOP Values

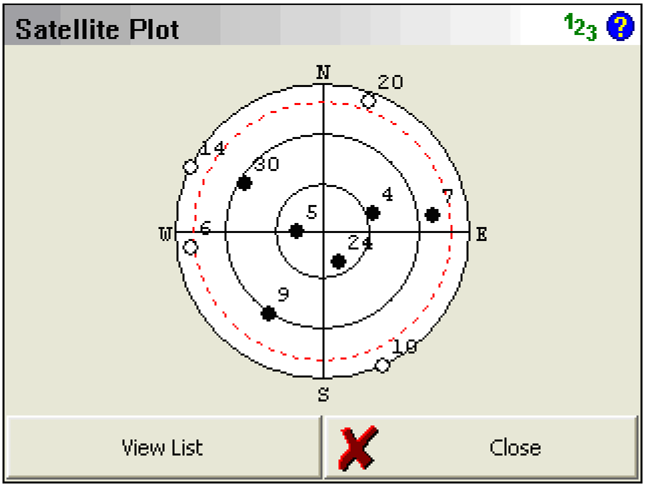
The second button displays the DOP values for the current RTK position. Pressing the button will cycle through the PDOP, HDOP and VDOP. The PDOP is the default setting as this is most often used to ascertain the quality of the geometry in the RTK solution.

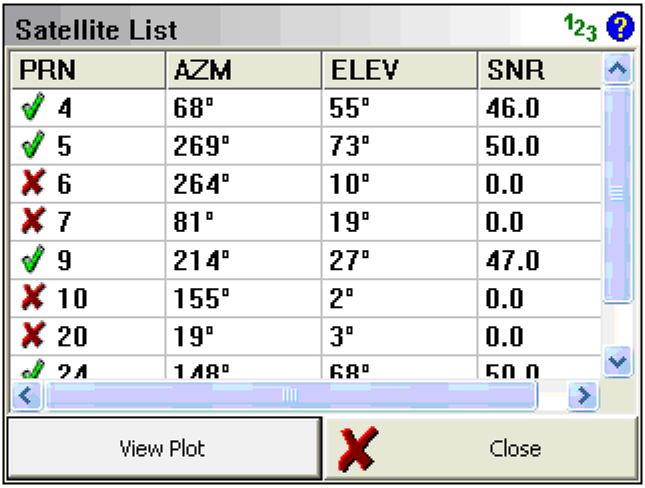
Satellite Plot/Satellite List

The third button is the number of SVs (Satellites) the rover is currently using in the RTK solution, and the total number of SVs visible to the rover. Press this to view a sky plot of the current SVs visible to the rover, or to access the Satellite List.

Press the **View List** or **View Plot** buttons to toggle between the Satellite Plot and Satellite List screens.

Press the **Close** button to return to the map screen.



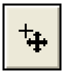

Satellite List

PRN	AZM	ELEV	SNR
4	68°	55°	46.0
5	269°	73°	50.0
6	264°	10°	0.0
7	81°	19°	0.0
9	214°	27°	47.0
10	155°	2°	0.0
20	19°	3°	0.0
24	148°	68°	50.0

View Plot Close

Current Position

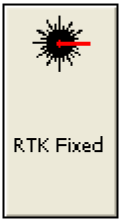
The fourth button is used to display the current position of the cursor in the project. Tapping it will first display the current geodetic position in the current map projection (with applied local transformation) or Latitude and Longitude (WGS 84 derived system). Tapping it again will show the UTM or State Plane coordinates. Tapping it a third time will show the current Hrms and Vrms values for quality control.



Cursor Tracking

The fifth button in the GPS toolbar will recenter the display on the current position of the cursor (RTK position).

Double tapping this button will set the system into an auto-pan mode where the position cursor will always be centered. Tapping the button once more will disable the auto-pan mode.



Measure

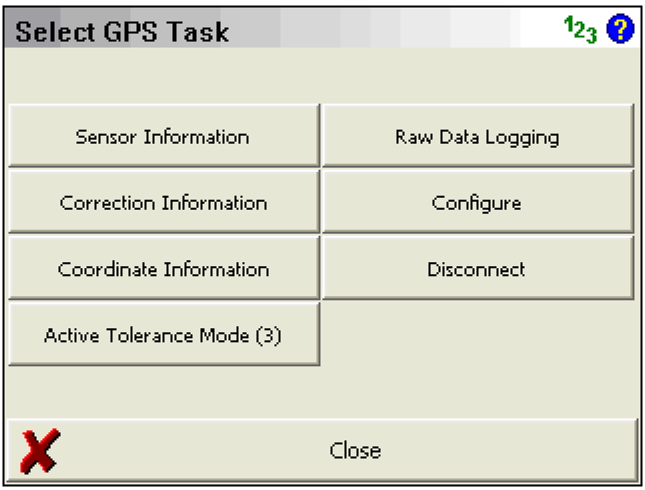
The sixth button on the GPS toolbar is the measure button.

This button also indicates the current solution type. This tells the user if the solution is Fixed, Float, WAAS, DGPS or Autonomous. This button will also indicate to the user if the corrections from the reference station have been discontinued by denoting "No Link".

Please refer to the GPS Measurement topic for more information.

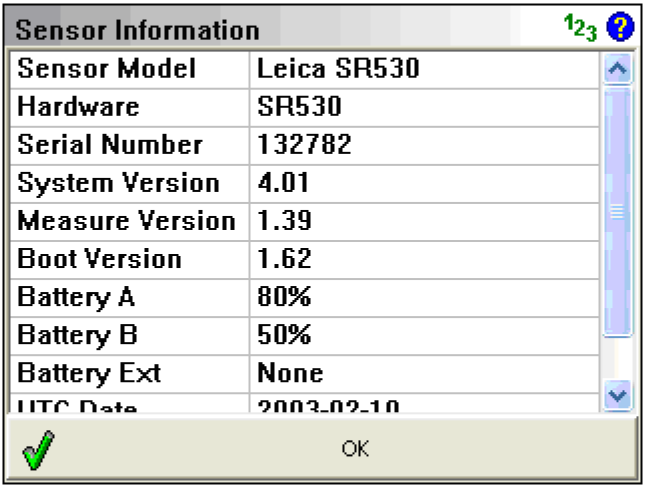
GPS Control

The GPS Control screen is accessed from the **Control** button on the GPS Toolbar.



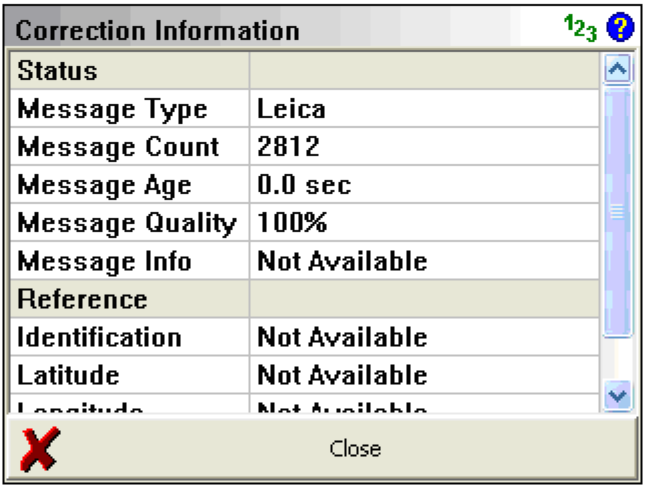
Sensor Information

This will display to you information about the hardware you've connected to.



Correction Information

This screen displays information about the correction message being received by your receiver.

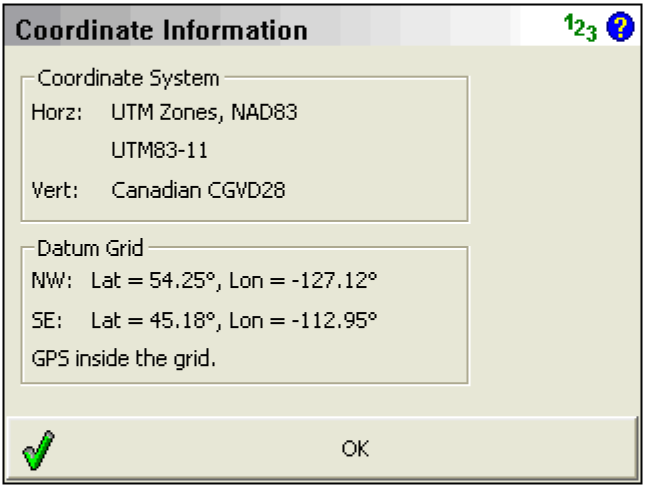


Modem On

This turns on your GPS Receiver's radio or modem to begin receiving RTK corrections, from either a base receiver or an NTRIP or GPRS server..

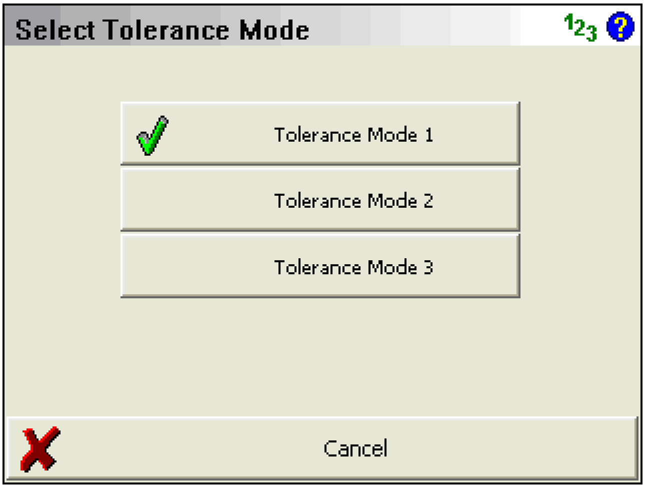
Coordinate Information

The Coordinate Information screen shows information about location and the Datum Grid you are working in. The grid size will be based on the grid files that you created using the Datum Grid Editor.



Active Tolerance Mode

This button indicates which of the three tolerance modes setup in your Rover Profile is currently being used. Press this button to change tolerance modes.

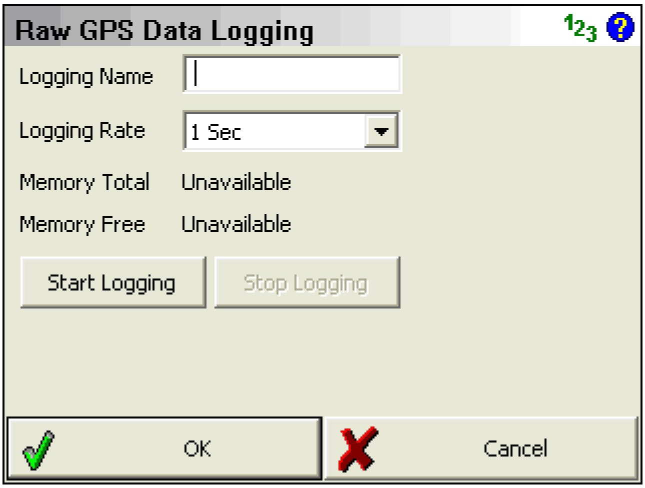


Raw Data Logging

Use this to start and stop raw data logging on your GPS reference or rover receiver.

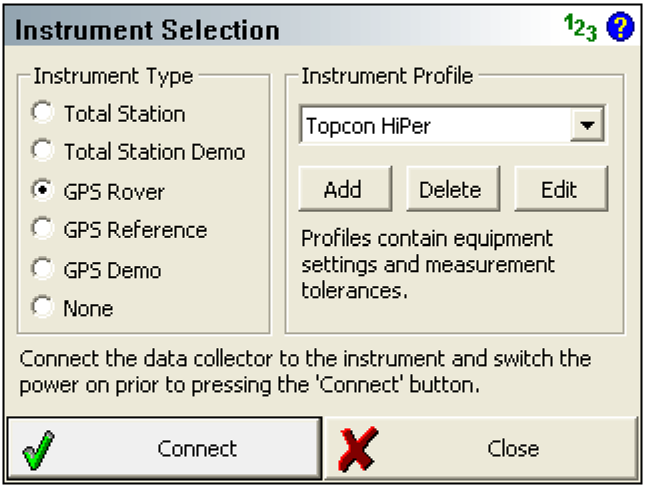
You can log data while you carry on with your survey.

Note: FieldGenius can not control the data logging on all models of GPS receivers. Currently, we support the Leica 1200, Novatel OEM 3, OEM 4, Trimble 5800, and the Topcon Hipers.



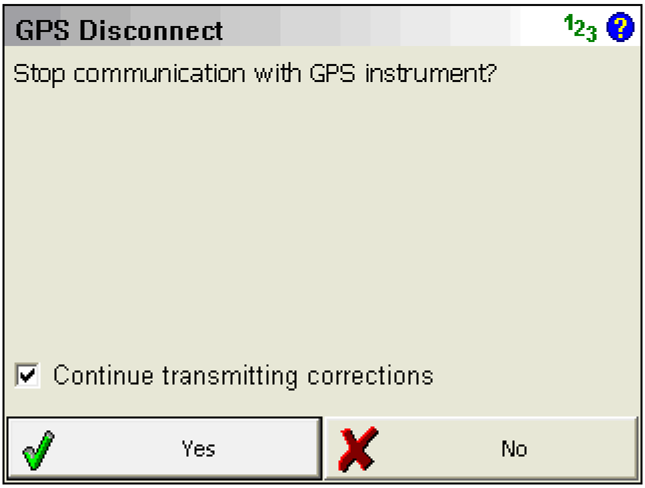
Configure

If you press this, it will stop the connection to the receiver to allow you to make changes to your profile.



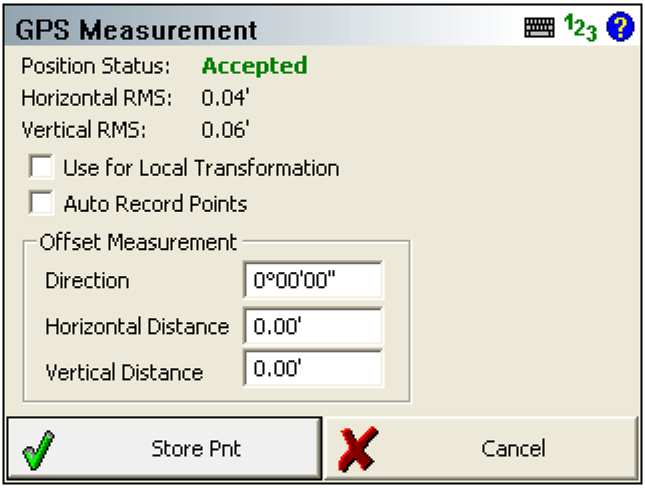
Disconnect

When you press this it allows you to disconnect from your receiver. You can choose to continue transmitting corrections (which is the default behaviour), or you can choose to halt the transmissions and power off the receiver.



GPS Measurement

When you have connected to your rover and you press the measure button on the GPS Toolbar you will see the GPS Measurement Screen



The measurement process works like this:

Once the satellites have been filtered out based on your elevations mask, FieldGenius will only begin collecting measurement data if all your mask settings are met. During the measurement process, you might see that certain masks settings are not being satisfied which is normal. FieldGenius will continue monitoring the measurement data and will accept measurements that pass the mask criteria.

Once the point tolerances and masks have been met, the position status will change to an **Accepted** position. Prior to accepting the position, the user can look at the RMS values for the computed position and determine if they wish to accept or reject the measurement. Pressing Cancel will exit the measure function without storing any data. Pressing Store Point will accept the position and store it in the database.   You can change your true or measured Antenna Height on the Store Point screen.

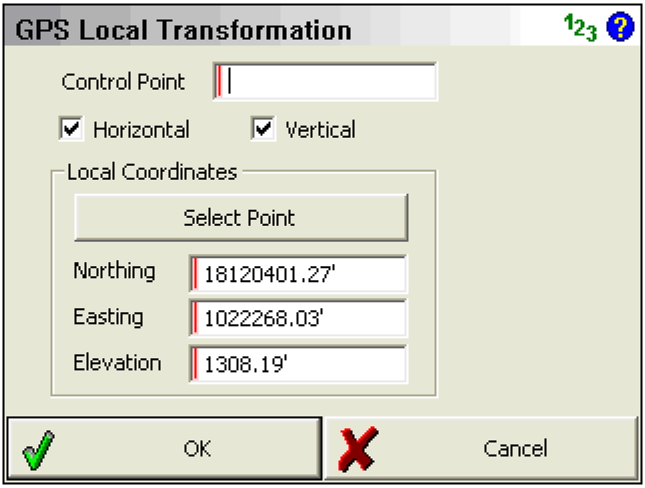
By default, if you have some transformation parameters defined, they will be applied to the measurement prior to storing it.

Offsets

You can specify an offset from your current position. The offset direction is a computed grid azimuth that you have determined.

Use For Local Transformation

To help you localize quickly, you can use this option. What will happen is after the measurement has been stored, we will automatically add this point to the GPS Local Transformation calibration point list. The point will be considered a measured point, and so you will be asked to define the control point that this point is to be constrained to.



Example: You've localized to a local system using a one point transformation so you can visually see in the map where your other points should be. You then decide to stake one of them so you can navigate to it. When you find the second point, you want to measure it's location and use it as one of the transformation points. Simply turn on the "Use for Local Transformation" parameter and FieldGenius will automatically store the point's Cartesian position, and automatically add it to your transformation points list.

When you use this option, FieldGenius will automatically ignore any transformation parameter you have defined and will store the "raw" GPS derived measurement.

Auto Record Points

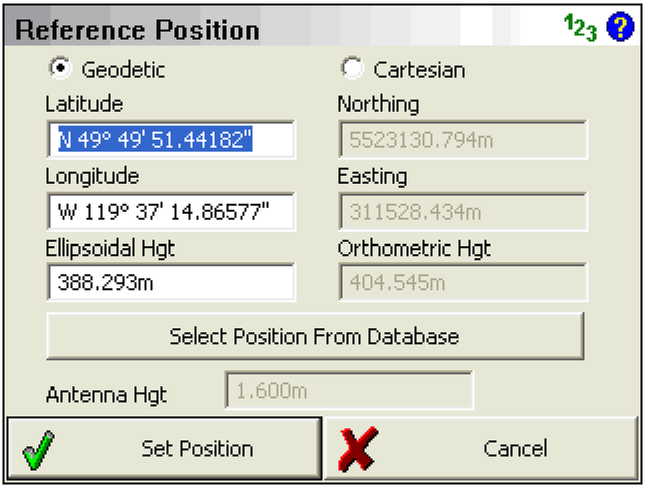
The Auto Record toggle allows the user to start measuring data in a Kinematic fashion. The data is logged based on a time or distance interval specified in Rover settings. Descriptions, Point ID's and the active linework are all automatically advanced with each successive point. To exit the Auto Record measurement mode, simply tap on the Measure button again.

Program Reference Receiver Position

When you're ready to program your base receiver with a position you need to press the **Measure** button on the GPS toolbar. When you do you will see a screen that allows you select three difference methods, known Geodetic position, averaged Geodetic position or transform to a point.

Known Geodetic Position

Use this when you know the geodetic position of the point the base is setup on. You have two options, you can program it with a known Geodetic or known Cartesian Coordinate.



Geodetic Coordinates

Enter the know Latitude, Longitude and Ellipsoidal Height for your base setup. The coordinates you enter here will be programmed into the receiver.

Cartesian Coordinates

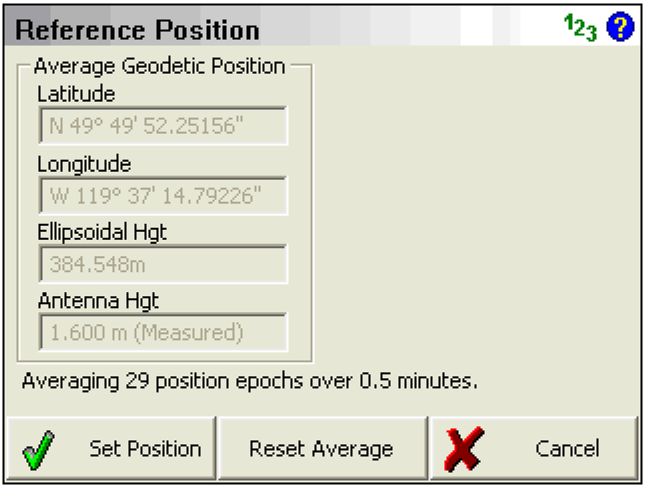
Cartesian coordinates can be SPCS, UTM coordinates or any other grid system as long as it matches the horizontal and vertical system you've defined in your GPS profile. You can not enter local coordinates as Cartesian coordinates! Doing so will cause a warning message to be displayed indicating that the coordinates you entered do not fall inside the GPS grid files you have loaded on your data collector.

Select Position from Database

This allows you to choose a point a number of different ways. The point you select must be a grid coordinate such as a SPCS or UTM coordinate.

Use Averaged Geodetic Position

Use this to measure and average an Autonomous Geodetic position.

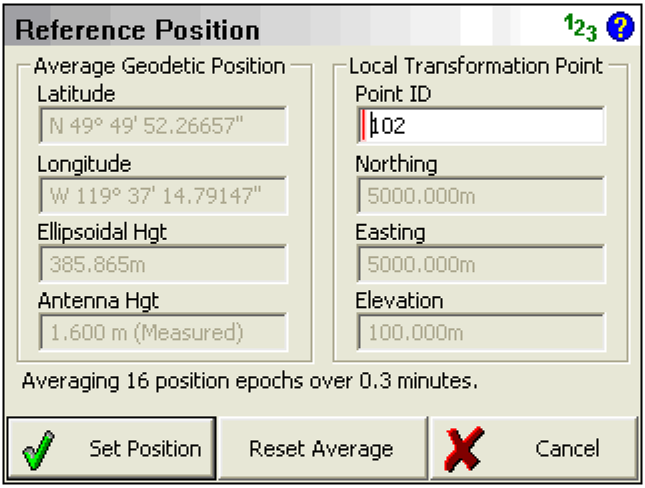


It is up to you to determine how many observations or the duration of time you want to wait before accepting the averaged position. At any time you can restart the process by pressing the **Reset Average** button.

If you press **Set Position**, your receiver will be programmed with the new position and you will have the option of storing a point's position in the database.

Local Transform to Point

Use this to compute a one point transformation so your GPS derived measurements can be referenced into a local system.



When this option is used, FieldGenius starts receiving data and computes an averaged Autonomous position for the base receiver. The current position, how many epochs it has received and the total elapsed time is displayed on the screen.

It is up to you to determine how many observations or the duration of time you want to wait before accepting the averaged position. At any time you can restart the process by pressing the **Reset Average** button.

You then have to define a local coordinate that you want to localize to. It is assumed that the point exists in your project. If it doesn't, simply double tap the Point ID field which will open the point toolbar. You can use the new option to create a point or if it exists select it from the map or from the list.

When you press Set Position, FieldGenius will save the averaged location into the point database. It will then compute a one point transformation which is simply a horizontal and vertical shift from the grid coordinate system into your local system, as well as a combined scale factor. All future GPS measurements will have your new transformation parameters applied automatically.

Local Transformation

Due to a variety of reasons, it may be necessary to adjust position coordinates for distortions which can include scale, rotation, translation in northing and translation in easting. The flexibility of FieldGenius's local transformation utility allows it to be used for a variety of applications and applied to positions derived from GPS or terrestrial observations. For GPS applications there are two possible reasons for the need of a transformation:

1. Translating from Local System to Plan System

   GPS receivers by default generate geodetic coordinates (latitude, longitude and ellipsoidal height) and the process of converting to Cartesian coordinates (northing, easting and orthometric height) or local system is done with existing well defined map projection systems such as Universal Transverse Mercator (UTM) or the State Plane Coordinate System (SPCS). Selection of the map projection in FieldGenius is done within the Datum page of the GPS Configuration and a local zone is selected to minimize scale and meridian convergence distortion. Most land, boundary or property surveys are unique with regards to their generalized plane and coordinate origin for each project. The coordinate system for these surveys is often referred to as a plan system with coordinate magnitudes being kept small for ease of recording and calculations. The majority of projects can suffice with a simple translation in northing and easting to produce plan system coordinates from GPS determined local system coordinates. The translation is easily determined by comparing a plan system coordinate and a local system coordinated for a single point.

2. Consideration for Scale and Rotation

   Projects with larger extents need to take into consideration the curvature of the earth's surface which can be handled by the application of scale and rotation transformations plus the previously mentioned translations. In the case of mixing GPS observations and terrestrial observations it does become important to apply a transformation, especially in scale, due to the fact that there is a difference in distance between positions measured on the ellipsoid and the terrain surface. As seen in Figure 1, coordinates derived from GPS are always referenced to the surface of the ellipsoid as per the application of map projections. When the two points on the ellipsoid are projected upwards along the ellipsoid normals onto the earth's surface, they diverge, and a terrestrial distance observed between the points will be greater than the computed distance of the same two points on the ellipsoid. The effects of this zenith divergence becomes more evident as distance between the two points becomes greater and for larger terrain heights above the ellipsoidal surface.

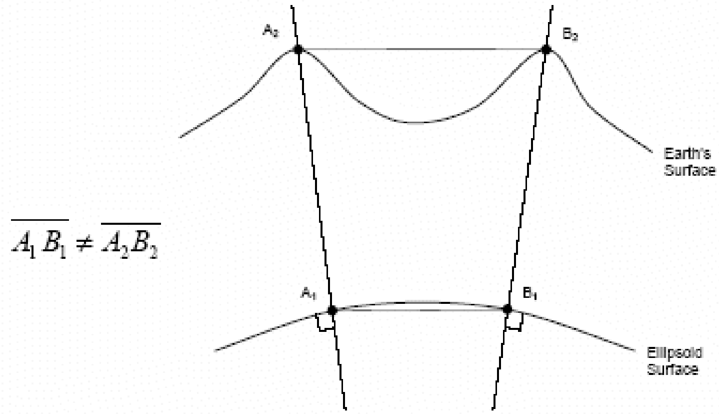


Figure 1. Divergence of Ellipsoid Normals.

Figure 1. Divergence of Ellipsoid Normals.

Transformation Concepts

In order for the transformation parameters to be resolved, a sufficient number of control points are required with coordinates in both the plan system and local system. The determination of a four parameter transformation (two translations, scale and rotation) on a horizontal plane requires at minimum two physical points with each having two sets of corresponding coordinates as illustrated in Figure 2. Points A1 and B1 exist in what is termed the local system and are transformed into the plan system points of A2 and B2. The use of more coordinate observations will provide redundancy and the means to identify outliers for elimination. Solving for over constrained parameters is done with the application of least squares to provide the most rigorous minimization of residuals. Once transformation parameters have been resolved, newly observed or existing coordinates can easily be converted to the plan coordinate system.

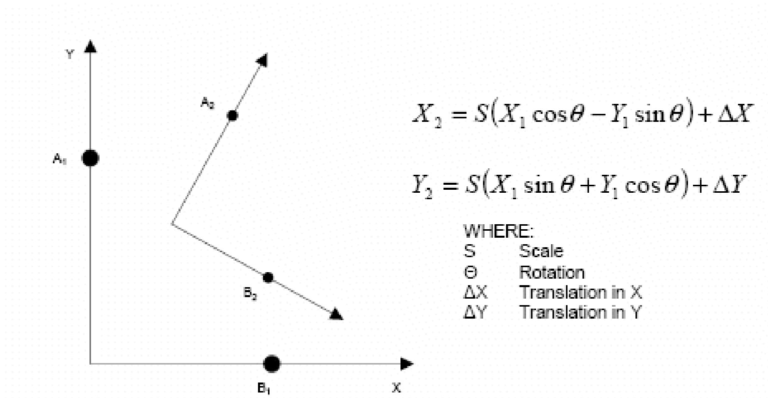


Figure 2. Horizontal Four Parameter Transformation.

The selection of control points for determining the transformation parameters are critical in reducing a colinearity condition along a particular axis. Colinearity will present itself if the control points are concentrated in a linear fashion as shown in Figure 3 (Poor Design) and thus weaken the parameters in a perpendicular direction. Control points should extend to the corners of the project boundary and be extended with equal distances in both horizontal directions.

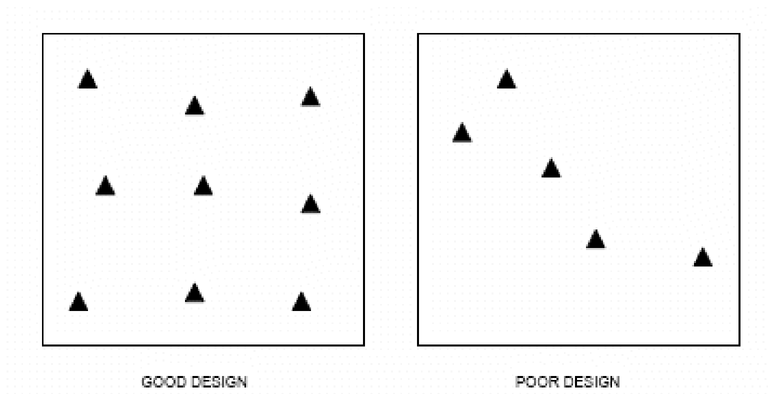


Figure 3. Transformation Control Design.

Vertical Transformation

The vertical transformation function of FieldGenius operates independently of the horizontal transformation. A sloped plane is calculated from the residuals of the constrained point pairs to determine a vertical bias, slope in X and slope in Y. To determine a vertical bias at least one point pair must be constrained and for all three parameters to be determined at least three point pairs must be constrained.

The use of the vertical transformation function should be restricted to cases where a geoid model is not available or there is a know problem with an existing geoid model.

Local Transformation Example A

For this example the simple case of translating the GPS derived coordinates to the desired plan coordinates will be used. The example will demonstrate how FieldGenius can be used to determine and apply the transformation parameters. A project is created consisting of four points in the plan system as denoted in Figure 4 and the corresponding coordinate listing shown in Table 1.

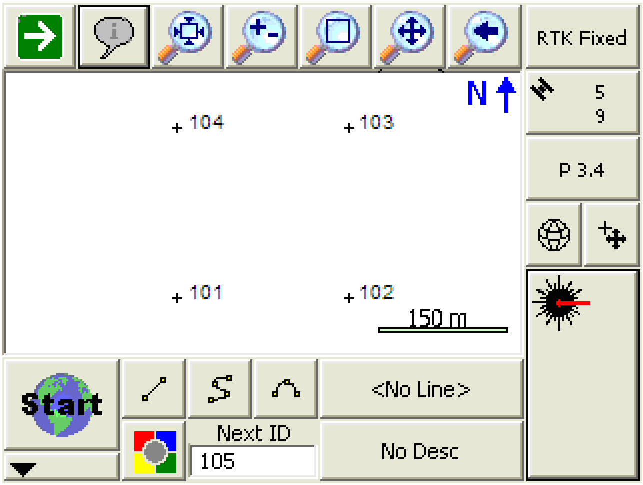


Figure 4. FieldGenius Project with Points in the Plan System.

Point	Northing	Easting
101	1000.000 m	1000.000 m
102	1000.000 m	1200.000 m
103	1200.000 m	1200.000 m
104	1200.000 m	1000.000 m

Table 1. Plan System Points.

The GPS reference station will need to occupy a point within the project area which can be an existing plan system point (101-104) or a new point set up randomly somewhere in the project area. For either setup of the reference station, the GPS antenna should have an unobstructed view to the satellite constellation to ensure that the rover station operates at its full potential. If the reference station is unable to occupy a plan system point, the rover station can instead measure an existing plan system point with local system coordinates and for this example that case will be assumed. Using FieldGenius to configure the GPS reference station, a suitable map projection is selected and the reference station position will be determined autonomously.

Once the reference station is operating and transmitting corrections, the rover station is used to measure plan system point 103 and the new local system point is assigned point number 203. Table 2 indicates the measured coordinates of point 203 in the local system which corresponds to point number 103 in the plan system. Figure 6 illustrates that FieldGenius now has points in two different coordinate systems as indicated by the large separation.

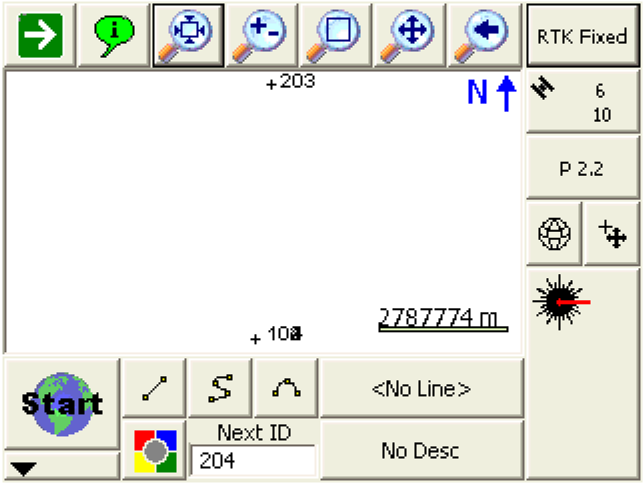


Figure 6. FieldGenius with Two Coordinate Systems.

Point	Northing	Easting
203	5523295.939 m	311585.808 m

Table 2. Local System Point.

Now that points exist in each of the coordinate systems the local transformation parameters can be determined and applied. Transformation Settings can be accessed from the **Main Menu | Survey Tools | GPS Local Transformation.** Initially the transformation parameters of translation in northing, translation in easting, scale and rotation will be null and any transformation will not be applied to GPS positions as indicated in Figure 7.

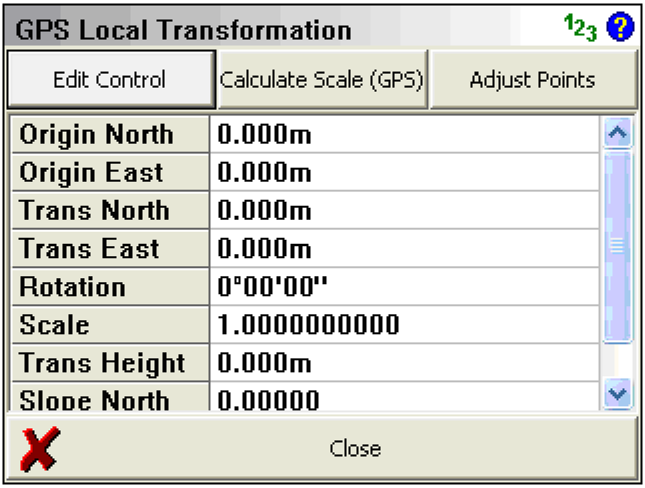


Figure 7. FieldGenius Default Transformation Parameters.

From the Local Transformation Setup select the **Edit Control** button for the entry of control and measured point pairs to be used in the determination of the transformation parameters.

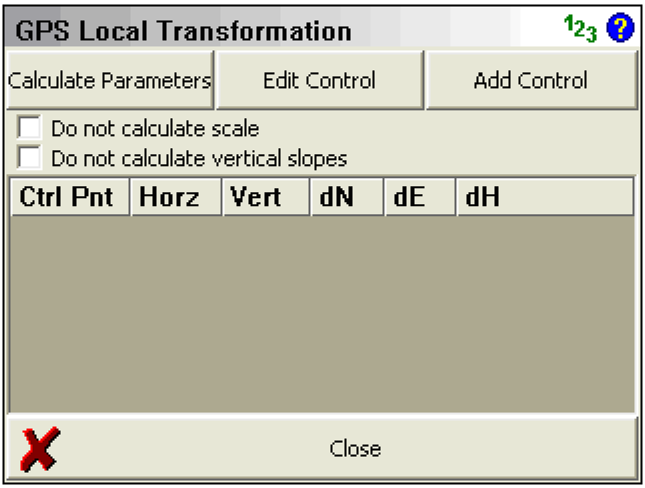


Figure 8: FieldGenius Default Control-Measured Point Pairs.

Select the **Add Control** button to enter the control and measured points. As seen in Figure 9 point 203 is selected as a measured (local coordinate) point and corresponding point 103 is entered as a control system point. The check boxes for constraining to horizontal and vertical are left enabled.

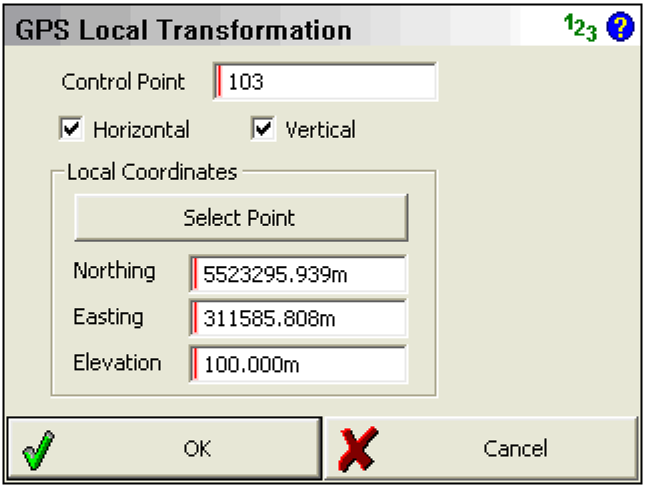


Figure 9: FieldGenius Control Point Pair Definition.

Select the **Calculate Parameters** button to have FieldGenius calculate new transformation parameters based on the control pair that has been added. The following tabular columns denote residuals in northing, easting and height and for this case are all zero due to the transformation being minimally constrained.

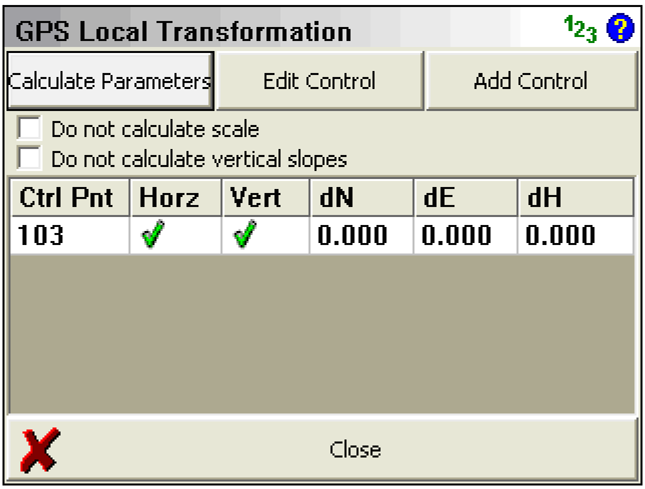


Figure 10: FieldGenius Contrained Points for Transformation.

The calculated transformation parameters can be viewed by choosing **Close** and returning to the Parameters page. Since only one point pair is being constrained, the utility has only determined a translation in northing, translation in easting and vertical bias. The addition of more point pairs would allow for scale, rotation and slopes in X and Y to be determined.

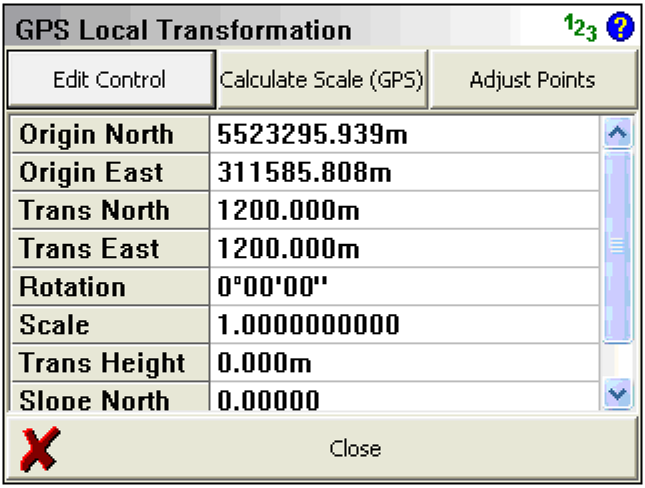


Figure 11. FieldGenius Calculated Transformation Parameters.

The map view of FieldGenius will now show the effect of the transformation by showing the new position of the GPS position cursor and denoting new coordinate values. Returning to point 103 with the rover station will verify the transformation process. New points measured with GPS will reflect the applied transformation parameters.

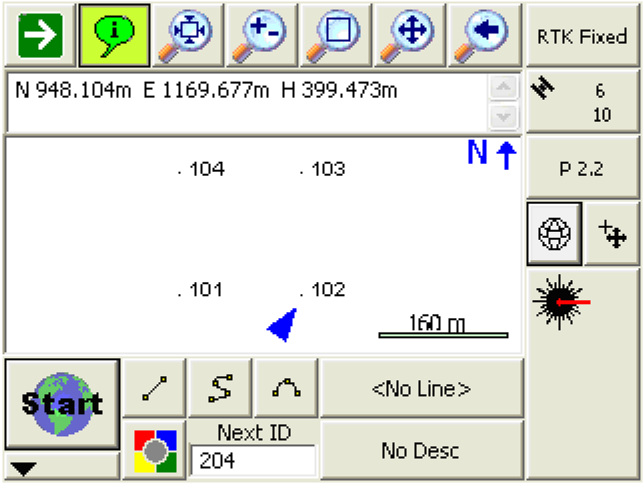


Figure 12. FieldGenius Transformation in Effect.

The GPS measured observations at this point are still stored in the project database as a cartesian coordinate. It is sometimes beneficial to have FieldGenius re-compute the coordinates for these points by using the Adjust button in the Transformation Settings screen. This will force FieldGenius to scan your raw file and convert all the GPS derived points into your local system.

Local Transformation Example B

This example will investigate the process of transforming a set of existing terrestrially derived positions so that they are constrained to a set of GPS derived positions. The process of transforming points is reversed from previous discussions and will therefore imply that the GPS derived coordinates are in the plan system and the terrestrially derived positions are in the local system. Another consideration for this example is that the project area is relatively large and more than one point pair will require to be constrained to determine all four parameters and for redundancy. Determination of the transformation parameters will account for the geodetic implications of the earth's curvature and meridian convergence. The existing FieldGenius project is illustrated in Figure 13 with the 100's series points having been established with a total station.

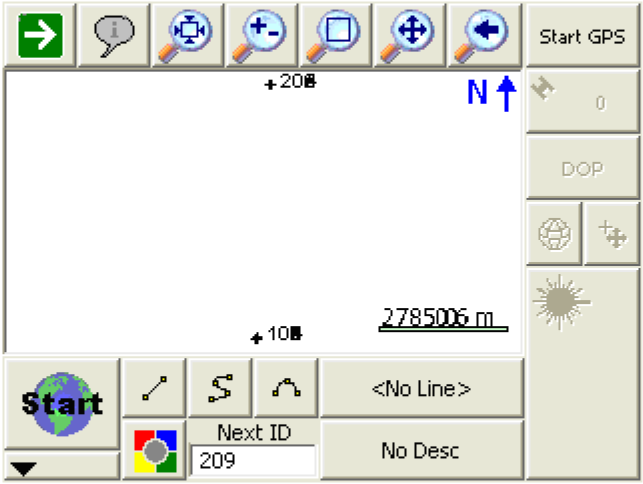


Figure 13. FieldGenius Project with Points in the Local System.

The GPS reference station occupies a national geodetic control point and has been configured with the corresponding published coordinates. The GPS rover station is used to measure points 102, 104, 106 and 108 to establish coordinates in the plan system and these new points are respectively named 202, 204, 206 and 208 (Table 3).

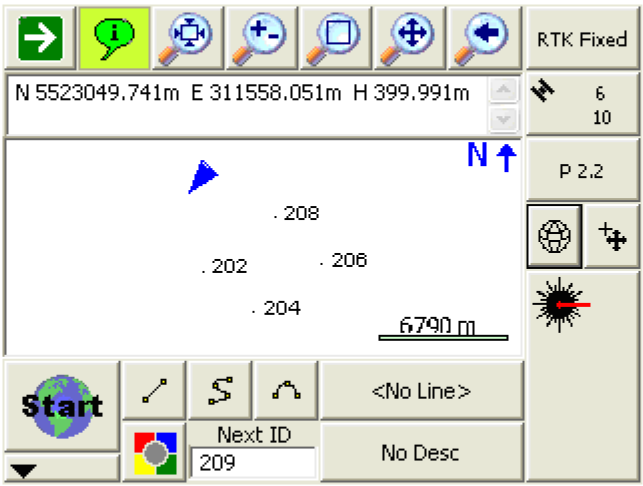


Figure 14. FieldGenius Project with Points in the Plan System.

Local System (Conventional Points)				Plan System (GPS Points)			
Point	Northing	Easting	Height	Point	Northing	Easting	Height
101	10820.603	3060.696	383.133				
102	6765.098	1674.638	384.936	202	5516443.987	311551.600	384.946
103	3325.620	2136.657	384.589				
104	3941.646	5216.788	383.543	204	5513620.403	315093.864	383.557
105	3736.304	8810.273	383.299				
106	7227.118	9939.654	382.980	206	5516905.954	319816.969	382.983
107	11539.300	9323.628	381.795				
108	10461.255	6654.182	384.380	208	5520140.241	316531.321	384.376

Table 3. Coordinate Listing.

Now that coordinates have been established in both the plan system and local system, the Transformation Setup is started from the Point menu of FieldGenius. Transformation Settings can be accessed from the **Main Menu | Survey Tools | GPS Local Transformation.** Figure 15 shows the Constrain page after the point pairs have been entered and their corresponding computed residuals. With four point pairs being used the horizontal transformation has a redundancy of two point pairs and the vertical transformation has a redundancy of one point pair. The residuals are within acceptable limits and do not necessitate the removal of point pairs.

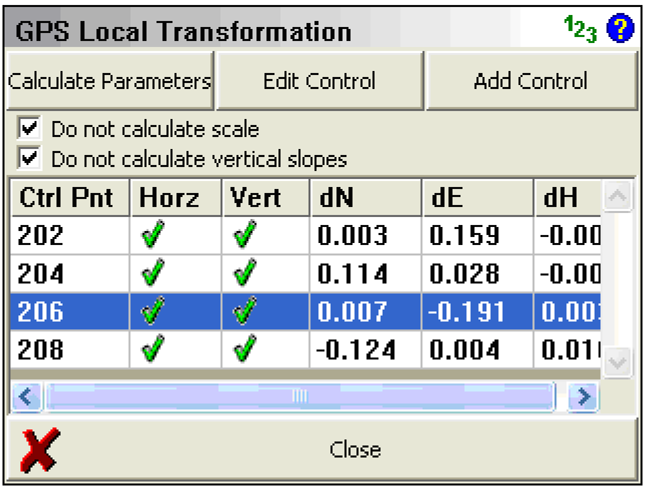


Figure 15. FieldGenius Constrained Points for Transformation.

Viewing the Parameters page, as indicated in Figure 16, will provide feedback of the calculated horizontal and vertical transformation parameters.

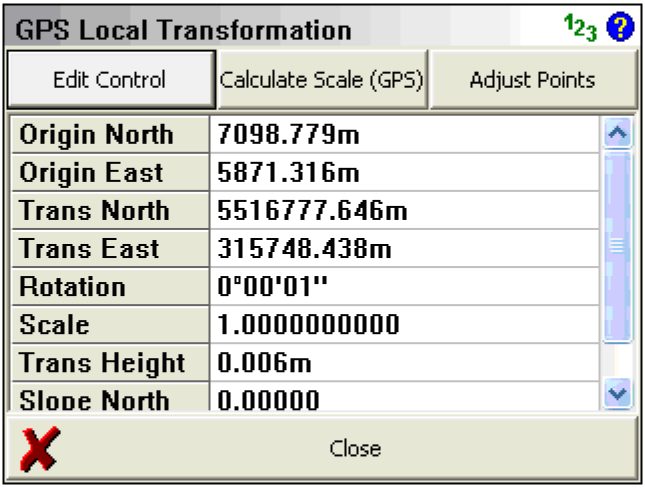


Figure 16. FieldGenius Calculated Parameters.

Using the calculated transformation parameters the control system points (101–108) can be transformed. First you need to open the coordinate database by going to **Main Menu | Data Manager | Coordinate database**, or by clicking on the button on the map screen. Click the Find button and enter a point range 101-108 to select these points. The list of terrestrially derived points is entered as shown in Figure 17.

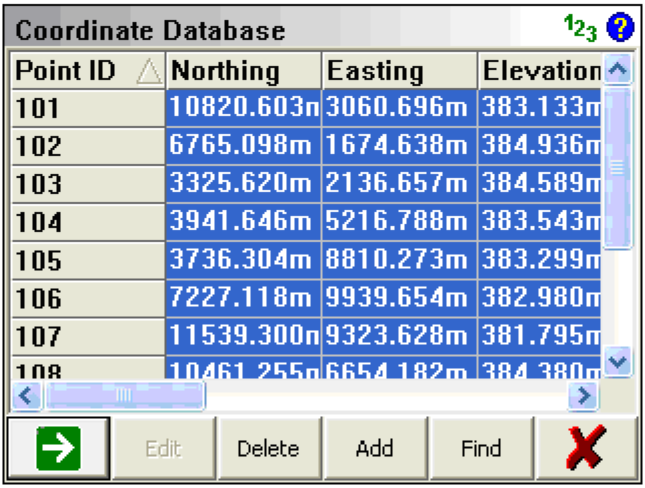


Figure 17. Transforming Existing Points to the Control System.

To apply the transformation parameters to the local points, go to the second set of buttons by pressing the **green arrow** and then the **Local Transform** button.

After successfully transforming the points 101 through 108 from the local system to the plan system which was constrained to the GPS point 202 through 208 the results can be seen in Figure 18. The diagram illustrates the matching of points 102, 104, 106 and 108 with corresponding points 202, 204, 206 and 208 respectively.

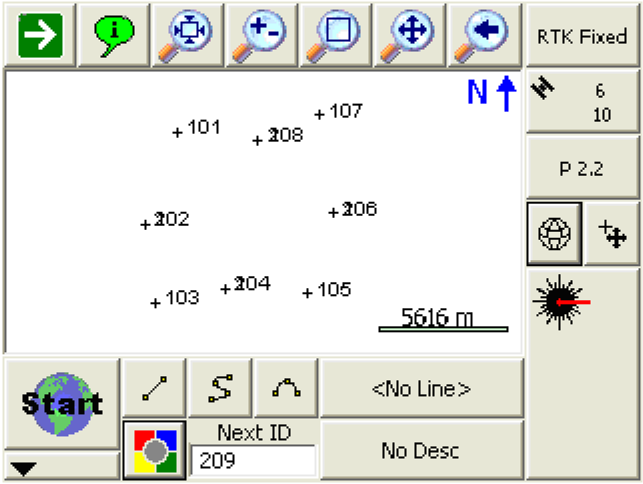


Figure 18. Results of the Transformation.

Local Transformation Example C

Two approaches can be used in applying the Local Transformation utility; parameters can be manually entered or automatically computed given a set of control points. The explanation of the use of FieldGenius's Local Transformation is best described with an example of integrating GPS observations and terrestrial observations and using the utility to compute the parameters.

Terrestrial Observations

The example project has a local user defined system that was uploaded to the data collector. Below you will find the coordinate listing for this user coordinate system. For the rest of the example we will refer to this as the Plan System.

We will make the assumption that the plan system is to be held fixed, that is we want to transform our GPS derived UTM coordinates into the user (plan) system.

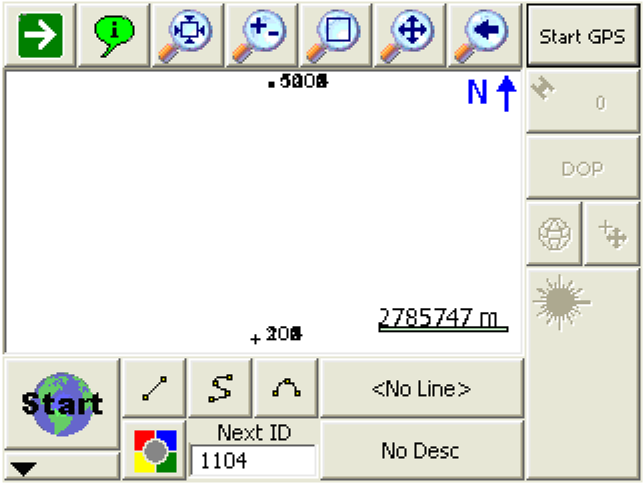
Point ID	Northing	Easting	Elevation	Description
100	4937.480	5033.487	399.387	
101	5009.092	4999.688	401.188	
102	5004.814	4977.172	400.850	
103	4975.631	4980.361	399.795	
104	4939.713	4990.346	399.552	
105	4914.671	4975.005	399.233	
106	4886.675	4988.968	398.049	
201	5002.175	4995.656	400.632	
202	5000.000	5000.000	400.665	
203	5007.341	5008.610	401.095	
204	5005.103	5020.902	400.946	
205	5013.644	4963.513	401.686	

GPS Observations

This project is going to be surveyed using a RTK system so measurement were made to some of the plan points and tagged with a new point number. The GPS derived coordinates are in the 1000 range. Their coordinates are listed below and for the remainder of this topic we will refer to this coordinate system as the local system.

Point ID	Northing	Easting	Elevation	Description
1000	5523156.277	311533.446	400.536	HUB:TEMP
1001	5523168.850	311529.902	401.204	NAIL
1102	5523164.198	311507.469	400.863	NAIL
1103	5523135.089	311511.178	399.787	NAIL
1105	5523074.026	311506.904	399.243	NAIL
1106	5523046.273	311521.362	398.068	NAIL
1202	5523159.787	311530.386	400.664	HUB
1203	5523167.281	311538.852	401.104	NAIL
1204	5523165.231	311551.178	400.957	NAIL
50	5523150.433	311520.031	399.906	MH

If you do a zoom extents in the project, you will see the two coordinate systems.



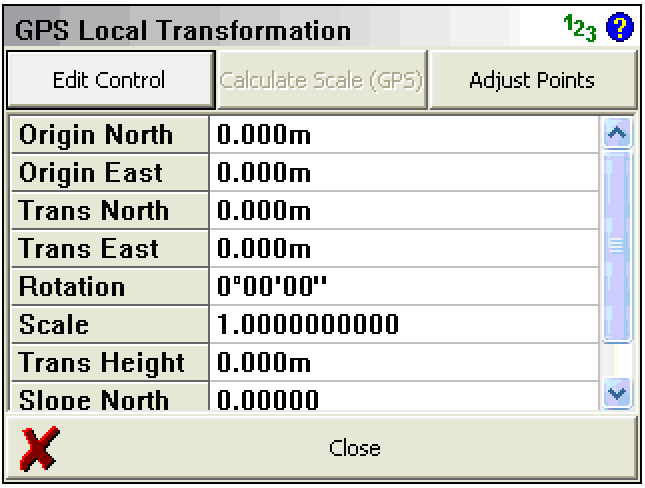
Adjustment Analysis

The program assumes the following:

The coordinates of the plan system are considered fixed and error free.

Equal weighting is applied to all "measured" coordinates in the local system that are used to calculate the solution

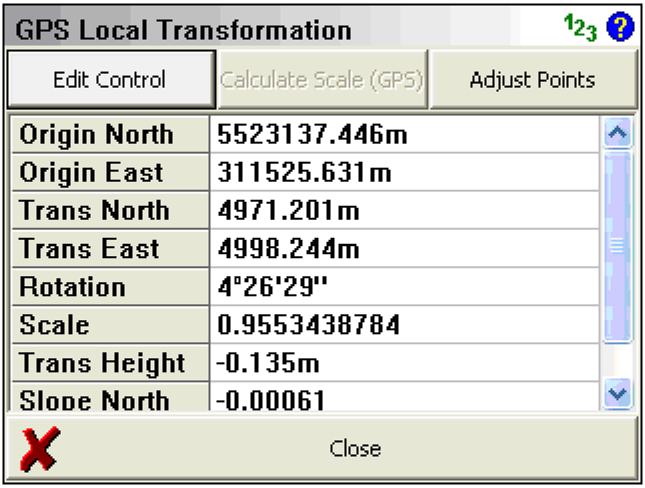
Completion of the gps observations to the control stations will produce a list of point pairs with the terrestrial determined points (100-205) being termed control points and the GPS determined points (1000-1204) being termed local points. The computed transformation parameters will provide the transformation to go from measured local points to resulting plan points. The transformation utility in FieldGenius is started by going to the **Main Menu | Survey Tools | GPS Local Transformation** button.



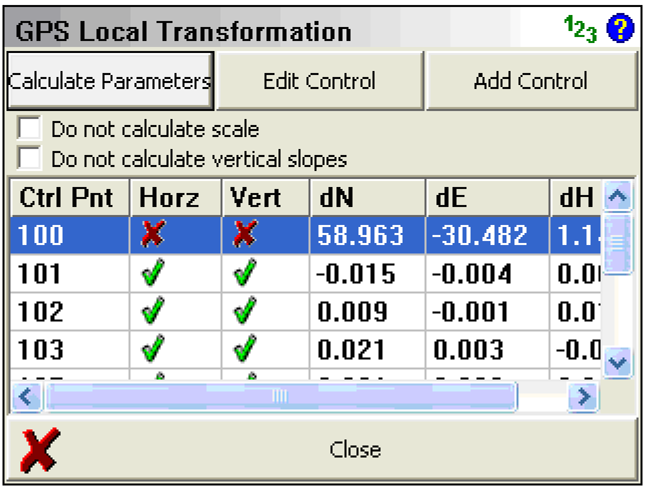
To begin computing the transformation you need to define the point pairs. You can do this by pressing the **Edit Control** button which will open the point pair's screen. Use the Add Control button to add control points to the list and to define the measured coordinate the control point should be constrained to. Note: Control points are points that reside in the plan system and are considered to be fixed.

In this example, control points 100, 101, 102, 103, 105, 106, 202, 203, and 204 were paired with the measured local points 1000, 1001, 1102, 1103, 1105, 1106, 1202, 1203, and 1204 respectively.

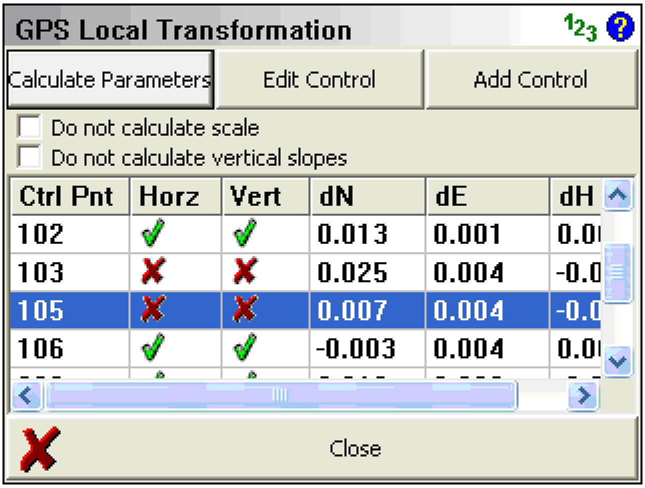
After all of the control station pairs have been entered, you need to compute the transformation parameters. To update the grid of the constraint pairs so it displays the transformation parameters and residuals, press the **Calc Parameters** button. You will see the transformation parameters update with new values. Instantly we can tell that there is a mistake with one of the point pairs as the scale value should be closer to a value of 1.



Upon returning to the control point list you will notice that the delta northing is large for the first point pair, so let's exclude it from the solution by turning off the green checkmarks. Highlight row 100 then press **Edit Control** and uncheck the Horizontal and Vertical options. Once you do this you will have to use the **Calc Params** button again to compute a new solution. In our example that helped tighten up the residuals.



Enabling or disabling constraints in either the horizontal or vertical components for determining the transformation parameters is done with the **Edit Control** button. The last three columns of dN, dE and dH represents the residuals between the control coordinates and the transformed local (measured) coordinates in northing, easting and height.

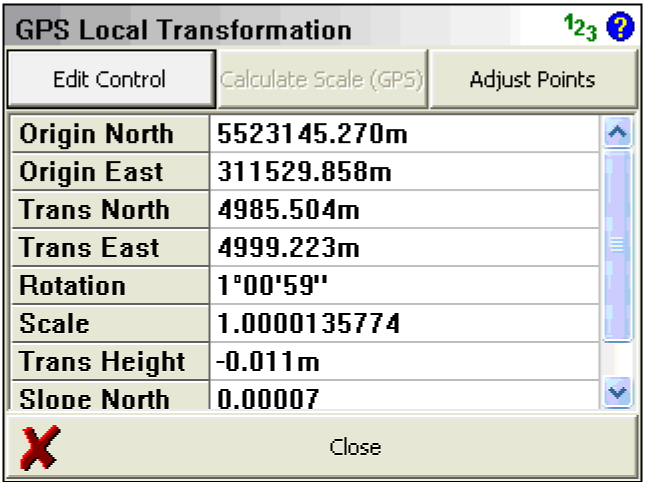


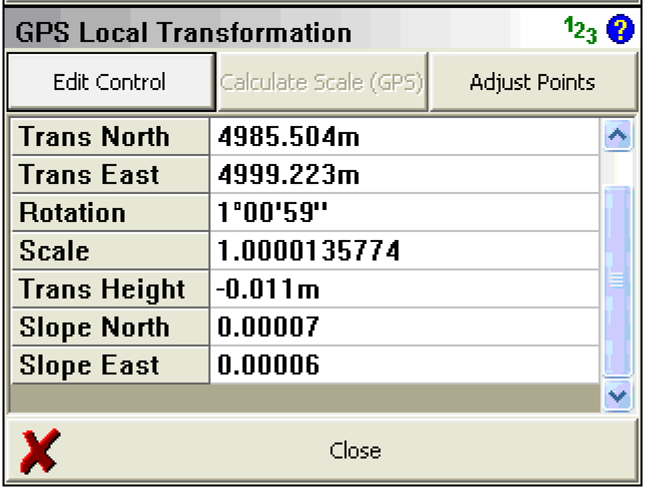
Since this network is over constrained, it is possible to reserve a couple of point pairs as check values in testing the parameters of the horizontal transformation. Pairs 103/1103 and 105/1105 have been randomly selected as test pairs and have been deselected as constraints in the horizontal and vertical component.

These two test pairs will not be used in the computation of the horizontal transformation parameters but the transformation parameters will be applied to the measured points (1103 and 1105) to produce the residuals as shown. In this case we see that the residuals are acceptable and thus it can be assumed that the determined transformation parameters are reliable.

Adjustment Results

Upon satisfaction of the applied constraints and relevant residuals, the transformation parameters can be viewed or modified. As indicated in Figure 9, the four horizontal transformation parameters (translation in northing, translation in easting, scale and rotation) and the three vertical transformation parameters (bias, slope in X, and slope in Y) are shown in the grid list.





When you press the **Calc Parameters** button it uses the point pairs that you've defined to calculate the transformation parameters. The values that are computed can be modified by the user. You can do "what if" scenarios by changing any of the values and checking the residuals on the control screen. You can always revert back to the default calculated values by pressing the **Calc Parameters** button again.

The number of horizontal transformation parameters can be decreased to three from four by fixing the scale to unity using the Do not calculate scale check box.

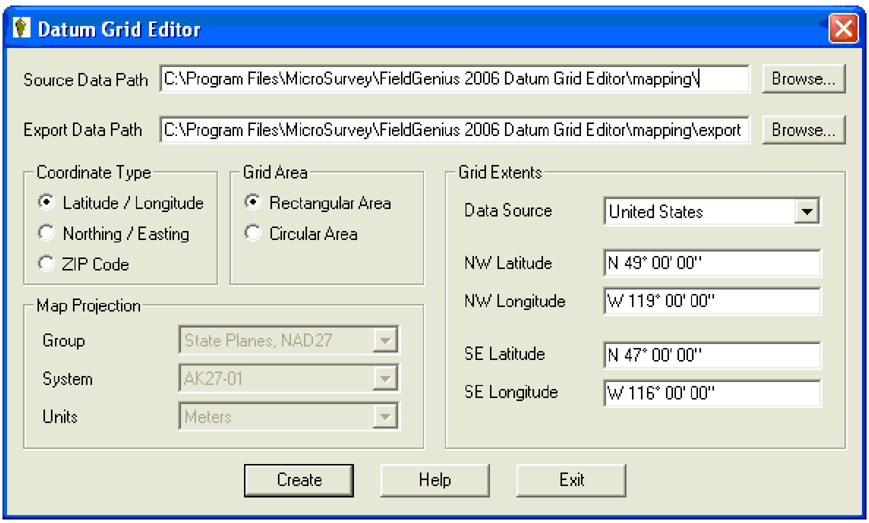
For the vertical component the determination of the parameters can be reduced to solving only for a vertical translation by toggling the parameter "**Do not calculate vertical slopes**". Upon enabling this, the parameters North Slope and East Slope will be automatically set to zero.

Datum Grid Editor

This is a desktop program that is installed on your desktop computer. You can start it by running "Datum Grid Editor" under the MicroSurvey\FieldGenius 2008 program group on your system.

The GPS module of FieldGenius requires geodetic datum transformation grids and geoid model grids in order to precisely determine positions in the user's coordinate system. Usually these grids are supplied by national organizations such as the National Geodetic Survey (USA) or the Geodetic Survey Division of Canada and the data files can be upwards to 15 megabytes in size. Data collectors are restricted in storage resources and cannot handle the large sizes of the grid files; therefore it is necessary to create smaller more manageable files. The Datum Grid Editor is a companion utility for FieldGenius to build smaller sub grids from the original grids while preserving integrity. The process of building sub grids needs to be repeated only when performing GPS surveys in locations which exceed the area of the original sub grids. The Datum Grid Editor is installed on the desktop machine from the CD that came with FieldGenius or from our website www.microsurvey.com/helpdesk.

When it starts, you will see the following dialog:



Data Paths

Installation of the Datum Grid Editor utility will include recent grid data for both the United States and Canada. The edit box for the source data path will contain the installed path for the datum configuration files and the respective national grid data. Newly built grids will be written to the path defined by the edit box for the export data path. The installation process will have created a specific export path. Paths can be modified by changing the contents of the edit boxes or by pressing the adjoining browse button and selecting the path from the presented directory tree.

Coordinate Type

Coordinates for defining the extents of the user sub grid can be either geodetic (latitude and longitude) or Cartesian (northing and easting). The contents of the Map Projection section and Grid Extents section will reflect the selected coordinate type. You can also specify a ZIP code that will define the center of your sub grid.

Grid Area

The user sub grid extents can be entered as a rectangle where the diagonal corners of the northwest boundary and southeast boundary are used. Alternatively a central coordinate can be used with a bounding radius. Selection of either boundary method will be shown as parameters in the Grid Extents section.

Map Projection

If using Cartesian coordinates (northing and easting) for defining the boundary of the sub grid, it will be necessary to select the appropriate map projection for deriving geodetic coordinates used with internal computations. The group field contains various national and regional coordinate systems composed of map projection and related horizontal datum. Each group will be composed of zones or sub coordinate systems and will be updated in the system field as the group field is changed. Finally the linear unit can be selected for the coordinate entry.

Grid Extents

The data source from which the sub grid is to be built must be selected and is defined by national organization. All necessary grids and supporting files will be built for FieldGenius including horizontal datum transformations, vertical datum transformations and geoid models. Be aware of the fact that the source data for both Canada and the United States extend beyond their political boundaries and therefore the choice of the source data is critical to avoid coordinate deviations.

The remainder of this section contains the boundary information for the user grid and its format will depend on the selected coordinate type and the selected grid area. Linear Cartesian coordinates do not need to be appended with a unit designator. Geodetic coordinates must be delimited with spaces to denote direction, degrees, minutes and seconds. Listed below are possible entries for geodetic coordinates with all being equivalent in value:

N 49 12 9.0 (direction, degrees, minutes, decimal seconds)

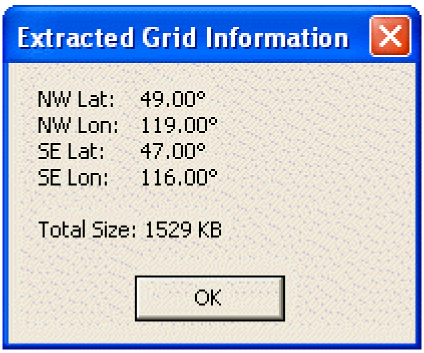
N 49 12.15 (direction, degrees, decimal minutes)

N 49.2025 (direction, decimal degrees)

Grid Creation

Once all parameters have been carefully selected, the sub grids can be produced by pressing the **Create** button. The time period for building the grids will depend on the area of the chosen grids and completion will be indicated by the following dialog which reiterates the grid extents and the total size of the sub grids and supporting files.

If the source path or export path described above are invalid, the appropriate message box will be presented to denote the error.

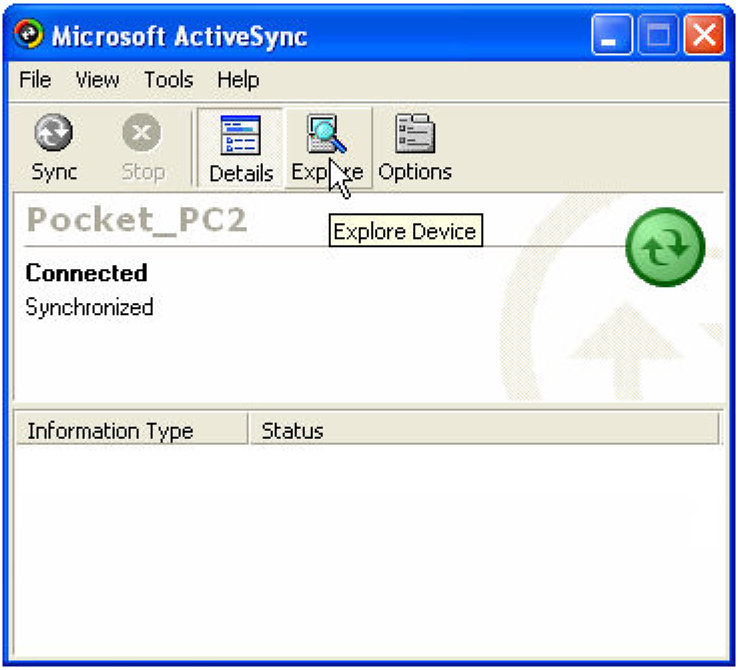


Transferring Data

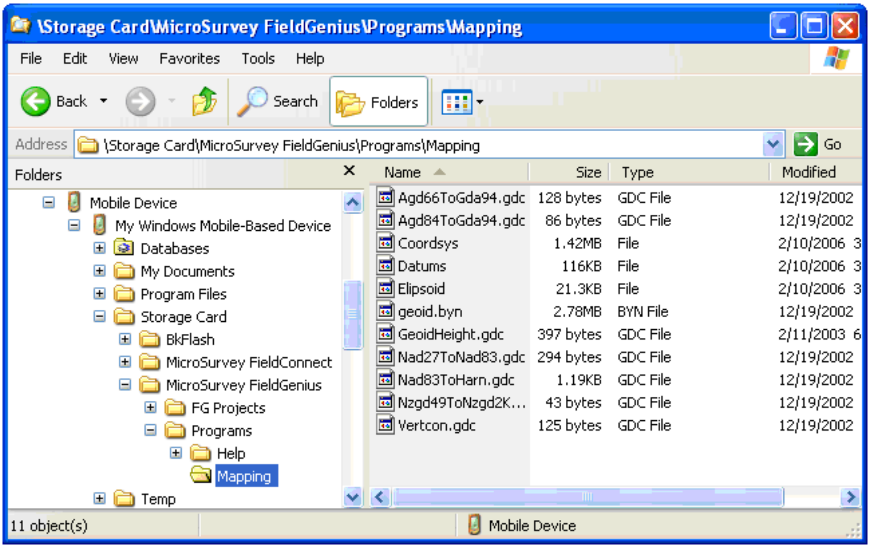
The final step in creating sub grids is transferring the entire contents of the defined export path to the data collector. Microsoft ActiveSync provides easy access to **Explore** the contents of the data collector.

Transfiriendo Datos

El paso final en creando sub-retículas es transferir el contenido completo de la ubicación de exportación definida al colector de datos. La aplicación Microsoft ActiveSync provee fácil acceso para iniciar la exploración de los contenidos del colector de datos.



After cutting or copying the contents of the export path, use the explorer to paste the files into the ...\MicroSurvey FieldGenius\Programs\Mapping\ path on the data collector. If prompted to overwrite the existing files while pasting, respond with yes.



NOTE: the path shown may not exactly match your device. Make sure you know where FieldGenius is installed in your data collector. It might be in SystemCF, C_Drive, Disk, Storage Card, SD Card, Built-in Storage, Program Files, or some other memory location.

ROAD REFERENCE

Roads Manager Menu

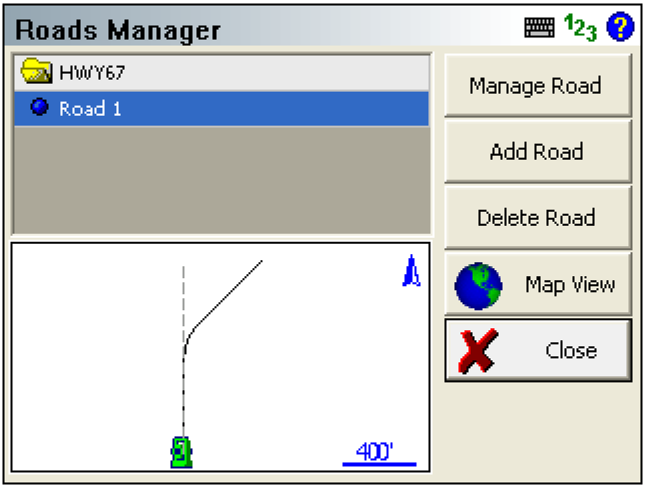
Main Menu | Roads Manager

To stake an alignment you first need to define the geometry that defines the horizontal and vertical element. You can also define a template that will be used to define cross sections at specific stations along the alignment.

FieldGenius can use the following three methods to define an alignment.

1. Manual Entry – You can manually enter the data to define the alignment.
2. Import XML – You can import a LandXML file that contains your alignment data.

To open the road editor go to **Main Menu | Roads.** This will open the Roads Manager screen.



By default you will see an alignment in the list with the current project name. In this example the project name is Hwy67. An alignment can contain multiple roads, and each road can contain the following elements.

- **Horizontal Element:** This can contain straight tangents, curves and spirals.

- **Vertical Element:** This can contain grade breaks, parabolic curves and non-symmetrical curves.
- **Templates:** Template can contain horizontal and vertical offsets, as well as widening and super elevation data.
- **XML Cross Sections:** XML cross sections define specific stations along an alignment. These sections contain horizontal, vertical and template data. XML cross sections are created using desktop software which is then imported into FieldGenius.

Manage Road

This option is only available once you've created a road using the New Road button or imported an XML file. To input or review alignment data, press the Manage Road button to access the Road Settings screen.

If you imported a LandXML file, or manually inputted a road you can stake it by pressing this button. As a minimum you need to have the following before the stake command will continue.

- XML Cross sections

- Horizontal C/L, Vertical Profile and template.

- Horizontal C/L and DTM Surface

Add Road

Use this button to create a new road. You can create as many roads as needed and they will be stored in an XML file that will reside is the project directory.

Delete Road

Use this to delete a road. You first need to highlight the road you want to delete, and then press the button to remove the road from the alignment. This road will be permanently deleted and can not be undone.

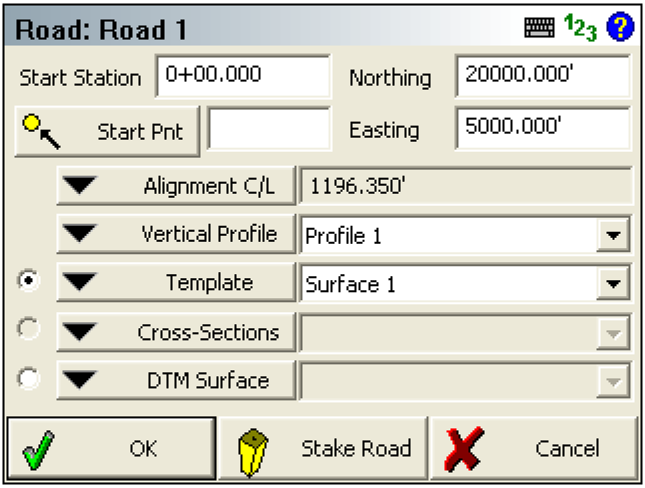
Map View

Use this button to display the map view. From this view you can use the zoom controls to zoom around your drawing so you can find important or relevant data for your alignment such as a POB point. Press the Close View button to return back to the Roads Manager.

Tell me more about ...
Road Settings
Manua Entry - Alignment C/L
Manual Entry - Vertical Profile
Manual Entry - Template
LandXML Cross Sections

Road Settings

The road settings screen is used to help you create, review or modify road elements.



From this screen you can do anyone of the following:

- Define start station
- Define start point or start coordinates
- Define the horizontal element
- Define the vertical profile
- Choose either a template or XML cross sections
- Choose an optional DTM surface

Define Start Station

Each road has to have a starting station defined. The starting station will place the station sign automatically for you after you enter the station. Stations generally are measured in 100 foot intervals when working in feet, and measured in 1000m intervals in metric projects.

There are three station format settings that you can choose from. You can change this by going to the Main Menu | Settings | Road Settings or by pressing the Alignment C/L button and selecting settings.

Stationing Format 0+000.000

Units Station

10 0+010.000

100 0+100.000

1000 1+000.000

1000.564 1+000.564

10000 10+000.000

Stationing Format 0+00.00

10 0+10.00

100 1+00.00

1000 10+00.00

1000.564 10+00.56

10000 100+00.00

Stationing Format 0.000

10 10.000

100 100.000

1000 1000.000

1000.564 1000.564

10000 10000.0000

Notes: Positive or negative start stations are valid.

Define Start Point or Coordinates

Every road that you create needs to have a starting location defined. You have two options available to define this location.

Start ID

If you have a point stored in your project's database that is also the start point for the alignment, you can use this point as the start location. Simply enter the point number in the Start ID field, or use the point chooser to select it from the map. Once you've selected the point, the point's northing and easting values will be displayed. At this point, the elevation is not needed because the profile is what defines the elevations along the road.

When you use the point chooser or enter a point id, all that will happen is the coordinates for the point are written to the alignment file. The next time you open the alignment file, you will no longer see the point ID that was used, you will only see the coordinate values.

Enter Coordinates

If you don't have a point that defines the start location, you can define it by entering a Northing and Easting value. You have to leave Start ID field blank if you want to enter coordinates.

Manual Entry - Alignment C/L

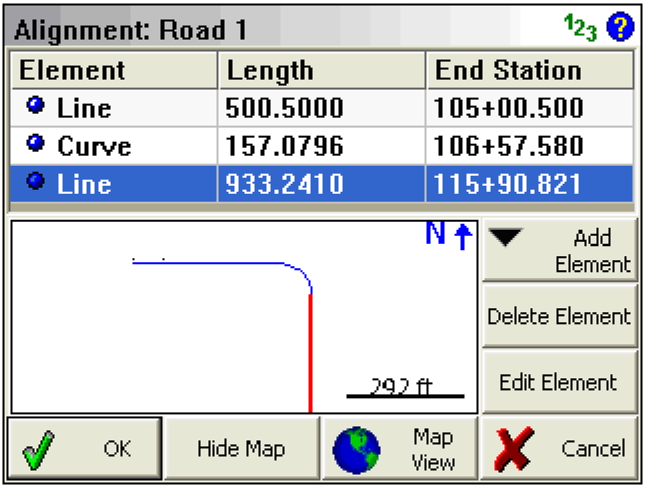
Main Menu | Roads Manager | Edit Road | Alignment C/L

To define the centerline data press the **Alignment C/L** button which will open a menu. On this menu select **Edit** to open the C/L Editor.

If you're entering a new road the C/L Editor will not have any elements listed. In the example shown below there are three elements defined; 2 tangents and 1 curve element. In the element list, it will always display the length of the element and its end station. Furthermore, all elements that are defined will be displayed in the Map so you can visually confirm that the geometry is correct.

Delete C/L Alignment

You can not delete a C/L Alignment once it has been created.



The C/L Editor can display a view of the map along the bottom. This view can be toggled on and off by pressing the **Show Map/Hide Map** button.

If you would like to zoom into or pan around the map, press the **Map View** button which will display zoom and pan controls. Press the Close View button when you want to return the C/L Editor.

Adding an Element

To add an element to a road you need to use the **Add Element** button. Once you press this you will see 5 options appear that will help you define the different elements supported by FieldGenius.

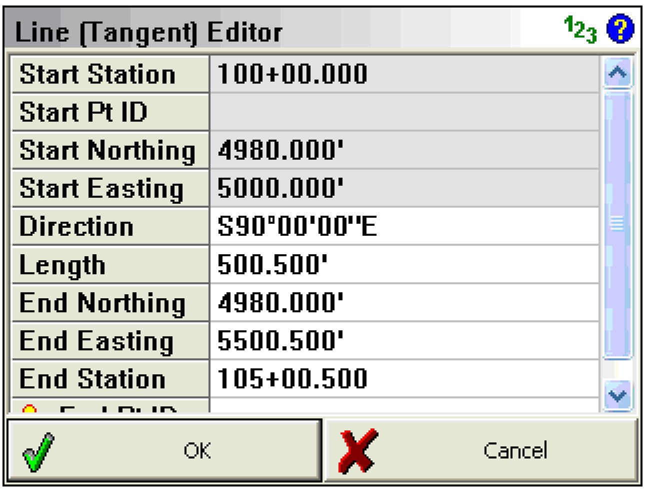
- Line (Tangent)
- Curve
- Spiral
- Spiral-Curve-Spiral
- Chain

Tip: When you're prompted for a distance or direction, you can always use the distance and direction recall features just like you would for COGO calculations.

Line (Tangent) Element

In the Line Element editor, gray fields indicate fields that can not be edited. All other non gray fields can be edited by the user. When you enter your known values and have confirmed their correctness, press OK to save these values, or press Cancel to exit without saving.

A tangent is defined by a direction and length. There are four ways you can define the tangent and they are explained in further detail below.



Direction and Length

If you know these two values, you can enter them in their respective fields. You will see that the end coordinates and end station will be computed automatically.

End Nothing and End Easting.

If you know the coordinates for the end of the tangent, you can enter them in the End Northing and End Easting fields. Once you've done this, the direction, length and end station fields will be updated automatically.

Direction and End Station

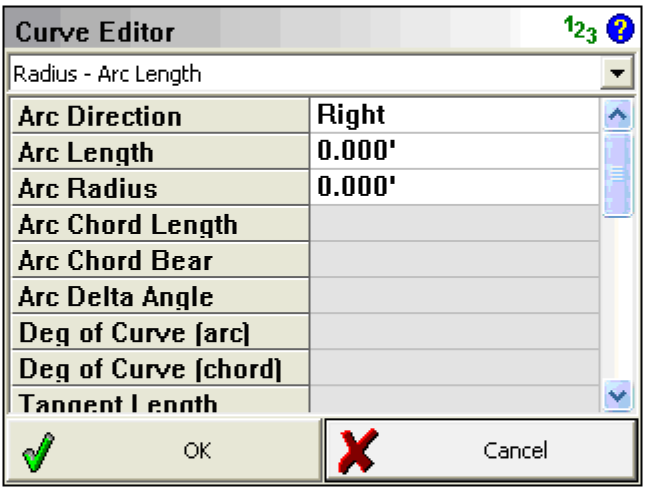
If you know the direction and end station of the tangent, enter these known values in their respective fields. Once you've done this, the length and end coordinate fields will be updated automatically.

End Point ID

If you have a point in the project database that defines the end of the tangent, you can enter the point number in the ID field, or use the point chooser to select it from the map. Once you've done this, the direction, length, end coordinates and end station fields will automatically be updated.

Curve Element

When you select this option your will see the curve editor with most of the fields being empty.



Define Known Data

You first have to define what known information you want to use to compute the curve. If you click on the drop down list you will see a list of all the options that can be used to compute the unknown values.

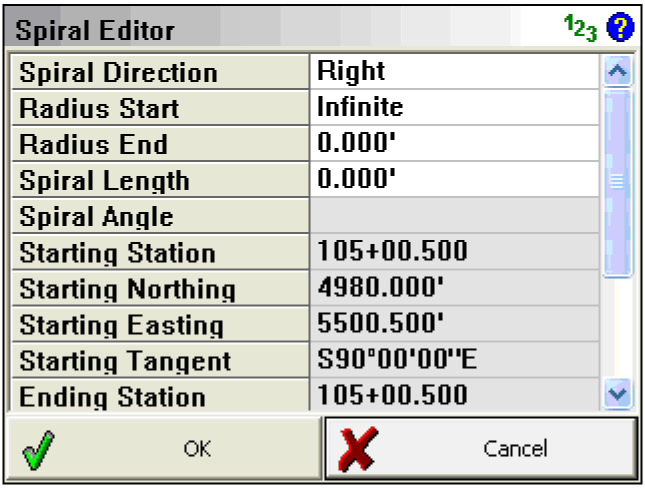
Enter the Known Data

Once you define the known data format, you will see grayed out fields which indicate they can't be edited. White areas indicate fields that can be edited, and these fields will match what you defined in the first step.

1. You always have to define the direction for the curve, either right or left.
2. Enter your know values.
3. You don't have to specify the PC point, the function will assume that you're beginning at the end of the last leg.
4. A PC Tangent direction will automatically be computed based on the previous tangent. You can always over ride this value if you need to define a non-tangent curve.
5. Press **OK** to save your inputted values, **Cancel** to exit without saving.

Spiral Element

When you select this option your will see the spiral editor. This will help you define a spiral segment for your alignment.



Define Known Data

To solve for this type of element you need to know:

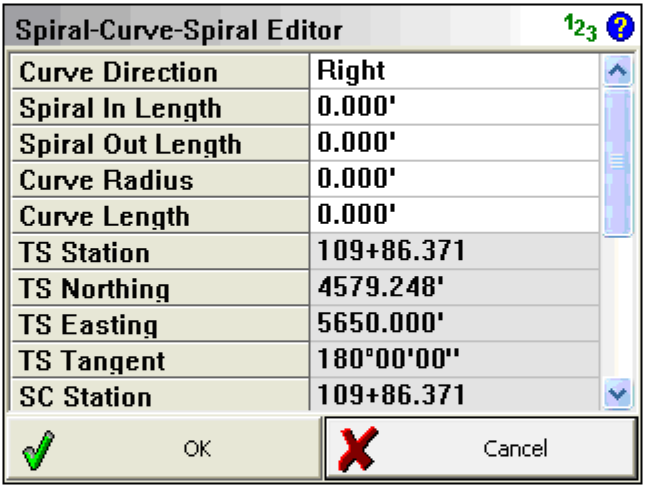
- Spiral Direction
- End Radius
- Spiral Length

In the editor, gray fields indicate fields that can not be edited. All other non gray fields can be edited by the user.

Press **OK** to save your inputted values, **Cancel** to exit without saving.

Spiral – Curve – Spiral

When you select this option you will see the Spiral – Curve – Spiral editor.



Define Known Data

To solve for this type of element you need to know:

- Spiral Direction
- Spiral In Length
- Spiral Out Length
- Curve Radius
- Curve Length

In the editor, gray fields indicate fields that can not be edited. All other non gray fields can be edited by the user.

Press **OK** to save your inputted values, **Cancel** to exit without saving.

Chain

Use this option if you want to select points or figures in your drawing to define the centerline and the profile (optional).

When you select the **Add Figure** option you will be taken to the map screen where you can select a figure.

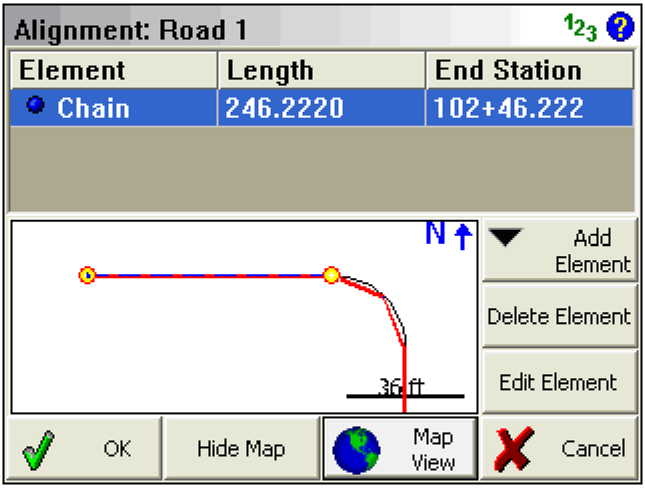
You can also add points individually by using the **Add Points(s)** button.

Press **OK** to save the chain, press **Cancel** to exit without saving.

> **Note:**
> You should only select Tangent sections for a Chain. If you Add a Figure which contains arcs or splines, the chain will straight-line any curved segments, so the resulting Chain length and stationing will not be the same as the original Figure.

Chain Element

When you return to the road editor you will see that a chain element has been created. Chain elements differ from regular elements in that even though a chain can be made up of line and curve elements, it will appear in the list as a chain.

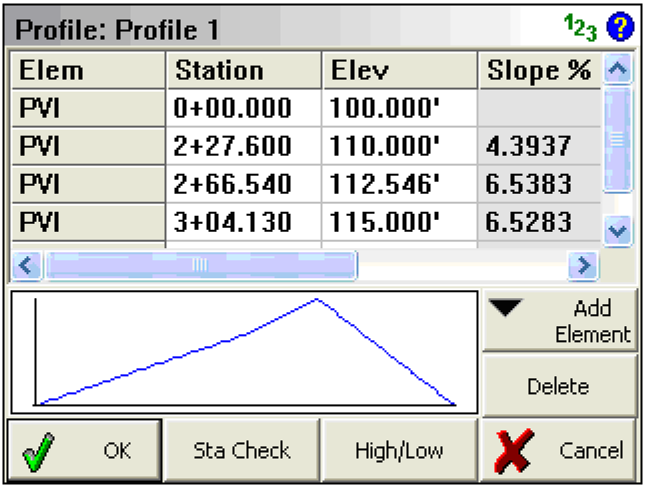


Auto Profile

After you press OK, you will be asked if you would like to create a vertical profile based on the chain point's elevation. If you select Yes, then you will be prompted for a Profile Name.

Vertical Profile

As mentioned above, a vertical profile can optionally be created automatically. If this option is chosen by the user, PVI points will be created for the profile. Each PVI point represents the points that make up the chain.



Manual Entry - Vertical Profile

Main Menu | Roads Manager | Edit Road | Vertical Profile

To create your vertical profile for your alignment, press the **Vertical Profile** button. When you do this you will see two options: New and Edit. Press **New** to create a new profile. If you want to edit an existing profile, then you need to select the profile, and then press the **Edit** button.

Delete Profile

You can not delete a profile once it is created.

Para crear su perfil vertical para su alineamiento, presione el botón **Perfil Vertical**. Cuando usted haga esto usted verá dos opciones, nuevo y editar. Presione **Nuevo** para crear un nuevo perfil. Si usted quiere editar un perfil existente, entonces usted necesita seleccionar el perfil, y entonces presionar la opción **editar**.

Borrar Perfil

Usted no puede borrar un perfil una vez que este es creado.

Profile Editor Overview

When you create a new profile you will see the profile editor. The **Add Element** button is the command center for you profiles and it allows you to add profile elements:

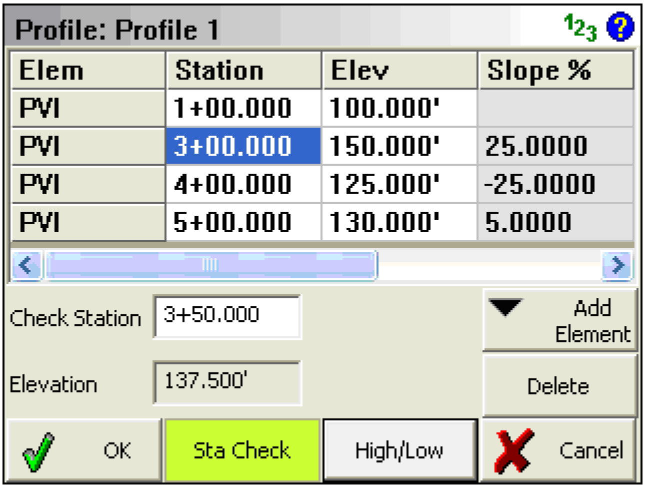
- PVI
- Parabolic Curve
- Unsymmetric Parabolic Curve

Once created, you can always edit and delete each element.

Station Check

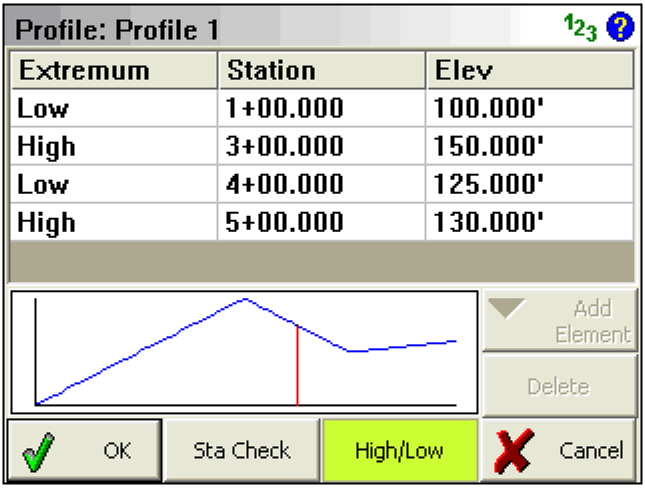
Use this button to calculate an elevation along your vertical profile at the station you define. In the example below you will see the station entered was 3+50, and the computed elevation is 137.50.

The station check button can be used with all vertical element types.



High / Low Display

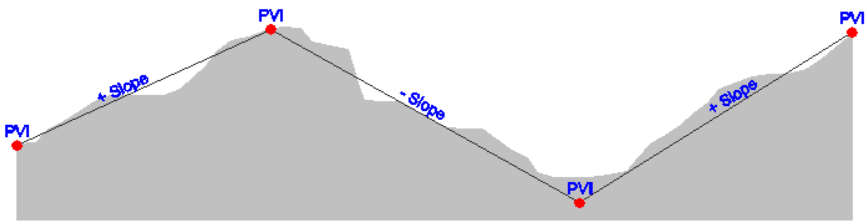
When you use the High / Low button it will compute the high and low points for your vertical profile.



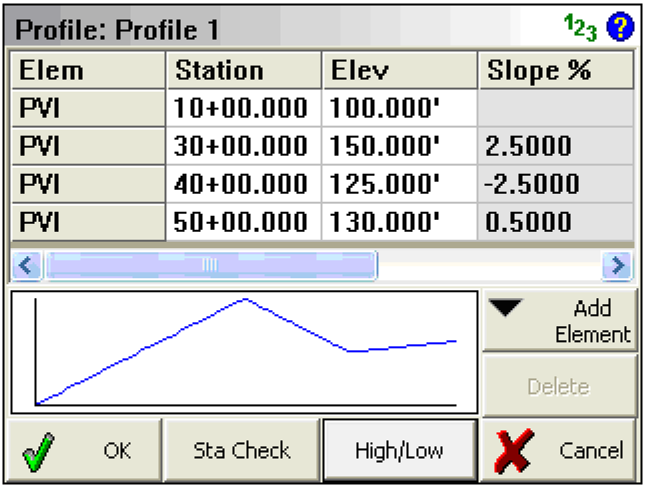
In the example above you can see that the high and low points are listed in the grid. This option can be used to display the high / low information for all vertical profile elements.

PVI Element

PVI elements are essentially straight grade segments that change direction at grade breaks. Each grade break (PVI) has to be defined by a station and elevation.

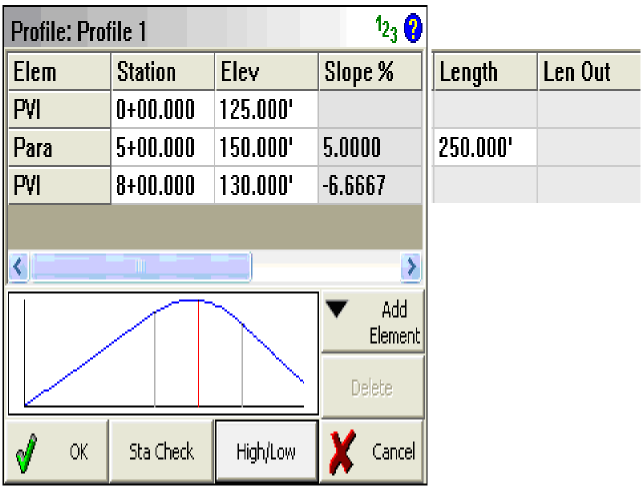


When you select to add a PVI element you will have two fields available where the station and the elevation at that station can be entered. Once you have a minimum of two PVI points, the slope of the line will be displayed.



Parabolic Curve Element

This option allows you to enter an equal tangent vertical parabolic curve. As a minimum you need to know the **PVI station**, **PVI Elevation** and **Curve Length** for your vertical curve. Furthermore if this is a new profile you need to define a PVI point before the vertical curve, as well as define a PVI, Parabolic, or Unsymmetrical Parabolic curve after the vertical curve. Elements are needed before and after the vertical curve element so the profile editor can calculate the tangents.



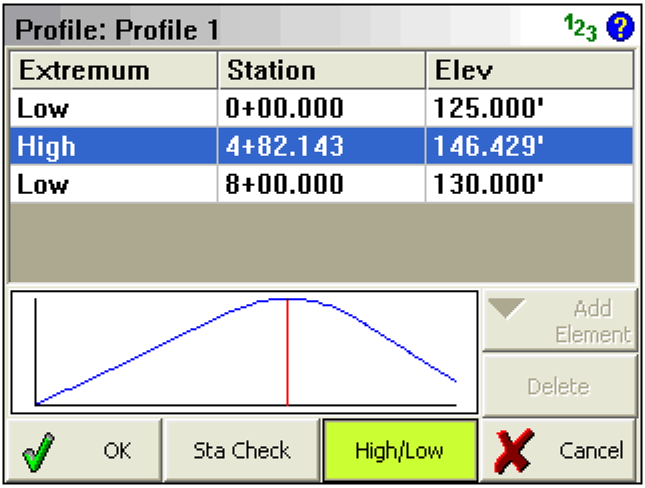
In the example you will see that a PVI was established for the beginning of the vertical profile. Then the PVI for the vertical curve was defined, as well as another parabolic curve. You will also notice that if you click a para element, its location will be displayed in the display area.

Station Check

You can also do a station check on a parabolic vertical curve. Simply press the Sta Check button and enter the station you would like to compute an elevation for.

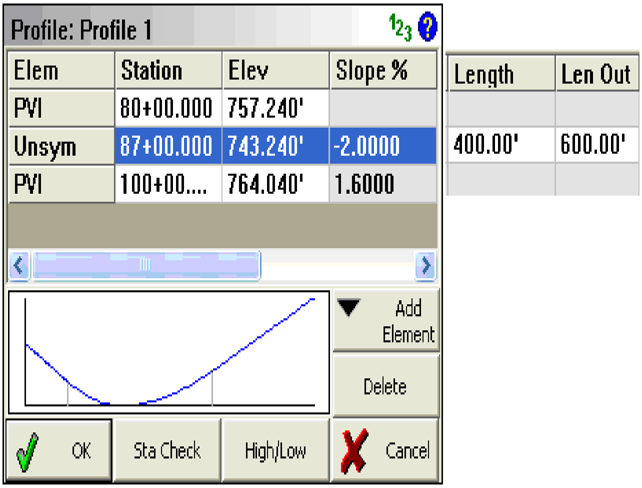
High / Low Calculation

With all vertical curves, the high or low point can be computed. For example, if we use the High/Low button to compute this information you will see the high point is at station 4+82.143 at an elevation of 146.429'.



Unsymmetrical Parabolic Curve Element

This option allows you to enter an unequal tangent vertical parabolic curve. As a minimum you need to know the **PVI station**, **PVI Elevation**, **Curve Length In** and **Curve Length Out** for your vertical curve. Furthermore if this is a new profile you need to define a PVI point before the vertical curve, as well as define a PVI, Parabolic, or Unsymmetrical Parabolic curve after the vertical curve. Elements are needed before and after the vertical curve element so the profile editor can calculate the tangents.



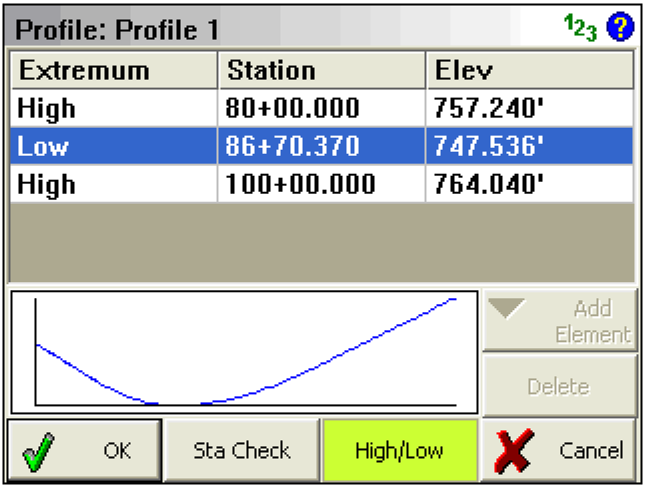
In the example you will see that a PVI was established for the beginning of the vertical profile. Then the PVI for the unsymmetrical vertical curve was defined, as well as another PVI element. You will also notice that if you click a Unsym element, its location will be displayed in the display area.

Station Check

You can also do a station check on an unsymmetrical vertical curve. Simply press the Sta Check button and enter the station you would like to compute an elevation for.

High / Low Calculation

With all vertical curves, the high or low point can be computed. For example, if we use the High/Low button to compute this information you will see the low point is at station 86+70.370 at an elevation of 747.536'.

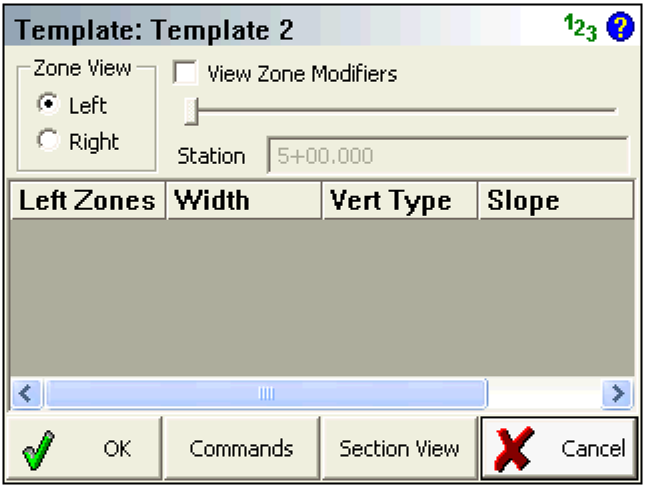


Manual Entry - Template

Main Menu | Roads Manager | Edit Road | Template

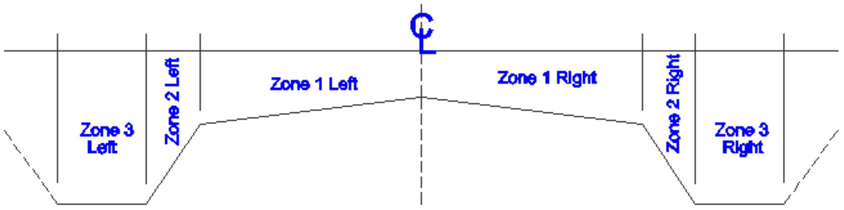
You can define templates that will be used to create a cross section along your alignment. You can create new templates, and edit existing ones you've created. Each template can have unlimited zones right or left of the centerline. Each template can contain zone modifiers that can help you define sections that need widening or superelevation.

When you create a new template you will be asked for a template name. After you enter the name you will see the Template editor.



Add Zones

Many software programs refer to templates as having segments, in FieldGenius they are referred to as zones. Zones contain horizontal and vertical components, and these zones are located on the right or left of the template centerline.

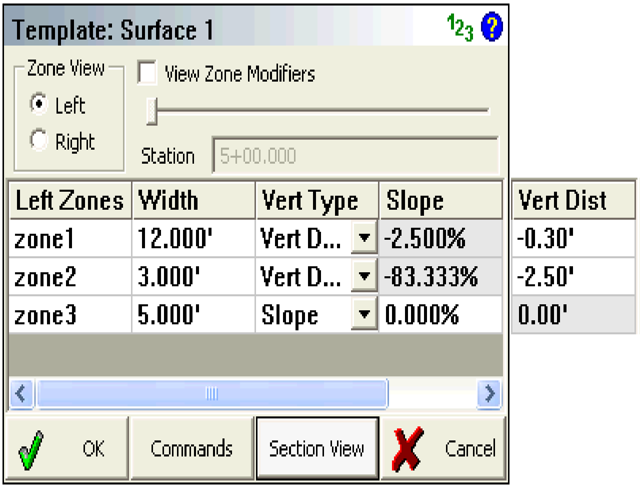


You first need to define what side of the centerline your zone belongs to: **Left** or **Right**.

Once you do that you can choose the **Add Zone** command from the **Commands** button.

When you select the add zone command you will see your first zone item appear in the grid area. You need to enter a horizontal width distance and then specify how you will be defining the slope for the zone. The slope for the zone can be defined by entering a slope value (%) or a vertical distance also referred to as a delta Z. In the example shown below you will see that three zones have been defined for the left side of the template.

By default all new zones are attached to the zone found furthest from the centerline.



Delete Zones

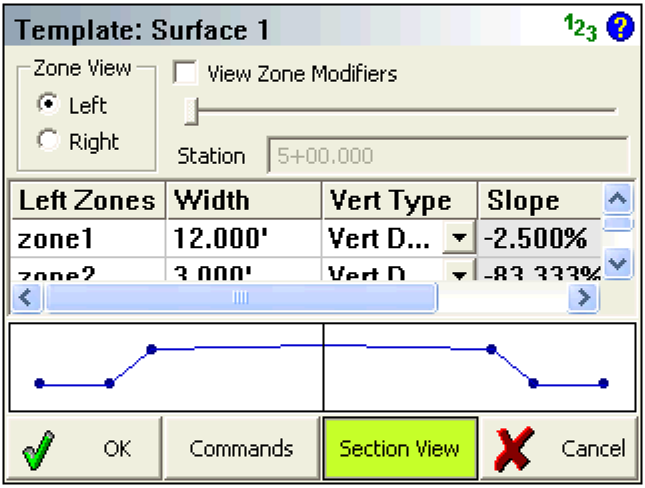
Any zone that is highlighted in the zone list can be deleted by using the **Delete Zone** command. There is no undo, so be careful when you use this command.

Clear All

At any time, you can clear the zone list so you can start over. To do this use the **Clear Zone** command. There is no undo, so be careful when you use this command.

Mirror Zones

There are two variations of this command. You can mirror your zones from left to right, or right to left. In our example from above, when the **Mirror Left to Right** command is used, the zones are duplicated on the right side of the template.



Note: Depending on what side you're displaying, you will only see the zones listed for that side of the template. To see the zones for the other side you need to change to the opposite side using the Left Zone and Right Zone buttons.

Move Zone

Zones can be shifted around by moving them in or out form the centerline. To do this, use the **Move In** and **Move Out** commands.

View Zone Modifiers

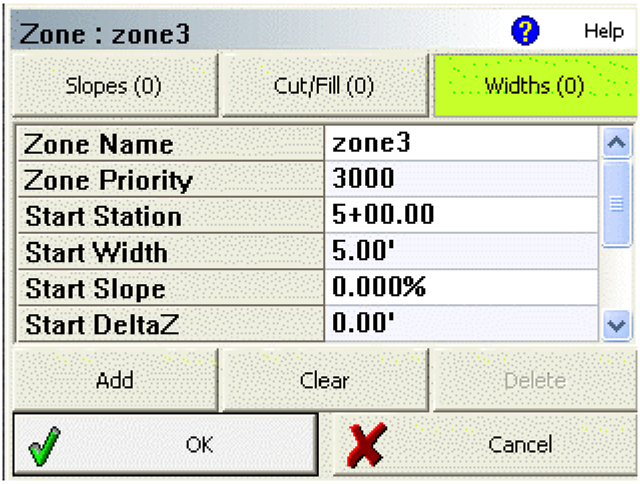
The template you define is a typical cross section for the entire alignment. You can define changes to the template at specific stations and these changes are referred to as **Zone Modifiers**. Zone modifiers modify the typical template to allow for deviations such as road widening and super elevations.

This tool is meant to be used when you've defined zone modifiers. Please see the advanced template editing for more information.

Advanced Zone Edit

Advanced editing of your zones is available to give you even more power and flexibility. Being able to modify the zones at specific stations, allow you to create template transitions, widenings and superelevation transitions.

You first need to highlight the zone you want to modify in the zone list. Once you do that press the **Advanced Zone Edit…** command. This will then display the zone editor for the zone you've selected, in this example it is zone 3.



By default when you create a zone, the width, delta elevation and slope are used from the beginning of the zone to the end. The start and end stations are determined by start and end station defined in the horizontal alignment.

Slopes Modifier

When you use this button you will see the slope modifier page. On this page you can define different modifiers that change the slope or delta Z value for the zone.

Cut/Fill Modifier

When you use this button you will see the cut/fill modifier page. On this page you can define different modifiers that change the cut / fill value for the zone.

Note: This function is currently not implemented fully and is reserved for a future version. Slope values from the hinge point can be set in the Options screen.

Widths Modifier

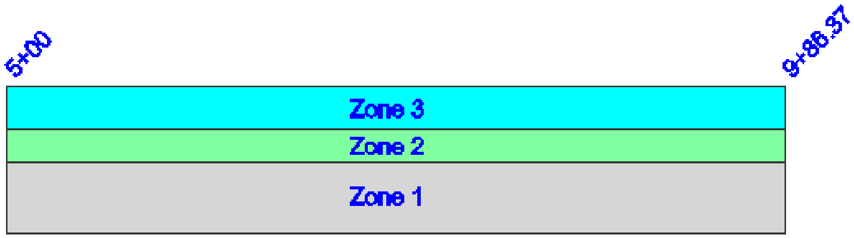
When you use this button you will see the widths modifier page. On this page you can define different modifiers that change the width value for the zone.

Advanced Template Editing

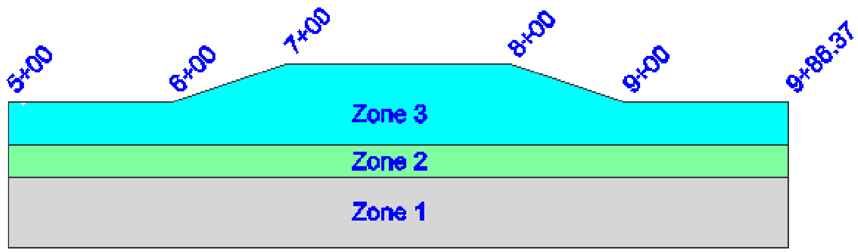
Advanced Zone Edit – Widening Example

In this example we will use the template example from the Template section. We want to widen the template at a specific station and change the grade of the template.

The original zone 3 has a constant elevation and width from beginning to end, but we want to modify it to include a section that has a slope and width difference.



The new zone 3 will look like the following example. From station 6+00 to 7+00 the width of the zone transitions from a width of 5' to 10' and the elevation transitions from 0 down to -2'. Then from station 8+00 to 9+-00 it transitions back to the normal width and grade.



Slope Modifier

First you need to highlight the zone that you want to add modifiers to.

Then select the **Advanced Zone Edit** command from the commands button. This will open the zone modifier screen for the zone. In our example, we'll be modifying zone 3 on the left side of the template.

To add slope modifiers, press the **Slopes (#)** button. From here you can press the Add button to add modifiers for the zone. The following table shows the information that would have been inputted.

You have to define if you are entering a relative vertical change, or want FieldGenius to compute it for you using a slope percent and horizontal distance for the zone. You can do this by selecting the Vert Type and set it to Vertical Distance or Slope.

Start Station	Start Slope	Start Delta Z	End Station	End Slope	End Delta Z
6+00	0.0%	0.00	7+00	-20.0%	-2.00
7+00	-20.0%	-2.00	8+00	-20.0%	-2.00
8+00	-20.0%	-2.00	9+00	0.0%	0.00

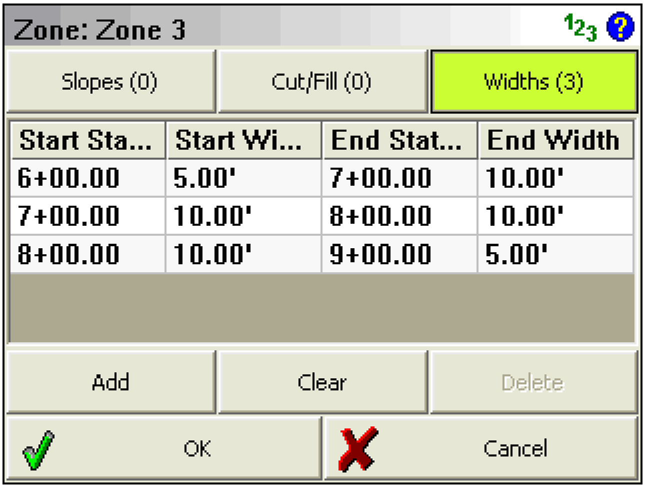
Press **Ok** to save the modifiers.

Widths Modifier

First you need to highlight the zone that you want to add modifiers to.

Then select the **Advanced Zone Edit** command from the commands button. This will open the zone modifier screen for the zone. In our example, we'll be modifying zone 3 on the left side of the template.

To add width modifiers, press the **Widths (#)** button. From here you can press the Add button to add modifiers for the zone. The following table shows the information that would have been inputted.

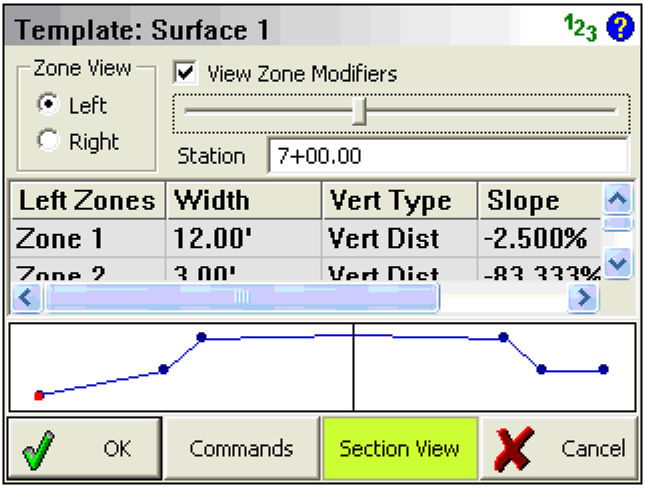


Press **Ok** to save the modifiers.

Checking Width Modifiers

At any time from the Template editor you can confirm that your modifiers are correct by using the station slider.

If we use our example from above, and want to preview the template at station 6+00, you can do so by entering it in the station field.

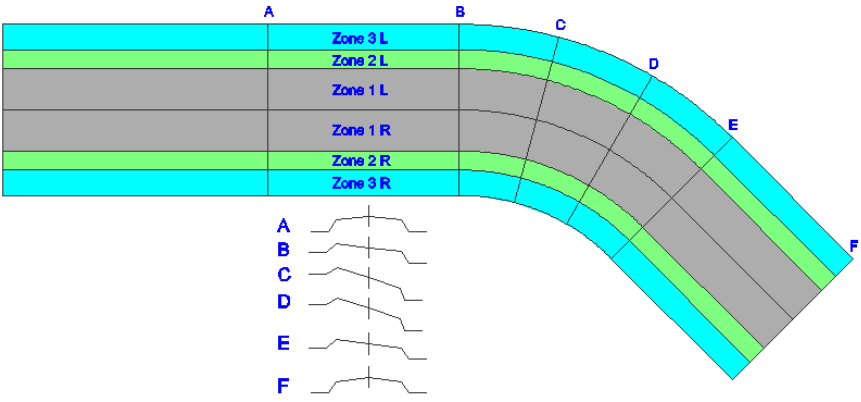


If we check station 7+00 you will see that the zone now extends further and drops down.

Advanced Zone Editing – Superelevation

In this example we will use the template example from the Template section. We want to add superelevation data to our template so it can be staked in the field. FieldGenius can not calculate superelevations; you need to know what delta z or slope the zone should be transitioning for your superelevation section.

To do this we will be adding slope modifiers to Zone 1 L and Zone 1 R.



Labels A to F show the stations where we will be adding modifiers to modify the template so the road transitions from normal crown to full superelevation and back. **Note:** In this example the superelevation is exaggerated for ease of viewing.

Slope Modifier

First you need to highlight the zone that you want to add modifiers to.

Then select the **Advanced Zone Edit** command from the commands button. This will open the zone modifier screen for the zone. In our example, we'll be modifying zone 3 on the left side of the template.

To add slope modifiers, press the **Slopes (#)** button. From here you can press the Add button to add modifiers for the zone. The following table shows the information that would have been inputted.

Left Side Zone 1

Start Station	Start Slope	Start Delta Z	End Station	End Slope	End Delta Z
900	-6.7%	-0.80	1000	6.7%	0.80
1000	-13.3%	-1.60	1078.54	13.3%	1.60
1078.54	-26.7%	-3.20	1157.08	13.3%	1.60
1157.08	-26.7%	-3.20	1235.62	6.7%	0.80
1235.62	-13.3%	-1.60	1300	-6.7%	-0.80

Right Side Zone 1

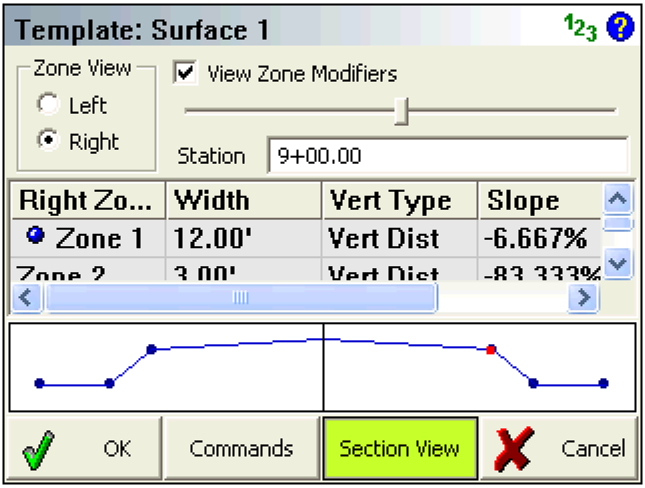
Start Station	Start Slope	Start Delta Z	End Station	End Slope	End Delta Z
900	-6.7%	-0.80	1000	-13.3%	-1.60
1000	-13.3%	-1.60	1078.54	-26.7%	-3.20
1078.54	-26.7%	-3.20	1157.08	-26.7%	-3.20
1157.08	-26.7%	-3.20	1235.62	-13.3%	-1.60
1235.62	-13.3%	-1.60	1300	-6.7%	-0.80

Press **Ok** to save the modifiers.

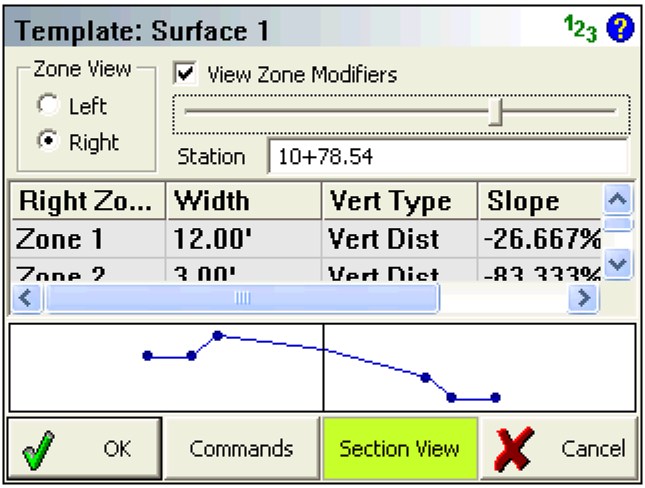
Checking Width Modifiers

At any time from the Template editor you can confirm that your modifiers are correct by using the station slider.

If we use our example from above, and want to preview the template at station 9+00, you can do so by entering it in the station field. You will see at this station we have a typical road cross section.



If we check station 10+78.54 you will see that we are at the full superelevation section.

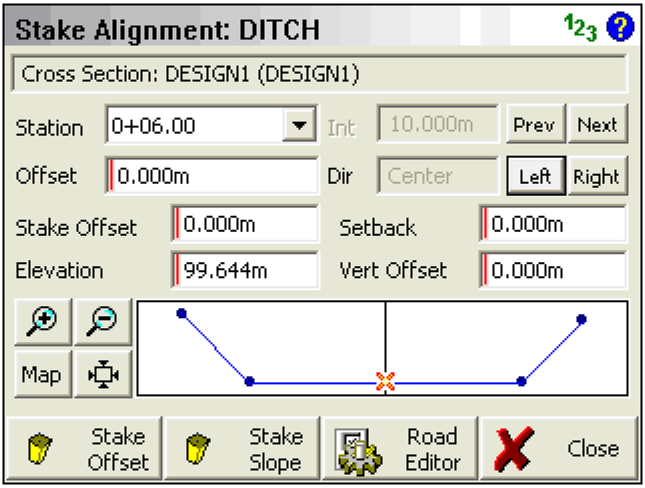


LandXML Cross Sections

Main Menu | Roads Manager | Edit Road | Cross-Sections

LandXML cross sections are created with desktop software such as Eagle Point, Caice, LDD and many others.

If you import a LandXML file that has cross sections in it, you can immediately go to the Roads Manager and select the road to stake. You will see the roads in the Cross-Sections list. Choose one, then press the Stake Roads button you will see the stake Alignment screen.



Please see the Stake Alignment section for more information about using this command.

Alignment DTM Surface

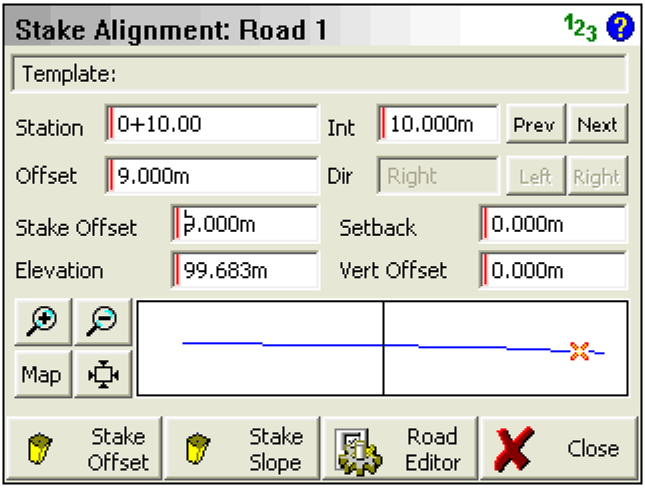
Main Menu | Roads Manager | Edit Road | DTM Surface

If you've imported a surface file, either through the QSB or LandXML importer, you can stake to the surface along a defined horizontal alignment.

All you need to do is define the alignment using the **Alignment C/L** button then select a surface from the surface drop down list found next to the **DTM Surface** button.

When you press the **Stake Road** button you will see the alignment screen. In the area where you would normally see your cross section or template, you will now see the surface at the stake station you have defined.

If you enter a Design Offset, it will compute an elevation based on the surface.



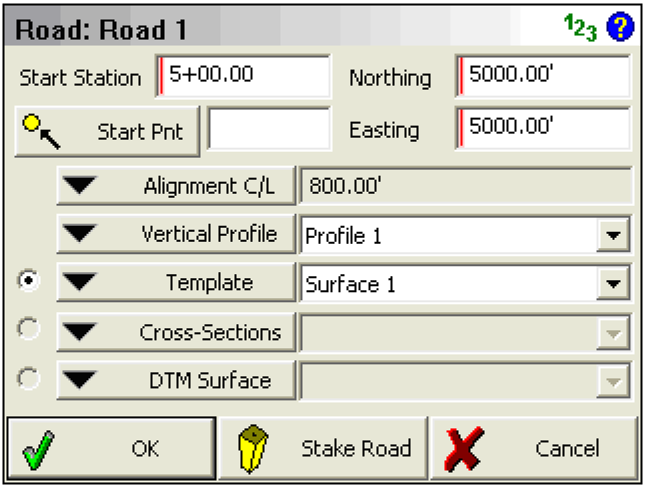
Alignment Staking - Part 1

There are two things that have to happen before you can stake a road.

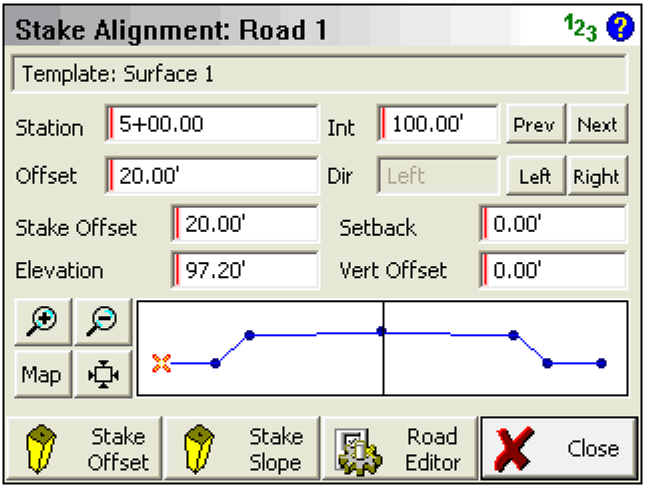
1. You have to create an alignment, vertical profile and a template. Or…
2. Import a LandXML file and use XML cross sections to stake from.

Stake from Alignment, Profile and Template.

If you've taken the time to define your alignment, you need to select the vertical profile and template that you want to stake from in the road settings screen.



Use the **Stake Road** button to start the road staking which will display the Stake Alignment screen.



Station and Station Interval

If you enter a station interval, it will move forward and back along the alignment by this amount when you use the **Prev** and **Next** buttons. This interval will start from the station that is currently entered in the Stake Station field.

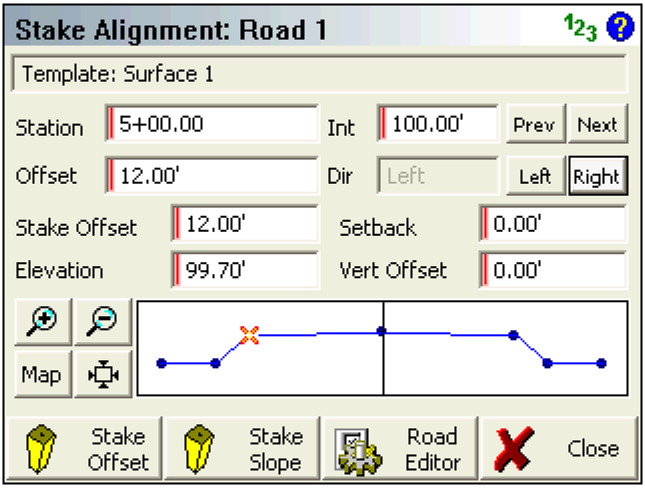
Stake Station

You can also manually enter the station you would like to stake by entering it in the Station field.

Design Offsets

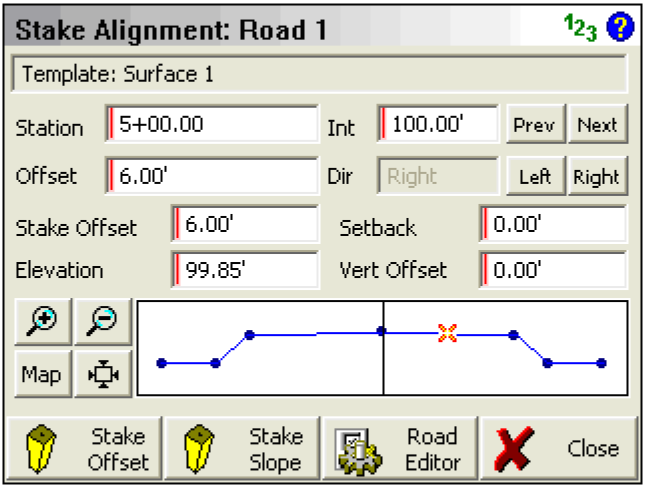
Move Along Template

You can move along the template by using the left and right buttons. As you do this the offset from the centerline will be displayed in the Design Offset field. Furthermore you will see what side of the template you're on by looking at the direction field. As you can see below, the user moved along the template until they were 12m left of centerline. You will also note in the drawing the "x" visually marks the design offset.



Define an Offset

You can define your own offset to stake by entering the value in the design offset field. You will see below that an offset of 6' was defined. To enter a Left offset, use a negative value.



Stake Offset and Setback

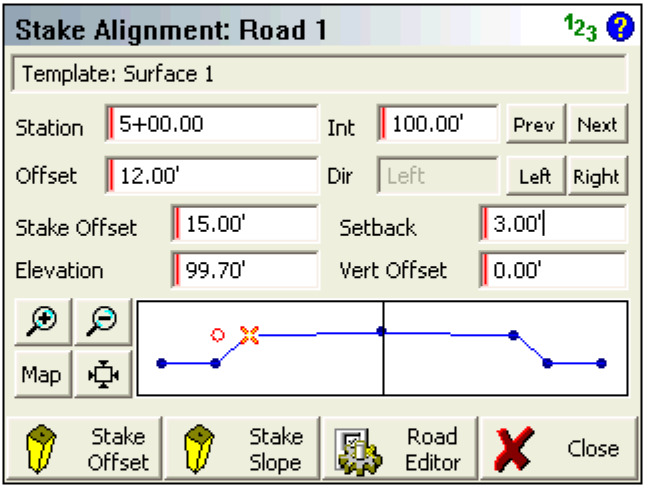
Stake Offset

By default the Stake Offset will equal the Design Offset value. The stake offset is designed to help you enter the offset that you want to stake your point at. Sometimes, the contractor asks you to stake a point at a certain distance from the centerline, this will help you do that.

Setback

The setback and stake offset fields work in conjunction with one another. You will note that as you enter a stake offset, a value is computed in the setback field. This value is computed by subtracting the Stake Offset from the Design Offset.

If you know that the offset or setback for a template point is to be a specific value, enter the value in the setback field; the stake offset field will update automatically.



You will note that when a setback or stake offset is defined, you will see an orange circle in the preview screen. This circle indicates the location of the setback.

Note: If you want to make sure that you're staking nothing but design points along the template, then make sure the Setback field is equal to 0.0.

Elevation and Vertical Offset

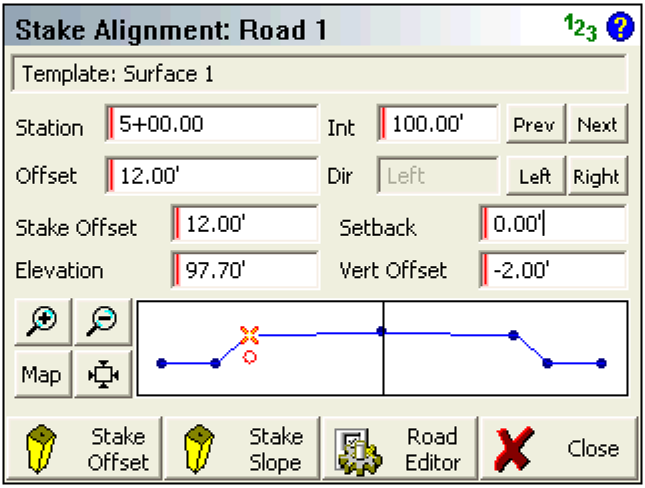
Elevation

The field will show you the computed elevation on the template at the design offset specified. This value can be changed to allow you stake a different elevation.

Vertical Offset

This field works in conjunction with the elevation field. If the user enters a different elevation than the one that was computed on the template, the difference between the elevations is shown in the vertical offset field.

If you know what the vertical offset is for the point you're staking on the template, you can enter it in this field. You will see the elevation for the point update to reflect the offset you defined.



You will see above that a vertical offset of -2 was defined. In the template preview screen you will see an orange circle. This circle indicates the location of the vertical offset point that will be staked.

Note: If you want to make sure that you're staking nothing but design points along the template, then make sure the Setback field is equal to 0.0.

Template Preview

You can zoom into your template using the zoom controls. You can also pan the template by tapping on it and dragging it on the screen.

Use the Map button to display the location of the template along you alignment. This will be displayed in the map view window.

Stake Offset

Once you've defined that point you want to stake, you can select the **Stake Offset** button to start the staking process. When you press this button you will see the staking toolbar. For an explanation of the staking toolbar and alignment staking, please refer to the next section, Alignment Staking - Part 2.

Stake Slope

This is the **Stake Slope** toggle. Normally you will slope stake from the hinge point on the template, but it is totally up to you. The slope staking feature can be used from any point on the template.

Road Settings

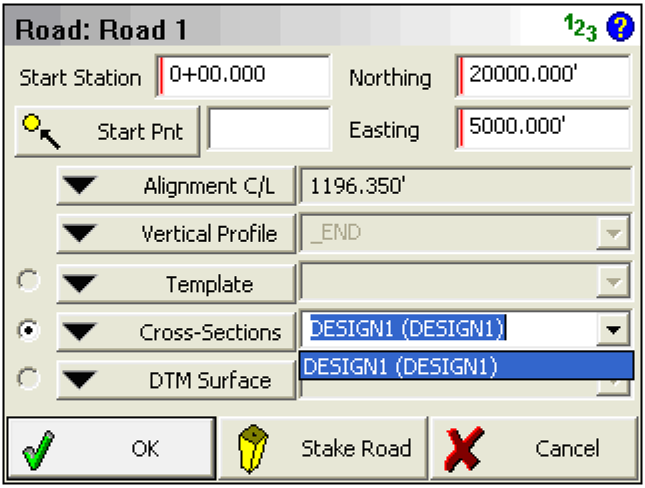
Press this button to return to the road settings screen.

Stake Cross Section from LandXML

To stake cross sections from a LandXML file you first need to import it using the LandXML importer found in the Import Menu.

You can then select the alignment form the map screen to open the Roads Manager, or you can access it form the **Roads Menu**. In this menu you can select the alignment that has the cross sections, and then press the **Road Settings** button.

You then have to select the cross section that you want to use by selecting it in the cross sections field.

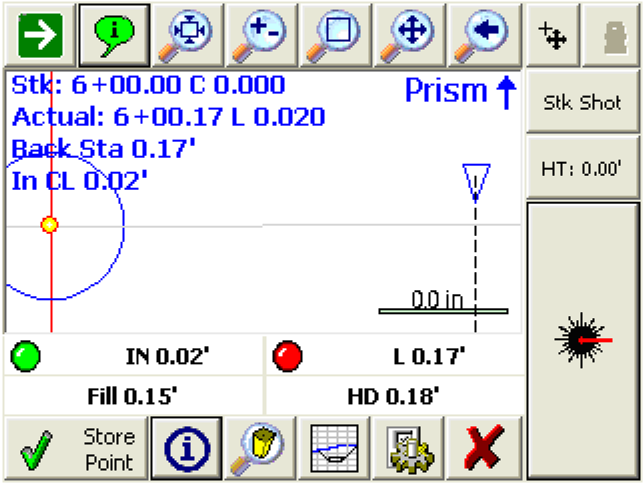


When you press the **Stake Road** button you will see the Stake Alignment screen which is described in detail above.

Alignment Staking - Part 2

From the stake alignment screen, when you press the **Stake Offset** button you will see the staking toolbar.

The staking process is similar to normal point staking. What is different is you will see more information about where the prism is in relation to the alignment and more importantly, the point you've staking.



Alignment Offset Values

In the map view you will see values that help you determine where you are and where you need to move to stake your point.

STK: 6+00.00 C 0.00 – This indicated the station and offset that was defined in the stake alignment screen. **C** indicates that it is on centerline, **R** indicates right of centerline and **L** indicates left of centerline.

Actual: 6+00.17 L 0.020 – This display the current station and offset at the prism.

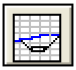
Back Sta 0.17' – This indicates how much you need to move forward or back along the alignment to stake the point. If you need to move forward, you will see the word **Forward**. If you're right on the station you will see **On Station**.

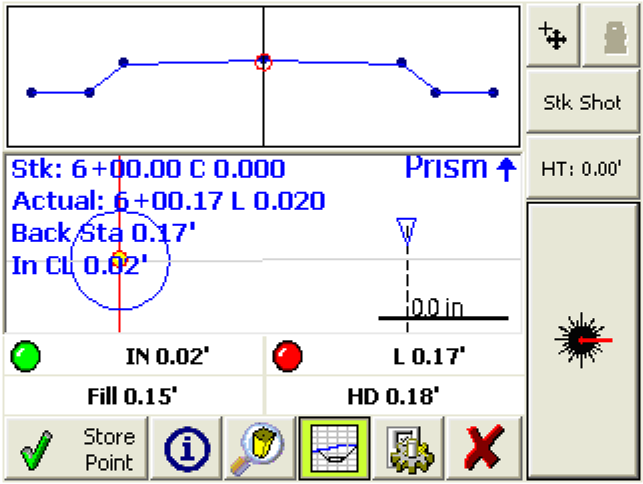
In CL 0.02' – This is the amount you need to move in or away from the centerline to stake the point. If you need to move away, you will see the work **Out**. If you're right on the offset, you will see the word **On Offset**.

Template Preview

At any time during your stakeout you can check to see where your shot is in relation to the template defined for the alignment.

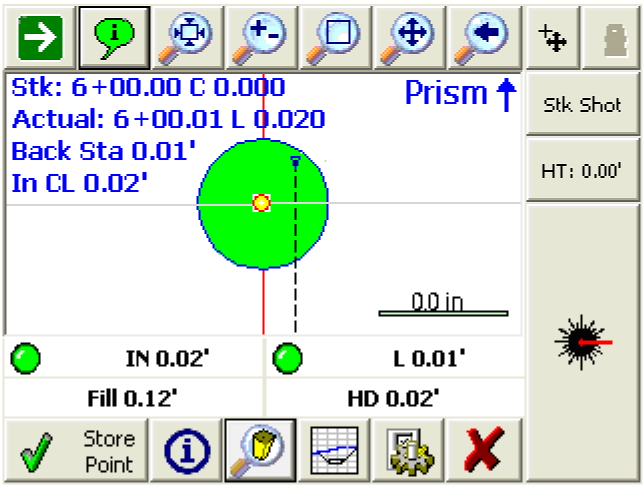
When the Template button is pressed you will see an orange circle which indicates the actual position of the rod.



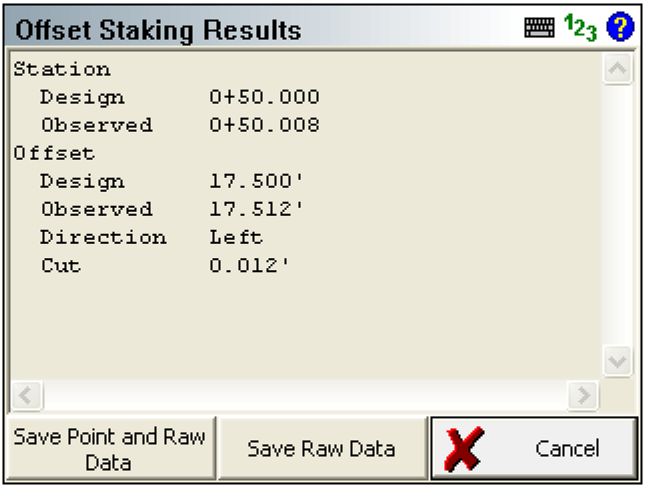


Store Point

When you are ready to store the stake point press the **Store Point** button. You will then see the results for your stakeout.



If you are using GPS to stake the alignment, then you will not see the Store Point button. Instead, press the Measure button to trigger the measurement and store the shot.



Press **Save Point and Raw Data** to store a point for this shot and to write your stake and cut sheet records to the raw file. By default the description for the stored stake point will equal the station and offset that was being staked.

Press **Save Raw Data** to write your stake and cut sheet records to the raw file, without storing a point..

If you press **Cancel**, nothing is stored or written to the raw file.

Records written to raw file

Following are the records that are written to the raw file when you store a point.

```
SP,PN4,N 20000.0068,E 5000.0099,EL100.1038,--0+00.00
C 0.000
CF,ST0.000,OD1,OL0.010,EL100.1038,GD100.0000
OE,ST0.000,OE0.010
DE,PN,N 20000.000,E 5000.000,EL100.000,--
SD,ND-0.007,ED-0.010,LD-0.104
SK,OP1,FP4,AR201.48000,ZE93.10000,SD269.6600,--
0+00.00 C 0.000
```

If you have the Store Staked Point toggle turned off the stake settings screen then no SP record is recorded as no point was stored in the database.

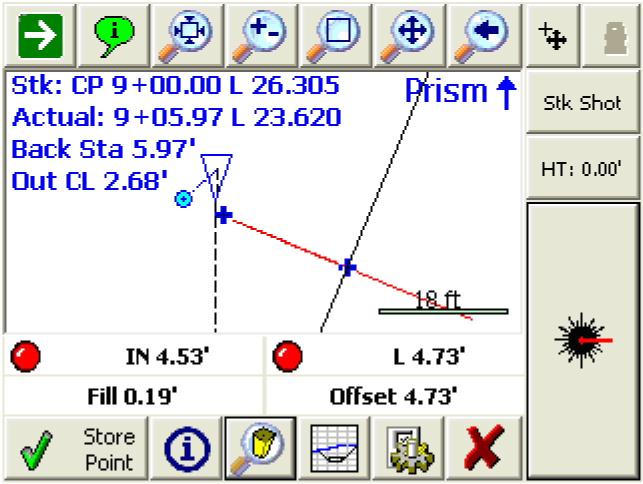
```
CF,ST0.000,OD1,OL0.010,EL100.1038,GD100.0000
OE,ST0.000,OE0.010
DE,PN,N 20000.000,E 5000.000,EL100.000,--
SD,ND-0.007,ED-0.010,LD-0.104
```

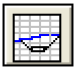
```
SK,OP1,FP,AR201.48000,ZE93.10000,SD269.6600,--
0+00.00 C 0.000
```

Alignment Slope Staking

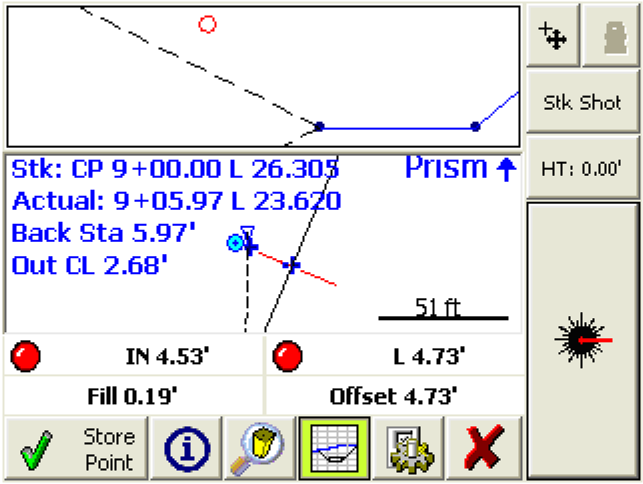
When you're staking a point from a template, you can select the **Stake Slope** button form any point. However, you will usually slope stake from the hinge points on your template.

When you start slope staking and you measure your first shot, the program computes an intersection between a horizontal plane and the slope defined in the stake settings. At this point, FieldGenius will compute a best guess location of the catch point and will tell you how much you need to move. After you measure a second shot, FieldGenius will create an imaginary line between these the two shots and intersects the slope from the hinge point. It then computes a new solution for the catch point.

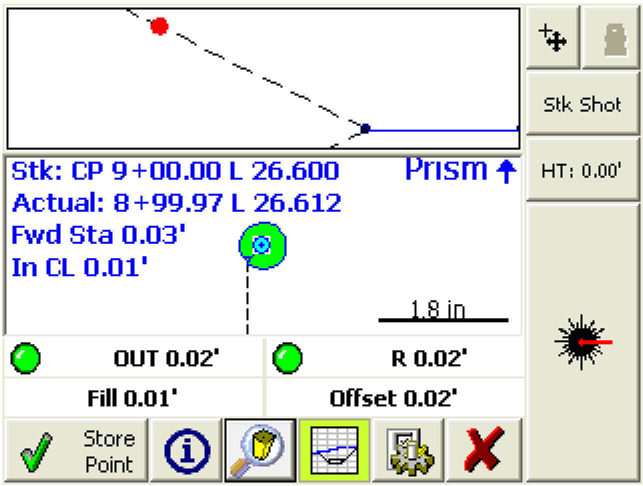




At anytime during your staking you can press the Profile button to see the actual rod position which will be shows as an orange circle. You will also see the slope lines from the hinge point.

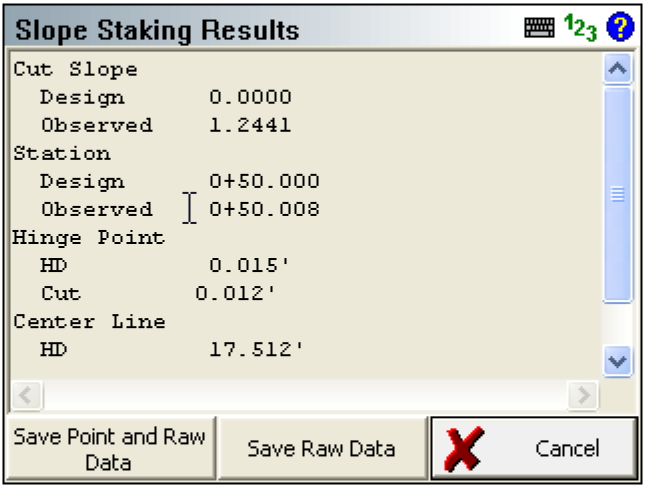


When you get to the catch point you will see a green circle in the map view.



Slope Staking Results

When you store your catch point position you will see the results screen. This screen will always report the following:



Cut or Fill Slope – The first line will always tell you if you staked a cut slope or fill slope. It will also display the design slope that was specified and record the actual computed slope that was staked.

Station – This will display the station of the template or cross section, and will show the actual station staked at the catch point.

Hinge Point – This is the distance from the rod position to the hinge point. It will also indicate the vertical distance from rod position to the hinge point. A cut indicates that the hinge point is lower; fill indicates that it is higher than the current rod position.

Center Line - This is the distance from the rod position to the centerline. It will also indicate the vertical distance from rod position to the centerline. A cut indicates that the centerline is lower; fill indicates that it is higher than the current rod position.

Save Shot

Press **Save Point and Raw Data** store a point for this shot and to write your stake and cut sheet records to the raw file. By default the description for the stored stake point will equal the station and offset that was being slope staked. An example of an auto generated description is **CP 0+06.00 L 1.000**. The **CP** stands for Catch Point.

Press **Save Raw Data** to write your stake and cut sheet records to the raw file, without storing a point.

If you press **Cancel**, nothing is stored or written to the raw file.

Records written to raw file

Following are the records that are written to the raw file when you store a point.

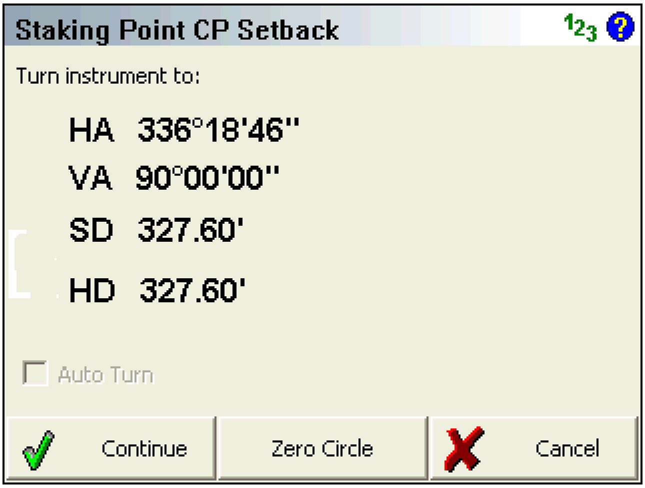
If you have the Store Staked Point toggle turned off in the stake settings screen, you will see that no SP record is recorded as no point was stored in the database.

```
SP,PN81,N 5002.9770,E 4997.8367,EL99.9829,--CP
0+12.00 L 1.000
SL,ST12.000,OD2,EL99.983,GD99.983,AS0.005,HH0.985,VH
0.966,HC1.985,VC0.966,CF0,DS1.000000,OB1.019583
SK,OP100,FP81,AR282.28000,ZE90.16000,SD3.6800,--CP
0+12.00 L 1.000
```

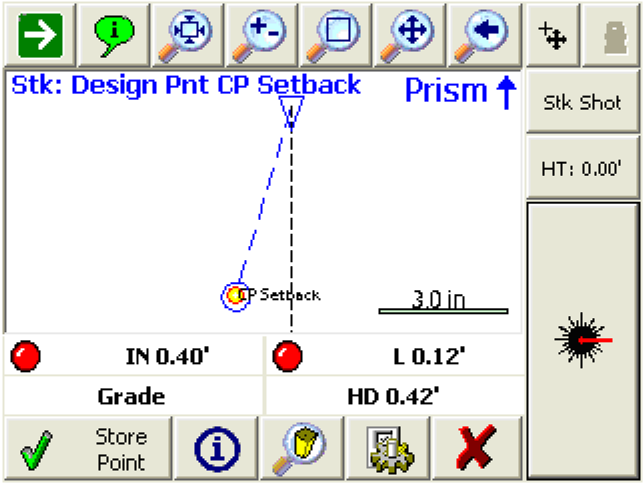
Slope Staking and Offset

In the Stake Alignment screen if you specify a stake offset or a setback distance, after you store your catch point position you will be asked if you want "Continue with staking the catch point setback?" If you press no, then this will be cancelled.

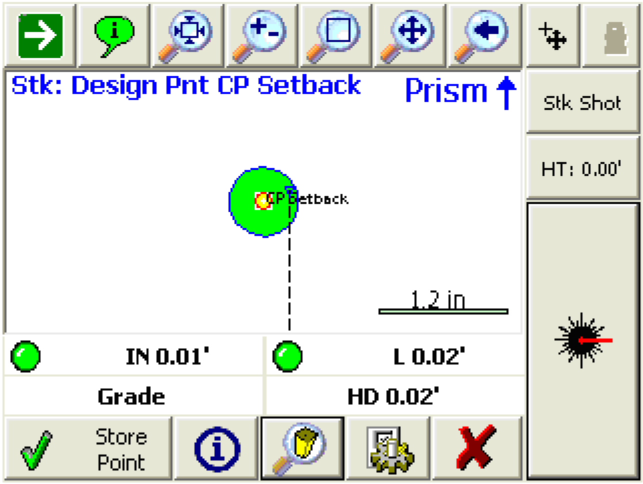
When you press **Yes**, you will then see the "Turn To" screen which will stake a position that is offset from the computed catch point. This offset will be equal to the offset you specified in the alignment screen.



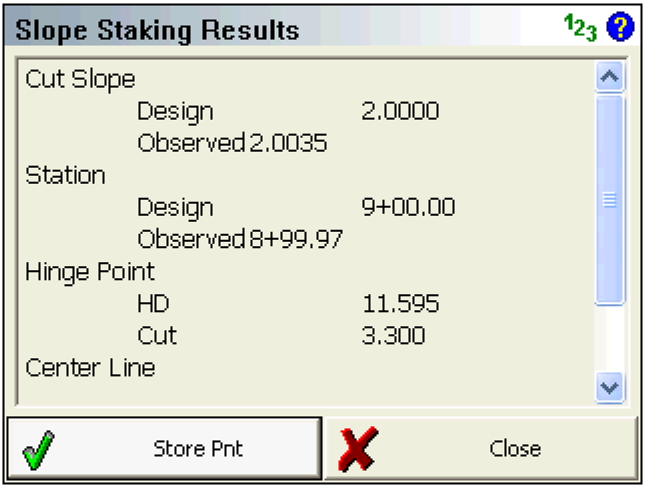
Now on your map screen you will see the word **Design Pnt CP Setback** which indicates you're currently staking a slope stake setback.



When you get to the offset position and store the point you will see the results screen once again. This time, the offsets to the hinge point and centerline will include the offset distance.



The vertical distances that are reported on the results screen are not computed using the current rod position. These values will be in relation to the actual catch point that was staked.



When you store the point you will see that the description that is auto generated for the point will be similar to the following example. **REF CP 0+06.00 L 2.00**

Records written to raw file

Following are the records that are written to the raw file when you store a point.

If you have the Store Staked Point toggle turned off in the stake settings screen, you will see that no SP record is recorded as no point was stored in the database.

```
SP,PN5004,N 5007.7522,E 5001.5139,EL100.1445,--CP
0+06.00 L 1.000
SL,ST6.000,OD2,EL100.144,GD100.144,AS-
0.002,HH0.498,VH0.501,HC1.498,VC0.501,CF0,DS1.000000,
OB0.994169
SK,OP101,FP5004,AR353.45220,ZE90.23420,SD13.9200,--
CP 0+06.00 L 1.000
SP,PN82,N 5007.2194,E 5002.2307,EL102.2842,--REF CP
0+06.00 L 2.000
SR,ST6.000,OD2,EL102.284,GD100.144,AS-
0.002,HH2.390,VH0.501,HC2.387,VC0.501,CF0,DS1.000000,
OB0.994169,OL1.000
DE,PNCP Setback,N 5007.078,E 5002.253,EL100.144,--
SD,ND-0.141,ED0.022,LD-2.140
SK,OP101,FP82,AR351.10340,ZE82.00000,SD14.6850,--REF
CP 0+06.00 L 2.000
```

CONNECTING TO COMPUTER

Microsoft ActiveSync / Windows Mobile Device Center

Microsoft ActiveSync and Microsoft Windows Mobile Device Center facilitate communication between your PC and your handheld device.

If you are using Windows XP or earlier, **Microsoft ActiveSync** has to be installed on your computer so you can download data between your hand held and desktop computers. The current version (at time of printing) is ActiveSync 4.5. You may have to use an earlier version if you are running Windows 95 or 98. Check the web page noted below for more information.

If you are using Windows Vista, **Microsoft Windows Mobile Device Center** has to be installed on your computer, rather than Microsoft ActiveSync. The current version (at time of printing) is Windows Mobile Device Center 6.1.

Installing ActiveSync / Windows Mobile Device Center

Installing From Web

Microsoft ActiveSync or Microsoft Windows Mobile Device Center might already be installed on your computer; you can confirm this by looking for it in your Windows Start Menu.

If you do not have Microsoft ActiveSync or the Windows Mobile Device Center installed, you can download and install the latest version from Microsoft's website at this address:

http://www.microsoft.com/windowsmobile/activesync/default.mspx

Note: You may be asked to reboot your system once the installation is complete.

Installing From CD

Microsoft ActiveSync or Microsoft Windows Mobile Device Center might be already be installed on your computer, you can confirm this by looking for it in your Windows Start Menu.

If you do not have Microsoft ActiveSync or the Windows Mobile Device Center installed, and you don't have access to the internet, it can be installed from your FieldGenius CD. You can browse into the FieldGenius folder on your CD and run one of the following files:

MSASYNC.EXE (for Windows XP or earlier)

MSWMDC32.EXE (for Windows Vista 32-bit)

MSWMDC64.EXE (for Windows Vista 64-bit)

Note: You may be asked to reboot your system once the installation is complete.

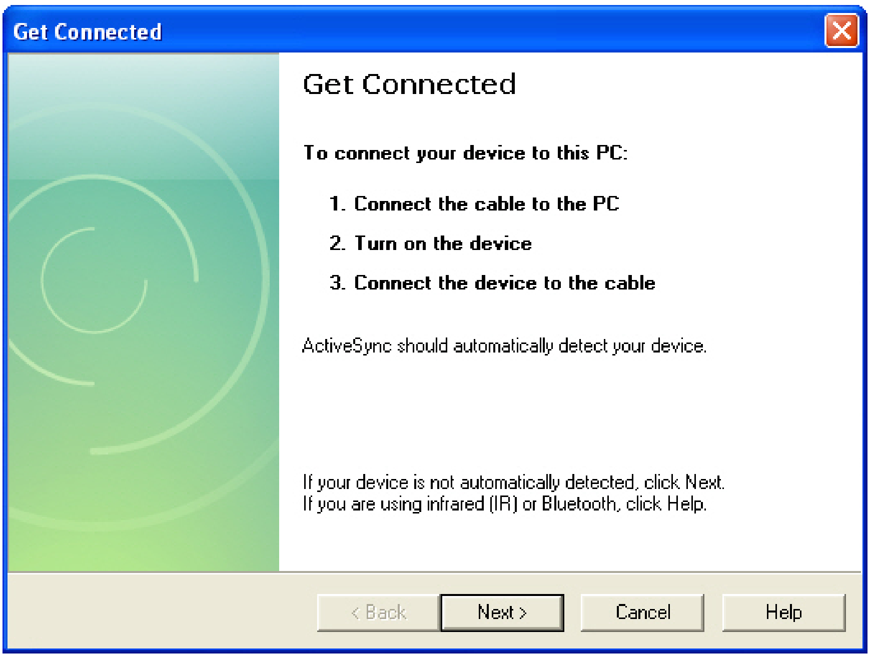
Connecting ActiveSync / Windows Mobile Device Center

Get Connected

We now need to establish a connection between your data collector and desktop computer as prompted by the ActiveSync or Windows Mobile Device Center Connection Wizard. The following screenshots are specific to ActiveSync, but the Mobile Device Center is almost identical.

After the install is complete, ActiveSync will display a Get Connected screen.

If ActiveSync was already installed, you can start it by going to your Start menu | All Programs | Microsoft ActiveSync. The Get Connected Wizard should appear. If it does not, go to the ActiveSync **File** menu and select **Get Connected**.



Connect your handheld data collector to your desktop or laptop computer using the supplied cradle and/or cables.

Power ON the data collector and click **Next** on the Get Connected Wizard. Some devices such as the MicroSurvey Tracker or Allegro CE will require you to tap a **PC Link** icon on the device while the Get Connected function is in operation.

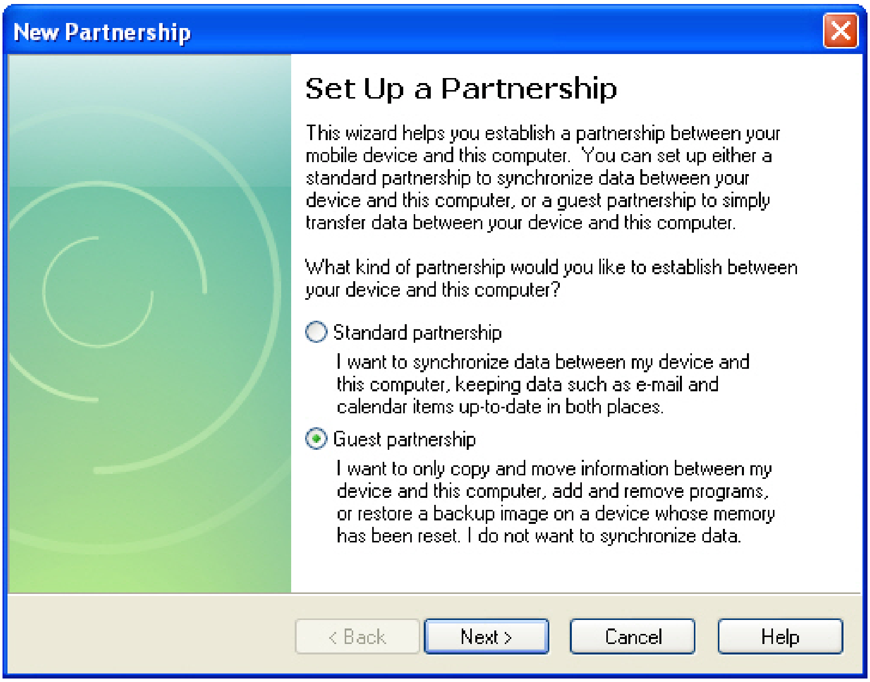
When communication is established, you will be prompted to set up a partnership between your data collector and the desktop computer.

Note: If your device does not connect as shown, turn the device off, and then back on again to retry

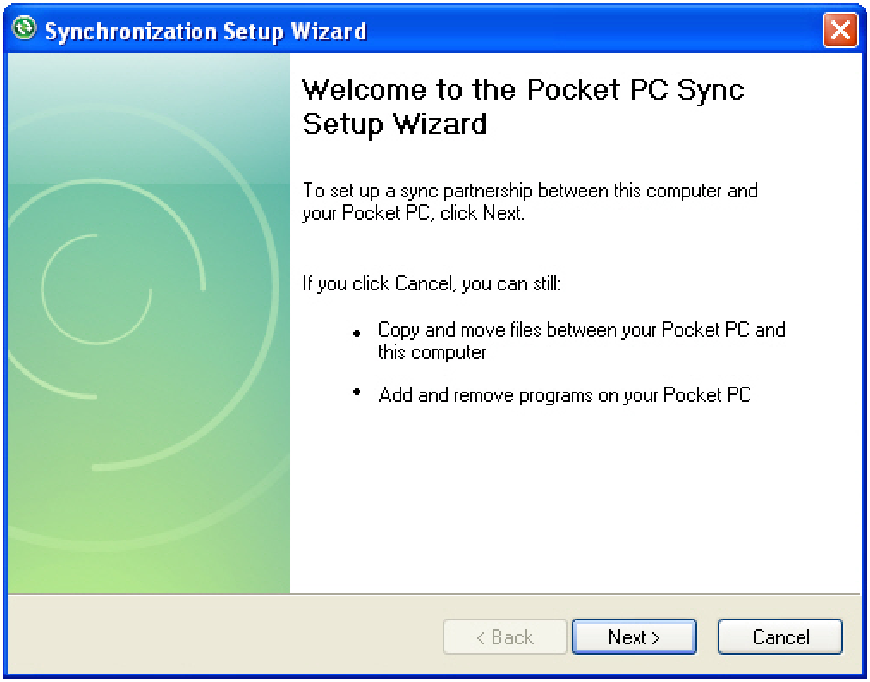
Establish a Guest Connection

After you successfully connect to your computer, you will be asked to setup a partnership. Choose **Guest Partnership** then click **Next** to continue.

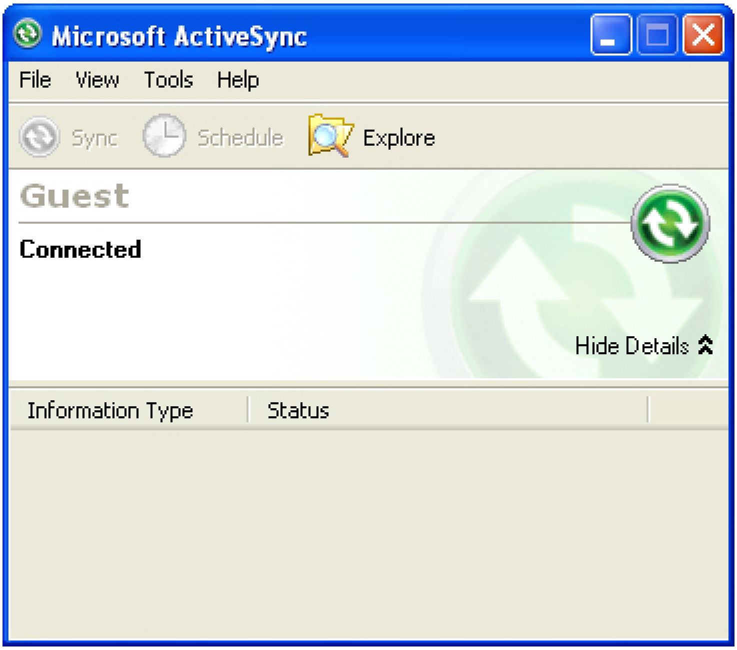
> **Note:**
> You can setup a Standard Partnership if desired, but this is not necessary and adds complexity. We recommend using a Guest Partnership.



Or if you are using a handheld device running Windows Mobile 5.0 or newer, you may instead see the Synchronization Setup Wizard, simply press **Cancel** to use a guest connection.



ActiveSync should now display as shown below:



You are now ready to move on to the next step - [MicroSurvey Transfer Program]

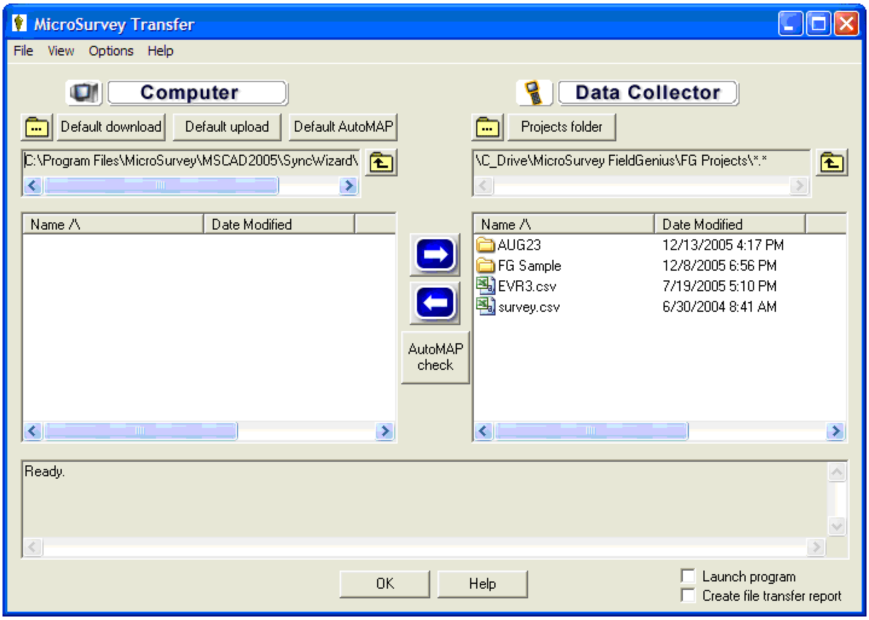
Note:
A small circular ActiveSync icon will appear in the lower right corner of your desktop (like the one at right in the above image). This will display in gray when ActiveSync is inactive but will change to green when your device is connected.

MicroSurvey Transfer Program

MicroSurvey provides a free transfer tool to help you copy projects to and from your data collector. The program is called the MicroSurvey Transfer program and it can be download from our website or installed directly off of the CD provided with FieldGenius.

Once installed all you need is to connect your handheld computer to your desktop computer via an ActiveSync or Windows Mobile Device Center connection. ActiveSync is a Microsoft Windows product which establishes a serial or USB connection between your data collector and your computer.

Once connected, you can start the MicroSurvey Transfer program.

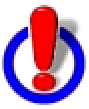


The program has been designed to streamline the transfer of projects and files back and forth between you data collector and computer.

For more details, please refer to the Help file included with the MicroSurvey Transfer program.

Synchronize with MicroSurvey CAD or inCAD

To import your projects into your MicroSurvey desktop product, please refer to the **"FieldGenius SyncWizard"** section in the MicroSurvey CAD or inCAD help file.



FieldGenius 2004 projects can only be imported directly into MSCAD 2004 or later, or inCAD 2004 or later.

FieldGenius 2005 projects can only be imported directly into MSCAD 2004 or later, or inCAD 2004 or later.

FieldGenius 2006 projects can only be imported into MSCAD 2005 SP1.2 or later, or inCAD 2006 or later.

FieldGenius 2007 (and newer) projects with an unencrypted raw file can only be imported into MSCAD 2005 SP1.2 or later, or inCAD 2006 or later.

FieldGenius 2007 (and newer) projects with an encrypted raw file can only be imported into MSCAD 2008 or newer.

Synchronize with MicroSurvey CAD or inCAD

To import your projects into your MicroSurvey desktop product, please refer to the **"FieldGenius SyncWizard"** section in the MicroSurvey CAD or inCAD help file.

FieldGenius 2004 projects can only be imported directly into MSCAD 2004 or later, or inCAD 2004 or later.

FieldGenius 2005 projects can only be imported directly into MSCAD 2004 or later, or inCAD 2004 or later.

FieldGenius 2006 projects can only be imported into MSCAD 2005 SP1.2 or later, or inCAD 2006 or later.

FieldGenius 2007 (and newer) projects with an unencrypted raw file can only be imported into MSCAD 2005 SP1.2 or later, or inCAD 2006 or later.

FieldGenius 2007 (and newer) projects with an encrypted raw file can only be imported into MSCAD 2008 or newer.

RAW FILE REFERENCE

Raw File Record Types

To increase our compatibility with other data collectors and desktop systems, FieldGenius uses the TDS RW5 raw file format. The raw file virtually contains all the measurement made in the field and is a complete history of what was recorded.

For more information on the raw data record format, or for additional record types, please review the Raw Data Record Specification document from Tripod Data Systems, Inc. It is available for download at www.tdsway.com

Conventional Raw Data Records

-- - Note or Comment Records

A comment in the raw file will be depicted with a record type of two dashes. Text found after the dash is the comment.

Comments are ignored during processing of the raw file and are used only for information purposes only. You can add a comment to the raw file by using the Add Comment button in the Survey / Traverse Menu.

```
-- This is a comment
```

BK - Backsight Record

A backsight record is written to the raw file when you complete an occupy point command. Please review the Setup Occupy Point topic for more information.

Field headers:

OP: Occupy point

BP: Back point

BS: Backsight

BC: Back circle

```
BK,OP101,BP100,BS0.00000,BC0.00000
```

CF - Cut Sheet

When you stake out a point, a CF record will be recorded in the raw file.

ST: Station

OD: Offset direction (ENUM)

OL: Offset length

EL: Elevation

GD: Grade (design)

DE - Design Point / Location

During a stakeout the point you're staking will be recorded in the raw file with as DE record.

PN: Point name (*design point, may be blank*)

N : Northing

E : Easting

EL: Elevation

--: Description (*design point description, may be blank*)

JB - Job Record

Every time a raw file is created or opened a JB record will be written to the file.

Field headers:

NM: Job name

DT: Date

TM: Time

```
JB,NMTraverse1,DT03-05-2004,TM14:07:52
```

LS - Line of Sight (Instrument and Target Height)

HI: Height of instrument

HR: Height of rod

```
LS,HI1.500,HR1.500
```

MO - Mode Setup Record

Every time a raw file is created or opened a MO record will be written to the file.

Field headers:

AD: Azimuth direction - (0 = North) (1 = South)

UN: Distance unit - (0 = Feet) (1=Meter) (2=US Survey Feet)

SF: Scale factor

EC: Earth curvature - (0 = off) (1=On)

EO: EDM offset (inch) (Default string "0.0") **Not used by FieldGenius

AU: Angle unit - (0=Degree) (1=Grads)

```
MO,AD0,UN1,SF1.000000,EC0,EO0.0,AU0
```

OC - Occupy Point Record

When you complete the occupy point command an OC record will be written to the raw file. Please review the Setup Occupy Point topic for more information.

Field headers:

OP: Point number

N : Northing (the header is N space)

E : Easting (the header is E space)

EL: Elevation

--: Description

```
OC,OP101,N 1000.0000,E 1000.0000,EL10.0000,--
```

OF - Off Center Shot Record

When you use any of the offset shot commands an OF record will be written to the raw file. Two types of measurements will create offset records and they are the Angle Offset and Distance Offset measurement modes. Please see the Measurement Modes topic for more information.

Field headers:

AR: Angle right

ZE: Zenith

SD: Slope distance

OL: Offset length

HD: Horizontal distance

VD: Vertical distance

LR: Left/Right Offset

```
OF,AR90.00000,ZE90.00000,SD50.0000
OF,ZE60.00000,--Vert Angle Offset
OF,OL45.00000,--Right Angle Offset
OF,HD-10.0000,--Horizontal Distance Offset
OF,LR0.0000,--Left / Right Offset
OF,VD0.0000,--Elevation Offset
```

Offset shots will always contain the original measurement plus the offset information. You will also see a SS record accompany the OF records and it will contain the reduced measurement. Following is an example of a distance offset where an offset of -10 was entered:

```
OF,AR180.00000,ZE90.00000,SD50.0000
OF,HD-10.0000,--Horizontal Distance Offset
OF,LR0.0000,--Left / Right Offset
OF,VD0.0000,--Elevation Offset
LS,HI1.500,HR1.500
SS,OP1,FP5,AR180.00000,ZE90.00000,SD40.0000,--<No
Desc>
```

RB – Repeat Backsight

When using the multiset function, a RB record will be recorded to the raw file for each backsight shot you measure. Please refer to the Muti-Set topic for more information.

Field headers:

OP: Occupied point

BP: Backsight point

AR: Angle right

ZE: Zenith angle

SD: Slope distance

HR: Height of rod

```
RB,OP333,BP100,AR79.48560,ZE93.42500,SD1.9700,HR1.50
0,--
```

RF - Repeat Foresight

When you use the multiset function, a RF record will be recorded to the raw file for each foresight shot you measure. Please refer to the Muti-Set topic for more information.

OP: Occupied point

FP: Foresight point

AR: Angle right

ZE: Zenith angle

SD: Slope distance

HR: Height of rod at the foresight

--: Description

```
RF,OP333,FP888,AR20.45530,ZE89.56080,SD1.9800,HR1.50
0,--<No Desc>
```

RE - Remote Elevation

When you use the Benchmark Shot function a RE record will be recorded in the raw file. RE records will be accompanied by a SP record.

The FE value will be defined by the Benchmark Method selected by the user as being either an existing point or a user entered value. Please refer to the Measure Benchmark topic for more information.

OP: Occupied point

FE: Foresight elevation

ZE: Zenith angle

SD: Slope distance

--: (always "Remote elev")

```
RE,OP1,FE10.000,ZE90.00000,SD50.0000,--Remote elev
```

RS - Resection

When you use the resection function a RS record will be recorded for each observation made to your control points. Please refer to the Resection topic for more information.

PN: Point number

CR: Circular reading

ZE: Zenith (or VA, CE)

SD: Slope distance (or HD)

```
RS,PN103,CR2.42220,ZE90.00000,SD25.0980
```

When you complete a resection the control points you used will be written as SP records and after the RS records you will see one final SP for the computed resection point. An example of a resection is shown below:

```
--Resection
SP,PN103,N 3135.070,E 1511.185,EL399.795,--:
SP,PN100,N 3097.874,E 1564.984,EL399.387,--:
LS,HI1.300,HR0.000
RS,PN103,CR2.42220,ZE90.00000,SD25.0980
RS,PN100,CR102.26120,ZE90.00000,SD56.3050
SP,PN999,N 3110.000,E 1510.000,EL398.291,--
```

SD - Stakeout Deltas

When you complete a stakeout by pressing the store point command a SD record will be written to the raw file. It is the difference between the design location (DE record) and the actual point staked (SP record).

ND: Delta northing

ED: Delta easting

LD: Delta elevation

SK - Stake Out Record

When you stake out a point and use the Store Point command a SK record will be written to the raw file. This is the raw observation that was recorded when you stored you stake point.

OP: Occupy point

FP: Foresight point

AR: Angle right

ZE: Zenith

SD: Slope distance

```
SK,OP251,FP10000,AR175.00000,ZE90.00000,SD6.0000,--
Design Point: 342
```

SL - Slope Staking Record

ST: Station

OD: Offset direction (ENUM)

EL: Actual catch point elevation

GD: Grade (design elevation of the catch point based on the slope line)

AS: Ahead on station (positive when rod is beyond design station, negative when

before station)

HH: Horizontal distance to hinge point (always positive)

VH: Vertical distance to hinge point (positive when rod is above hinge)

HC: Horizontal distance to center line (always positive)

VC: Vertical distance to center point (positive when rod is above center point)

CF: Slope used (ENUM)

DS: Design slope

OB: Observed slope

SP - Store Point

Many routines in FieldGenius will write a SP record to the raw file. SP records contain coordinate information that can be used for setups, resections, etc…

PN: Point number

N: Northing

E: Easting

EL: Elevation

--: Description

```
SP,PN103,N 3135.070,E 1511.185,EL399.795,--:
```

SS - Sideshot

When you record a shot a SS record will be recorded in the raw file. Many other functions also create a SS record such as when offset and multi set shots are reduced.

OP: Occupy point

FP: Foresight point

AR: Angle right

ZE: Zenith

SD: Slope distance

--: Description

```
SS,OP1,FP7,AR176.11093,ZE90.00000,SD60.1332,--<No
Desc>
```

TR - Traverse Shot

When you record your shot as a Traverse shot, a TR record will be recorded to the raw file. Please refer to the Measurement Info and Traverse Report topics for more information.

OP: Occupy point

FP: Foresight point

AR: Angle right

ZE: Zenith

SD: Slope distance

--: Description

```
TR,OP1,FP7,AR176.11093,ZE90.00000,SD60.1332,--<No
Desc>
```

GPS Raw Data Records

AH - GPS Antenna Height

DC: Derivation Code (ENUM)

MA: Measured antenna height

ME: Measure Method (ENUM)

RA: Reduced antenna height (to phase center)

BL - GPS Base Line

DC: Derivation

PN: Point Name

DX: Base line Delta X

DY: Base line Delta Y

DZ: Base line Delta Z

-- : Description (Feature Code)

GM: GPS Measure Method (ENUM)

CL: Classification

HP: Horizontal Precision

VP: Vertical Precision

BP - Set Base Receiver Position

PN : Point Name

LA: Latitude

LN: Longitude

HT: Ellipsoid Height

SG: Setup Group (default = 0)

CS - Coordinate System Identity

CO: Coordinate system option (ENUM)

ZG: Zone group (system) name

ZN: Zone name

DN: Datum name

CT - Calibration Point

PN: Point Name

DM: Dimensions used (ENUM)

RH: Horizontal residual

RV: Vertical residual

CV - RMS Covariance of GPR Position

DC: Derivation (ENUM)

SV: Minimum number of SV during observation

SC: Error Scale

XX: Variance X

XY: Covariance X,Y

XZ: Covariance X,Z

YY: Variance Y

YZ: Covariance Y,Z

ZZ: Variance Z

EP - Geodetic Position

When you save the location of a point, its geodetic position is also recorded.

TM: Time

LA: Latitude

LN: Longitude

HT: Ellipsoid Height

RH: Horizontal RMS returned from receiver

RV: Vertical RMS returned from receiver

DH: HDOP if receiver returns this info

DV: VDOP if receiver returns this info

GM: GPS Method (ENUM)

CL: Classification (ENUM)

HA - Horizontal Calibration (Adjust)

N : Origin north

E : Origin east

TH: Translation north

TE: Translation east

RT: Rotation about origin

SF: Scale factor at origin

GS - GPS Store Point

This is similar to a regular SP (store point) record but the GS indicates that it is create by GPS.

PN: Point Name

N : Local Northing

E : Local Easting

EL: Local Elevation

-- : Description

RP - Local coordinates of calibration point

N : Northing

E : Easting

EL: Elevation

-- : Description

VA - Vertical Calibration (Adjust)

PV: Type of vertical adjustment (ENUM)

N : Origin north (*may be blank*)

E : Origin east (*may be blank*)

LZ: Constant adjustment – translation Z (*may be blank*)

SO: Slope north (*may be blank*)

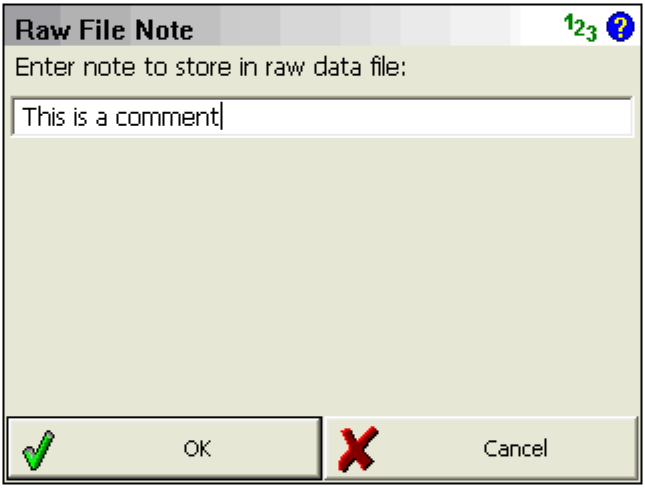
SA: Slope east (*may be blank*)

GN: Geoid Model Name

Raw File Comment

Shortcut Key - X

At any time you can enter a note that will be recorded to the raw file. Simply press the X key on your keyboard device which will open the Enter Comment dialog. Enter a comment that you want appended to the end of your raw file. You are limited to 99 characters.



If you view your raw file your comments will appear as shown in the following example.

```
! --This is a comment                              !
```

You can also enter comments into the raw file by using the Raw File Viewer.

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