Survey Pro Field Software

User Guide

From V5.2

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Trimble Navigation Limited d/b/a Spectra Precision

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The Survey Pro installation program will use your internet connection to compare the data collector's serial number against a data base that contains the warranty status on all units. If the unit is under a valid warranty, the installation will proceed. If the unit is not covered under warranty, then a message will be displayed informing you of this and the installation will stop.

To receive Survey Pro minor improvement releases, identified by the version numbering system, you only need to be on the current version of the latest minor update. In other words, if you have version 5.0.x you are authorized for a version 5.0.5 improvement release automatically. For minor updates, 5.0 to 5.1 for example, it is now required that the data collector or Survey Pro software be on a current warranty plan.

The warranty plans are listed on Spectra Precision price lists. Data collector serial numbers are required in order to generate the proper registration codes for your unit and to log the warranty plan into the database.

Survey Pro User Guide Release Notes, October 2012

The content of this new Survey Pro User Guide reflects the changes and enhancements made to Survey Pro 5.2 compared to Survey Pro 5.1. The following changes and add-ups have been introduced:

General:

1. You can now create a multitude of survey reports on your data collector using the Job>View Report function (see *Chapter 3*, *Creating a Job*, *Generating Survey Reports* section).
2. You can now share your files over the Internet using the File > Share function (see *Chapter 3*, *Creating a Job*, *Sharing Files Over the Internet* section).
3. Survey Pro now accommodates Snap-To functions to help you make automatic point selections on the map (see *Chapter 2*, *Introduction to the Survey Pro User Interface*, *Map View* section). We also added a description of the Zoom buttons in this section.
4. Survey Pro now offers a new stakeout routine called “Stake Skew Line”. The new routine is introduced in *Chapter 7*, *Stakeout Routines*, *Other Stakeout Routines* section.

Optical:

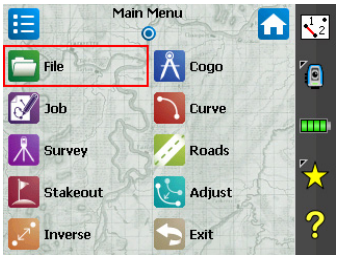
5. Backsight and foresight targets are now indifferently managed in a single database. This is discussed in the *Appendix Chapter*, *Managing Smart Targets* section.
6. Station setup on unknown point (resection) has been modified so that the station location can be solved more accurately. This relies on a new computation process using data you set on the Precision tab, now part of the settings of optical instruments. This impacts *Chapter 5*, *Optical Surveying*, *Instrument Setup*, *Station Setup on Unknown Point, Resection Method* section).

GNSS:

7. The definition of what a *receiver profile* is has been extended so that connecting to a GNSS receiver can be quicker and simpler. This is discussed in *Chapter 4*, *Connecting Survey Pro to an Instrument*, *Connecting Survey Pro to a GNSS Receiver* section). This also impacts the *Starting an RTK Base* and *Starting an RTK Rover* sections in *Chapter 6* and the *Appendix Chapter, Memo for GNSS Users* section. *Network profiles* are also described as a specific section in Chapter 4.
8. Post-processing survey functions have been merged with RTK survey functions. This impacts *Chapter 2*, *Introduction to the Survey Pro Interface* and *Chapter 4*, *Connecting Survey Pro to an Instrument* at different locations.
9. A reference station database is now created to easily retrieve and use all the reference stations you have used previously (see *Chapter 6*, *GNSS Surveying*, *Managing Reference Stations* section). This impacts the workflow when setting up an RTK rover (see *Starting an RTK Rover* section in *Chapter 6* as well).
10. You can collect data without the need for starting a survey. This is now possible using the *Autonomous Rover* mode. This is discussed in *Chapter 6*, *GNSS Surveying*, *Collecting Data out of a Survey* section.

Table of Contents

1. Welcome to Survey Pro



Congratulations on your decision to purchase a Spectra Precision product. Spectra Precision is serious about providing the best possible products to its customers and knows that you are serious about your tools. We are proud to welcome you to the Spectra Precision family.

Scope

This manual will guide you through your first steps using Survey Pro. Whether you are using optical or GNSS equipment, you will find here key instructions and explanations for a successful start.

If you are new to Survey Pro, reading the first three sections will help you understand the organization and workflow of the software. Chapter 3 will also give all the details to understand what a "receiver profile" is and how it is used to easily connect to and configure a GNSS receiver for RTK and/or post-processing data collection.

The rest of the guide is dedicated to helping you start your field work.

- Station setup is an essential step when surveying with an optical instrument: this guide discusses the Known Point and Resection routines, followed by a short description of a few standard surveying procedures (traverse/sideshot, repetition).
- Choosing the right coordinate system before starting a job with GNSS is also an essential step: the guide will take you through the different possible scenarios, followed by a short description of standard data collection procedures.
- Stakeout routines are functions common to optical and GNSS surveying. These are introduced in *7. Stakeout Routines on page 59*.
- The last section provides instructions specific to Survey Pro running on Nikon Nivo and Spectra Precision FOCUS total stations.

From your first successful experience with Survey Pro, based on the information provided in this guide, you will be able to extend your knowledge of the software to its many other functions, relying on your own experience as a surveyor and referring to the on-line Help whenever necessary.

Conventions Used

The following conventions are used:

- Text strings in **bold font** represent the names of software items such as fields, buttons, check boxes, tabs, messages, screens, menus, etc.
- The symbol ">" is placed between menus, tabs and/or buttons to indicate that you have to tap on these parts successively in that order.
- When referring to both optical instruments and GNSS receivers, the term "instruments" will be used to encompass the two types of equipment.

The following acronyms and abbreviations are used:

- BS: Backsight
- EDM: Electronic Distance Meter
- NEE: Northing, Easting, Elevation (grid coordinates)
- HA: Horizontal Angle
- LLH: Latitude, Longitude, Height (geodetic coordinates)
- PPM: Part Per Million
- SD: Slope Distance
- SS: Side Shot
- ZA: Zenith Angle

The following conventions are used when inputting or outputting angles:

- **Azimuths**, **latitudes**, **longitudes** are entered in degrees-minutes-seconds format and are represented as **DD.MMSSsss**, where:
  - **DD**: One or more digits representing the degrees
  - **MM**: Two digits representing the minutes
  - **SS**: Two digits representing the seconds
  - **sss**: Zero or more digits representing the decimal fraction part of the seconds.

  E.g.: 212.0805 would indicate 212 degrees, 8 minutes and 5 seconds.

- **Bearings** can be entered in either of the following formats:
  - S32.0805W to indicate South 32 degrees, 8 minutes, 5 seconds West.
  - 3 32.0805 to indicate 32 degrees, 8 minutes, 5 seconds in quadrant 3.

When a field accepts a time for its input, the time is entered in hours-minutes-seconds format, which is represented as **HH.MMSSsss**, where:

- **HH**: One or more digits representing the hours
- **MM**: Two digits representing the minutes
- **SS**: Two digits representing the seconds
- **sss**: Zero or more digits representing the decimal fraction part of the seconds.

2. Introduction to the Survey Pro User Interface

Home Screen and Main Menu

On launching Survey Pro, you will first be asked to open a job. When done, the software will open at the **Home screen**. The home screen shows a selection of the functions you will most frequently use in the field. You can customize the Home screen based on your needs.

If this is your first time using Survey Pro, a message box will inform you how you can customize the items and layout of the functions on the Home screen (see *How to Customize the Home Screen on page 5*).

Because some of the available Survey Pro functions are mode dependent (optical, GNSS), there is a different Home screen for each mode. That also means there is a slightly different default Home screen depending on which instrument is used. See below, from left to right: Optical, GNSS.

The functions available from the Home screen are taken from the **Main Menu**, which contains all the possible Survey Pro functions.

You can access the functions available from each submenu by tapping the corresponding submenu icon.

Each submenu, and all the functions attached to the submenu, are represented by icons of the same background color. For example the File submenu and its functions are all in green.

Switching Between Home Screen and Main Menu

The table below lists the buttons allowing you to navigate between the Home screen and the Main Menu and its submenus.

Icon / Check boxes	Result
	Takes you to the Home screen from the Main Menu or any submenu.
	Takes you back to the Main Menu from the Home screen.
	Takes you back to the Main Menu from an open submenu.
	The default Home screen has only one page so there's only one blue dot (a radio button), and it is necessarily checked. When adding functions through customization, other pages may be created for the Home screen to accommodate all the added functions (see *How to Customize the Home Screen on page 5*). In that case, tap one of the radio buttons to display the desired page.

Command Bar Description

The command bar is that portion of the Survey Pro screen that remains always displayed whether the Home screen, the Main Menu or one of its submenus is displayed. The command bar contains the following items:

- **Map View [1]**: This button will access the map view of the current job when it is tapped. The map view is available from many screens (see *Map View on page 8*).
- **Instrument Used [2]**: The Instrument icon indicates the mode (optical or GNSS) that the software is in, and the type of instrument the software is currently associated with.

Icon	Current Instrument Selection
	Optical instrument
	GNSS receiver

This icon is also used to change the instrument and perform additional settings on this instrument. See *4. Connecting Survey Pro to an Instrument on page 18*.

- **Battery Level [3]**: The battery icon displays the condition of the data collector's rechargeable battery. The icon has five variations depending on the level of charge remaining, and a sixth variation to indicate battery charging.

Icon	Meaning
	100% charge remaining
	75% charge remaining
	50% charge remaining
	25% charge remaining
	Less than 5% charge remaining
	Battery charging from AC adaptor

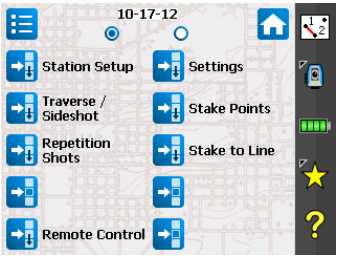
  Tapping the battery icon is a shortcut to the Windows Mobile Power Settings screen.

- **Quick Pick [4]**: The Quick Pick button will open a customizable list of routines. To quickly access a routine, just tap on it.
- **Online Help [5]**: This button opens the online help, which allows you to access information for each screen.

How to Customize the Home Screen

A message is displayed right after opening or creating a job asking you to "Tap and hold on menu items to manage the Home screen". This message prompts you to customize the Home menu so that only the functions you will most frequently be using in the field will be made available from this screen.

After you have become familiar with the customization process and next time you launch Survey Pro, you can dismiss the message by checking the Don't ask this again prompt before tapping OK to close the message.



Adding a Function

This is a three-step procedure:

- Go to the Main Menu, then to the submenu containing the function you would like to add to the Home screen.
- Tap and hold the corresponding function item and select Add to Home. Survey Pro then shows the Home screen with all the possible free locations for the new function, all represented as unnamed icons. Note at this point that all the icons are shown with the same background color (see example).
- Tap on a free icon (an unnamed one) or on the icon of an existing function. The new function is inserted at the tapped location. Icon colors are then restored.

  If you tap on an existing function, this function and the next ones are shifted down by one location. Survey Pro will automatically create a new page of Home screen if the resulting number of functions on the screen is greater that what the screen can accommodate.

Removing a Function

On the Home screen, tap and hold the function you want to remove and select Remove Item. This instantly removes the function from the Home screen.

Moving a Function

- On the Home screen, tap and hold the function you want to move and select Move Item. Apart from the function you want to move, which keeps its original appearance, all other function items change color to blue.
- Tap on the location where you wish to move the function. This may be a free location, or the location of an existing function. If you tap on an existing function, the moved function will be inserted at the selected location and the function at that location and the ones that follow will be moved down.

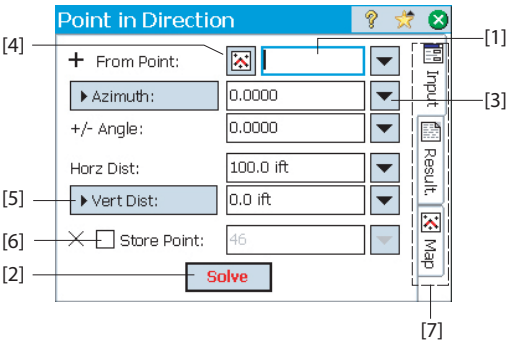
Home Screen Pages

The default home screen consists of a single page. You may add up to three additional pages as part of the Home screen in order to make your many favorite functions accessible from this set of pages.

- Adding a page is done by tapping and holding any function on the Home screen and selecting Insert Page Before or Insert Page After.
- Switching from one page to the other is done by tapping on radio buttons at the top of the screen.
- Removing a page is done by tapping any location on that page and selecting Remove Page. This action requires user confirmation.

Screen Details

The screen example below illustrates the different types of items you will usually encounter on the screen when using the different Survey Pro functions:



- Input Field **[1]**: An area where you can enter a specific value.
- Output Field: Only displays a value that cannot be changed.
- Simple Button **[2]**: Typically used to run the function described by its name. Just tap it to run the function. When the button name appears in red characters, you can alternately press the Enter key on the keypad to perform the same action.
- Power Button **[3]**: Typically used to provide context-sensitive functions to modify the corresponding field. Once you have tapped on it, a drop-down list will appear with several choices. Simply tap the desired choice from the drop-down list.
- Choose From Map Button **[4]**: Always associated with a field where an existing point is required. When the button is tapped, a map view is displayed. To select a point for the required field, just tap it from the map.

NOTE: If you tap a point from the map view that is located next to other points, another screen will open that displays all of the points in the area that was tapped. Tap the desired point from the list to select it.

- Scroll buttons **[5]**: When a button label is preceded with the > symbol, it indicates that the button label can be changed by tapping it, thus changing the type of value that would be entered in the associated field. As you continue tapping a scroll button, the label will cycle through all the available choices.
- Check boxes **[6]**: Tap on these boxes to successively check or clear the corresponding option.
- Tabs **[7]**: Many screens show tabs, which look like the tabs on index cards. Tapping on a tab displays a subset of information part of the selected screen.

The following buttons will appear in the area usually occupied by the command bar.

Item	Function
	OK button. Accepts the changes made and closes the window.
	Cancels the changes made in the open window
	Closes the current window
	Quick access to the relevant Settings screen
	Quick access to the Help system
	Quick access to the Quick Pick list.

Map View

The *map view* is a graphical representation of the objects in the current job. It will show *basemaps* in the background if you are using one (see screen example).

Basemap files may be either raster images (such as a georeferenced TIFF file, or a JPG image with an associated world file) or CAD drawings (DXF files).

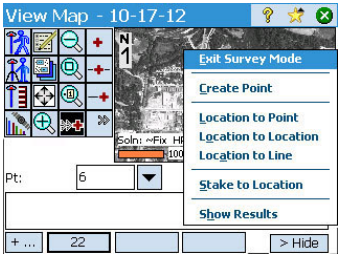
There are different map views depending on how the map view is accessed. Each can display slightly different information, such as a vertical profile. A bar is shown at the bottom of every map view that indicates the scale. The buttons along the left edge of the screen allow you to change what is displayed in the map view.

TIP: You can pan around your map by dragging your stylus across the screen.

The “main” map view is the one you get after tapping  in the command bar (from the Home screen or Main Menu).

From all those screens including a  button, you will also display a map view after tapping this button.

The “main” map view, as well as any map view accessible from a survey routine, will also function as an “active” map. That means you can perform several actions directly from the map. Tap and hold on the map to bring up a context menu of available actions. The actions available will depend on what you have selected at the tap-and-hold location.



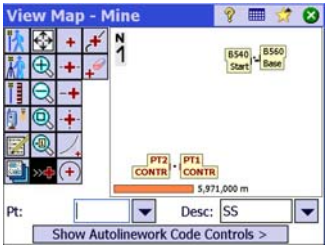
The main map can also function as an interface to collect measurements. Tap and hold on the main map and choose **Survey Mode** to enable the Measurement interface (see screen example for GNSS).

When in **Survey Mode**, you can collect data from the main map by tapping on one of the available buttons (see table below).

You can also press the Enter key to trigger an observation. By default, the Enter key will trigger a "Topo" observation. You can change the Enter key to trigger a point observation by clearing the **Survey Map Use Enter Button for Topo** prompt on the **Job > Settings > Surveying** tab.

Shortcut buttons are available to optimize your work. These are defined below:

Optical	Function	GNSS	Function
	- Mechanical optical instrument: Triggers the instrument to take a shot in the current mode (fine or coarse). - Robotic optical instrument: Similar to GNSS, i.e. takes the latest tracking mode data and stores a point.		One-epoch point measurement
	- Mechanical optical instrument: Takes a fine mode observation. - Robotic optical instrument: Opens up the remote control screen where you will hit the **Take Shot** button to take a fine mode observation.		Multi-epoch point measurement (static occupation)
	Setting target height		Setting antenna height
	Station setup		GNSS status



The main map view includes two additional toolbars:

- The Zoom toolbar
- The Snap-To toolbar

  These are described below.

Showing /hiding the two toolbars depends on the current survey mode status.

When the survey mode is inactive:

- The Zoom toolbar is always shown.
- Tap  to show the Snap-To toolbar,  to hide it.

When the survey mode is active:

- Tap  and select **Show Snap To Options** from the menu to show both the Zoom toolbar and the Snap-To toolbar. Any of the zoom functions can also be run directly from this menu.
- Tap  to hide both of them.

Zoom toolbar:

Button	Function
	Will change the scale of the screen so that all the points in the current job will fit on the screen.
	Will zoom the current screen in by approximately 25%.
	Will zoom the current screen out by approximately 25%.
	Allows you to drag a box across the screen. When your finger or stylus leaves the screen, the map will zoom to the box that was drawn.
	Prompts you for a point name and then the map view will be centered to the specified point with the point label displayed in red.

Snap-To toolbar:

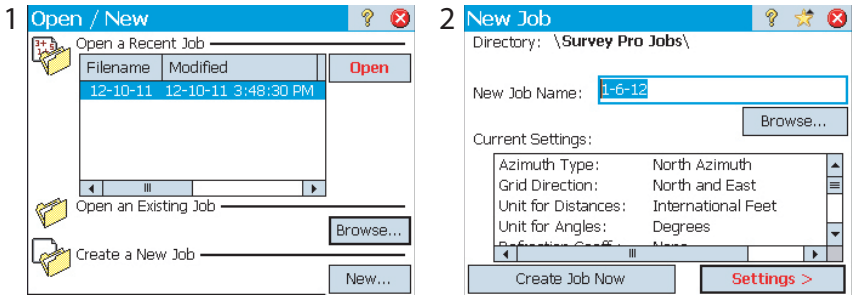
Button	Function
	Snap to nearby point.
	Snap to the midpoint of the selected line segment.
	Snap to the nearest of the begin point or the end point of the selected line segment.
	Snap to the intersection of two straight line segments. You cannot snap to the intersection of line segments that are curves or spirals.
	Snap to the point of intersection (PI) of the selected curve segment.
	Snap to the radius point (RP) of the selected curve segment.
	Snap to the nearest point on the selected straight line or curve segment.
	Remove all of the Snap To temporary points created on this map.

3. Creating a Job

Survey Pro cannot start without a job being open. Upon launching Survey Pro, the **Welcome to Survey Pro** screen will guide you through the process of creating a new job or opening an existing job.

NOTE: Upon launching the onboard version of Survey Pro, the initial screen allows you take measurements without having to open a job. Refer to *8. Survey Pro's On-Board Version on page 67*.

- Tap the **New** button. The **New Job** screen opens, which prompts you for a job name where the current date is the default name.



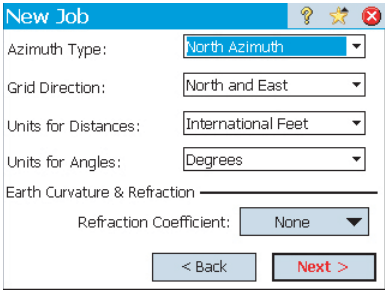
- Either type in a new job name or accept the default name.
- You can create the job in two different ways:
  1. Tap the **Create Job Now** button. The new job will be created with the current default settings (as listed at the bottom of the screen) and will be stored in the default directory (\Survey Pro Jobs\).
  2. Tap the **Settings** button to access the different job settings (see below). After you have gone through the different settings, tap the **Finish** button. This will create and store the new job.

NOTE: The job names listed in the upper portion of the screen are those of the most recent jobs you opened in Survey Pro. This list does not necessarily reflect the list of jobs stored in your data collector. If you are looking for a job stored in your data collector, use the **Browse** button.

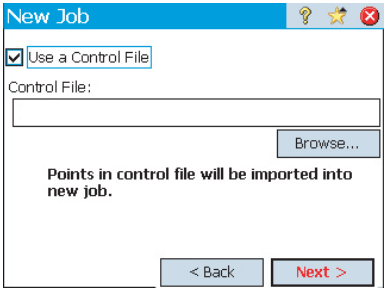
Job Settings

The settings and values entered for a new job become the default values for any subsequent new jobs. A short description of the jobs settings is given below.

[1]

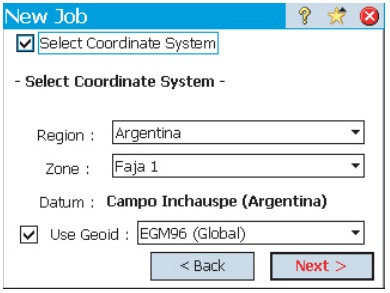


[2]

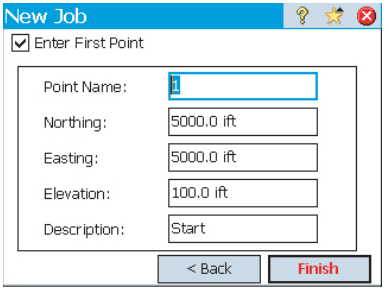


- **Units [1]**: When creating a new job, set all the desired units for the job. You can also enable the setting for Earth Curvature and Refraction correction for optical measurements.
- **Control File [2]**: Control points can optionally be imported from another existing job by checking the Use a Control File check box. After tapping Finish to create the job, a message will indicate the number of imported points. If you are using a control file, by default the coordinate system of this control file will be used for the new job. You can override this default setting on the coordinate system page. A control file can be imported from either a .Job or .Survey file.

[3]



[4]



- **Select Coordinate System [3]**: When you are using a control file, you can start the job with the control file's coordinate system, or you can pick a different coordinate system from the database. If you don't have a control file, you need to choose the coordinate system for the job. To select the coordinate system for the new job:
  - Clear the check box when you are doing an optical survey with a ground scale factor of 1, or if you are doing a GNSS survey and there's no known projection or datum for your local grid coordinates.
  - Check this box when your local grid coordinates are defined by some known map projection and datum.

  Understanding Scale Factor for your coordinate system:
  - If your job has "no coordinate system", Survey Pro automatically sets the scale factor for optical measurements to "1.0". This means that the distance measured on the ground will be 1:1 to the distance on the grid. If you start a GNSS survey, Survey Pro will use default Ground Calibration mode to calculate your grid coordinates from GNSS measurements.
  - If your job is using a map projection and datum, Survey Pro will automatically calculate the correct scale factor for each station setup so the distance measured on the ground will properly be reduced to the coordinate grid. If you start a GNSS survey, Survey Pro will use the selected projection to calculate grid coordinates from GNSS measurements.

  NOTE: You can modify the default optical scale factor settings in the Job > Settings > Scale Factor tab.

- **First Point [4]**: A default point name and coordinates are prompted to become the first point in the job. You can freely change the name and coordinates of this point before creating it. You may also clear the box if you do not want to create a new point at this stage.

You may start your measurements now if you don't need anything else in your job at this time. In that case, go directly to *4. Connecting Survey Pro to an Instrument on page 18*.

If you need to add data (points, polylines, alignments, etc.) into your job before starting, the sections below will tell you how to import or create/edit data from within the open job. The last section lists the possible formats in which the data stored in the job can be exported.

Importing Data

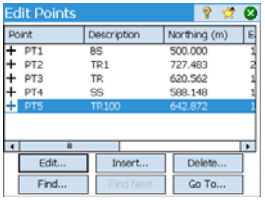
Use the File > Import function to add points to the open job. The points may be imported from different file formats:

- Survey Pro native formats (*.Survey, *.JOB, *.JXL, *.CR5). JXL is the extension for files in JobXML format, a Spectra Precision standard format for point, alignment, and measurement data.
- LandXML (*.XML), an industry standard format for point, alignment, and measurement data.
- Text format (*.TXT, *.CSV). An Import ASCII wizard will help you define the content of every TXT file you will import.

Survey Pro will parse and import all the known elements from the chosen file. These elements will be added to the current job as points, polylines and alignments. See the definition of these elements in *Editing Points on page 14*, *Editing Polylines on page 15* and *Editing Alignments on page 15*.

The File > Import Control function is used to import points onto the control layer of your job. Points on the control layer are protected from being modified. Control files should be in *.Survey or *.JOB format.

Editing Points



A point in Survey Pro has coordinates and properties. A point's coordinates can be derived in one of two ways:

- *Key-in point*: The coordinates for this point were entered using the Job > Edit Points function (Insert button) or this point was created by importing data to the job.
- *Observed point*: The coordinates for this point are calculated from measurements in the current job.

NOTE: To see the current coordinates and properties of a point, you can tap the point on the map. This will open the Point Details screen showing the Origin of the point, which describes how the point was created.

You can use the Edit button of the Edit Points function to modify the description, layer, picture and features of any single point. With a selection of multiple points, you can use the same button to modify the description and layer of the entire selection.

Selecting several points not in sequence is obtained by first activating the Control key and then tapping successively on the points to edit. The Control key is accessible from either the virtual keyboard (CTL key on Nomad, Recon or ProMark 200) or the real keyboard (CTRL key on Ranger). The Shift key can also be used to select several points in sequence.

You can use the Edit button of the Edit Points function to modify the coordinates of any key-in point in the job. The Location tab allows you to enter coordinates for the point. You can enter Grid, global geodetic (WGS84 LLH) or local geodetic (Local LLH) coordinates.

- Grid: This point's local grid coordinates are the Northing, Easting, Elevation values that were keyed in or imported. This point's global geodetic coordinates will be calculated by transforming grid coordinates into latitude, longitude, height coordinates using the current projection.
- Global geodetic: This point's WGS84 coordinates are the latitude, longitude and height values that were keyed in or imported. This point's local grid coordinates will be calculated by transforming geodetic coordinates into Easting, Northing, Elevation coordinates using the current projection.
- Local geodetic: This point's local geodetic coordinates are the latitude, longitude and height values that were keyed in or imported. This point's grid and global geodetic coordinates will be calculated by transforming the local geodetic coordinates with the current projection.

When there is no projection set or solved, there is no way to transform the keyed in values into grid or geodetic coordinates. You will see these coordinates are missing when you look at the point details.

If this point is derived from an observation, the Location tab will list its current coordinates but these cannot be edited.

For more information on *Descriptions*, *Layers* and *Features*, see *Appendix on page 73*.

Editing Polylines

A polyline in Survey Pro is a line connecting points together. Each vertex of the line is defined by an existing point, whether an observed or keyed in point. Points in polylines can be connected with either straight segments or horizontal curves.

You can use the polyline editor to modify polylines (go to Job > Edit Polylines). The polyline editor is described in the Online Help.

Editing Alignments

An alignment in Survey Pro is a line defined by vectors starting at a Point of Beginning (POB). The POB can be an existing point in the job, or just location coordinates. Alignments can have horizontal segments and optionally a vertical profile. Horizontal segments can be straight segments, circular curves or spiral curves. A vertical profile can be defined using a vertical curve and straight grade segments.

You can use the alignment editor to modify alignments (go to Job > Edit Alignments). The alignment editor is described in the Online Help.

You can import alignments for staking, using Roads > Edit Roads menu. Alignments imported using this function can be viewed in the alignment editor but cannot be modified.

Exporting Data

Use the File > Export function to export data from the open job to one of the supported file formats. For most formats (Survey, JOB, TXT, CSV, XML, CR5 and DXF), you may select the portion of the current job you wish to export. For export to Survey Pro 4.x (Job/RAW) or JobXML format, the entire job database will always be exported.

Generating Survey Reports

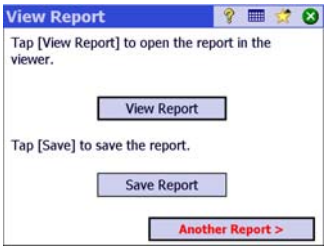
Survey Pro can generate a report of your survey based on the content of the currently open job and formatted according to the template you chose at the beginning of the process.

Up to 18 templates are available (see list below) and most of them are customizable.

- Complete Survey Report, in html format
- Report in fbk format
- GNSS Points report in csv format
- Google Earth report in kml format
- LisCAD report in fld format
- Report in Nikon RAW format
- Optical observation report in htm format
- Two different points reports in csv format
- Nine different stakeout reports in csv or htm format

To generate, view, and save a survey report for the open job, follow the instructions below:

- Go to the Main Menu and tap **Job**, then **View Report**.
- Select the desired template, then tap **Next**.
- Whenever prompted, customize the report, then tap ✔ to let Survey Pro generate and then view the report.
- Depending on the chosen template, do the following to access the screen from which you will be able to save the report:
  - For html reports, tap  ,  then  . You then get the screen below.
  - For Google Earth reports, in absence of an application capable of viewing the generated report, Survey Pro will take you directly to the screen below.
  - For all other types of reports, tap ✖ to access the screen below.



- Tap **Save Report** to save the report to the desired folder.

  (On the same screen, the **View Report** button would take you back to the survey report view, and the **Another Report** button would allow you to ask for a new report, based on the same or a different template.)

Sharing Files Over the Internet

Survey Pro allows you to share files over the Internet. This requires that you first set up an Internet connection on your data collector using Windows Mobile's Settings > Connections > Connections function.

After the Internet connection has been established, go to File > Share and choose one of the two options below depending on how you wish to share your files:

- **DropBox**, This option provides access to a web service that lets you post your files in a shared folder. Using this service requires that you first create a DropBox account and then you log in to it every time you open a session to upload or download files. (The shared folder is in fact a remote folder that you can see through the Internet connection.)

  For more information on how to create an DropBox account, please refer to: https://www.dropbox.com/. DropBox is a free service for volumes of shared data less than 2 Gigabytes.
- **E-mail**: Use this option to send e-mails to one or more recipients, with your files attached to your e-mails. If several files are selected to be attached to an e-mail, Survey Pro will automatically zip the files so there is always one single file attached to the email.

  Sending e-mails requires that you use an e-mail profile. You can set up your own e-mail account (e.g. Gmail) or use one of the default e-mail profiles (SMS, ActiveSync) set up by Windows Mobile. After you have set up your own e-mail account, it will appear as an additional option in the E-mail Profile list.

The Share function can be called directly from many Survey Pro functions that requires loading or saving a file (e.g. File > Save as).

Within these functions, tap  to access the Share function.

4. Connecting Survey Pro to an Instrument

Before you start taking new measurements in a job, you must tell Survey Pro if an optical instrument or a GNSS receiver will be used to perform the job.

NOTE: Selecting an instrument only makes sense when Survey Pro is running on a data collector. If it's running in the instrument you are using (e.g. FOCUS 30), only this instrument can be used in Survey Pro.

Before you make this choice, power on the instrument. This will allow the data collector to detect it and establish a radio, Bluetooth or serial connection with it when asked to do so.

With GNSS equipment, you may simply use a rover receiver, or both a base receiver and a rover receiver. In the latter case, it's good practice to start your survey having both receivers running side by side. This way, you can complete the setup of both receivers and ensure they are communicating on the data link, and you are getting a fixed position at the rover.

When using a serial connection to start a base and rover, the data collector must be connected to the base receiver first. Once the base is set, disconnect the cable from the base and connect it to the desired rover.

Instrument Icon and Options List

- Run Survey Pro.
- Open or create a job.
- Tap on the Instrument icon in the command bar.

  (This icon may look like any of the following:  or ).

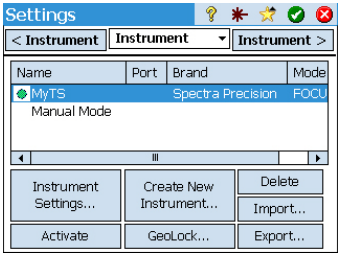
  This opens a list of options (see screen example).
- Manage Instruments provides access to various functions allowing you to declare a new instrument and make advanced settings for each instrument.
- The available options below the Manage Instruments button are for selecting the desired operating mode for Survey Pro:
  - Optical for optical instrument (the selected one in the example)
  - GNSS for GNSS receiver used in RTK or/and post-processing
- In the section above the Manage Instruments button is a list of all instruments that have been added to Survey Pro for the currently selected mode. The current active instrument is indicated with a check mark. An additional option is available ("Manual Mode" for optical; "Demo Mode" for GNSS) allowing you to use Survey Pro standalone, as if it were connected to a real instrument.The "Manual Mode" and "Demo Mode" profiles cannot be deleted or renamed.

In summary, tapping the Instrument icon allows you to:

- Select Optical or GNSS mode
- Quickly activate an instrument for use in the selected operating mode
- Quickly access the Instrument Settings screen
- Add a new instrument supported in the selected operating mode.

Connecting Survey Pro to an Optical Instrument

- Tap the Instrument icon and select **Switch to Optical**
- Tap the Instrument icon and select **Manage Instruments**. This opens the Settings screen listing all the current instrument profiles.



- Tap the **Create New Instrument** button and define the new instrument: Choose its brand and model, and then name it.

  Depending on the model you select, additional settings may be required (connection, radio, etc.) and status is also provided (port, connection, level bubble, etc.). An **Instrument Settings** button is also available giving access to advanced settings (collimation, EDM, lights, etc.).

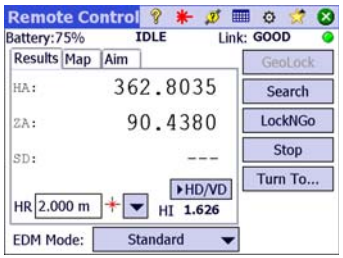
- Tap ✔ to create the new instrument and close the **Instrument Setup** screen. The new instrument is automatically selected in the list, as indicated by the green spot shown before the instrument name. (You would use the **Activate** button to activate another instrument after selecting it in the list.)

- Tap ✔ to close the **Settings** screen.

The **Settings** screen for optical instruments includes the following buttons:

- **Instrument Settings**: Gives quick access to the settings of the instrument selected in the list. The type and number of settings depend on the brand and model of the instrument selected. All instruments have a **Precision** tab through which you can type in the expected precision values of the instrument (angles, distances, PPM). These values are used in the resection routine (see *page 33*) to weight the observations used in the computation process.
- **GeoLock**: Allows you to enable or disable GeoLock, a GPS-assisted target search function usable with some robotic instruments only.
- **Export** and **Import**: These buttons allow you to respectively save or load instrument profiles. Survey Pro saves Instrument profiles as SPI files. Importing an SPI file is a quick way of adding a preset instrument in Survey Pro.
- **Delete**: Allows you to delete the instrument profile you select in the list.

Remote Control Screen



If you are using a robotic total station, use the **Survey > Remote Control** function to control the total station from the data collector running Survey Pro.

In addition to providing the same level of control as Survey Pro's onboard version, the Remote Control screen constantly provides information about:

- The charge status of the battery used in the total station
- The operating status of the total station (IDLE/ MEASURING/Locked)
- The quality of the radio link between the robotic total station and the data collector.

The following buttons are also available from this screen to control the instrument:

- **GeoLock** button: Launches a GPS-assisted search for the prism
- **Search** button: Launches a search for the prism starting at the current instrument direction
- **LockNGo** button: Enables or disables the lock-and-go feature
- **Stop** button: Stops the current turn or search operation
- **Turn To** button: Opens up the "Turn To" screen where you can select a point or angles to turn the instrument to.

The following icons are made available next to the title bar:

Item	Function
	Visible laser pointer off. Tapping on this icon will turn the laser pointer on. Note: Standard safety precautions should be taken to ensure that persons do not look directly into the beam.
	Visible laser pointer on. Shown to indicate the visible laser is currently active. In the command bar, the instrument icon will then look like this:  Tapping  will turn the laser pointer off. Note: Standard safety precautions should be taken to ensure that persons do not look directly into the beam.
	Provides access to the Instrument settings screen.
	Shows or hides the on-screen keyboard.
	Provides access to Geolock activation, status and reset.

Connecting Survey Pro to a GNSS Receiver

Introduction to Receiver Profiles

Survey Pro connects to a GNSS receiver through a *receiver profile*, which is a convenient way of connecting to and configuring a GNSS receiver in one click, using information previously saved as a receiver profile.

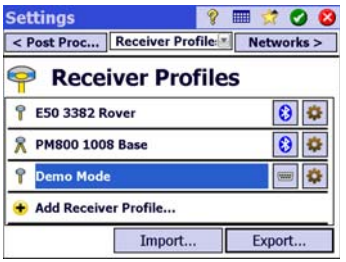
Receiver profiles allow you to use GNSS receivers for either RTK data collection, post-processing data collection, or both simultaneously.

There are two ways of adding a receiver profile into Survey Pro:

- Using Spectra Auto-Configure. This procedure can only be used with Spectra Precision receivers. Survey Pro uses Bluetooth to detect all the nearby Spectra Precision receivers. For each detected receiver, Survey Pro will offer to create a base, rover, and network rover profile using the default settings for that receiver type. You can then choose the receiver profiles you would like to create for the newly detected receivers.
- Using Manual Configuration. This procedure allows you to connect to a single receiver either through a serial connection or over Bluetooth. This procedure is suitable for any of the supported manufacturers and models of GNSS receivers. Once the connection with the receiver is established, you have to define your receiver profile by yourself (see *Modifying a Receiver Profile on page 25* for more information). In the last step, you will name the receiver profile and save it.

NOTE: Adding a profile through one of these two procedures does not mean you simultaneously set the receiver to operate according to this profile. Survey Pro just identifies the type of the receiver so that it can prompt a default profile for this receiver.

Example of Receiver Profiles List



Later, when you start a survey, just select the desired receiver profile –and a *network profile* if you are working in a a network; see also *Managing Network Profiles on page 26*– before you ask Survey Pro to connect to the receiver you are using. Survey pro will configure the receiver hardware according to the settings defined in the selected receiver profile.

When you are using Bluetooth to communicate with receivers, you will typically have a different profile for each receiver, since the Bluetooth address is part of the profile. However, you can change the receiver a profile connects to by changing the Bluetooth address.

You may have two or more different profiles for the same receiver. For example, if you use receiver “x” as a rover with a radio base on some days, and as a network rover with an NTRIP server on other days, then you would have two different profiles for this same receiver.

Receiver profiles can be imported or exported as SPR files allowing you to deploy consistent receiver profiles across your surveying crews.

Receiver profiles can be modified, renamed or deleted.

Adding Receiver Profiles

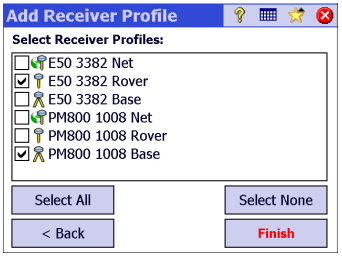
- Tap the Instrument icon and select **Switch to GNSS**.
- Tap the Instrument icon and select **Manage Instruments**. This opens the Settings screen listing the currently existing GNSS receiver profiles.
- Tap **Add Receiver Profile**, then use of the two procedures described below.

Example of Detected Receivers

Adding Receiver Profiles Using Spectra Auto-Configure:

- Tap on the **Start** button in the **Spectra Auto-Configure** pane. Survey Pro then scans automatically for new Spectra Precision GNSS receivers within Bluetooth range. After a while, the screen lists the names of all the detected receivers.
- Select each of the receiver for which you would like to add a receiver profile.

Example of Selected Standard Receiver Profiles

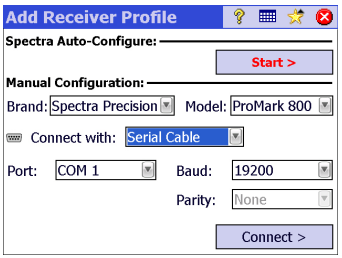


- Tap **Next**. Survey Pro will in sequence connect to each of the selected receivers and will then return a list of standard receiver profiles, each of them corresponding to a possible usable profile for that receiver.
- Check each of the receiver profiles you would like to add.

- Tap **Finish**. Survey Pro comes back to the Receiver Profiles screen on which you can now see the added profile(s). Receiver profiles may be imported or exported at this point (see *Managing Your Receiver Profiles on page 23* for more information).
- Tap ✔ to return to the Home screen.

Adding a Receiver Profile Using Manual Configuration:

Example of Serial Connection



- In the **Manual Configuration** pane, do the following:
  - Select the brand of your GNSS receiver
  - Select the model of your GNSS receiver
  - Select the type of connection to the receiver.

    1) If it's a Bluetooth connection, select **Bluetooth** and then tap the **Bluetooth Settings** button. This button opens up the **Bluetooth Instruments** screen, from which you can scan for Bluetooth devices supporting a serial port service (or open up the Windows OS Bluetooth application).

    Tap **Start Scan** and let the utility search for all the devices. When the search is complete, select the device corresponding to your GNSS receiver. Then tap **Add Selected**, change the Bluetooth name if you wish, set the Bluetooth PIN if required,and tap ✔.

    Tap ✖ to return to the initial screen. The name of the chosen Bluetooth device now appears in the **Bluetooth Device** field.

NOTE: The **Bluetooth Device** field lists the names of the previously detected Bluetooth devices. Use this field when the receiver you want to connect to was detected beforehand, is still running nearby, or you know its Bluetooth name and this name is still listed in the drop-down menu. Only in that case can you directly select the Bluetooth name from that list and quickly establish a connection with the receiver.

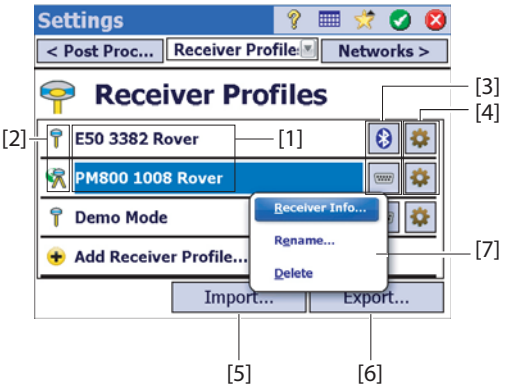
2) If it's a serial connection, check **Serial** and select the port used on the data collector side for this connection.

- Tap **Connect**. You can now define a receiver profile for use in the connected receiver. Complete the four tabs (**Survey**, **Modem**, **General**, **Reset**). See *Modifying a Receiver Profile on page 25* for more information on receiver profiles.
- Tap ✔ to save the new receiver profile. This profile is now available from the list of receiver profiles. Receiver profiles may be imported or exported at this point (see *Managing Your Receiver Profiles on page 23* for more information).
- Tap again ✔ to return to the Home screen.

Managing Your Receiver Profiles

Do the following to access the list of existing receiver profiles in Survey Pro:

- Tap the Instrument icon and select **Switch to GNSS**.
- Tap the Instrument icon and select **Manage Instruments**. Survey Pro lists the receiver profiles as detailed below.



- **[1]**: Receiver profile **name**. By default, the name includes the receiver model first, followed by its serial number (last four characters), then its survey function.

- **[2]**: **Survey function** icon: This may be one of the four icons below (see also *Modifying a Receiver Profile on page 25*).

Icon	Meaning
	Rover.
	Base.
	Network Rover.
	Network base.

- **[3]**: **Connection** icon: This may be one of the two icons below.

Icon	Function
 or 	Shown when respectively a Bluetooth or cable connection has been set between Survey Pro and the receiver. If the Bluetooth icon is shown, tapping this icon will provide the receiver brand and model as well as the receiver Bluetooth name. If the Serial icon is shown, tapping this icon will provide the receiver brand and model as well as the serial line settings.

- **[4]**: **Settings** icon:  . Provides access to the receiver profile's **Survey**, **Modem**, **General** and **Reset** tabs. See *Modifying a Receiver Profile on page 25* for more information.
- **[5]**: **Import**. Tap on this button to import a receiver profile, then:
  - Select the SPR file you want to import.
  - Tap  . Survey Pro returns the name of the receiver profile contained in the file.
  - Select the profile name to continue.
  - Tap **Import** to complete the import sequence.
- **[6]**: **Export**. Tap on this button to export a receiver profile, then:
  - Select the receiver profile you want to export.
  - Tap **Export**.
  - Name the file, then tap  to export the profile and save it as an SPR file in the chosen folder.

Example of Receiver Information

- **[7]**: This menu is displayed after you tap and hold a receiver profile in the list. From this menu you can do the following:
  - Receiver Info: Use this function to view more information on the receiver connected to Survey Pro through this profile (see example). The possible capabilities of a receiver (shown as icons) are identified below.

Icon	Capability
	The receiver has rover capability.
	The receiver has base capability.
	The receiver has data collection capability (for post processing).

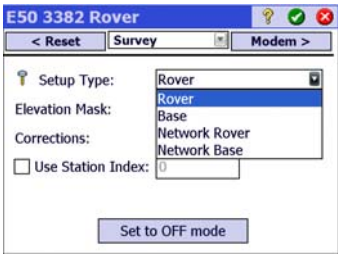
  - Rename: Used to rename the selected receiver profile.
  - Delete: Used to delete the selected receiver profile. Then tap Yes to confirm that you really want to delete the profile.

Modifying a Receiver Profile

Tap on the corresponding  button in the receiver profiles list to make changes to a receiver profile. The receiver profile is described on four different tabs, the content of which is receiver-dependent.

IMPORTANT! All changes you make to a receiver profile will be effective only if a receiver is connected to Survey Pro through this profile. In addition, the changes made to a receiver profile will not be effective immediately in the connected receiver, but only next time you start a survey using the modified receiver profile to connect to and configure the receiver.

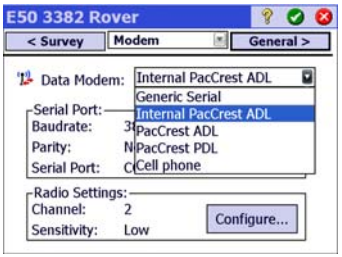
Epoch 50's Survey tab



- The Survey tab is primarily used to define the following RTK survey parameters:
  - Setup Type: Used to assign one of the four functions to the receiver:
    1) Rover: Corrections received via radio.
    2) Base: Corrections broadcast via radio.
    3) Network Rover: Corrections received via a GSM modem.
    4) Network Base: Corrections sent to an IP address.
  - Elevation Mask: Limits the use of satellites to those that are high enough in the sky, seen from the receiver antenna. All satellites located under this zenith angle will be rejected (default: 10°).
  - Corrections: Used to set the format of corrections received (rover) or broadcast (base). This setting is not used for rover receivers that support automatic detection of correction format.
  - Use Station Index: Used to assign a station ID to a base, or identify the base a rover is expected to use.

– Set to Off mode: Sets the receiver idle, i.e. no more corrections are sent out if the receiver is a base –or network base– or the receiver stops listening for corrections if it's a rover or network rover. There is an exception with ProMark receivers, which in all cases will keep on operating as rovers.

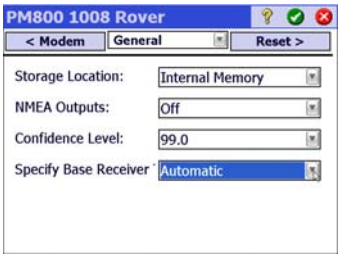
Epoch 50's Modem tab



- The Modem tab allows you to configure the RTK data link.
  - If Setup Type = Rover or Base, allows you to enter the UHF radio settings (i.e. baud rate, frequency channel and sensitivity for most radio models).
  - If Setup Type = Network Rover or Network Base, allows you to set the cell modem used, either the one internal to the data collector (Current Internet or Windows Networking option), the one internal to the receiver (Internal GPRS Modem option), or an external cell phone (IP Modem option).

    Setting a cell modem mainly implies entering the service provider information (APN) and your connection profile (username & password).

ProMark 800's General tab



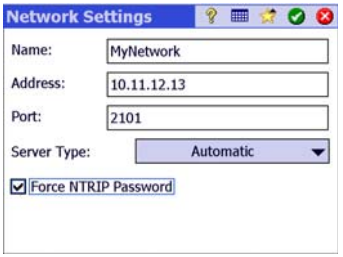
- The General tab allows you to configure settings that are specific to the brand and model of this receiver profile. For more information on brand- and model-specific settings, see the online help.
- The Reset tab provides additional control over the connected receiver. Three buttons may be available:
  - Set Rx. to OFF mode: Same as Set to Off mode above.
  - Soft Reset: Will reboot the receiver with its current settings.
  - Hard Reset: Will reboot the receiver with its default settings (depends on the model of receiver used).

Managing Network Profiles

Network profiles are managed the same way as receiver profiles. Network profiles are required:

- To specify the source of RTK corrections a GNSS receiver acquires when it is set as a network rover.
- To specify the destination of the RTK corrections a GNSS receiver will generate when it is set as a network base.

Example of Network Profile



To add a new network profile:

- Tap the Instrument icon and select **Switch to GNSS**.
- Tap the Instrument icon and select **Manage Instruments**. This opens the Settings screen listing the currently existing GNSS receiver profiles.
- Tap on the **Networks** tab
- Tap **Add Network**. Enter your network parameters (see below), then tap ✔.

A network profile is defined by:

- A name
- An IP address
- An IP port
- A server type (**NTRIP**, **Direct IP** or **Automatic**)
- Additionally for Automatic or NTRIP server type, you need to set the **Force NTRIP password** option. If this option is enabled, you will be prompted for user name and password for every NTRIP mount point, even if the NTRIP table specifies that they are not required. This option is to deal with poorly formatted NTRIP tables, where the source table says that password is not required, but the selected mount point actually requires one.
- Additionally for Direct IP server type, you need to specify the data format of the corrections the network delivers.

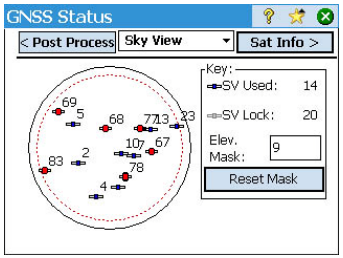
When later starting a survey, you will be requested to specify the network your receiver will work with. Choose the name of the network profile to specify this network.

At this point, the **Manage Networks** button allows you to return to the list of existing network profiles to make changes if necessary.

Checking the GNSS Status

Checking the GNSS status of the connected receiver is recommended before starting a job.This implies that the GNSS receiver is in real conditions of use, preferably in an open sky environment.

Use the GNSS Status function on the Survey menu to read this information. The GNSS status is split into six different tabs:



- Receiver: Provides additional information describing the position solution computed by the receiver. In RTK, the Reset Ambiguities button allows you to re-initialize the computation of the position. For more information, see *6. GNSS Surveying on page 41*.
- Data Link: Describes how a rover is provided with RTK corrections, or the type of RTK corrections generated by a base. For more information, see *6. GNSS Surveying on page 41*.
- Post Process: This tab is useful to help you conduct a Post Process survey. The rest of the time, the tab is empty.
- Sky View: Provides a polar view of the sky showing the location and type of each satellite being tracked (Lock) and the total number being used in position solutions (see example). You may change the value of the elevation mask on this screen. This will update the value read on the General tab as well (see *Managing Your Receiver Profiles on page 23*).
- Sat Info: Shows the L1 signal strength (SNR) of each satellite in tabular and graphic form. Depending on the receiver used, you may be given the ability to reject some satellites you don't want to use (because the signals received from them are too weak for example, or because they are officially declared unhealthy).
- Position: Provides the three coordinates of the position solution currently computed by the GNSS receiver, the solution status, as well as heading and speed if the receiver is currently moving. The position may be expressed in WGS84 (always possible), in a local coordinate system (if selected and solved) or as grid coordinates (if the grid is selected and solved).

Before going any further in your work, you should check that at least 6 satellites are received and used, each satellite providing a good signal level, and the receiver delivers a 3D position solution.

5. Optical Surveying

What you have done already:

- You have set up the optical instrument on a tripod over a point of your choice and measured the instrument height.
- You have selected Optical from the instrument icon located on the Home screen or Main Menu.
- You have activated the instrument for use with Survey Pro. See *Connecting Survey Pro to an Optical Instrument on page 19*.
- You have configured the proper settings in the Job > Settings > Surveying tab. This tab allows you to configure:
  - Earth Curvature & Refraction correction: To adjust measured zenith angles for the effects of earth curvature and refraction.
  - PPM: To adjust the measured slope distances for the atmospheric effects on the EDM.
  - Survey with True Azimuths: Automatically sets the Circle on the instrument to match the BS Azimuth that is set when pointed at the backsight.

What you should do now: You have to position and orient the total station in your local coordinate system before you start measuring points. This can be done using one of the methods below, by choosing whichever is most appropriate:

- Known Point: Station setup on a point with known coordinates.
- Unknown Point /Resection: Station setup on an unknown point using the resection method to determine the position of the point.
- Use Last Setup: This method is made available only after a station has been set up in the current job. Use it only if you are certain the tripod is still exactly at the same location as when the last setup was performed, and the same BS and Circle are being used.

The first two methods are described below. The point or points used should have previously been stored in or imported into the job.

Station Setup on a Known Point

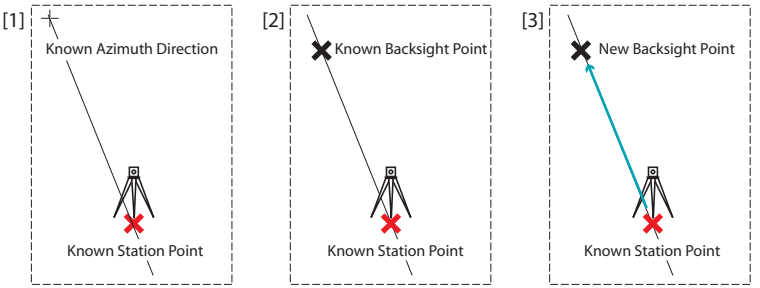
The name and coordinates of the known point where the station is set up can be picked from within the open job. This method offers three different scenarios:

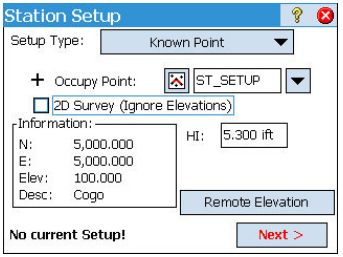
- BS Azimuth [1]: Backsight azimuth. The station location will be set from the coordinates of the known point. The circle is set using the value you enter in the Backsight Circle field. The backsight azimuth will be the value you enter.

  Typically, this is an "assumed" backsight and the value will be 0 or North. In most cases when using this method, the BS azimuth and the circle will both be set at 0.

  There are two variations on this, depending on whether the Survey with True Azimuths setting is enabled or not. If it is enabled, then the circle will always be set to what the BS Azimuth is. If not, then it's your choice what to set.
- BS Point [2]: Backsight point. The station location will be set from the coordinates of the known point. The station circle orientation will be set from the azimuth between the station point and another known point (backsight) in the job.
- New Point [3]: This is a variant of backsight azimuth in which the azimuth is given to a new point you would like to measure and add to the job.

The diagram below illustrates the three possible scenarios.





Start the station setup as follows:

- Go to the Main Menu, then tap **Survey** > **Station Setup**.
- Choose **Setup Type= Known Point**.
- Enter the name of the station setup point in the **Occupy Point** field. The point name can be entered directly, or, picked from the map or point list using the ▼ button.
- If you wish to ignore elevations in your job, check the **2D Survey** box. You will otherwise enter the **HI** (height of instrument) field.
- Tap **Next**.

Then, of the three possible options, choose the one that is suitable for your job:

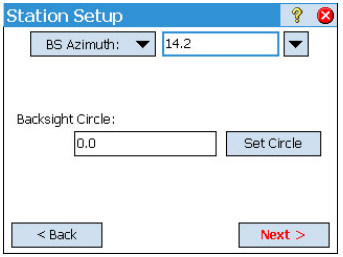
1. If you choose **BS Azimuth**:
   - Aim the instrument in the direction of a known or assumed azimuth.
   - Enter the known or assumed value of azimuth.
   - Enter the desired value of circle in this direction (typically "0" or the true azimuth). If the **Survey with True Azimuths** setting is enabled, then the circle value will automatically be set by Survey Pro.
   - Tap **Set Circle**.
   - Tap **Next**. The screen provides a summary of what you have just done and prompts you to check the setup.

     Check the Setup:

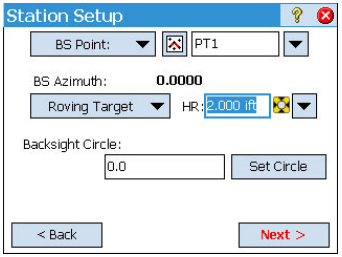
     a. If you choose the **By Angle** option, just make sure the instrument is still aimed in the direction of known azimuth, then tap **Check**. You should read the previously set backsight circle.

     b. If you choose the **By Point** option, enter the name of the point used for checking, specify the target used on that point, correct the target height if necessary and tap **Check**. A measurement is then made. Check the delta values reported on the screen, which should be as close as possible to zero.

     c. You cannot use the **By Distance** option in this case.
   - If you are satisfied with the read values, tap **Finish**. You can now start measuring new points.



NOTE: Checking the backsight is an optional step that is enabled by default. If you wish to skip backsight checks after station setup, you can turn this off in the **Job** > **Settings** > **Surveying** tab.



2. If you choose **BS Point**:
   - Enter the name of the backsight point. It can also be picked from the map or the list of points.
   - Specify the type of target used at the backsight point (**Fixed Target** or **Roving Target**).

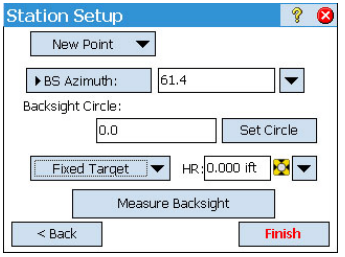
     A "roving target" is when you measure to the backsight with the same rod and prism you will be using for your subsequent data collection.

     A "fixed target" is when you have a tripod and prism that will remain at the backsight and that will be different from the rod and prism you will be using for subsequent data collection. See also *Managing Smart Targets on page 75* for more information on the Survey Pro target database and the fixed backsight target.
   - Using , select the name of this target. As a result, the **HR** (height of rod) field is updated to provide the height of this target.
   - Aim the instrument at the known backsight point.
   - Enter the desired value of backsight circle in the direction given by the backsight point (typically "0" or the true azimuth). If the **Survey with True Azimuths** setting is enabled, then the circle value will automatically be set by Survey Pro.
   - Tap **Set Circle**.
   - Tap **Next**. The screen provides a summary of what you have just done and prompts you to check the setup.

     As previously explained for **BS Azimuth**, you can in the same way check the setup either **By Angle** or **By Point** (see **Check the Setup** above).

     You can also use the **By Distance** option. Just make sure the instrument is still aimed in the direction of the backsight point and tap **Check**. The measured horizontal and vertical distance errors are reported on the screen. They should be as close a possible to zero.
   - If you are satisfied with the read values, tap **Finish**. You can now start measuring new points.

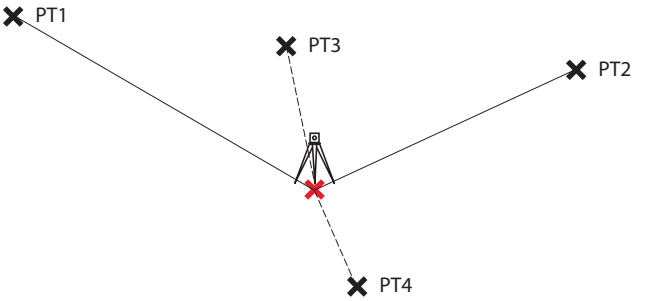
NOTE: Checking the backsight is an optional step that is enabled by default. If you wish to skip backsight checks after station setup, you can turn this off in the **Job** > **Settings** > **Surveying** tab.



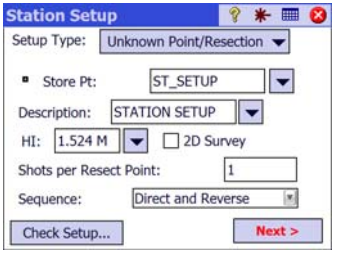
3. If you choose **New Point**:
   - Place a target at the unknown (new) backsight point.
   - Aim the instrument at this point.
   - Enter the known or an assumed value of azimuth along this direction.
   - Enter the desired value of backsight circle for this direction (typically "0" or true azimuth). If the **Survey with True Azimuths** setting is enabled, then the circle value will automatically be set by Survey Pro.
   - Tap **Set Circle**.
   - Specify the type of target used at the backsight point (**Fixed Target** or **Roving Target**).
   - Using ▼, select the name of this target. As a result, the **HR** field is updated to provide the height of this target. Update the height value if necessary.
   - Tap **Measure Backsight**.
   - After making sure the instrument is sill pointed at the backsight point, tap **OK**.
   - Enter a name and description for the new backsight point.
   - Tap ✔ to measure and store the point.
   - Tap **Finish**. You can now start measuring new points.

Station Setup on Unknown Point, Resection Method

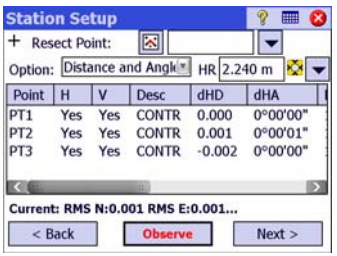
The resection method is illustrated below.



At least two known points should be observed to solve the station setup (e.g. PT1, PT2). Other known points (PT3, PT4,..) may be added to refine the computation.



- Go to the Main Menu, then tap **Survey** > **Station Setup**.
- Choose **Setup Type**= **Unknown Point/Resection**.
- Use the **Store Pt** and **Description** fields to enter respectively the name and description of the point where the instrument is set up. (This is a new point, with unknown coordinates.)
- If you will ignore elevations in your job, check the **2D Survey** box. You will otherwise enter the height of instrument in the **HI** field.
- You can take one or more shots of each point. Enter the desired number of shots in the **Shots per Resect Point** field.
- You may want the instrument to perform either **Direct and Reverse** measurements (recommended for station setup) or a **Direct Only** measurement. Use the **Sequence** field to make this choice.
- Tap **Next**. This opens the **Station Setup** screen on which you should define the following parameters:
  - **Resect Point**: Enter the name of the first point used (PT1 for example).
  - **Option**: Define the type of measurement you will perform on the point (**Distance and Angle** or **Angle Only**).
  - Define the type of target used and its height (**HR**).



- Tap **Observe** then **Take Shot** to start a measurement. You are then taken back to the **Station Setup** screen where the measured point is listed as the first point involved in the station setup.
- Repeat the previous two steps for the next point (PT2 for example), and then for additional points (PT3, PT4, etc.) for data redundancy.

  As you get new points, Survey Pro tries to compute a solution for the station location.

  When a solution is available, the RMS values of the solution are shown in the lower part of the screen. If not a good contributor to the solution, any measured point may be removed from the process by clearing the corresponding check box. You will immediately see the impact of this point removal on the quality of the solution.

  Likewise you may reject the horizontal or vertical contribution of a point by tapping on the corresponding "Yes" which will then be changed into a blank field. Again, you will immediately see the impact of this change on the quality of the solution.

- When you are satisfied with the results, tap **Next**. The screen then shows the properties of the station setup. If you scroll down the list of results, you will see the components of the final error ellipse for the solved point.

  On this screen, Survey Pro defines one of the control points you have just used in the resection method as a backsight point.

- At this stage, you can tap Finish to complete the station setup. The instrument circle used for this setup will be the direct circle reading on the first resection point used in the setup, unless you are surveying in true azimuth mode.

  In true azimuth mode, the instrument circle will be adjusted so that your circle will now read the true azimuth when pointed at the first resection point used in the setup.

  Alternatively, you can tap Backsight to proceed to the normal backsight setup, with your newly calculated station point as the setup point, and your last resection point as the backsight point. It is a good practice to do a backsight check after a resection to ensure the instrument circle is oriented as you expected.

  When this is done, tap Finish. You can now start measuring new points.

Variants to the Basic Station Setup Procedures

There are variants to the basic step-by-step procedures described above, related to your current job settings (in Job > Settings > Surveying tab):

- **Check Setup**: You may shorten the BS Azimuth and BS Point routines by checking the Skip check during Station Setup option.
- **PPM Correction**: By default, the PPM will not show up in the station setup routine. But, if you check the box for Prompt for PPM during Station Setup, the PPM will become the first step in your station setup routine.

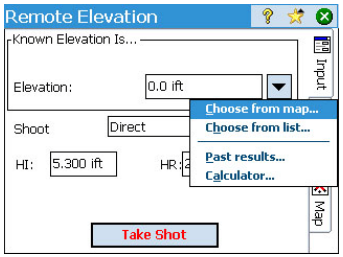
  The PPM correction is applied to all measured slope distances. This may be achieved in one of two different ways:

  1. You enter the PPM in the instrument which in return will provide Survey Pro with slope distances corrected for the PPM.
  2. Or you enter the PPM in Survey Pro, in which case the instrument will return uncorrected slope distances (make sure the PPM is set to "0" in the instrument). Survey Pro will apply the PPM correction to any slope distances that will be used in further calculations.

NOTE: With some instruments (e.g. FOCUS 30 and S6), the PPM correction can only be set using the second method.

For any station setup, you can also set the elevation of the station point independently using the Remote Elevation routine (see *Remote Elevation on page 36*).

Remote Elevation



This routine will set the elevation coordinate of the station from a point with known elevation. It is accessible from within the first station setup screen by tapping the **Remote Elevation** button (provided the **2D Survey** box is unchecked).

The point with known elevation is either:

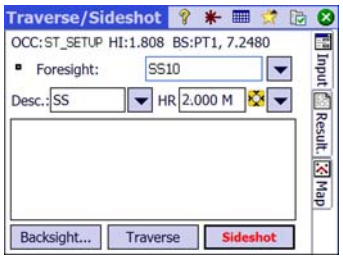
- A point stored in the job. You will select it from the map or the list of points.
- A point not stored in the job, but its elevation is known, perhaps through past results, by calculation, or printed on a data sheet.

Step-by-step procedure:

- Have a target set up on the point.
- Aim the instrument at the point.
- Go to **Station Setup** and then tap the **Remote Elevation** button.
- Enter the elevation according to the suitable method.
- Check the **HI** value.
- Select the target and check the **HR** value.
- Tap **Take Shot**.

Point Measurement

Introduction to Traverse / Sideshot

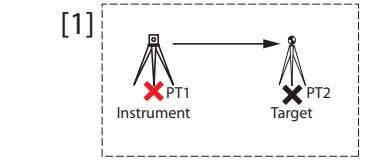


- Tap **Survey > Traverse / Sideshot**. This screen allows you to make traverse and sideshot measurements. It also provides access to the station setup via the **Backsight** button allowing you to either check the current setup or start a new setup. The current setup is summarized at the top of the screen.
- Enter the name (**Foresight**) and description (**Desc.**) of the point you will now be measuring, as well as the type and height (**HR**) of the target used on that point.
- The next step is choosing between sideshot or traverse.

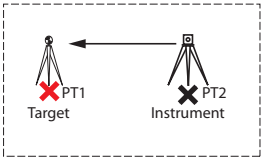
  Choosing "Sideshot" means you simply want to take a measurement of the point. (See *Sideshot on page 37*.)

  Choosing "Traverse" (see illustration below) means you are expected to move the instrument to that point either immediately or after measuring other points (sideshot).

[1]



[2]



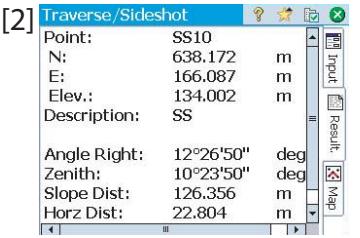
This implies a new station setup is required after moving the instrument. (See *Traverse on page 38*.)

Sideshot

- Be sure the instrument is pointed at the target placed over the point.
- Tap **Sideshot**. Survey Pro returns the results of the measurement in the lower portion of the screen (**[1]**). The point name is automatically incremented for the next measurement. Tapping on the **Result** tab will provide more information on the measurement made (**[2]**).

[1]

[2]



Point: Point name

N: Point coordinate Y

E: Point coordinate X

Elev.: Point coordinate Z

Description: Point description

Angle Right: Azimuth angle measured from the occupy point to the foresight point (measured in a horizontal plane)

Zenith: Zenith angle measured from the occupy point to the foresight point (Zenith is measured in the vertical plane, relative to gravity, where 0 is pointing straight up, parallel to gravity, and 90 is pointing straight ahead, orthogonal to gravity.)

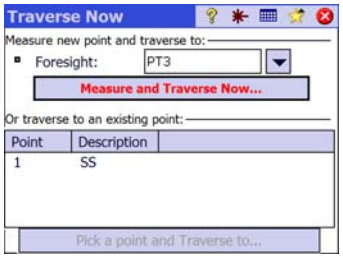
Slope Dist: Slope distance measured from the occupy point to the target

Horz Dist: Horizontal distance calculated from the occupy point to the target

Vert Dist: Vertical distance measured from the occupy point to the target.

- Repeat the above two steps until all your points have been measured.

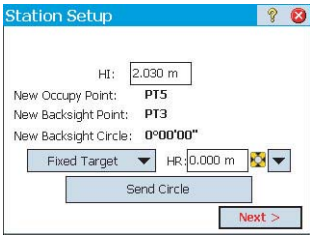
Traverse



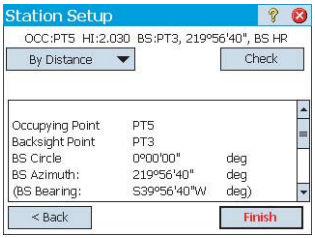
- Be sure the instrument is pointed at the target placed over the point.
- Tap Traverse. The screen prompts you to measure a new point, or to pick a point that was previously measured from the current station setup (Survey Pro will display a list of appropriate points), and then move the instrument to that point. If you create a new point to traverse to, you will then be asked to enter the description of the point before measuring it.

- After the measurement is done or the point selected, Survey Pro provides a summary of what the new station setup will be (see **[1]** below).
- Move the instrument to the new station point and level it on its tripod.
- Measure the new instrument height and enter the measured value (HI).
- Aim the instrument in the direction of the point you came from (now the backsight point).
- Enter the type and height (HR) of the target used on the backsight point (see **[1]**).

[1]



[2]



- Tap Send Circle to set the circle. The New Backsight Circle will be preset to zero, unless you are surveying with true azimuths.

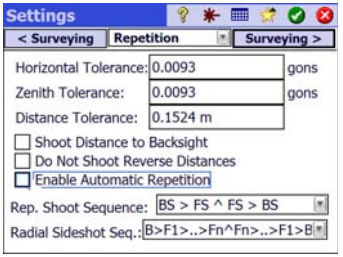
  In the true azimuth case, the circle will be the azimuth from the new location occupied by the station back to its previous location, which is now your backsight point.
- Tap Next and complete the station setup as you would normally do using the Known Point (backsight) method (see **[2]**).

NOTE: The Station Setup routine can be used at any point to occupy any existing point in the job at any time. It is up to you to determine if and when this is appropriate.

Repetition Shots

The Repetition shots function allows you to perform sideshots or traverse shots using any number (between 1 and 99) of repeated measurements ("Sets").

- Go to the **Survey** menu and tap **Repetition Shots**.



- Tap in the command bar to access the job settings relating to repetition shots (equivalent to navigating to the **Job > Settings > Repetition** tab).
- Tap the **Repetition** tab. The **Rep Shoot Sequence** field allows you to choose the desired sequence of repetitions (7 available):
  - "FS" stands for "Foresight":
  - "BS" stands for "Backsight"
  - The ">" symbol is used to denote the next shot coming in the sequence using the same face of the instrument (direct or reverse).
  - The "^" symbol is used to denote when in the sequence you will flip the instrument to take observations in the opposite face.

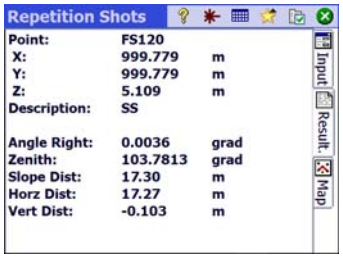
  The other parameters on this screen are self-explanatory. Set them to meet your application. The **Radial Sideshot Seq** field allows you to specify the sequence of observations to be taken in the Radial Side Shot routine. This setting is NOT used for either regular repetition shots or multiple side shots.
- Tap to return to the **Repetition Shots** window.

- Use the **Foresight** field to enter a name for the point you will measure through repetition shots.
- Enter the number of Sets you want the sequence to be repeated.
- Select the type and enter the height (**HR**) of the target used on the foresight point.
- Start the sequence by tapping either **HA**, **ZA**, **SD** or **All**, whichever is appropriate in your case. Depending on the instrument used, run the series of measurements manually or let the instrument do this automatically. Results are displayed at the end of the sequence (see illustrated).
  - **Average of**: Shows the average angle or distance to the point from all the shots taken. The number in parenthesis is the total number of repetitions performed.
  - **Worst Residual**: Displays the worst residual calculated from all the sets of the selected measurement type.

  You may use one or more of the **Toss** buttons to remove from the solution the set of measurements that provided the worst residual. A **Toss** button can only be used if three or more sets have been collected.

  When you tap **HA**, **ZA**, **SD** or **All**, Survey Pro will collect an additional observation of that type (or all of them) and add it to the sets already collected.

EXAMPLE: If you had three complete sets, then selected to toss the worst HA, you would now have two HA sets, three ZA sets and three SD sets. If you tapped HA, you would collect an additional set of horizontal angles only, and on return to this screen, you would now have three HA, three ZA, and three SD sets. If you hit HA again, on return to this screen you would have four HA, three ZA and three SD sets.



- Additionally from this screen, you can either traverse to the point (tap **Traverse** and then follow the usual traverse procedure) or tap **Sideshot** to store a measurement of the point, based on all the data gathered during the repetition shots, to store the point with the measurements taken.

NOTE: The **Sideshot** or **Traverse** buttons will not become active unless at least one observation for each type of measurement (HA, ZA, SD) has been performed.

If you tapped **Sideshot**, the observation is used to store a new point, and you view the results (see example). If you tapped **Traverse**, the traverse prompt will open and you will be guided through moving and setting the instrument on the new occupy station point. The traverse procedure is described above (see *Traverse on page 38*).

Tap **Sideshot** if you plan to occupy the measured point at a later time. You can use the **Traverse** button later to initiate moving the instrument to any point measured from the current station.

Tap ⊗ to quit the Repetition Shots function.

Starting an RTK Base

NOTE: You don't need to set up a base if you are working in a network. Just make sure your rover is configured to receive network corrections, and actually receives them before you start taking measurements in your job. See *Starting an RTK Rover on page 43*.

What you have done already:

- You have set up the base GNSS receiver on a tripod over a point of your choice and measured the antenna height.
- You have selected GNSS from the instrument icon located on the Home screen or Main Menu.
- You have created a receiver profile that matches the use of your receiver as a base (or network base) and the receiver has been reported as being "base" capable. See *Connecting Survey Pro to a GNSS Receiver on page 21*.
- You have made sure the GNSS status is correct at the location where the base is to be operated. See *Checking the GNSS Status on page 28*.

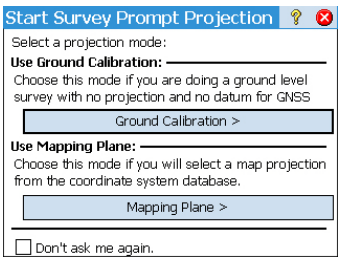
What you should do now:

- Go to the Survey menu and tap Start Survey. You may also find the Start Survey function on your Home screen.
- Unless already done, highlight the name of the receiver profile you intend to use for operating your base.

  For a "network base", select the network to which the base will deliver its corrections by selecting the relevant network profile name. For a "base", there may be additional settings required using the Configure Modem button (the radio settings provided by the selected receiver profile may not match your case of use).
- Tap Connect.

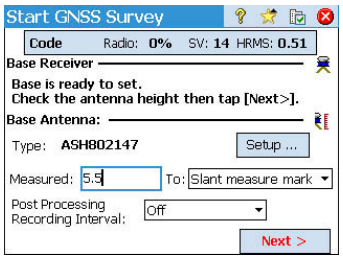
  When creating a job, if you decided not to choose a coordinate system, you will be asked to reconsider this choice when starting the base. The Start Survey Prompt Projection screen will appear at this time with two possible options:

  1. Ground Calibration: Choose this option if there is no known projection or datum to relate your local grid coordinates to geodetic coordinates (through this choice, you confirm your decision to use local control to set up a coordinate system). The selection of a geoid is possible after making that choice.



2. Mapping Plane: Tap on this button if you now wish to use a coordinate system (i.e. known origin and type of projection + known datum) that can either be keyed in or picked from Survey Pro's coordinate system database. For more information on the projection mode, refer to *Introduction to Calibration on page 52*.

NOTE: If you always start your GNSS surveys with the same type of projection mode, then you can tap Don't ask me again at this prompt, and Survey Pro will start the GNSS survey with the settings you used to create the job.



- Survey Pro will poll for the base position. While Survey Pro does this, enter the antenna height you measured previously (Measured field) and how you measured it (To field).

  You may ask the base to log raw data (for post-processing) by just specifying a recording interval in the Post Processing Recording Interval field. When you start a rover, by default it will automatically use the same recording interval as the base you set. Set the recording interval to "Off" if you do not want to record raw data.
- Tap Next. Survey Pro searches the point database for a location that matches the current base position (the one that was checked on the previous screen). If a matching point is found in the job, or else in the reference station database (see *Managing Reference Stations on page 57*), then Survey Pro offers this as the default base point. Tap Change to choose a different point or to create a new point for the base setup.
- Tap Next. The base is now started. Survey Pro prompts you to start the rover (as if you had tapped Start Survey on the Home screen). Underneath the GNSS receiver profiles list, the name of the modem for the selected profile is displayed).

NOTE: if you only want to set the base at this time, tap . Survey Pro will then exit the Start Survey wizard and open the GNSS status page connected to the base.

Starting an RTK Rover

This section describes how to configure and start an RTK rover.

What you have done already:

- You have set up the GNSS receiver on a pole and measured the antenna height.
- You have selected GNSS from the instrument icon located on the Home screen or Main Menu.
- You have created a receiver profile that matches the use of your receiver as a rover (or network rover) and the receiver has been reported as being "rover" capable. See *Connecting Survey Pro to a GNSS Receiver on page 21*.
- You have made sure the GNSS status is correct where you start your survey. See *Checking the GNSS Status on page 28*.

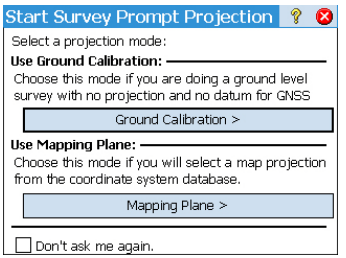
What you should do now:

- Go to the Survey menu and tap Start Survey. You may also find the Start Survey function on your Home screen.
- Unless already done, highlight the name of the receiver profile you intend to use for operating your rover.

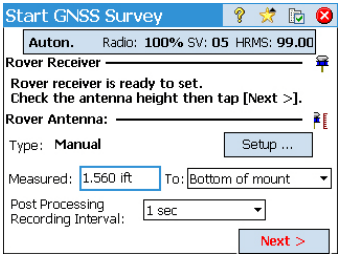
  For a "network rover", select the network from which the rover will receive corrections by selecting the relevant network profile name. For a "rover", there may be additional settings required using the Configure Modem button (the radio settings provided by the selected receiver profile may not match your case of use).
- Tap Connect.

  When creating a job, if you decided not to choose a coordinate system, you will be asked to reconsider this choice when starting the survey (unless you started your own base and you were already prompted to make a choice at that time). The Start Survey Prompt Projection screen will appear at this time with two possible options:

  1. Ground Calibration: Choose this option if there is no known projection or datum to relate your local grid coordinates to geodetic coordinates (through this choice, you confirm your decision not to use any known coordinate system). The selection of a geoid is possible after making that choice.
  2. Mapping Plane: Tap on this button if you wish to use a coordinate system (i.e. known origin and type of projection + known datum) that can either be keyed in or picked from Survey Pro's coordinate system database. For more information on the projection mode, refer to *Introduction to Calibration on page 52*.



NOTE: If you always start your GNSS surveys with the same type of projection mode, then you can tap Don't ask me again at this prompt, and Survey Pro will start the GNSS survey with the settings you used to create the job.



- While the rover receives data (corrections and position) from the base, enter the rover antenna height you measured previously (**Measured** field) and how you measured it (**To** field).

  You may ask the rover to log raw data (for post-processing) by just specifying a recording interval in the **Post Processing Recording Interval** field. If you earlier set up a base doing the same, then make sure you are using the same recording interval for both receivers. Select "Off" if data logging is not required.
- Tap **Next**.
- Confirm or change the point where the base is located.

  For most receivers, the height of the base antenna is broadcast over the data link, so you do not need to change the base antenna height displayed on this page.

NOTE: The broadcast height will be reduced to the antenna phase center, and will show as an "Unknown" antenna brand.

If your rover receiver does not get the base antenna height from the data link (**Measured**= "0.000", **Base Brand**= "Unknown" and **Antenna Type**= "Unknown Broadcast"), you need to specify the antenna brand and type used at the base, enter the measured height and specify the mark used to measure the height (tap on the **Change** button to access the base's **Antenna Height** definition screen).

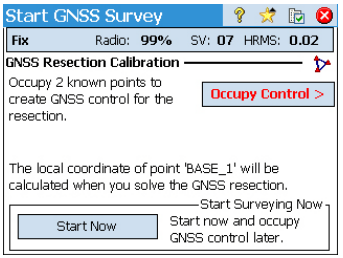
NOTE: Next time you run your rover, Survey Pro will automatically query the Base Info list (see *Managing Reference Stations on page 57*) for the suitable base to use with the rover, thus skipping the base location selection step described here.

If both the base location and antenna type match, Survey Pro will automatically use the antenna parameters stored in the Base Info list for that base, and not the antenna parameters broadcast by the base.

The message **Rover is ready to set with reference station "x"**. will indicate that the base was picked from the reference station data base, whereas the message **Rover is ready to start a survey with base point 'x'**. will indicate it was found in the survey file.

Any time a VRS (Virtual Reference Station) survey is started, excluding a PRS (Physical Reference Station) in a VRS survey, automatic base selection will be done as well. The message **Rover is ready to start a survey with virtual base 'x'** will be displayed in this case.

- If the **Finish** button is displayed, this means the coordinate system is fully solved, and you are ready to collect data.



If the **Next** button is displayed instead, this means you are working in Default Ground mode, where a calibration is always required, or you are working in mapping plane mode but you started your base on a new point with a new autonomous position. Tap this button. You will see a new screen asking for occupation of control points (see screen example).

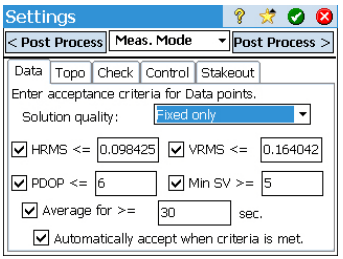
For the sake of clarity, calibration is discussed in a separate section (see *Solving Calibration on page 52*).

NOTE: Solving the calibration is optional when your coordinate system is a known map projection and datum, and your base was setup on a known point.

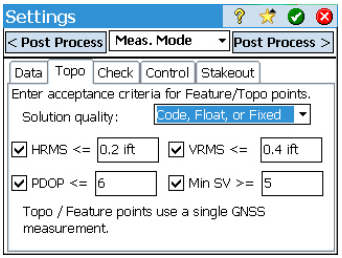
At this stage, you may tap **Start Now** to begin surveying with a temporary calibration solution, which will solve your translation, but the scale and orientation parameters will remain unknown. You can collect data points; their local coordinates will be calculated with this temporary calibration.

At any time during the survey, you can collect the required number of GNSS control points and solve the proper calibration for your site. After you solve the calibration, any data collected points will automatically be recalculated using the latest solution of coordinate system.

Some routines, such as point stakeout or offset points, cannot be run until the calibration is properly solved.



- Before starting data collection, tap  in the command bar. This directly opens the **Meas. Mode** tab (part of the **Job Settings** screen) where you can set the acceptance criteria for different types of point collection:
  - On the **Data** tab, define the criteria for all the points you will collect using **Point** from the **Data Collection** screen or from the active survey map.
  - On the **Topo** tab, define the criteria for all the points you will collect using **Topo SS** from any measurement screen or from the active survey map. Topo criteria are also used for feature collection.
  - On the **Check** tab, define the criteria for all the points you will collect after tapping successively **Control** (on the **Data Collection** screen), then **Check**.
  - On the **Control** tab, define the criteria for all the points you will collect after tapping successively **Control** (on the **Data Collection** screen), then **Control**.
  - On the **Stakeout** tab, define the criteria for all the points you will collect through any stakeout routine.



Independently for each type, you can set the following criteria:

- **Solution quality**: "Fixed only" or "Code, Float or Fixed"
- Max. tolerated **HRMS** and **VRMS** values
- Max. tolerated **PDOP** value
- Minimum number of satellites required (**Min SV**).
- Minimum position averaging time, in seconds (**Average for**)
- Automatically accept data collection or not when criteria are met.

NOTE: The last two criteria make sense when the receiver is set to static to give the best averaged position. Since in **Topo SS** point collection Survey Pro is allowed to store a point using the single latest epoch of data, these two criteria are irrelevant in that case (compare the two screen examples on the left).

If you enabled raw data logging for post processing, the **Post Process** tab is also accessible through which you will set the **RTK autonomous points** field as follows:

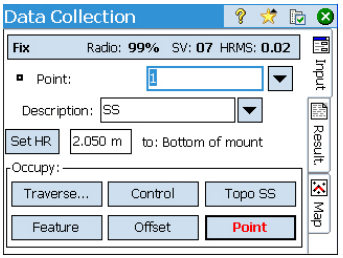
- **Allow in PPK Survey**: Choose this option to allow Survey Pro to store an autonomous solution for a data point. This will happen during an RTK survey in case of intermittent or prolonged data link failure. By doing this, you will be able, after the survey and through post-processing, to calculate a precise solution for the point using the data from the GNSS raw data file (PPK logging file).
- **Do Not Store**: No autonomous point will be stored.

- Tap ✔ to save your settings. Survey Pro displays the **Data Collection** screen.

Collecting Data

Standard data collection routines are presented below. Keep in mind that you may have to solve the calibration before your measured GNSS coordinates are properly transformed into your local grid (see *Solving Calibration on page 52*).

Remember also that you can access the data collection functions from the active map after you have tapped and held on the map and selected **Survey Mode** from the popup menu.



From the Data Collection screen, you can perform several types of point collection:

- Point: Tap this button to collect the averaged position of a point after a timed, static occupation on that point. The acceptance criteria defined on the Data tab will apply. (The corresponding markers will be inserted into the GNSS raw data file if raw data logging for post-processing is activated.)
- Topo SS: Tap this button to collect the "instant" position solution of a point. The acceptance criteria defined on the Topo tab will apply.
- Feature: Tap this button to collect points at regular intervals of time or distance as you walk along a feature. The acceptance criteria defined on the Topo tab will also apply in this case.
- Offset: Tap this button to collect the position of a point you cannot physically occupy. Azimuth and distance information to that point from the reference point (i.e. a nearby point you can occupy) will be necessary to collect the position of the offset point. Ancillary equipment (e.g. laser range finder) will be required to collect this additional information.
- Control: Tap this button to collect control points. Used for solving calibration. See *Solving Calibration on page 52*.
- Traverse: Follow this routine to measure a new point with the GNSS rover, and then move the base to this new point, similar to an optical survey traverse.

Collecting Points

Place the pole in vertical position over the point to be surveyed and tap Point. to start collecting data on this point.

The workflow of this routine will depend on the choice you made for the following acceptance criteria:

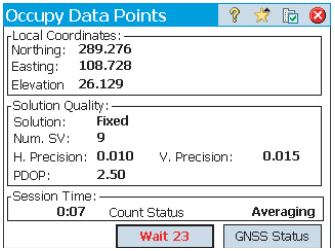
- Average for checked and a minimum averaging time (in seconds) requested: After tapping Point, you will see screen type **[1]** on which the lower-left button label will show Survey Pro counting down from the requested averaging time (Wait xx). After that time, Accept is restored as the button label so you can decide on what to do: Accept the point collection now or wait more time for an even better averaged position.

NOTE: You can tap the Wait xx button to accept the point before the minimum duration has expired. You will in return be informed that the minimum duration is not yet met, at which point you can discard the warning by tapping Accept anyway.

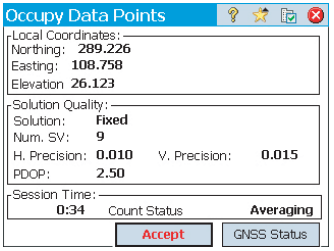
- Average for cleared: Screen type **[2]** will be displayed for an unlimited period of time, until you tap Accept. Point collection is then complete, unless some other acceptance criteria are not met in which case you will see screen type **[3]** after you tap Accept. You can also choose to accept the point before the wait time expires.

- **Automatically accept when criteria is met** checked: The use of this parameter makes sense when it is combined with **Average for** checked. Survey Pro will automatically store the point at the end of the averaging time, unless some other acceptance criteria are not met. In that case, at the end of the count down, the **Accept** button will be restored on the screen and when you tap on it, you will see screen type **[3]**.

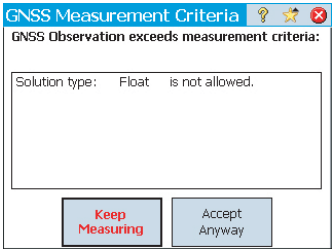
[1]



[2]

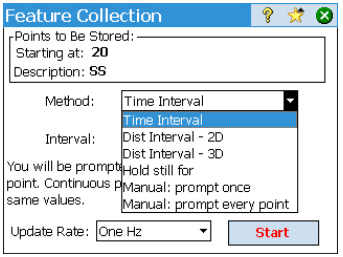


[3]



When screen type **[3]** is displayed, you can either ignore the warning message (tap **Accept Anyway**), or ask for more data collection on the point (tap **Keep Measuring**) until you are satisfied with the collected data (you will then tap **Accept** to end the point collection).

Collecting Features



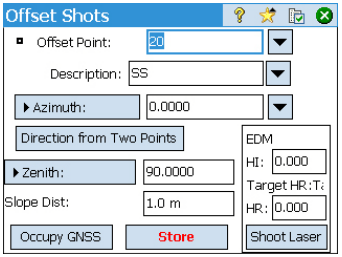
Tap **Feature** on the **Data Collection** screen. Features can be collected using one of the methods below. In all methods, each new point name is incremented automatically to the next available name.

- **Time Interval**: After accepting the first point, additional points will automatically be stored after the specified time interval (in seconds) has elapsed.
- **Dist Interval - 2D or 3D**: After accepting the first point, additional points will automatically be stored after traveling the specified 2D or 3D distance.
- **Hold Still For**: After accepting the first point, additional points are automatically stored when the pole is held in the same spot for the specified interval of time (in seconds).
- **Manual: Prompt Once**: Will store points in the same way as **Topo SS** from the **Data collection** screen, incrementing the point name automatically after each stored point.
- **Manual: Prompt Every Point**: Same as **Manual: Prompt Once** except that you are prompted for a new description, layer and attribute with each point stored.

When shown, **Interval** is the field where you should enter the time or distance interval used for continuous data collection.

Use the **Update Rate** field to set the speed at which the rover receiver should deliver position solutions. When **Five Hz** is selected, the receiver will compute positions five times a second minimizing the measurement latency.

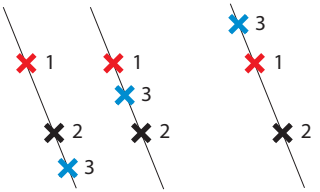
Collecting Offset Points



- Tap **Offset** on the **Data Collection** screen.
- Enter the offset point name and description.
- Tap **Azimuth/Bearing** to indicate that you will be measuring either the azimuth or bearing angle from the occupy point to the offset point. Then tap **Zenith/Vertical Dist** to indicate that you will be measuring either the zenith angle and slope distance or the vertical and horizontal distances from the occupy point to the offset point

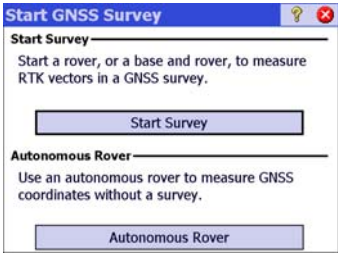
  You can take these measurements using a compass and a tape, or a laser range finder. The laser interface is shown in the lower-right corner: Enter the instrument height before taking a shot.
- Tap **Occupy GNSS** to collect the position of the occupy point. The acceptance criteria are those defined for **Data**.
- Tap **Store** to collect the offset point.

Another method exists to measure the direction from the occupy point to the offset point which is to collect another point (**3**) aligned with the offset point (**1**) and the "occupy" point (**2**). See diagrams below:



- Choose a suitable point (**3**) and place the pole over it.
- Tap **Direction from two Points** to collect this additional point. The acceptance criteria are those defined for **Data**.
- You will then be asked to define the location of this point compared to the offset and occupy points. This is to allow Survey Pro to determine the correct angle: Choose **In Front** if the offset point is located at one end of the line connecting the three points (see the two diagrams above, left), or choose **In Between** if the offset point is located somewhere between the occupy point and the additional point (see diagram above, right).
- Then you can collect occupy point (**2**) and then store offset point (**1**).

Collecting Data Out of a Survey



If you tap Data Collection on the Survey menu without having first started a survey, Survey Pro will invite you to choose between two options:

- Start the survey first, then collect data (this is the recommended way of using Survey Pro).
- Start collecting data right away (and possibly running any stakeout routines) using your receiver in *Autonomous Rover* mode, that is, with the receiver only capable of delivering autonomous position solutions. You will need to confirm this choice.

  Working in this mode means you will collect LLH coordinates in the open job regardless of the chosen acceptance criteria in the Data Collection function.

NOTE: Most receiver models will provide autonomous position solutions in that mode. However some may keep the ability to deliver more accurate solutions (i.e. DGPS, Float or Fixed).

If you are using such a receiver, to remind you at all times that you are working with no survey started, position solutions will be reported with a tilde character (~) placed before the position status if better than Autonomous (e.g. "~Float" instead of "Float", "~Fixed" instead of "Fixed").

Solving Calibration

Introduction to Calibration

A GNSS calibration is a 2D similarity transformation. The GNSS LLH coordinates are transformed using a map projection into XY mapping plane coordinates. The XY mapping plane coordinates are then translated, scaled and rotated into your local grid using the calibration.

Your choice of projection mode will determine the mapping plane used for this procedure:

1. If you started your job with no coordinate system, then there is no projection and no datum available to relate the LLH coordinates to the local grid coordinates. In this case, Survey Pro will initialize a default map projection when you collect your first GNSS control point. This default projection will be created to give ground distances at the height of the first control point.

   Because the orientation of your local grid relative to geodetic North is unknown, you must collect **at least two GNSS control points** to solve the scale, rotation, and translation between the default map projection and your local grid coordinates.
2. If you started your job with a map projection and datum, then the measured LLH coordinates can be transformed into local coordinates using this selected map projection. In this case, because the scale and orientation is defined by the map projection, you need only to solve for the translation parameter.

   If you set your base on a known point, then no calibration will be required. If you set your base on a new autonomous point, then you must collect **at least one GNSS control point** to solve the translation parameter.

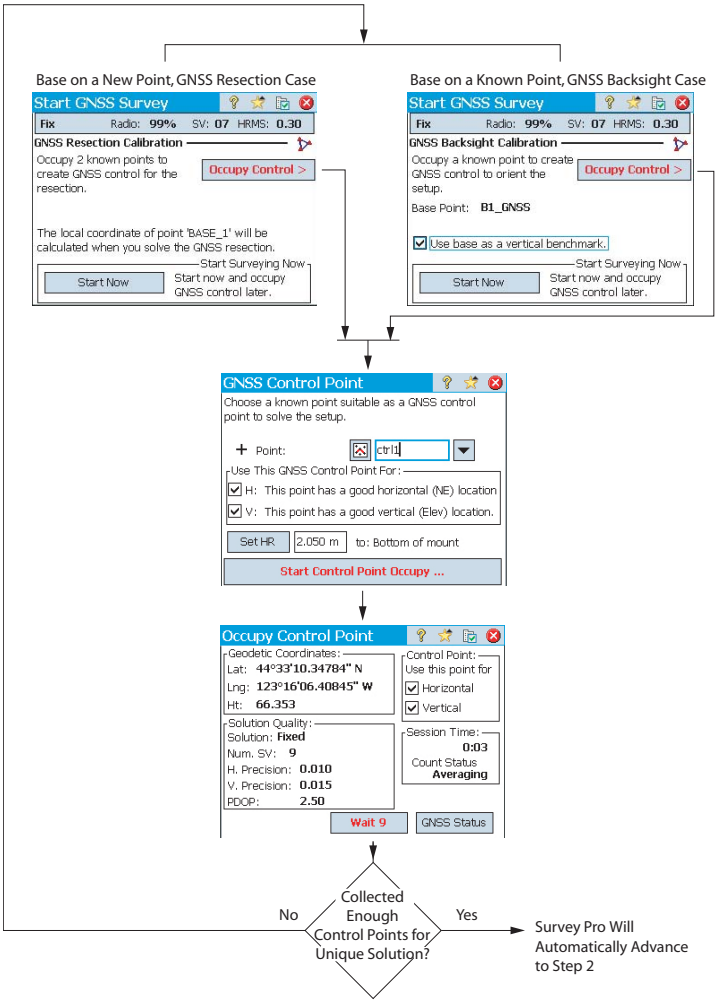
   A calibration with multiple points can still be performed to give extra redundancy to the calibration solution.

A calibration is solved by collecting GNSS control points. A GNSS control point is a point with an accurate local grid coordinate that you occupy with the GNSS rover. The LLH from the GNSS measurement is combined with the accurate grid point to form a calibration point pair. The calibration is then solved from these control points to give you the best fit between your GNSS measurements and the local ENE grid coordinate system.

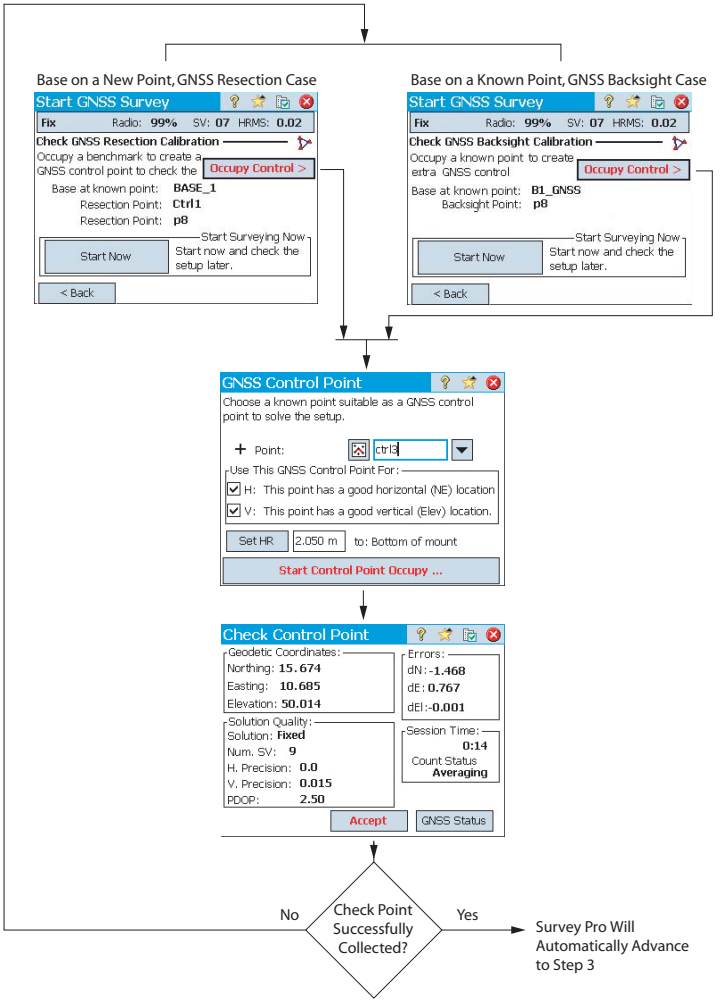
Calibration Procedure, Illustrated

The calibration procedure can be split into three distinct steps. These are described below as flowcharts:

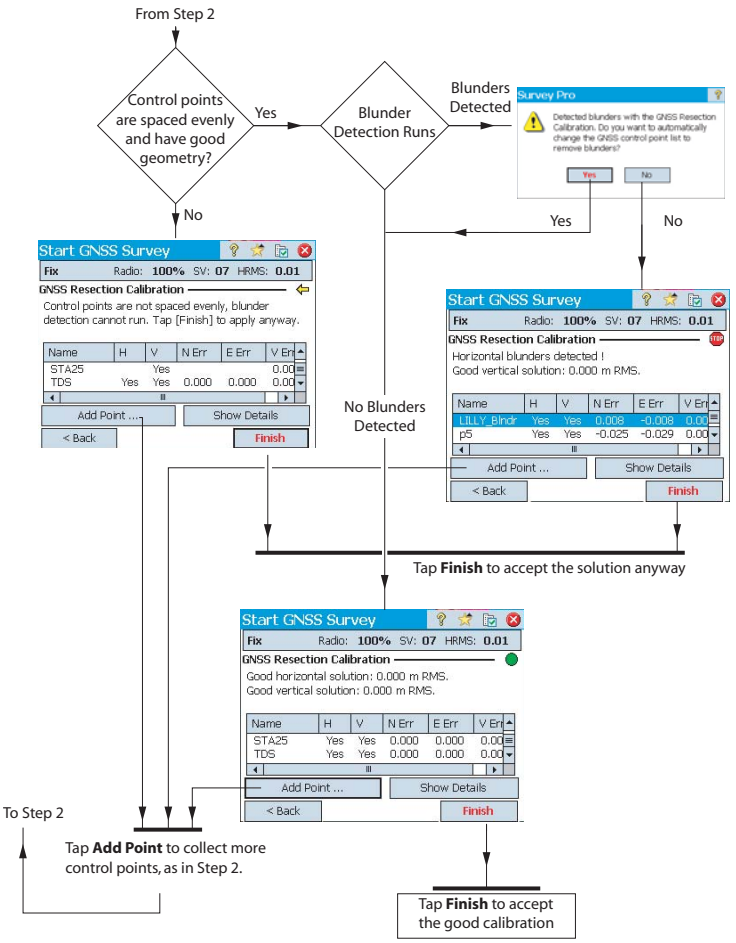
- **Step 1**: When you start a survey, Survey Pro will report the need for calibration on the Calibration Status page, which will guide you through the process of collecting the minimum amount of control points required for a unique solution of the calibration.



- **Step 2**: The Calibration check page will guide you through the process of collecting an additional GNSS control point to check the solution, and to provide redundancy for the best fit least squares solution.



- **Step 3**: The calibration results page will solve the calibration and display the results.



You can change the contribution of your control points to the calibration solution by tapping on the columns next to each point name in the list:

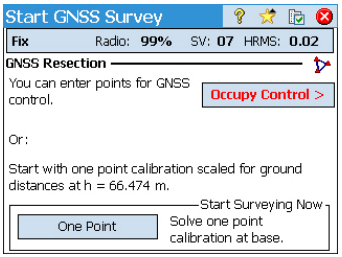
– Tap in the H column to deselect or select a point to be used in the horizontal calibration.

– Tap in the V column to deselect or select a point to be used in the vertical calibration.

Any time you change the contribution of a control point, the Finish button will change to a Re-Solve button. Tap this button to re-solve the calibration using the new contribution of that control point.

After you have solved the calibration as part of the Start Survey wizard, you can use the **Survey > Control > Control** routine, or the **Survey > Projection > Solve Calibration > Add Point** routine to add additional GNSS control points, re-solve the calibration, and have all the collected points updated with the latest calculation.

Special Case of One-Point Calibration



When you are using the Default Ground Calibration projection mode, and you have started a new job with no points, or only one point in it, you have the option of doing a one-point calibration to create the coordinate system for your job. If these conditions are met, the screen will look as illustrated.

You can tap **One Point** to set up the calibration for a ground level survey at the reference height displayed on this screen. Since there is only one point in the job to start, the orientation is not fixed by the local grid coordinates, so only the translation needs to be solved, which is possible from a single point.

How Survey Pro Deals With Base Location

With no known coordinate system used:

- If you set up the base on a known point, a geodetic point will be created for the base location, using the autonomous LLH coordinates from the GNSS receiver as the geodetic position for the base.

  EXAMPLE: Base location “B1” will have for geodetic counterpart a point named “B1_GNSS” with description “B1”.

  This point will automatically become a GNSS control point, with the known grid location of the base paired with its new geodetic coordinates.
- If you set up the base on an unknown point, Survey Pro will create a default point named “BASE_1” using the autonomous LLH coordinates from the GNSS receiver as the geodetic position for the base. This point is not eligible as a GNSS control point, because the grid coordinates are not known until they can be calculated with a calibration solution. Until the calibration is available, the grid coordinates of this point will be “-- -- --”.

  NOTE: You can set only one new autonomous base position in each job.

With a known coordinate system used:

- If you set up the base on a known point, the selection of a known coordinate system will allow Survey Pro to compute and attach the equivalent geodetic (LLH) coordinates to that point.
- If you set up the base on an unknown point: Same as with no coordinate system used.

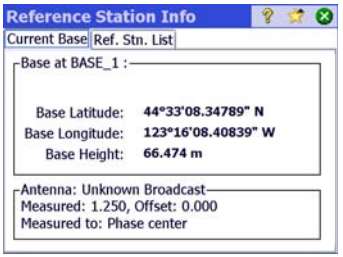
Unexpected Change of Base

Typically when working in a VRS network, your rover may detect a change of base location in the corrections it receives. In that case Survey Pro will warn you of that change. Tap OK to acknowledge the warning message. This will take you to the Start GNSS Survey screen where you should re-define the base location and antenna before you are allowed to continue your survey.

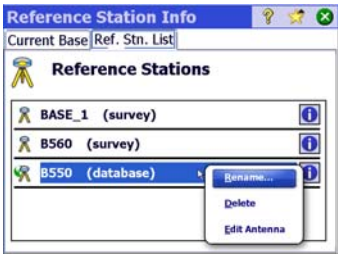
Managing Reference Stations

Survey Pro keeps up to date a list of reference stations that the software uses to enhance the search for base points when starting a survey. To view this list:

- Go to the Main Menu.
- Tap Survey, then Base Info.



The Current Base tab shows the properties of the base point currently used in the survey.



The Ref Stn List tab lists all the base points Survey Pro has been using so far. The list includes:

- Base point names followed by the term "(database)": These are read from the *reference station database*. By default, any NTRIP station set up in a survey –whether a single base, or a PRS in a VRS survey– is automatically saved to that database (in addition to being part of the survey). This is done because it is assumed that these stations are likely to be re-used in other survey jobs to provide the required base points.
- Base point names followed by the term "(survey)": These are read from the current survey and so belong to the survey file. These are considered to be temporary base points (reference stations using radios) not likely to be re-used. That's why they are not by default saved to the reference station database. You may however do so if you wish (see below).

From the Ref Stn List tab, you can:

- Tap  to view all the properties of any reference station: base point name, geodetic location, antenna used, and if applicable, additional information about the NTRIP mount point used.
- For a "re-usable" reference station (*<base point name> (database)*), you can use the context menu (tap and hold the base point name) to either rename or delete the reference station, or edit the properties of its antenna.

- For a “temporary” reference point (*<base point name> (survey)*), you can use the context menu to save the reference point to the *reference station database*.

Ending a Survey

Go to the Home screen and tap **End Survey**. Confirm the end of survey by tapping **End**.

A survey in progress implies that either a base or a rover or both are running. You will need to end the currently running survey if you wish to reset the base or rover.

Opening an existing job or creating a new one while a survey is in progress will automatically end the current survey.

When an RTK rover or/and an RTK base is used in a survey, then ending this survey will cause the rover to stop listening for corrections, and/or the base to stop sending out corrections. (ProMark will however continue to operate as rovers.)

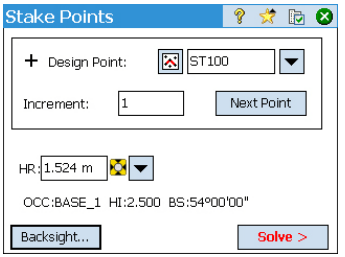
7. Stakeout Routines

This section introduces the basic stakeout routines with optical and GNSS instruments. When you become familiar with these routines, you will be able to extend your knowledge on more specific stakeout routines, such as stake to line, slope staking, etc.

What you should have done already:

- You should have now completed the station setup with your optical instrument.
- You should have now solved the calibration with your GNSS receiver.
- If the points to stake are not in your job, you can use the File > Import function to import your points to the job (see *Importing Data on page 14*).

Staking Points With a Mechanical Optical Instrument



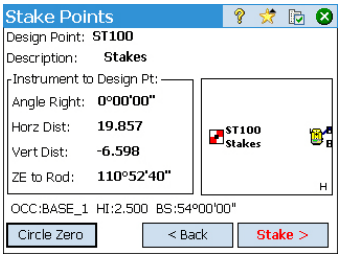
- Go to the Stakeout menu and tap Stake Points.
- Use the Design Point field to enter the name of the first point you want to stake.
- Enter an integer in Increment. This will allow Survey Pro to automatically select the next design point to stake once the current one will have been staked.

  e.g. "ST101" first staked and Increment= 2, then next point will be "ST103".

  (Tapping the Next Point button will instantly select the next point from the list, based on the Increment value.)
- Choose the type of target used and set the height of the rod (HR field). The information underneath describes the current station setup.

  (You may use the Backsight button to check the station setup or start a new setup.)
- Tap Solve. The Stake Points screen now indicates the angle and distances the instrument should measure with the target placed exactly over the design point.

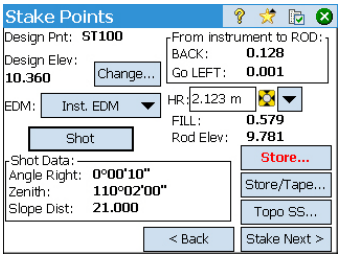
  It may be convenient at this point to change the circle setting so that it reads zero when the total station is facing toward the design point. This can be done by tapping the Circle Zero button. The first time you tap this button during a stakeout session, a message will warn that the original backsight reference will be lost.



The following appears when zeroing the circle:

- A new backsight circle value is computed, sent to the instrument and stored in the raw data.
- The Angle Right value is changed to zero to reflect the change (see example). **The instrument now needs to be turned horizontally to zero to face the design point**.
- To prevent errors, the backsight setup is invalidated when exiting the Stakeout function. You will need to reset your backsight circle to the proper reference after exiting stakeout before collecting any new data.

- Whatever your choice about the circle setting, orient the instrument as requested so the instrument is facing the target.
- Tap Stake then Shot to take a measurement. The screen returns the results of the measurement, providing information to adjust the position of the target (see screen example):
  - FORWARD / BACK: Indicates if the rod must move forward (toward the instrument) or backward (away from the instrument).
  - Go RIGHT / Go LEFT: Indicates if the rod must move to the right or left from the instrument's point of view.

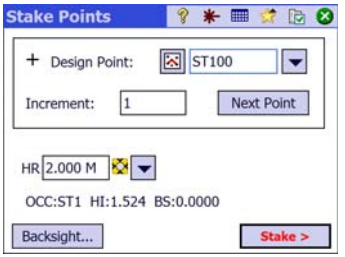


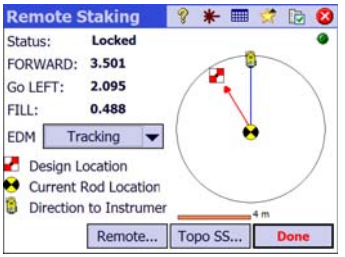
NOTE: You can also get the reverse indication (i.e. displaying directions from the rod's viewpoint) by clearing the View From Instrument to Rod (non-remote) option in Job > Settings > Stakeout tab.

  - CUT / FILL: Displays the required amount of cut or fill to bring the stake point to the design point's elevation.
  - Rod Elev: Displays the elevation at the rod's location computed from the last shot.

- When you are satisfied with the location of the target, stake the point and then do one of the following:
  1. Before moving on to the next point, you may want to store the location of the as-staked point: While still standing on the target, tap Store, name and describe the point, then tap ✔ to collect the point.
  2. Or If you wish to stake the next point without storing the results of this staked point, tap Stake Next.

Staking Points With a Robotic Optical Instrument





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- Enter an integer in Increment. This will allow Survey Pro to automatically select the next design point to stake once the current one has been staked.

  e.g. "ST101" first staked and Increment= 2, then next point will be "ST103".

  (Tapping the Next Point button will instantly select the next point from the list, based on the Increment value.)
- Choose the type of target used and set the height of the rod (HR field). The information underneath describes the current station setup.

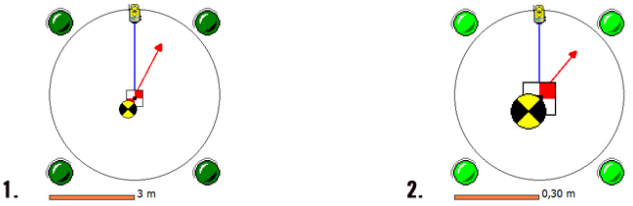
  (You may use the Backsight button to check the station setup or start a new setup.)
- Tap Stake. This opens the Remote Staking screen.

  If the status on that screen indicates that robotic tracking is not locked on, you can tap the Remote button to open up the Remote Control screen, where you can initiate a search for the target. Then tap ⊗ to close this screen.

  The Remote Staking screen (illustrated) will guide you to the design point. The screen provides information on how far you are from the design point:
  - FORWARD / BACK: Indicates if the rod must move forward (toward the instrument) or backward (away from the instrument).
  - Go RIGHT / Go LEFT: Indicates if the rod must move to the right or left from the rod's point of view. This requires that you have cleared the View From Instrument to Rod (remote) option in Job > Settings > Stakeout tab, otherwise you will get the reverse indication, i.e. directions from the instrument's viewpoint.
  - CUT / FILL: Displays the required amount of cut or fill to bring the stake point to the design point's elevation.
  - Rod Elev: Displays the elevation at the rod's location computed from the last shot.
- Walk toward the design point following the instructions on the screen:

Symbol	Meaning
	Design point location.
	Your current location.
	Instrument location.
10 m	Scale used on the graphic. Represents the circle radius.
FORWARD/BACK: xxx Go LEFT/Go RIGHT: xxx FILL/CUT: xxx	Horizontal and vertical components of the distance still to go.

When you get closer to the design point, the graphic will change to assist you in more precisely locating the design point. The point to stake becomes the fixed center of the display and the rod becomes the object that is moving. This aids in precisely positioning the rod over the point. A red arrow indicates the direction in which to go.



1. Distance to go is between 3.0 and 0.3 m (10 and 1 ft): Four dark-green spots appear around the graphic.
2. Distance to go is less than 0.3 m (1 ft): The spots around the graphic turn light green.

- When you are satisfied with the location of the target, tap **Done** to access the **Stake Points** screen. The screen indicates how close you are to the design point.
- Stake the point and then do one of the following:
  1. Before moving on to the next point, you may want to store the location of the as-staked point: While still standing on the target, tap **Store**, name and describe the point, then tap ✔ to collect the point.
  2. Or If you wish to stake the next point without storing the results of this staked point, tap **Stake Next**.

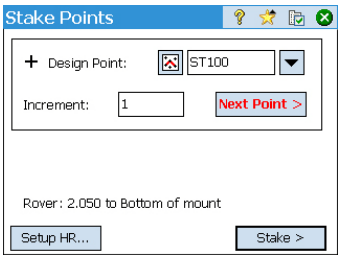
  Whatever your choice, you will then be taken back to the **Stake Points** screen with the next point to stake automatically selected, (based on the **Increment** value you entered previously).

NOTE: At this stage, you may:

- Change the elevation of the design point after tapping **Change**.
- Tap the **Turn** button to automatically turn the instrument toward the design point.
- Tap the **Shot** button to re-measure the point.
- Collect a **Topo SS** point using the **Topo SS** button.

WARNING: Be sure you are using the **Store** button to store stakeout data. The **Topo SS** button only stores sideshot data.

Staking Points With GNSS

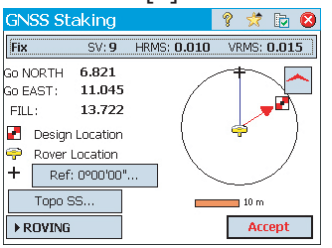


- Go to the **Stakeout** menu and tap **Stake Points**
- Use the **Design Point** field to enter the name of the first point you want to stake.
- Enter an integer in **Increment**. This will allow Survey Pro to automatically select the next design point to stake once the current one has been staked.

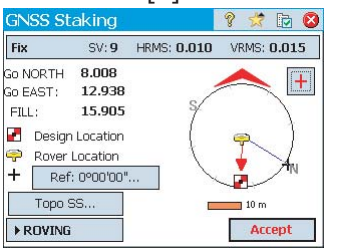
  e.g. "ST101" first staked and Increment= 2, then next point will be "ST103".

  (Tapping the **Next Point** button will instantly select the next point from the list, based on the **Increment** value.)
- Set the rover antenna height.
- Tap **Stake**. This opens the screen that will guide you to the point. Survey Pro offers two different navigation modes to help you walk to the design point.

[1]



[2]



NOTE: In the example above, the direction to follow is provided as **Go North / Go East** instructions. Survey Pro can instead provide **Azimuth / Distance** to the point if it's more convenient for you. Go to **Job > Settings > Stakeout** tab to change the setting of the **Display Directions As** field. Point tolerance (different from acceptance criteria) can also be set on this tab.

Tap on the  /  button to select one of these modes:

–  : The top of the screen will always show the selected reference point or azimuth you select through the **Ref...** button (**[1]**).

–  : The top of the screen will always show the direction in which you are walking (**[2]**). A large red arrow will appear as you walk. The North (**N**) and South (**S**) directions will be shown as well. You can also define a reference point or azimuth using the **Ref...** button. The resulting direction will appear as a blue line starting from your current position.

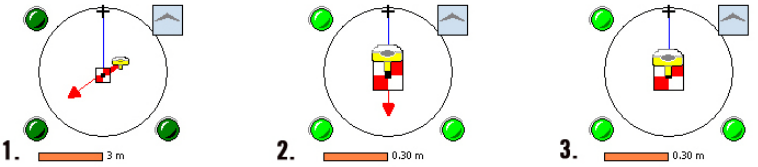
- Walk toward the design point following the instructions on the screen (see table below).

Remember the rover receiver is always in dynamic mode (>ROVING button displayed) as you navigate to the design point:

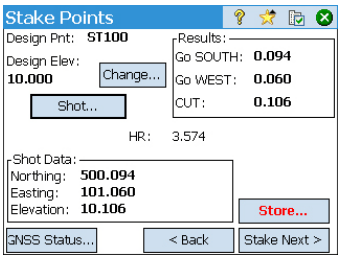
Symbol	Meaning
	Design point location.
	Your current location.
	Reference point or azimuth.
 10 m	Scale used on the graphic. Represents the circle radius.
Go N/S: xxx Go E/W: xxx FILL/CUT: xxx	Horizontal and vertical components of the distance still to go.

NOTE: You can use the Topo SS button any time along the way to store any point of interest. Survey Pro will ask you to name and describe that point before storing it.

When you get closer to the design point, the graphic will change to assist you in more precisely locating the design point. The point to stake becomes the fixed center of the display and the rod becomes the object that is moving. This aids in precisely positioning the rod over the point. A red arrow indicates the direction in which to go.



1. Distance to go is between 3.0 and 0.3 m (10 and 1 ft): Dark-green spots appear around the graphic.
2. Distance to go is less than 0.3 m (1 ft): The spots around the graphic turn light green.
3. Your current position is within the acceptance criteria defined on the Stakeout tab: The rover and the design point are practically superimposed at the center of the graphic.



- When you have located the design point and you wish to collect a static RTK occupation at this point in order to get a more precise position averaged from multiple epochs, you should toggle to occupying mode by tapping the >ROVING button (which is then changed into an >OCCUPYING button). This will turn the receiver into static mode for the occupation.
- When you are satisfied with the occupation results, you can tap **Accept** to finish the stakeout measurement. Depending on the acceptance criteria you set on the **Stakeout** tab, the button label may show **Wait xx** before it becomes an **Accept** button. The screen then shows the results of the position computation for the staked point.

NOTE 1: At this stage, you may tap **Shot** to re-measure the point. You may also change the elevation of the design point by tapping **Change**.

NOTE 2: If you are simultaneously collecting raw data for post-processing, the as-staked point is automatically stored when you tap **Accept** on the previous screen, provided you did a static occupation on the point.

WARNING: Be sure you are using the **Store** button to store stakeout data. The **Topo SS** button only stores sideshot data.

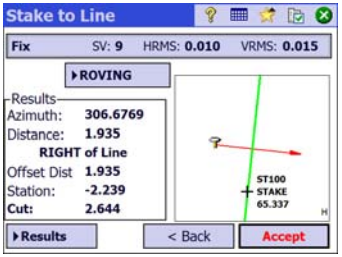
- Stake the point and then do one of the following:
  1. Before moving on to the next point, you may want to store the location of the as-staked point: While still standing on the target, tap **Store**, name and describe the point, then tap ✔ to collect the point.
  2. Or If you wish to stake the next point without storing the results of this staked point, tap **Stake Next**.

  Whatever your choice, you will then be taken back to the **Stake Points** screen with the next point to stake automatically selected, (based on the **Increment** value you entered previously).

Other Stakeout Routines

You can use Survey Pro for other stakeout routines:

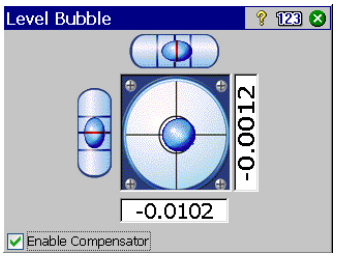
- **Stake List of Points**: Is used to stake points from a specified list of points. Points can also be selected by description or polyline.
- **Stake DTM**: Allows you to stake an area and get cut/fill information between the point being staked and a reference DTM surface at the same horizontal coordinates.
- **Define a Location**: Is used to manually enter the distance and direction to a new point from any existing reference point and then stake out the new point.
- **Where is Next Pt?**: Provides instructions to locate the next point in the job taking into account the current location of the operator (or rodman) and a reference point.



- Stake to Line: Allows you to locate any position in relation to a predefined line. The line can be defined by two points, a point and direction, a polyline or the centerline of an alignment. Distance, direction and cut/fill information is provided so the rod/the rover can locate the line by traveling the shortest possible distance (a perpendicular offset to the line).

  Compared to point stakeout, the guidance screen (illustrated) will be automatically restored after you have stored a point, ready for storing the next point. This routine is often used to keep the rod on-line while clearing line along a property boundary.
- Navigation: Allows you to navigate to existing points using autonomous positions from a GPS receiver that outputs a NMEA signal. The routine also allows you to store coarse-precision GPS points.
- Offset Staking: Is used to stake the center of a road, the road edge, the curb/ditch edge, or any offset at fixed intervals. An existing polyline, alignment, or a specified point range can define the centerline of the road.
- Slope Staking: Is used to locate the catch points for a roadway in any terrain. The first screen is used to define or select the line that describes the centerline of the road to be slope staked. An existing polyline or alignment can be selected, or a series of existing points can be entered to define the centerline.
- Stake Skew Line: is used to stake a usually short straight line (a skew line) intersecting the current polyline at a given point and with a given skew angle (for example this function is useful for staking a culvert going under a road).
- Point Slope Staking: Is a simplified version of the Slope Staking routine.
- Line and Offset, Curve and Offset and Spiral and Offset: Are used to stake stations at fixed intervals on respectively a line, curve or spiral, or at an offset to it.
- Show Station: Allows you to see where the rodman/rover standing anywhere near a polyline, a range of points that define a line, or an alignment is located in relation to the line.
- Store Offset Points: Is used to store points in the current job at a specified offset from an existing polyline or alignment at a specified interval.
- Road Stakeout: This function provides access to the complete road staking menu for more advanced roadway stakeout (e.g. staking any segment of a road profile at any station).

8. Survey Pro's On-Board Version



Survey Pro is used on board a Nikon Nivo or Spectra Precision FOCUS total station. After you have powered on the instrument, wait until the screen displays the desktop. Then do the following:

- Double-tap the Survey Pro icon:  . Survey Pro starts initializing the instrument. The Level Bubble screen is then shown (see screen example).
- Level the instrument and enable or disable the compensator, as required.
- Tap  when done. This opens the Quick Shot screen.

You may take measurements with Survey Pro without opening a job. You may also create or open a job where you can collect all your measurements and/or use as reference other measurements you collected earlier in that job.

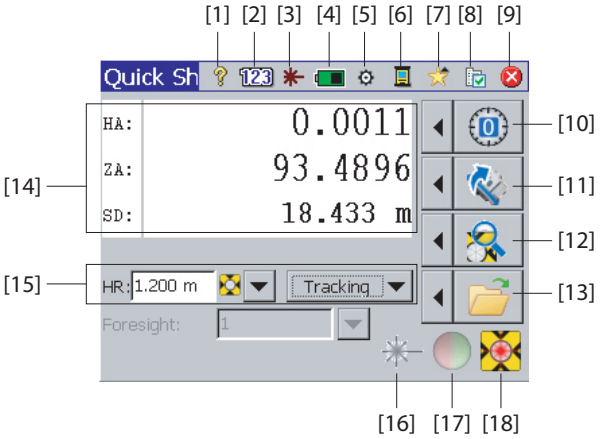
NOTE: The onboard version of Survey Pro will always start with no job open regardless of whether you ended your last Survey Pro session with a job open or not.

Working With No Job Open

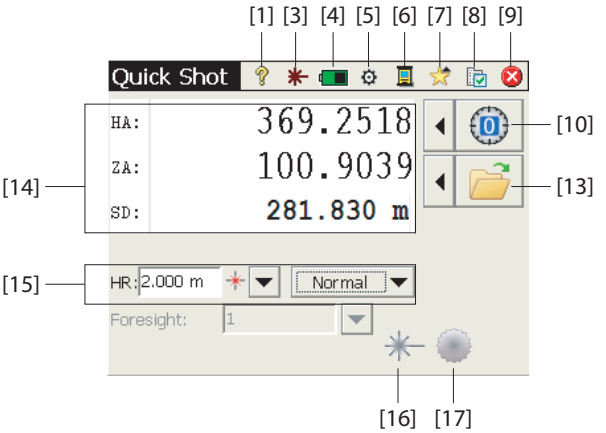
The Quick Shot screen you get at startup can be split into different parts:

- Command bar (**[1]** to **[9]**)
- Function buttons (**[10]** to **[13]**)
- Result pane (**[14]**)
- Target management (**[15]**)
- Other control buttons (**[16]** to **[18]**).

Robotic Instrument:



Mechanical Instrument:



Command bar:

- **[1]**: Provides access to on-board help.
- **[2]**: (Robotic instrument only) Denotes keyboard used in numeric mode.
- **[3]**: Provides status of visible laser pointer:
  - : Off. Tapping this icon will toggle it On.

    NOTE: Standard safety precautions should be taken to ensure that persons do not look directly into the beam.

  - : On. Tapping this icon will toggle it Off.

  For safety reasons, this button is always accessible so that at all times you can easily disable the laser pointer whatever the screen you are on.
- **[4]**: Battery status. This icon provides access to the power off setting through which you can set an idle time at the end of which the instrument will be turned off automatically.
- **[5]**: Provides access to the instrument settings (specific to each instrument).
- **[6]**: This icon allows you to switch to another data collection mode (using a data collector through a serial cable, Bluetooth or in Robotic mode).
- **[7]**: Quick Pick function: Provides quick access to common Survey Pro functions. About and Level Bubble are the only two selections available unless a job is open. After a job is opened, the list will populate with available functions.

- **[8]**: Provides access to Survey Pro settings:
  - Units tab: Used to set distance and angle units, directions, azimuth type and the order in which to display/deliver coordinates.
  - Format tab: Used to set the number of decimal places displayed by the instrument for each type of measurement.
  - Quick Shot tab: Used to choose which results to display (HA, ZA, SD or HA, HD, VD) and which function to assign to the Measurement key (Measure Only or Measure and Store). Measure and Store requires an open job. See *Working With a Job Open on page 71*.)
- **[9]**: Used to exit.

Function buttons:

(More functions are available from these buttons with a job open. See *Working With a Job Open on page 71*.)

The left-arrow button located before each function button opens a related menu. Tapping directly on the function button is equivalent to selecting the first option on the menu.

- **[10]**: Sets the circle to 0 or to any value you specify.
- **[11]**: (Robotic instrument only) Turns to angles you specify, or to flip the instrument.
- **[12]**: (Robotic instrument only) Starts the search target or LockNGo function or stops the one you last activated.
- **[13]**: Opens or creates a job where measurements will be stored.

Result pane:

(Item **[14]**) on the screen example.)

Depending on how you set the Display field on the Quick Shot tab (see **[8]** above), this pane will either provide the measured values of:

- Horizontal angle (HA), zenith angle (ZA) and slope distance (SD)
- Or horizontal angle (HA), horizontal distance (HD) and vertical distance (VD).

Tapping on the display over these labels will also toggle between the display modes.

Target management:

(Item **[15]**) on the screen example.)

- HR field: Enter the height of rod for the selected target
- / button: Specify the type of target used. Also provides access to the management of smart targets.
- Choose the EDM measurement mode. This is an instrument-dependent setting but these are the usual available options:
  - Standard: (Focus 30) Precise measurement mode, activated only when you trigger a measurement
  - Tracking: (Focus 30) EDM continuously measuring distances
  - Normal: (Nivo) Normal measurement mode
  - Precise: (Nivo) Precise measurement mode

Other control buttons:

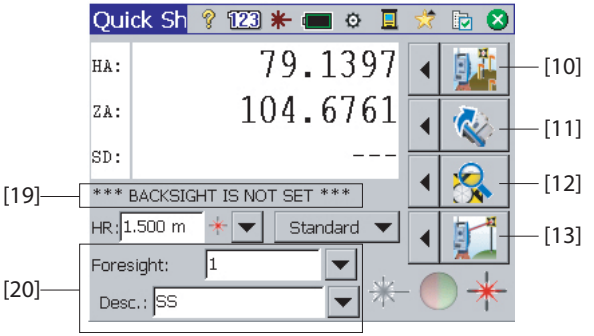
- **[16]**: A button equivalent to and bigger than button **[3]**.
- **[17]**: Turns on or off the instrument's track light. The track light is for helping the rodman stay online when staking. It will flash more quickly when the instrument is locked to the target.

  The track light is instrument dependent. For example, the Focus 30 has two different colors (green and red) located on either side of the instrument. Nivo has two red colors, one that flashes and the other that doesn't.
- **[18]**: Instrument dependent. Shows LockNGo status (IDLE, MEASURING or Locked). Also shows if the current measuring mode uses a prism or reflectorless target.

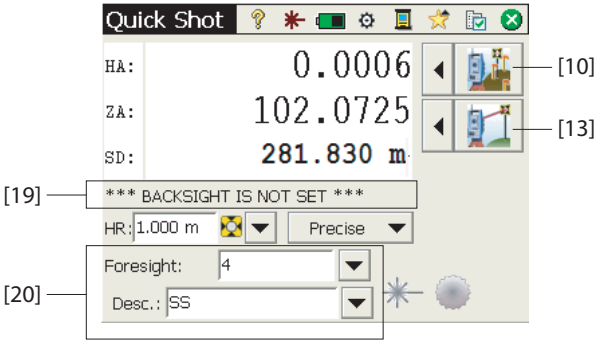
Working With a Job Open

If you open or create a job using button **[13]**, the Quick Shot screen will then show different options.

Robotic Instrument:



Mechanical Instrument:



The differences are listed below:

- **[10]**: With a job open, the Quick Stake screen can be accessed through this button. The Stakeout, Station Setup and Check Setup functions can be accessed by clicking on the arrow to the left of this button.
- **[11]** and **[12]**: Same as with no job open.
- **[13]**: With a job open, a sideshot can be taken and stored by pressing this button. The Sideshot and Traverse functions can be accessed by clicking on the arrow to the left of this button.
- **[19]**: The current station setup status is reported in this area.
- **[20]**: Use this area to name and describe each point you will be measuring and storing in the job. Make sure MSR Key= Measure and Store on the Quick

Shot tab if you plan to store measurement data (see **[8]** described earlier in this section).

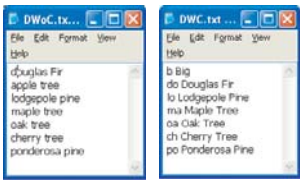
With a job open, you can perform a lot of the most commonly used functions from the Quick Shot screen. To access the full set of Survey Pro functions, you can close the Quick Shot screen and access the Survey Pro main menu.

NOTE: To access the Quick Shot screen at any time, simply press the "star"/F1 hard key on the instrument.

Appendix

Descriptions

[1] [2]



A description may be defined for each point you store in a job (e.g. tree, pavement). You can create a description list to automate the task of entering descriptions for points when they are stored. This is particularly useful when the same description is used frequently.

A description list is stored in Survey Pro as a description file (a TXT file you store in /Survey Pro Jobs/ for example), which may be in two different formats. Choosing one rather than the other determines how descriptions are entered:

- **Description list without codes [1]**: Only contains the list of descriptions you want to use.
- **Description list with codes [2]**: Similar to the previous one except a short code precedes each description (with a space or tab in between). Tapping the code rather than the full description will speed up entering descriptions.

You can use simultaneously two lists, one of each type. Use the Power button located near the Description field to manage your lists.

Layers

Layers help you manage the data in a job. Any number of layers can exist in a job and any new objects (points, polyline alignments) can be assigned to any particular layer.

The visibility of any layer can be toggled on and off, which gives full control over the data that is displayed in a map view. This is useful to reduce clutter in a job that contains several objects.

Layers can be added, deleted and renamed with the exception of Layer 0 and the Control Layer. Layer 0 is a special layer that must exist in every job for compatibility with AutoCAD and for storing objects not assigned to any other layer. The Control layer is a special layer used by Survey Pro to denote control points in the job. Control points are protected and cannot be modified.

Use the Power button located near the Layer field to manage your layers. Use the Set Active button on the Manage Layers screen to set the default layer used in your measurements.

Features & Attributes

Feature codes can be used to describe objects quickly and in more detail than a standard text description, particularly when data is collected for several points that fit into the same category.

Once a particular feature is selected, any number of descriptions can be made from sub-categories to the selected feature. These sub-categories are called *attributes*. In general, a feature describes what an object is, and attributes describe the details of that object.

Use the Feature tab when editing points to manage your feature codes.

Memo for GNSS Users

Assuming the following:

- A receiver profile has been created previously so you can use your RTK rover in a network.
- If you are using a “network rover”, a network has also been defined previously for the purpose of receiving corrections from an IP server. (No network profile needs to be created if you are using a “rover” receiving corrections from a base via radio.)
- A new job file needs to be created in which a known coordinate system and a geoid are used.

Then proceed as indicated below:

- Turn on your receiver.
- Start Survey Pro on the data collector.
- Create a job in which you select the coordinate system and geoid used.
- Tap the instrument icon and select Switch to GNSS.
- Go to Survey >Start Survey.
- Select the receiver profile prepared earlier for your rover.
- Select the network used (skip this step if you are using a “rover”, and not a “network rover”).
- Tap Connect.
- Wait until the rover receives data from the base.
- Confirm/change the point where the base is located.
- Set acceptance criteria for all your measurements.
- Make sure the receiver continuously delivers a “Fixed” position solution. (You may also go to Survey > GNSS Status to check the GNSS reception status and then come back to Survey > Data Collection.)
- Start collecting your data (points, offset points, lines). Data may be collected using one epoch of data (always the case when collecting data along a line), or by averaging the position through a static occupation on each point.
- When finished, select End Survey on the Home screen.

Managing Smart Targets

In earlier versions of Survey Pro, there was a separate list for backsight and foresight targets. With Survey Pro 5.2, there is now a single list of optical targets, so you can choose to take an observation to any target from any measurement routine.

This enhancement makes certain routines, such as repetition, multiple sideshots and shoot from two ends, much easier to use.

With all optical targets now managed from a single list of targets, you will notice some changes to the way "height of target" edit fields are handled in the case where you have a fixed backsight target defined in the station setup: When you choose your fixed backsight target as the target for the current observation, the edit field disappears and the height of the fixed backsight target is shown in static text next to the smart target selector. This prevents you from changing the height of the fixed backsight target.

When you upgrade to Survey Pro 5.2, you will notice that all of your optical targets are now merged into a single target selection list. There is no longer a separate list of backsight and foresight targets.

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