# TRAINING GUIDE

## Survey Pro (to Version 5.4)

### Ranger 3 Data Collector &

### FOCUS 30 Robotic Total Station

**SPECTRA PRECISION**
**www.spectraprecision.com**

# Training Guide

## Survey Pro (to Version 5.4)

### Ranger 3 Data Collector &

### FOCUS 30 Robotic Total Station

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Version 1.0

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# Table of Contents

**WORKFLOWS** ..... **6**

Step 1: Using this Document ..... 7
Step 2: Initial Setup Workflows ..... 7
Step 3: Data Collection Workflows ..... 7
Step 4: Stakeout Workflows ..... 7

**CREATE A NEW JOB** ..... **8**

Step 1: Open Survey Pro ..... 9
Step 2: Assign a Job Name ..... 9
Step 3: Select Job Units ..... 10
Step 4: Select Control File (optional) ..... 12
Step 5: Select Coordinate System (optional) ..... 13
Step 6: Select First Point (optional) ..... 14

**MANAGE INSTRUMENTS** ..... **15**

Step 1: Select Instrument Class ..... 16
Step 2: Select "Manage Instruments" ..... 16
Step 3: Select "Create New Instrument" Name the instrument configuration ..... 16
Step 4: Establish a radio connection ..... 17
Step 5: Leveling the instrument ..... 18
Step 6: Configure the instrument settings ..... 19
Step 7: Activating the instrument ..... 24

**GEOLOCK** ..... **25**

Step 1: Understanding GeoLock ..... 26
Step 2: Configure GeoLock on FOCUS 30 and Data Collector ..... 27
Step 3: Configure EDM ..... 30
Step 4: Review GeoLock Drop-Down Menu ..... 30
Step 5: Review GeoLock Status Icon ..... 32
Step 6: Using GeoLock ..... 33

**JOB SETTINGS** ..... **35**

Step 1: Navigate to the Job Settings pages ..... 36
Step 2: Set NMEA and Shared GPS parameters ..... 36
Step 3: Set General Settings ..... 37
Step 4: Set keyboard assignments ..... 38
Step 5: Select communication port settings ..... 39
Step 6: Set Time and Date for data collector ..... 39
Step 7: Select Repetition settings ..... 40
Step 8: Select Stakeout settings ..... 41
Step 9: Select Scale Factor ..... 42
Step 10: Select Survey Settings ..... 43
Step 11: Set Point and Description naming parameters ..... 44
Step 12: Select Description file ..... 45
Step 13: Select Feature file ..... 46
Step 14: Select numerical formats ..... 46
Step 15: Select units ..... 48
Step 16: Compass ..... 50

**IMPORT FILES ..... 51**

Step 1: Navigate to the File\Import page ..... 52
Step 2: Select the correct format for the file being imported ..... 52
Step 3: Navigate to the file being imported and select it ..... 53
Step 4: Assign the points to a job layer ..... 53
Step 5: Define the units and columns ..... 54
Step 6: Preview the import ..... 54
Step 7: Import the data and view the results ..... 55
Step 8: Navigate to the File\Import Control page ..... 55
Step 9: Navigate to the Control file being imported and select it ..... 56
Step 10: Import the control data and view the results ..... 56

**CUSTOMIZE THE HOME PAGE(S) ..... 57**

Step 1: Navigate to Home page(s) ..... 58
Step 2: Tap and hold (extended click) on icon to be moved ..... 59
Step 3: Drop icon in new location ..... 59
Step 4: Tap and hold, then select "Insert Page Before" ..... 60
Step 5: Drop icon on new page ..... 60
Step 6: Select "Repetition Shots" from Survey page and place on Home page ..... 61
Step 7: Remove a Home Page ..... 61
Step 8: Create a sample workflow oriented Home page ..... 62

**STATION SETUP ..... 63**

Step 1: Navigate to Station Setup ..... 64
Step 2: Input Temperature and Barometric Pressure (Optional) ..... 64
Step 3: Set Station on Known Point ..... 65
Step 4: Set Station on Unknown Point (Resection or Freestation) ..... 71
Step 5: Use Last Setup ..... 78

**DATA COLLECTION ..... 79**

Step 1: Traverse / Sideshot Page Overview ..... 80
Step 2: Remote Control ..... 82
Step 3: Assigning Feature Codes and Descriptions ..... 83
Step 4: Generating Linework ..... 84
Step 5: Viewing Results ..... 85

**STAKEOUT ..... 87**

Step 1: Stakeout Page Overview ..... 88
Step 2: Staking Options ..... 90
Step 3: Stake Points ..... 91
Step 4: Stake Lines ..... 94
Step 5: Stake Offset Lines ..... 97

**MAP VIEW ..... 101**

Step 1: Manage the Map View ..... 102
Step 2: Insert a Basemap ..... 103
Step 3: Manage Layers ..... 105
Step 4: Map Page Options ..... 106
Step 5: Snap-To Options ..... 109
Step 6: Data Collection in the active Map ..... 110
Step 7: Create Points ..... 114
Step 8: COGO ..... 116

STEP 9: STAKEOUT....117
STEP 10: MISCELLANEOUS MAP VIEW FEATURES....118

**EXPORT....120**

STEP 1: VIEW THE AVAILABLE EXPORT FORMATS....121
STEP 2: PRIMARY EXPORT OPTIONS....122
STEP 3: FORMAT DEPENDENT EXPORT OPTIONS....122
STEP 4: ARCHIVING AND RESTORING DATA....123
STEP 5: SHARING....124
STEP 6: REPORTS....127

# Workflows

In this section, you will learn how to:

Use this document. Sample workflows for initial setup, data collection and stakeout will be itemized to assist in completing the necessary tasks to help ensure a successful survey.


| | | ***Page*** |
|---|---|---|
| Step 1: | Using this Document | 7 |
| Step 2: | Initial Setup Workflows | 7 |
| Step 3: | Data Collection Workflows | 7 |
| Step 4: | Stakeout Workflows | 7 |

## Step 1: Using this Document

This document is intended to help accomplish specific tasks. Some surveying routines are accomplished infrequently while others are performed many times a day. Reference the appropriate chapter to preview the steps necessary to accomplish the task being performed.

## Step 2: Initial Setup Workflows

| | |
|---|---|
| Initial setups are only performed infrequently or when something changes. Ensure that these chapters have been reviewed. | a. Manage Instruments<br>b. GeoLock<br>c. Job Settings<br>d. Import Files<br>e. Customize Home Page<br>f. Map View<br>g. Export |

## Step 3: Data Collection Workflows

| | |
|---|---|
| For data collection, review these chapters. | a. Create a New Job<br>b. Import Files (Optional)<br>c. Station Setup<br>d. Data Collection<br>e. Export |

## Step 4: Stakeout Workflows

| | |
|---|---|
| For stakeout, review these chapters. | a. Create a New Job<br>b. Import Files (Optional)<br>c. Station Setup<br>d. Stakeout<br>e. Export |

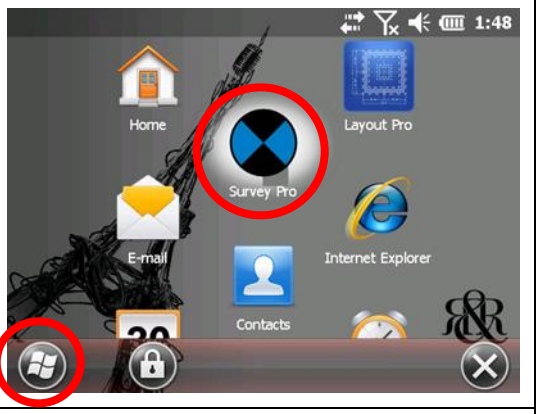
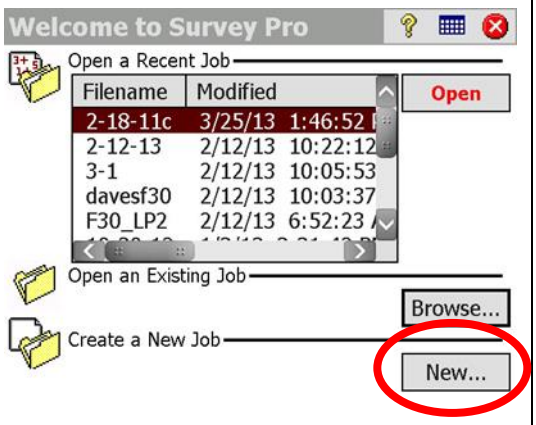
# Create a New Job

In this lesson, you will learn how to:

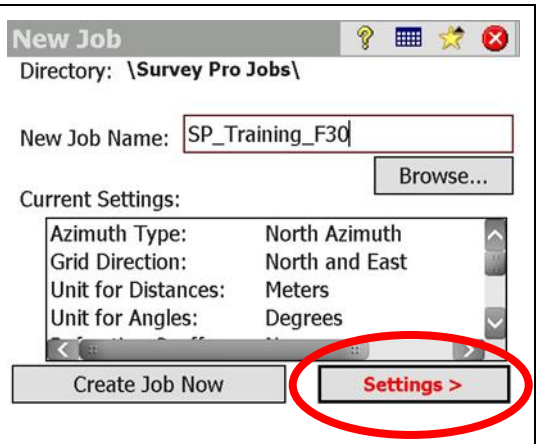
Open Survey Pro, create a new job or select an existing job, configure job settings, select a Control File (optional), select a Coordinate System (optional) and create a First Point for the job (optional).


| | | ***Page*** |
|---|---|---|
| Step 1: | Open Survey Pro | 9 |
| Step 2: | Assign a Job Name | 9 |
| Step 3: | Select Job Units | 10 |
| Step 4: | Select Control File (optional) | 12 |
| Step 5: | Select Coordinate System (optional) | 13 |
| Step 6: | Select First Point (optional) | 14 |

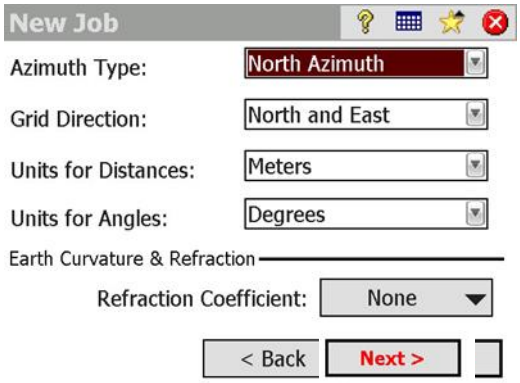
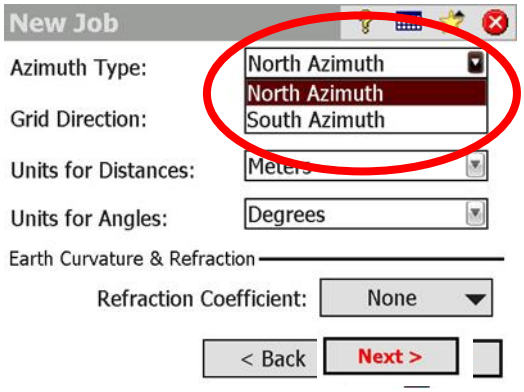
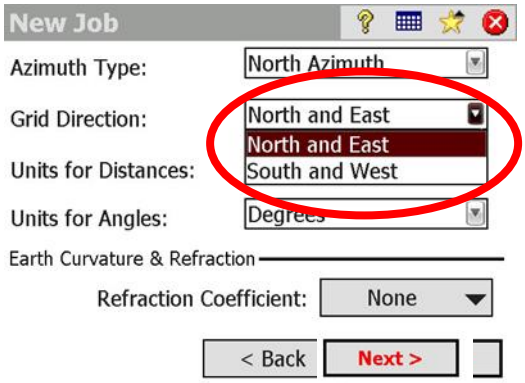
## Step 1: Open Survey Pro

| | | |
|---|---|---|
| 1. | Tap on the Windows icon to bring up the available programs in the lower left hand portion of the data collector's screen. Navigate to the Survey Pro icon and then tap on it. |  |
| 2. | Survey Pro automatically opens a dialogue where a New job can be created or any job on the data collector can be opened.<br>The "Open" button has **RED** font which indicates that hitting the "Enter" button on the data collector's keyboard will open the highlighted Recent Job.<br>Recent Jobs are listed in the order in which they were last used.<br>"Browse" will open a file browser. Any *.Survey or *.Job file on the data collector can be selected.<br>Select "New" to Create a New Job |  |

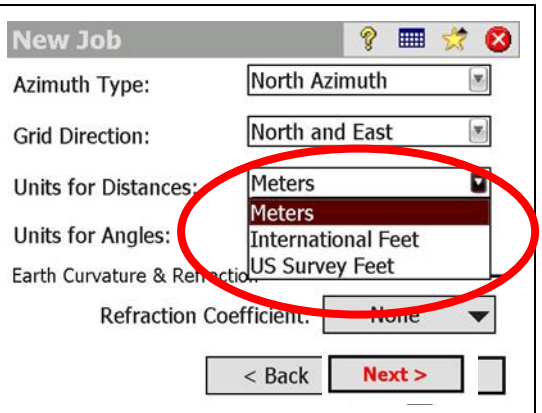
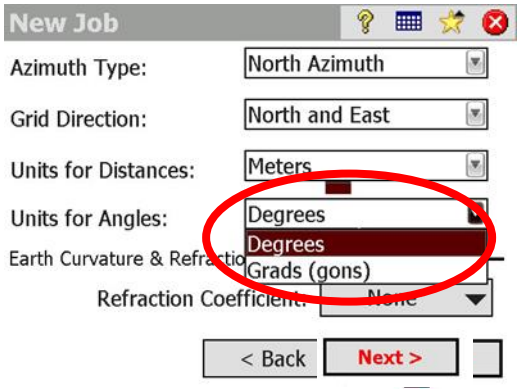
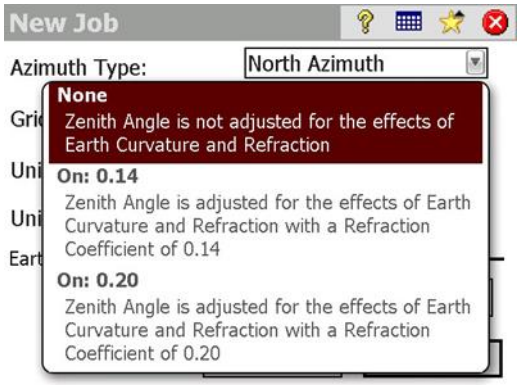
## Step 2: Assign a Job Name

| | | |
|---|---|---|
| 1. | Assign the job a name. (16 characters, upper/lower case)<br>"Browse" will open a file browser. The new job can be stored in any directory on the data collector.<br>"Create Job Now" will open the newly created job with the last job's settings. Note that the current job settings can be reviewed in the provided scroll window.<br>Select "Settings" to open the Job Settings dialogue. |  |

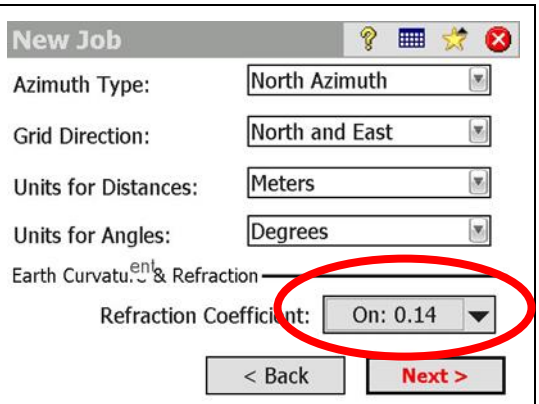
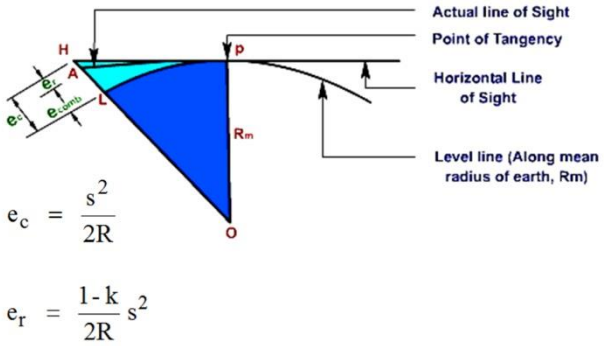
## Step 3: Select Job Units

| | | |
|---|---|---|
| 1. | Job units include azimuth types, grid direction, distances, angles and refraction correction coefficients. |  |
| 2. | Select North Azimuth or South Azimuth |  |
| 3. | Select Grid Direction North and East or South and West |  |

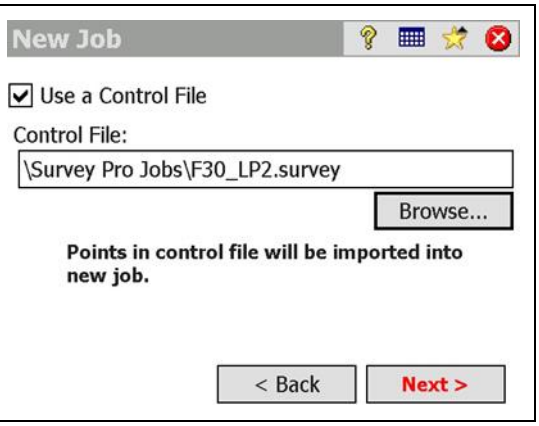
## Step 3: Select Job Units

| | | |
|---|---|---|
| 4. | Select distance units. Note that Metric is the default selection to ensure that the correct units of "Feet" are chosen intentionally. |  |
| 5. | Select the angular units. |  |
| 6. | Select the Refraction Coefficient. |  |

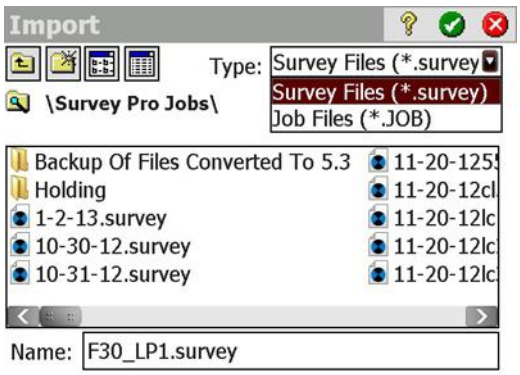
## Step 3: Select Job Units

| | | |
|---|---|---|
| 7. | For most day-time total station operation, select 0.14. |  |
| 8. |  $e_c = \frac{s^2}{2R}$ $e_r = \frac{1-k}{2R} s^2$ | |

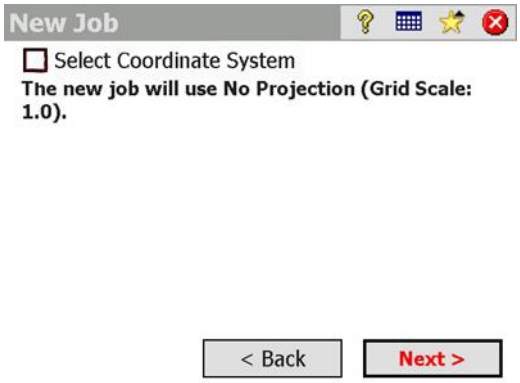
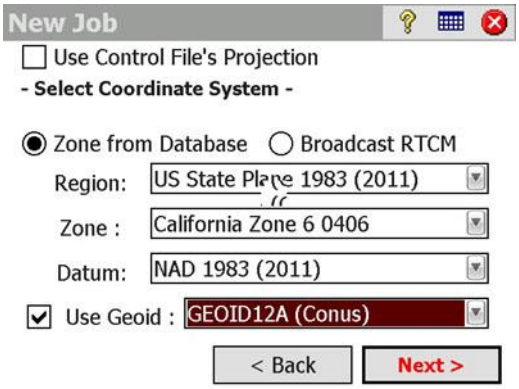
## Step 4: Select Control File (optional)

| | | |
|---|---|---|
| 1. | A Control File with design or control points can be placed onto a separate layer in the current job. Points from the Control File can be used for Station Setup, Site Calibrations and Stakeout. |  |

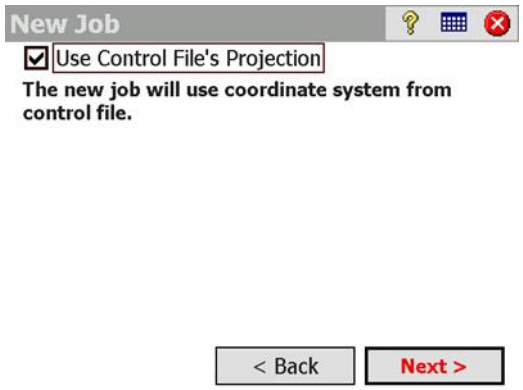
## Step 4: Select Control File (optional)

| | | |
|---|---|---|
| 2. | A Control File can be in the form of *.survey or *.job formats. |  |

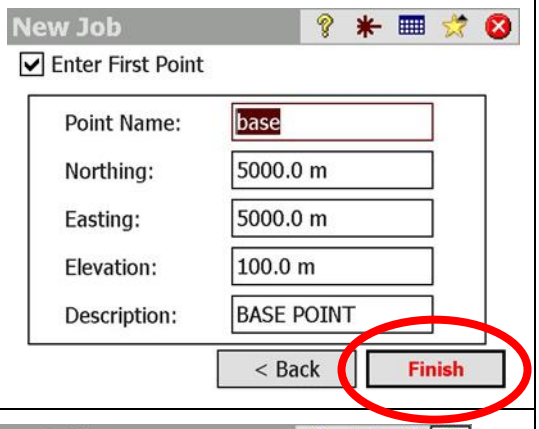
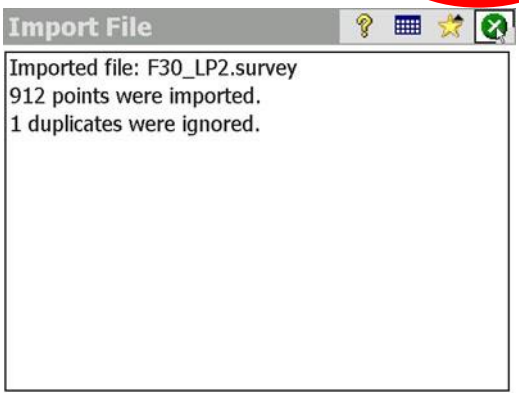
## Step 5: Select Coordinate System (optional)

| | | |
|---|---|---|
| 1. | A coordinate system can be selected. This is typical of GNSS surveys or Optical surveys that will be combined with GNSS data. |  |
| 2. | A coordinate system from the Coordinate System database may be selected.<br>A geoid model can also be attached. Models can be loaded using Spectra Precision Survey Office connected to the data collector or by transferring manually between computer and data collector. Typical location on the PC is:<br>C:\Program Files\Common Files\Trimble\GeoData |  |

## Step 5: Select Coordinate System (optional)

| | | |
|---|---|---|
| 3. | If the job is using a Control File, the Coordinate System from that job can be selected. A control file is a convenient way to keep "Control" or "Design" points on a different job layer than the "as-built" or "as-staked" points. |  |

## Step 6: Select First Point (optional)

| | | |
|---|---|---|
| 1. | The job can be optionally populated with an initial point. This can be convenient when setting up on a new job with no existing coordinates.<br>Selecting "Finish" will import the Control Layer if assigned. |  |
| 2. | A dialogue box is displayed showing the number of imported points. Clicking on the green check/tick mark will revert to the Home screen. |  |

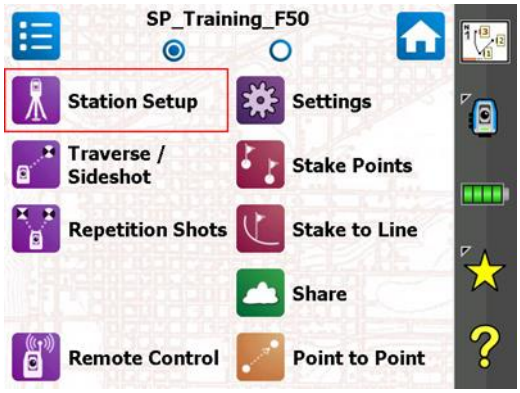
# Manage Instruments

In this lesson, you will learn how to:

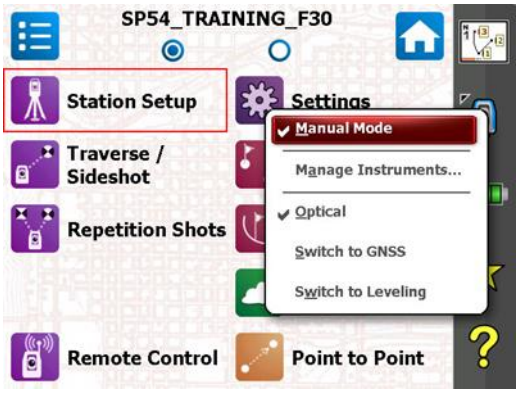
Switch between Optical, GNSS and Leveling survey modes, connect to a FOCUS 30 robotic total station via radio connection and configure the instrument settings.


| | | ***Page*** |
|---|---|---|
| Step 1: | Select Instrument Class | 16 |
| Step 2: | Select “Manage Instruments” | 16 |
| Step 3: | Select “Create New Instrument” Name the instrument configuration | 16 |
| Step 4: | Establish a radio connection | 17 |
| Step 5: | Leveling the instrument | 18 |
| Step 6: | Configure the instrument settings | 19 |
| Step 7: | Activating the instrument | 24 |

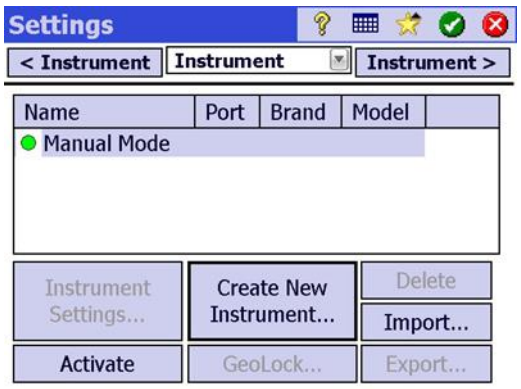
## Step 1: Select Instrument Class

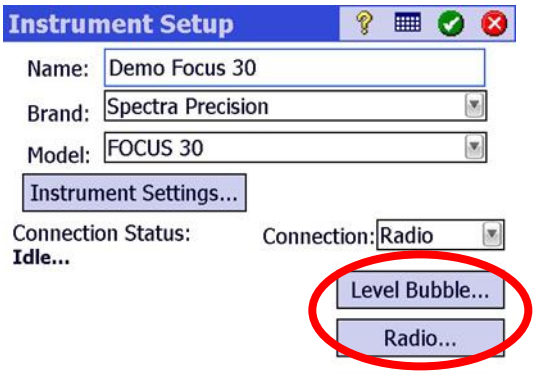
| | | |
|---|---|---|
| 1. | Tap on the icon of a total station on the sidebar. Note that this icon could resemble a GNSS antenna if that was the last instrument that was connected. Also note that depending upon the data collector being used, the sidebar may be in a different location on the display screen. |  |

## Step 2: Select "Manage Instruments"

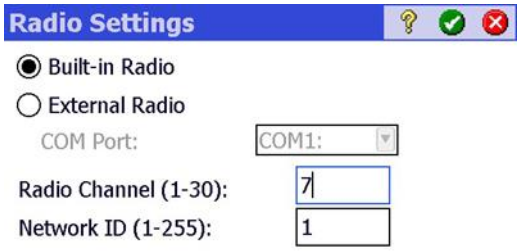
| | | |
|---|---|---|
| 1. | Select "Manage Instruments." Ensure that "Optical" is selected. |  |

## Step 3: Select "Create New Instrument" Name the instrument configuration

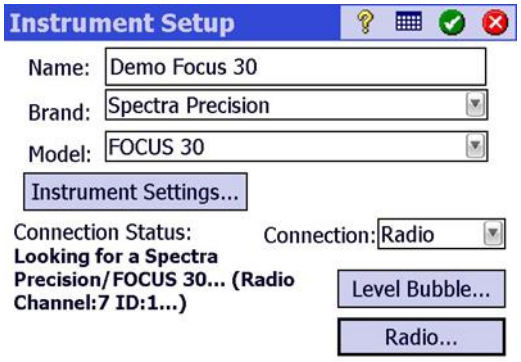
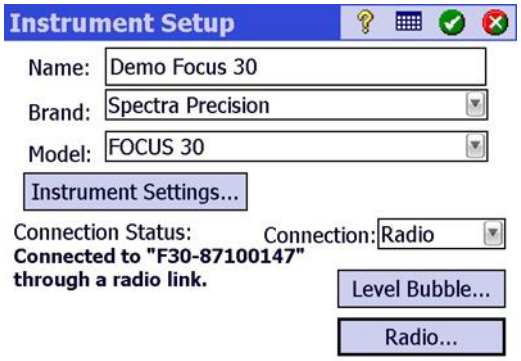
| | | |
|---|---|---|
| 1. | Tap on "Create New Instrument…" |  |

| | | |
|---|---|---|
| 2. | Set the instrument parameters:<br>User Friendly Name<br>Brand/Manufacturer<br>Model<br>Connection<br>Radio for robotics<br>Direct cable connections<br>Bluetooth<br>Electronic Level Bubble<br>Radio: Robotic Settings |  |

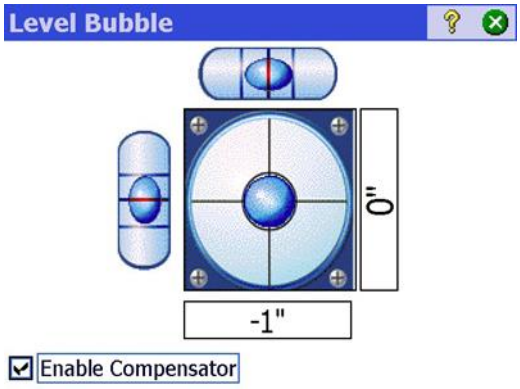
## Step 4: Establish a radio connection

| | | |
|---|---|---|
| 1. | Screen showing the data collector's radio settings<br><br>"Radio Channel (1-30)" and "Network ID (1-255)" fields must match the settings on the FOCUS 30. |  |
| 2 | The FOCUS 30 radio parameters can be viewed on the Face 2 display.<br>Optical plummet (far left of image)<br>Left button: Face 1/Face 2 rotation<br>Left middle button: Arrow up and instrument level vial<br>Right middle button: Arrow down and battery details<br>Right button: Enter and Service Menu access |  |

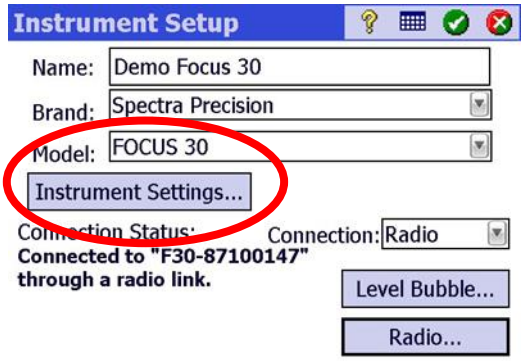
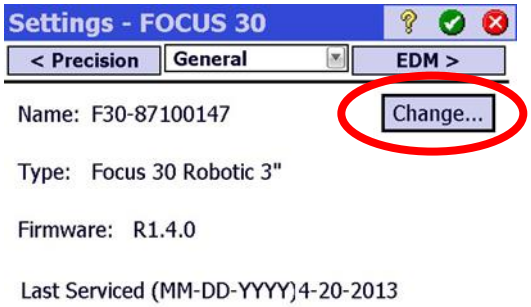
## Step 4: Establish a radio connection

| | | |
|---|---|---|
| 3. | Once the green check/tick mark in the upper right hand corner of Survey Pro's configure radio page is clicked, the instrument will begin looking for a FOCUS 30 within radio range with the same parameters. |  |
| 4. | Once an instrument has been found, the data collector will connect and Survey Pro will report the connection status as "Connected to…through a radio link." |  |

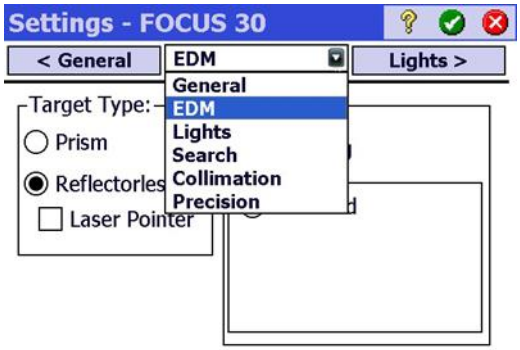
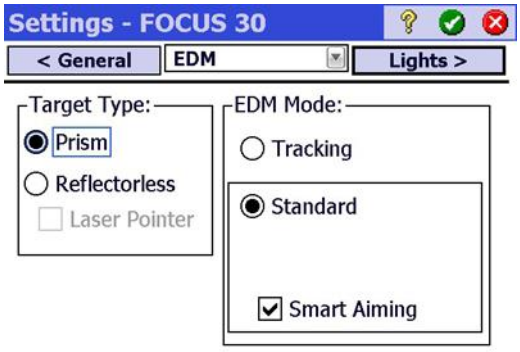
## Step 5: Leveling the instrument

| | | |
|---|---|---|
| 1. | Within a few seconds of the radio connection being established, Survey Pro will automatically open up the electronic digital leveling screen. There is an option to disable the compensator by deselecting the "Enable Compensator" checkbox.<br>The green X in the upper left hand corner of the page will exit this screen. |  |

## Step 6: Configure the instrument settings

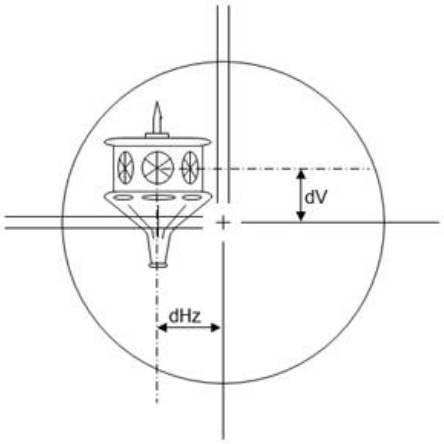
| | | |
|---|---|---|
| 1. | Instrument settings can be accessed from the Manage Instruments dialogue. |  |
| 2. | Instrument settings can also be accessed from the "Instrument Setup" page once an instrument is connected. |  |
| 3. | General information about the instrument including its firmware version, accuracy class and last servicing date can be viewed.<br>A user friendly name can be assigned by clicking on the "Change" button. |  |

## Step 6: Configure the instrument settings

| | | |
|---|---|---|
| 4. | Change the instrument's name for convenience if desired. Clicking on the green check/tick mark in the upper right hand page will accept any changes made to the page. Clicking on the red X is the cancel button and if tapped, will close the dialogue without saving any changes. |  |
| 5. | Tap on the centered settings page (in this example "EDM") to access the drop down menu, or arrow right or left. In this example, clicking on the word "< General" will scroll to the left through the menu choices while clicking on "Lights >" will scroll to the right. |  |
| 6. | The "Target Type" can be Prism or Reflectorless. If Reflectorless is chosen, the visible laser can also be activated for use as a Laser Pointer.<br>The Tracking EDM will activate a continuous tracking mode with constant updates as long as the EDM is receiving a valid signal return.<br>The Standard EDM is the most accurate EDM mode and should be used for most high precision work. |  |

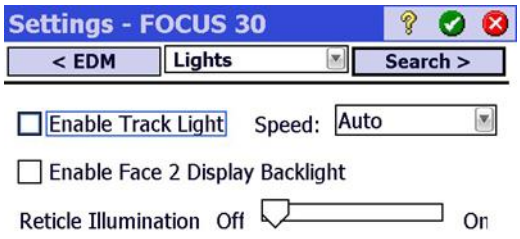
## Step 6: Configure the instrument settings

7. Smart Aiming allows the instrument to calculate the precise center of any prism without forcing the telescope to stay precisely on the center at all times. A very accurate "camera angle offset" correction can be calculated and then applied dynamically as a dVt and dHz between the observed and calculated center of the prism providing quicker responses and more accurate tracking.




This is a digital calculation that relies on maximum signal strength being returned from the center of any prism. This property can be used to reliably track the center of a prism without requiring the telescope to be fined tuned at all times to the center of the glass.

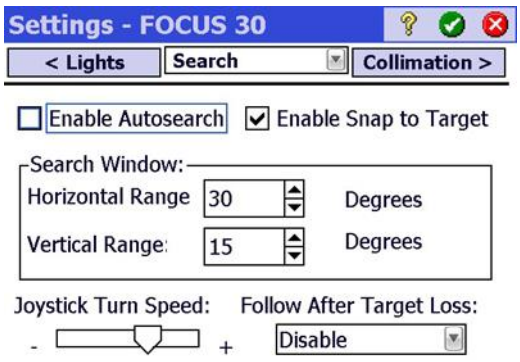
8. The "Enable Track Light" feature is very convenient for nearly all robotic and stakeout surveys. The remote rodman can know at a glance if the instrument is facing their direction and if it locked on to a prism.




A two-colored beam of light is emitted from directly below the instrument's telescope. If the remote operator stands to one side of the instrument's direction, the light appears green. If the operator stands on the other side of "line" or the direction the instrument is facing, the light appears orange. When the rodman can see both colors, the line of sight has been found very easily. The "Speed" field is set to "Auto" which causes the light to blink at a much faster rate when it is locked onto a prism and blink at a slow rate if it is not locked onto a prism.

## Step 6: Configure the instrument settings

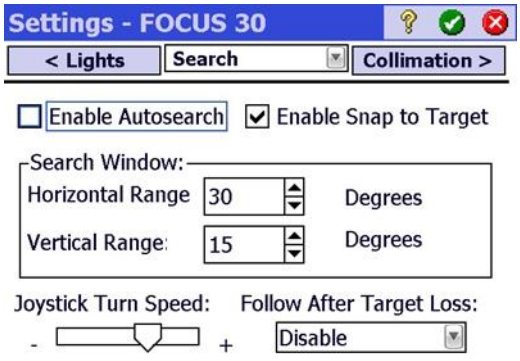
9. The "Search" page controls the settings for how the instrument will respond when commanded to "Search" for a prism or what to do if the instrument loses lock on the prism.




"Enable Autosearch" sets the instrument to begin a "Search" routine anytime loss of lock on a prism occurs. The "Search" routine will be based on the settings in the "Search Window" box.

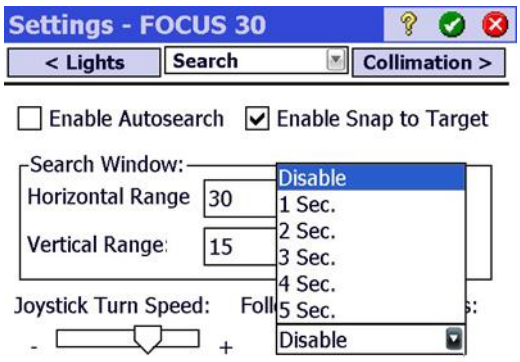
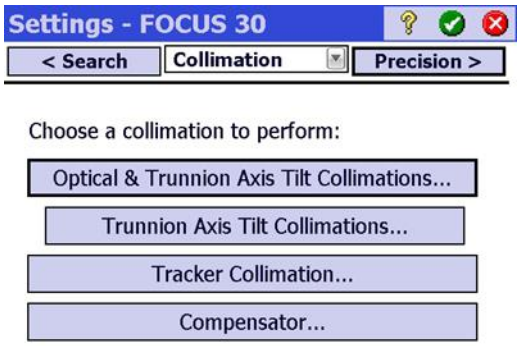
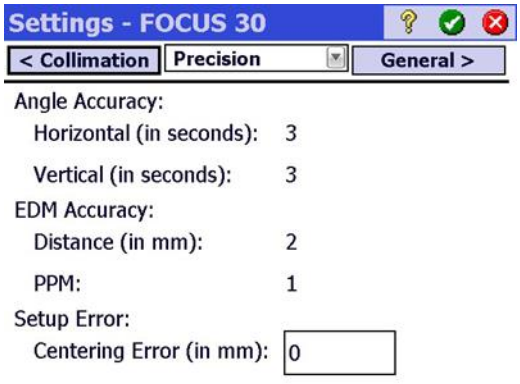
"Enable Snap to Target" sets the instrument to automatically jump to and lock on to a prism if it appears in the CCD camera's field of view. Note that the CCD camera which is responsible for the automatic targeting of any prism has a wider field of view by several degrees than the telescopic field of view. This can cause the instrument to jump to the center of a prism even though an operator looking down the telescope may not be able to see glass.

10. "Search Window" settings determine how wide the instrument will sweep from side to side and up and down when instructed by the operator to "Search" for a prism.

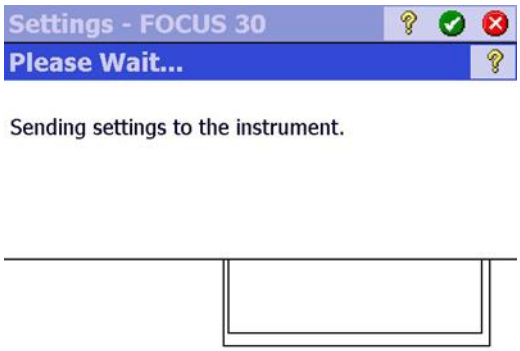
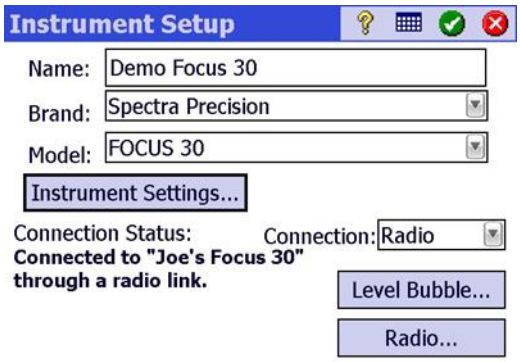



Depending upon the type of work being done and the average distance the operator may be from the instrument, these settings should be customized to fit the job being done. If distances are short and on flat grade, a horizontal sweep of 30 degrees may be appropriate but the 15 degrees vertically may be too much. If the operator will be 100 meters or more away from the instrument, both the horizontal and vertical sweep parameters should probably be lowered. "Joystick Turn Speed" controls how fast the instrument will turn when the "spider" key is used on the remote data collector.

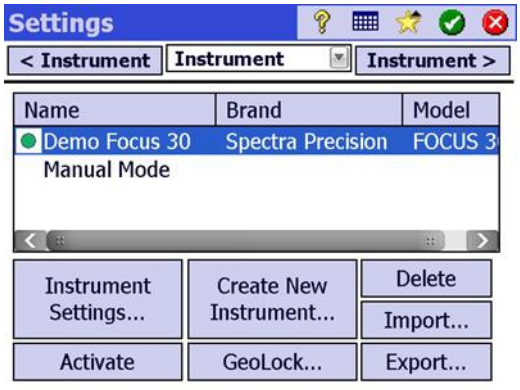
## Step 6: Configure the instrument settings

| | | |
|---|---|---|
| 11. | "Follow After Target Loss" controls how the instrument will react if it loses lock on a prism. 3 seconds is a nice average setting for many construction sites. |  |
| | If a piece of machinery comes between the remote operator and instrument, the instrument will continue to sweep through whatever trajectories and velocities it is currently using for another three seconds expecting that the operator will be found on the expected trajectory within the allotted time. | |
| 12. | Survey Pro allows user access to collimation and calibration routines for the instrument. |  |
| 13. | The "Precision" page displays the accuracy specifications for the instruments angles and EDM. A field is also available for entering an instrument "Centering Error" value. |  |

## Step 6: Configure the instrument settings

| | | |
|---|---|---|
| 14. | The centering error is a value estimate of the random error in the positioning of the instrument over the setup point. This value is only used by Survey Pro during a resection least squares calculation to determine the proper weighting of each observation. This value is also passed to Spectra Precision Survey Office for use in other least squares and network adjustments. Typical values are in the 2mm-3mm range. If this value is unknown, leave it set to 0. | |
| 15. | Once all of the Instrument Settings have been configured and the green check/tick mark in the upper right hand corner of the page has been clicked, Survey Pro sends all of these settings to the instrument and the changes are applied. |  |
| 16. | The instrument has now been configured and the data collector and FOCUS 30 are still connected via the radio link. Clicking on the green check/tick mark will close the Instrument Setup screen. |  |

## Step 7: Activating the instrument

| | | |
|---|---|---|
| 1. | The “Demo FOCUS 30” has now been configured and is the “Active” instrument as indicated by the green dot next to the instrument name. If there are other instruments available, optionally select the instrument in the list and tap Activate to make that instrument the active instrument. |  |

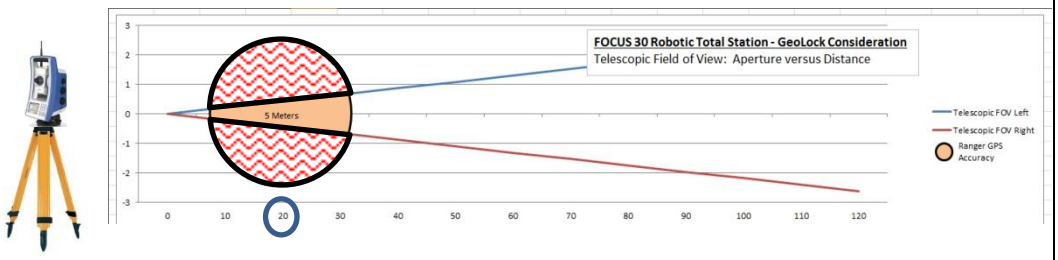
# GeoLock

In this lesson, you will learn how to:

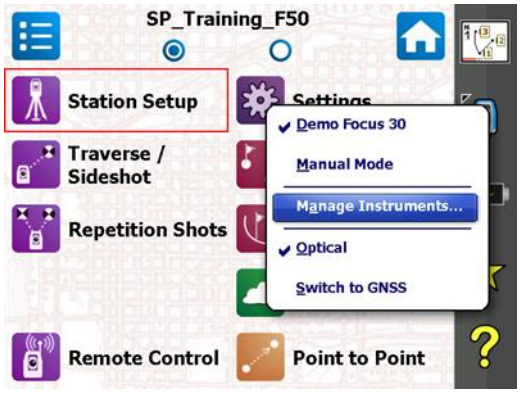
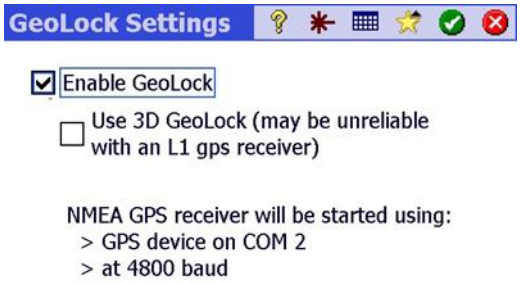
Configure GeoLock on both the FOCUS 30 and the Ranger 3 data collector, monitor and reset the GeoLock calibration and use GeoLock to find a prism.


| | | ***Page*** |
|---|---|---|
| Step 1: | Understanding GeoLock | 26 |
| Step 2: | Configure GeoLock on FOCUS 30 and Data Collector | 27 |
| Step 3: | Configure EDM | 30 |
| Step 4: | Review GeoLock Drop-Down Menu | 30 |
| Step 5: | Review GeoLock Status Icon | 32 |
| Step 6: | Using GeoLock | 33 |

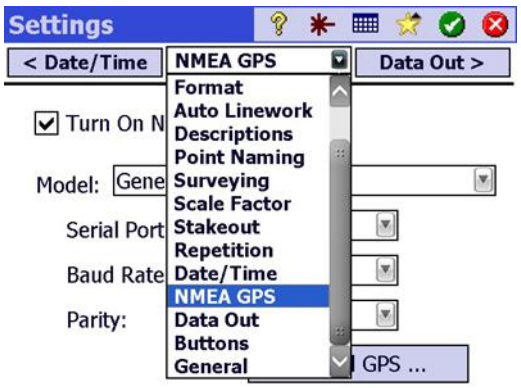
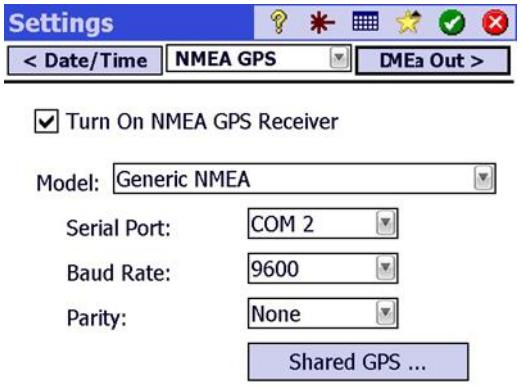
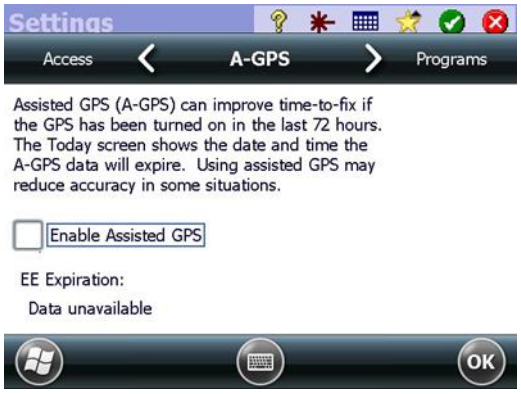
## Step 1: Understanding GeoLock

| | |
|---|---|
| 1. | GeoLock is a feature of Survey Pro that uses a GPS receiver in the data collector to calculate a position while working with the FOCUS 30 robotic total station remotely. If the total station loses lock on a prism, it can quickly turn to the prism's location based on the GPS position of the data collector. Most handheld data collectors can provide the necessary GPS information. Since GeoLock relies on GPS technology, it must be used outside with a decent view of the sky.<br><br>Once a backsight has been set and GeoLock is properly configured, GeoLock performs a background calibration that creates a positional relationship between the job's local coordinates and the global coordinates being supplied by the data collector's GPS. A point pair relationship between local and global coordinates is created with each EDM measurement. Therefore, a GeoLock calibration is computed more quickly when the tracking EDM of the instrument is used. |
| 2. |  <br><br>The accuracy of most data collector's GPS is in the 3 – 5 meters range horizontally. Therefore, the calibration process is sensitive to the distance from the instrument. At distance less than 20 meters, it is quite possible to have a GPS position provided by the data collector that is not in the field of view of the instrument. It is recommended that GeoLock calibrations take place at distances in the 50 to 100 meters range to obtain optimal results. |
| 3. | The geometry of the GeoLock calibration points should also be considered. While collecting the EDM measurements to be used in the calibration, move the data collector/prism pole non-lineally. It is recommended to move in an arc around the instrument to ensure strong geometry in the calibration solution. GeoLock is based on the same type of mathematics that is used in a resection. The same geometric considerations given to a resection should be considered with GeoLock.<br><br>If the open job is using a mapping plane, GeoLock will use these parameters to calculate its solution and will work as soon as a backsight is set. |

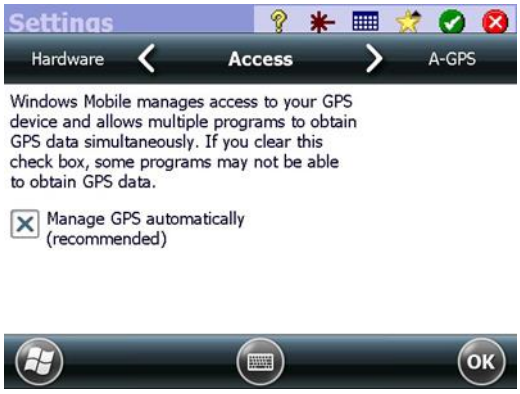
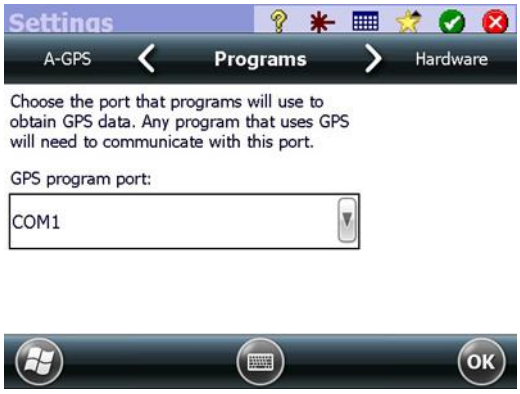
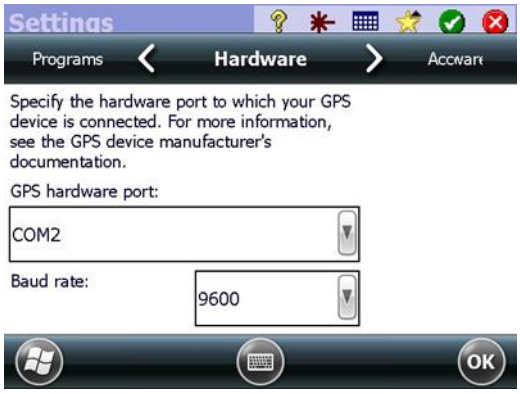
## Step 2: Configure GeoLock on FOCUS 30 and Data Collector

| | | |
|---|---|---|
| 1. | From the Sidebar menu, tap on the Total Station icon and select "Manage Instruments" |  |
| 2. | Ensure that the correct instrument is active as indicated by the green dot. Tap on the "GeoLock" button. |  |
| 3. | Ensure that GeoLock is Enabled as shown. It is recommended that 3D positions NOT be used when using a typical data collector's internal GPS. The vertical precision of these chips is quite poor and is therefore likely to degrade GeoLock performance. |  |

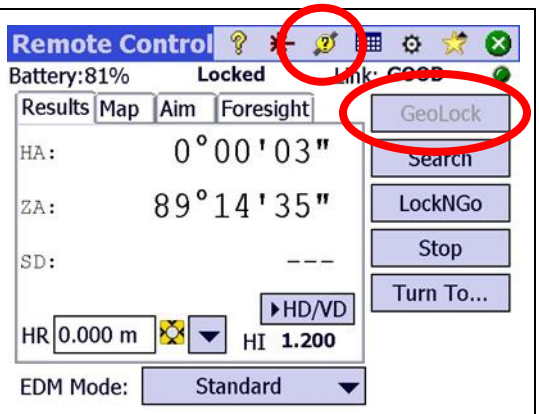
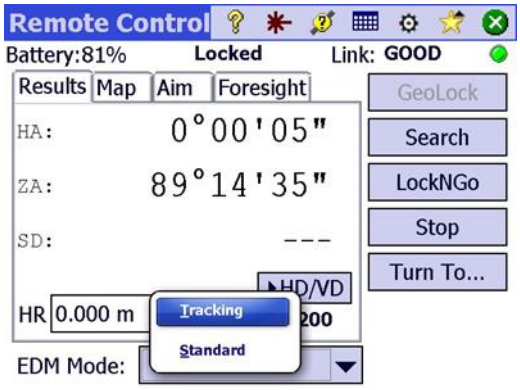
## Step 2: Configure GeoLock on FOCUS 30 and Data Collector

| | | |
|---|---|---|
| 4. | From the main menu, select Job\Settings and then scroll to the NMEA tab. |  |
| 5. | Ensure that Serial Port 2 is selected and that the Model is Generic NMEA and that the messages are turned on. Tap on the "Shared GPS" button. |  |
| 6. | At this time, testing has shown that using the A-GPS corrections that are available will degrade GeoLock performance. Therefore, we recommend that this be option be de-selected. Assisted GPS smooths the GPS positions while moving and will cause lag when collecting point pairs. |  |

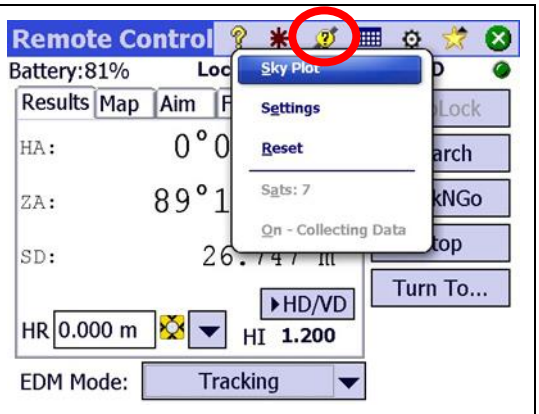
## Step 2: Configure GeoLock on FOCUS 30 and Data Collector

| | | |
|---|---|---|
| 7. | Allow the device to Manage GPS automatically (recommended) |  |
| 8. | GPS program port is set to COM1 |  |
| 9. | GPS hardware port set to COM2. Tap OK and then exit the Settings pages by tapping the green check/tick mark. |  |

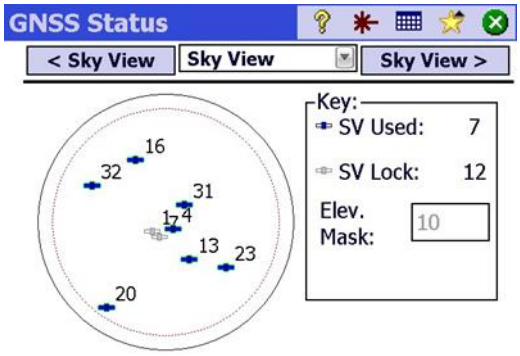
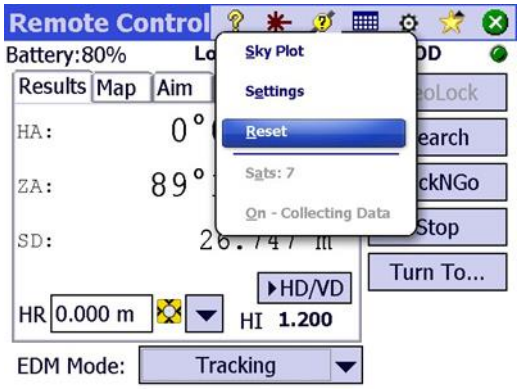
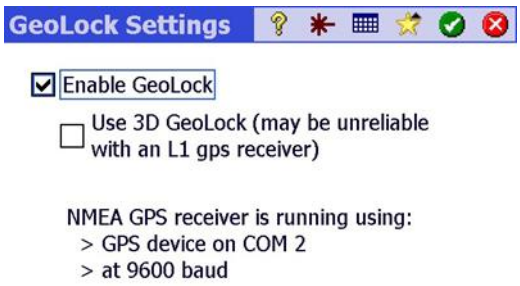
## Step 3: Configure EDM

| | | |
|---|---|---|
| 1. | Navigate to the Remote Control page (on the Ranger 3, the STAR button is a shortcut). Otherwise, it can be accessed from the third page of the Survey menu.<br><br>Notice that the GeoLock is not ready as can be seen by the Yellow icon at the top of the page with a question mark and the GeoLock button is grayed out. |  |
| 2. | Switching the EDM mode to Tracking mode allows the GeoLock calibration to occur more quickly than the Standard mode since a calibration point-pair is calculated for every EDM measurement/GPS observation. But, when moving rapidly, the GPS position errors can cause ambiguity. The calibration algorithm will remove some of the error, but it is still best to measure some points with the rod not moving if possible. |  |

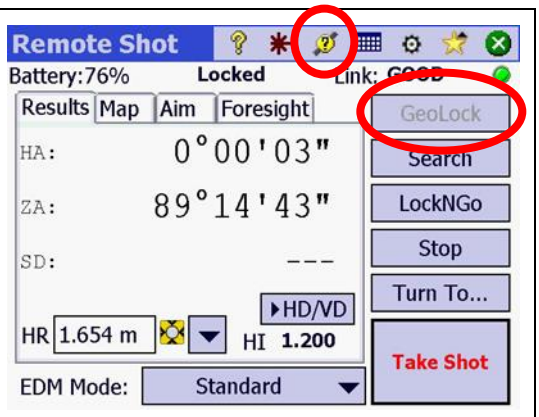
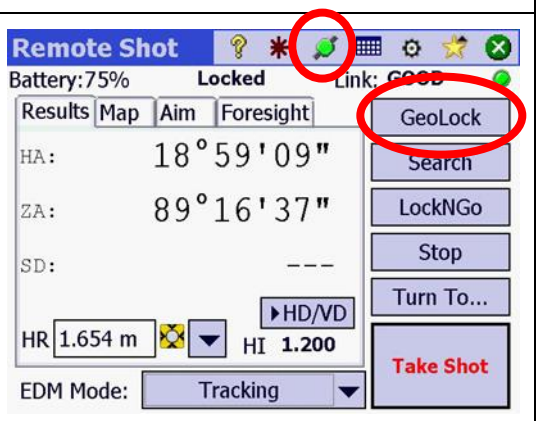
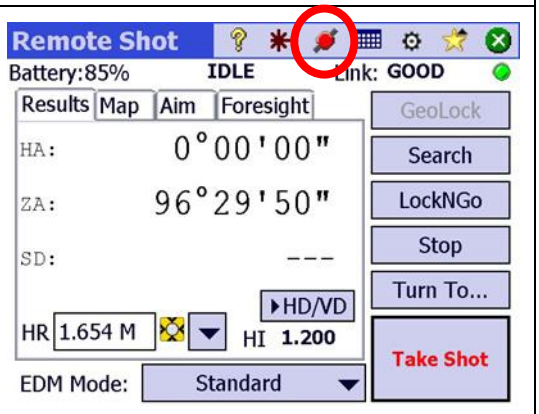
## Step 4: Review GeoLock Drop-Down Menu

| | | |
|---|---|---|
| 1. | Clicking on the GeoLock icon from the Remote Control and other data collection/stakeout pages will display the number of satellites being tracked and whether or not the system is collecting data to add to the calibration.<br>The Yellow icon with a question mark indicates that the GeoLock feature is not yet calibrated to the site. |  |

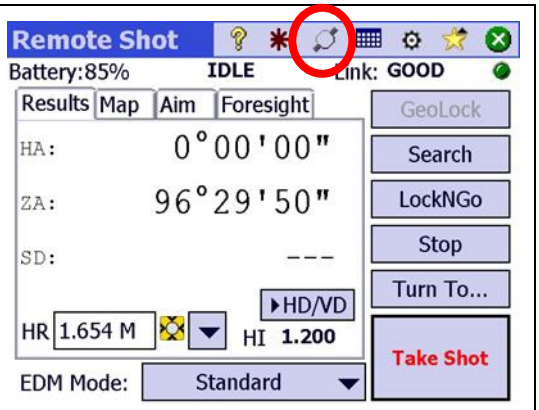
## Step 4: Review GeoLock Drop-Down Menu

| | | |
|---|---|---|
| 2. | The Sky Plot window displays the number and position of the satellites being tracked and the total number of satellites in view based on the current elevation mask. |  |
| 3. | The Reset command can be useful to erase previous calibrations and force the software to solve a new calibration.<br><br>For instance, an initial GeoLock calibration may have occurred quite close to the instrument in poor sky conditions. It is best to calibrate near the range from the instrument where the work will be done. |  |
| 4. | Clicking on the GeoLock icon and then on the “Settings” tab will enable or disable GeoLock. The current communication settings for the NMEA GPS messages that are being supplied to the software is shown. |  |

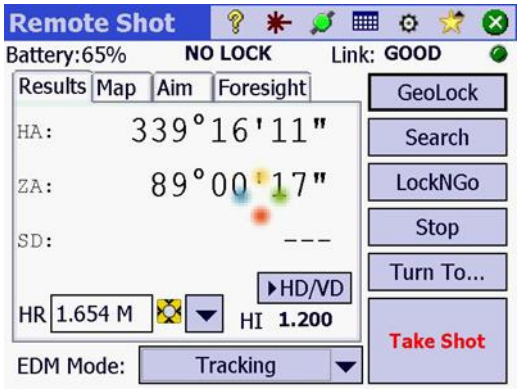
## Step 5: Review GeoLock Status Icon

| | | |
|---|---|---|
| 1. | These two indicators go together. The top GeoLock indicator means that GeoLock has not yet solved the coordinate calibration. Since the calibration has not yet been solved, it cannot be selected for execution. |  |
| 2. | Here in the "Remote Shot" page, the green icon indicates that the GeoLock calibration has been solved and is ready for use. The GeoLock button can be tapped and the instrument will turn from its current orientation towards the prism. Once it has turned to where it thinks the prism should be, the Search routine will automatically begin to search for the prism. |  |
| 3. | A Red GeoLock icon indicates the GeoLock feature is not configured correctly. Check communication port assignments and settings. |  |

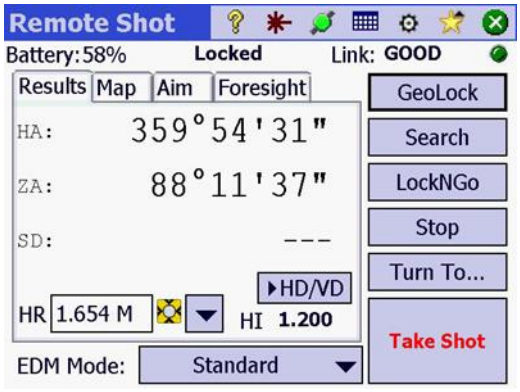
## Step 5: Review GeoLock Status Icon

| | | |
|---|---|---|
| 4. | GeoLock can also be turned off. |  |

## Step 6: Using GeoLock

| | | |
|---|---|---|
| 1. | GeoLock is ready to be used. This is indicated by the green GeoLock icon, the GeoLock button is selectable and the instrument has "NO LOCK" on a prism.<br><br>Tap on the GeoLock button. |  |
| 2. | Survey Pro displays a confirmation that a GeoLock routine is being performed. |  |

## Step 6: Using GeoLock

| | | |
|---|---|---|
| 3. | Once the instrument has turned to the angle that it has calculated should be close to the prism location, the EDM will then use its LockNGo targeting capabilities to lock onto the target. If that fails, then the instrument will do a normal search.<br><br>The Search extents are defined under the Instrument Settings – Search page. |  |
| 4. | Once a prism has been located and locked onto, the instrument is ready to make a measurement. Notice that the Tracking EDM is no longer being used since the GeoLock calibration has already been solved and this particular measurement requires the highest precision possible. |  |

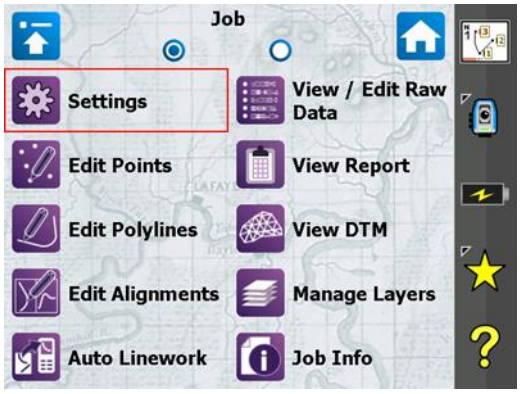
# Job Settings

In this lesson, you will learn how to:

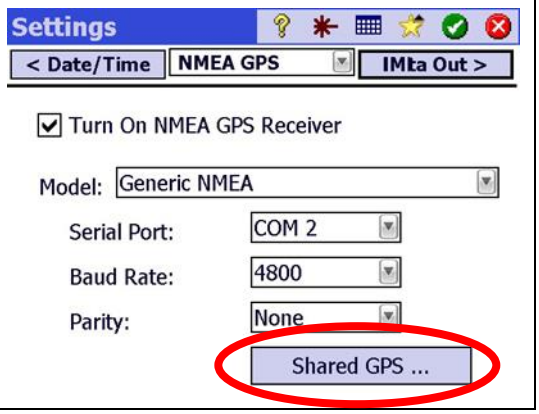
Configure settings that are specific to the current job. These include data collector settings for NMEA outputs, button assignments, date and time as well as software settings that controls how the instrument operates such as repetition shots, angle sets, stakeout tolerances, scale factors and units.


| | | ***Page*** |
|---|---|---|
| Step 1: | Navigate to the Job Settings pages | 36 |
| Step 2: | Set NMEA and Shared GPS parameters | 36 |
| Step 3: | Set General Settings | 37 |
| Step 4: | Set keyboard assignments | 38 |
| Step 5: | Select communication port settings | 39 |
| Step 6: | Set Time and Date for data collector | 39 |
| Step 7: | Select Repetition settings | 40 |
| Step 8: | Select Stakeout settings | 41 |
| Step 9: | Select Scale Factor | 42 |
| Step 10: | Select Survey settings | 43 |
| Step 11: | Set Point and Description naming parameters | 44 |
| Step 12: | Select Description file | 45 |
| Step 13: | Select Feature file | 46 |
| Step 14: | Select numerical formats | 46 |
| Step 15: | Select units | 48 |
| Step 16: | Compass | 50 |

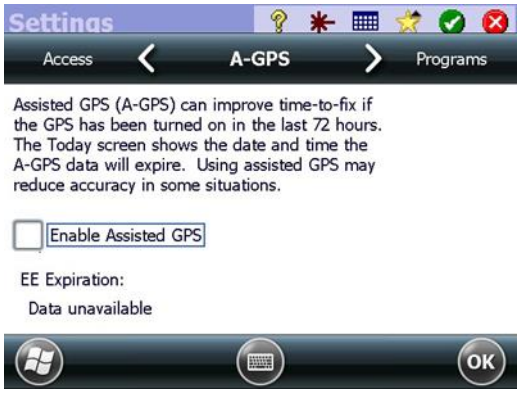
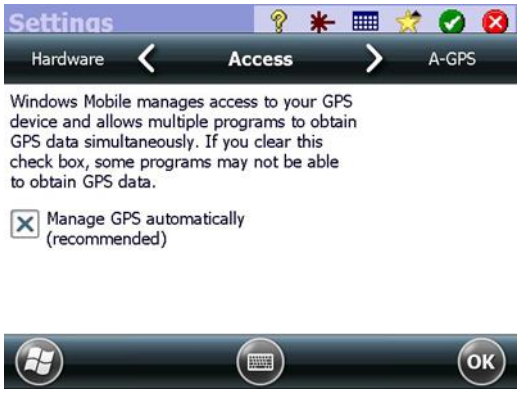
## Step 1: Navigate to the Job Settings pages

| | | |
|---|---|---|
| 1. | From the Main menu, tap on “Job” |  |
| 2. | From the “Job” menu, tap on “Settings” |  |

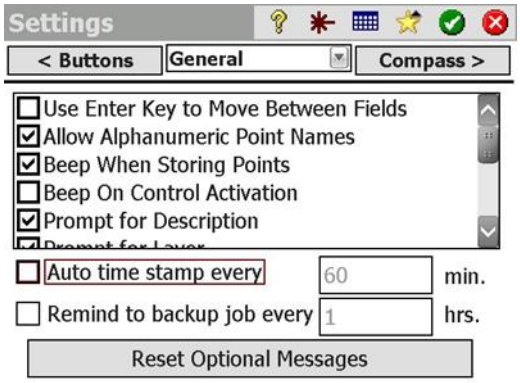
## Step 2: Set NMEA and Shared GPS parameters

| | | |
|---|---|---|
| 1. | The internal GPS of the data collector should be turned on if the GeoLock feature will be used. The COM port and baud rates vary by data collector. The settings shown here are applicable for a Ranger 3. Tap on the Shared GPS for more GPS parameters. |  |

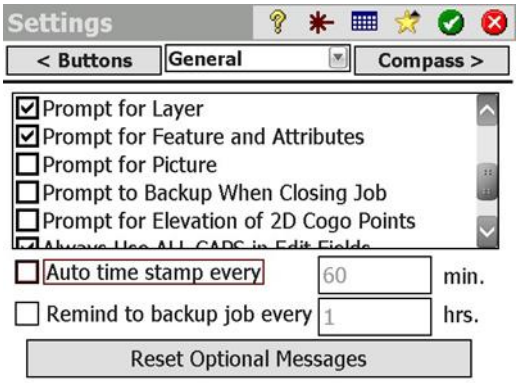
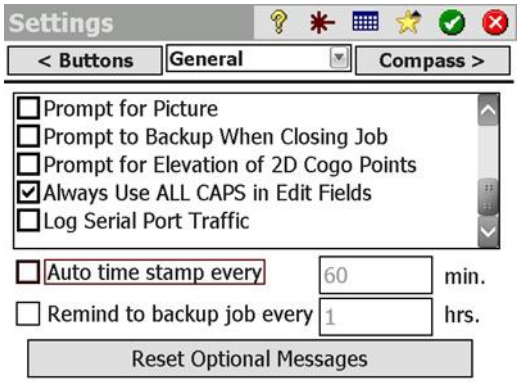
## Step 2: Set NMEA and Shared GPS parameters

| | | |
|---|---|---|
| 2. | For the purposes of GeoLock, it is recommended that A-GPS be turned off (deselected as shown). |  |
| 3. | For the purposes of GeoLock, it is recommended that "Manage GPS automatically" is selected as shown under the "Access" tab. Tap on OK to close this dialogue. |  |

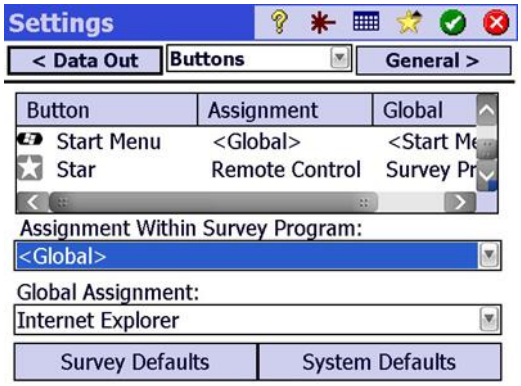
## Step 3: Set General Settings

| | | |
|---|---|---|
| 1. | General settings related to common operations can be selected. "Prompt for Description" will prompt for a description of the measurement just taken. "Auto time stamp every" *N* minutes will insert the data collector's time stamp into the raw data file at the *N* interval. |  |

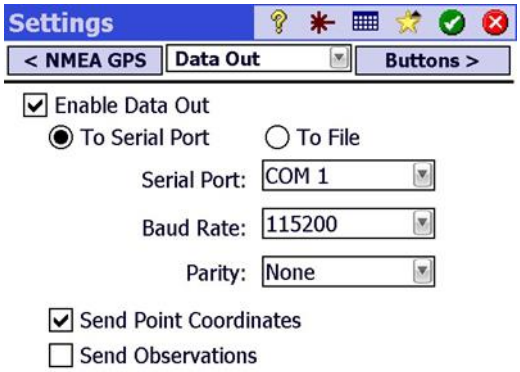
## Step 3: Set General Settings

| | | |
|---|---|---|
| 2. | Throughout Survey Pro, there are dialogue boxes that will pop up as Helpful Hints to assist in navigating the software. Each of these boxes has a check box to turn them off. If at some point, these messages need to be turned on, the "Reset Optional Messages" will restore all of these prompts. |  |
| 3. | "Always use ALL CAPS in Edit Fields" is very attractive to many users. |  |

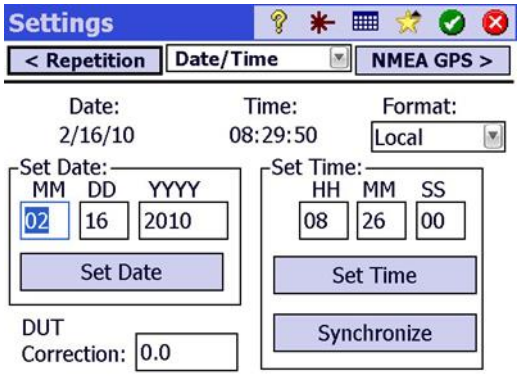
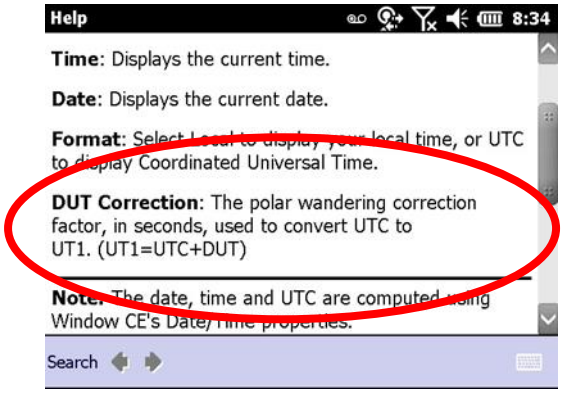
## Step 4: Set keyboard assignments

| | | |
|---|---|---|
| 1. | Certain buttons on the data collector can be assigned for special uses. Further, each of these customizable buttons can have one assignment when inside of Survey Pro and have another assignment when used outside of Survey Pro in Windows.<br>For instance, this image shows that the Ranger's "Star" button will open up the "Remote Control" screen. This is important to know. Outside of Survey Pro, the "Star" button is used to open the "Today" application. |  |

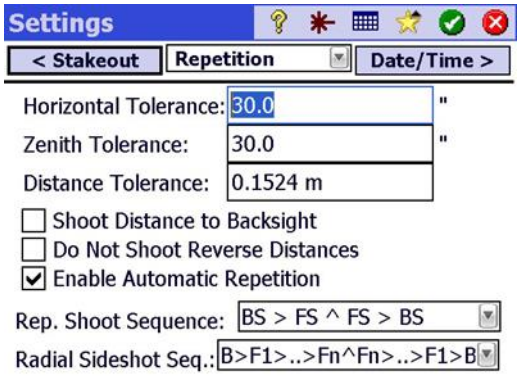
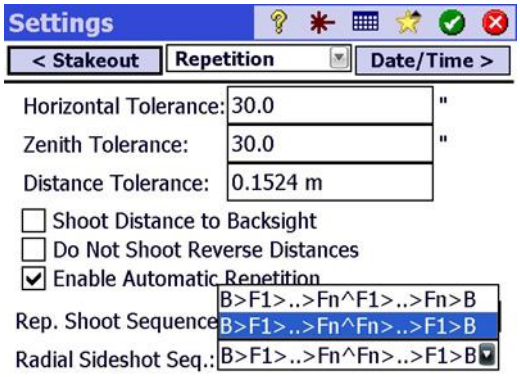
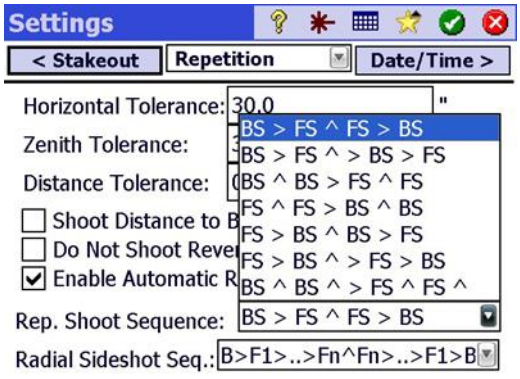
## Step 5: Select communication port settings

| | | |
|---|---|---|
| 1. | Point Coordinate and/or Observation data can be sent through the instrument's serial or Bluetooth ports to another device or be saved to a file in memory on the data collector. |  |

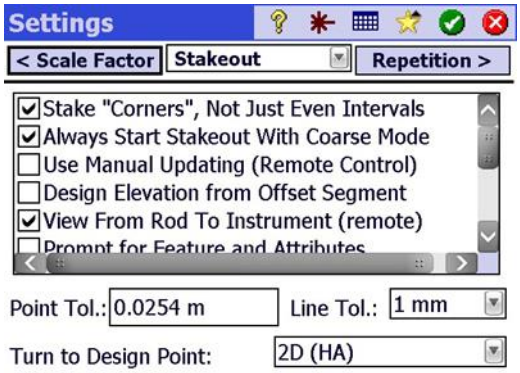
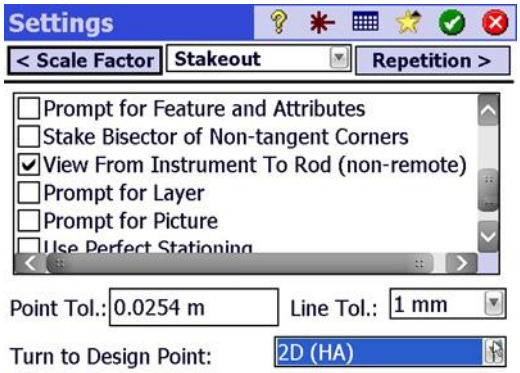
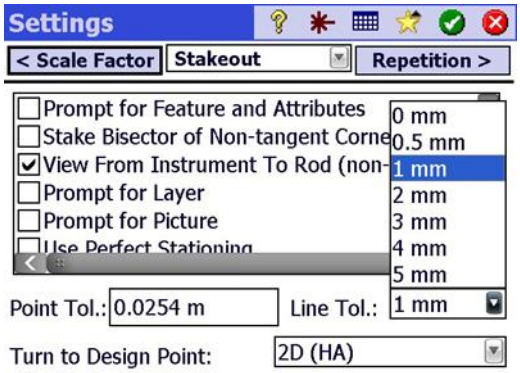
## Step 6: Set Time and Date for data collector

| | | |
|---|---|---|
| 1. | Date and Time can be set.<br>The "Set Date" button sets the value of the MM DD YYYY entries.<br>The "Set Time" button sets the value of the HH MM SS entries.<br>The "Synchronize" button zeroes the fractional portion of the current time to the nearest second so that the time can be set more accurately. |  |
| 2. | DUT corrections are described in the Help menu.<br>Wikipedia describes DUT corrections similarly:<br>http://en.wikipedia.org/wiki/DUT1 |  |

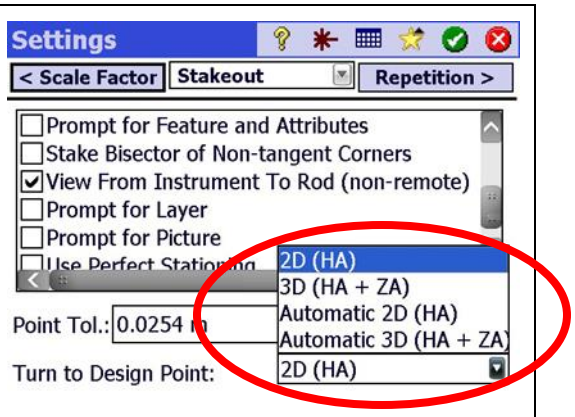
## Step 7: Select Repetition settings

| | | |
|---|---|---|
| 1. | A variety of repetition sideshots and repetition angle set routines can be executed.<br>Automated angle set and repetition sideshots (when using a robot) require that a "Fixed Target be set for the backsight.<br>Horizontal and Vertical tolerances can be set. If the tolerances are exceeded, a warning is provided. |  |
| 2. | Symbol ">" indicates the instrument turning to the next position horizontally . The ^ symbol indicates that the instrument will change face. |  |
| 3. | Symbol "^" indicates the instrument turning to the opposite face to then measure the current point or the next point depending upon the sequence of observations. |  |

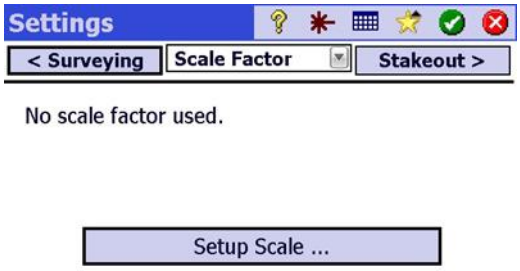
## Step 8: Select Stakeout settings

| | | |
|---|---|---|
| 1. | A variety of Stakeout settings are provided to maximize productivity or efficiency.<br>When using the FOCUS 30, the default stakeout mode uses a Tracking EDM. Selecting "Use Manual Updating (Remote Control)" will override this default. Individual EDM measurements can be executed by pressing the "Shot" button. |  |
| 2. | "Stake Bisector of Non-tangent Corners" will stake to the corner point where two centerline offsets intersect.<br>"Use Perfect Stationing" when checked will compute staking locations based on perfect stationing interval. For instance, if your starting station was 0+15 and your station interval is 100, your next stakeout station will be 0+100 instead of 0+115. |  |
| 3. | Point and Line tolerances can be set.<br>When performing a remote point stakeout, the final zoom level of the stakeout screen will appear when the rodman is within the distance to stake point specified in the "Point Tol:" field.<br>For the "Line Tol:" field, a message will be displayed when the rodman is within this perpendicular distance to the specified line. |  |

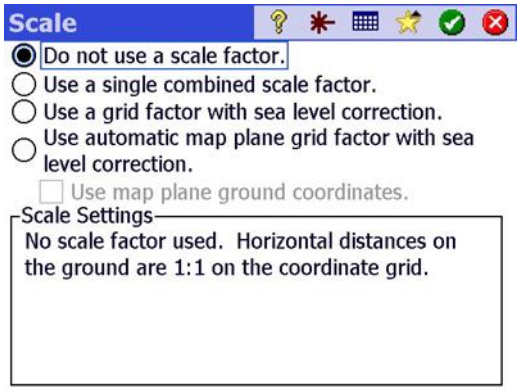
## Step 8: Select Stakeout settings

| | | |
|---|---|---|
| 4. | Since many staked points do not have an associated elevation, Survey Pro settings can determine whether the instrument should turn in 2D or 3D and whether the instrument should automatically turn to the stake point or not. Some surveyors prefer to have the instrument automatically turn ahead to the next stake point and they will pace the distance or track the guide lights to find the line. This is the automatic setting. Other surveyors would prefer that the instrument track them to the next stake point. For example, if "3D (HA + ZA) is selected and a tracking EDM is activated, Survey Pro will provide dynamic directions to the point or station being staked. |  |

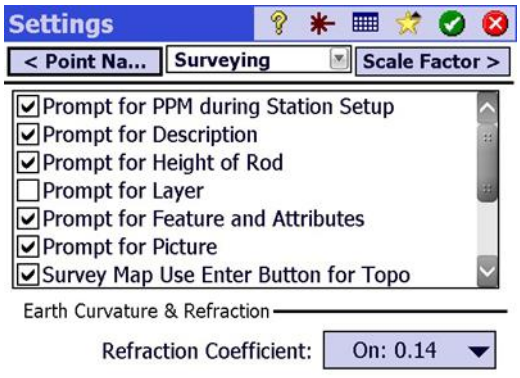
## Step 9: Select Scale Factor

| | | |
|---|---|---|
| 1. | For most total station work, this is left with "No scale factor used." This is the same as a scale factor of 1 to 1; grid distances equal ground distances. |  |

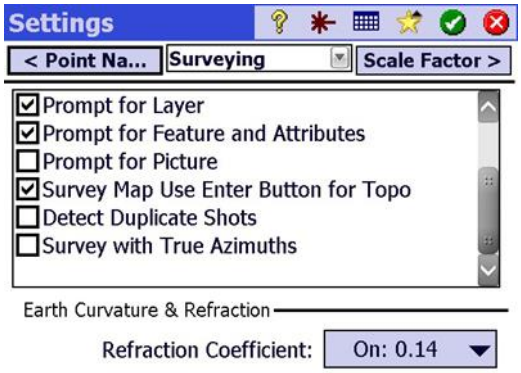
## Step 9: Select Scale Factor

| | | |
|---|---|---|
| 2. | "Use a single combined scale factor." to apply a single scale factor to all horizontal distance measurements.<br>"Use a grid factor with sea level corrections." to scale horizontal distances using a specified grid factor and a sea level correction applied for each measurement.<br>"Use automatic map plane grid factor with sea level correction." to scale horizontal distances using a grid factor calculated for each setup and a sea level correction for each measurement. This information is generated automatically by Survey Pro based on the mapping plane used for the survey. |  |

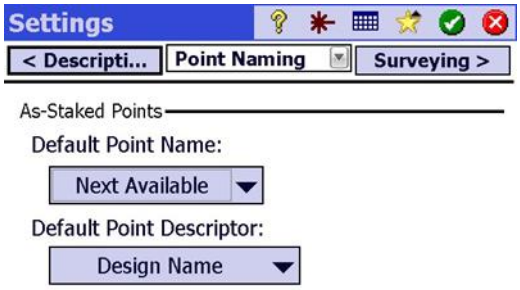
## Step 10: Select Survey Settings

| | | |
|---|---|---|
| 1. | Various prompts can be configured for use when performing data collection or "Surveying" routines. Prompts selected here occur after the measurement is taken.<br>The Refraction Coefficient can be changed at any time during a job. |  |

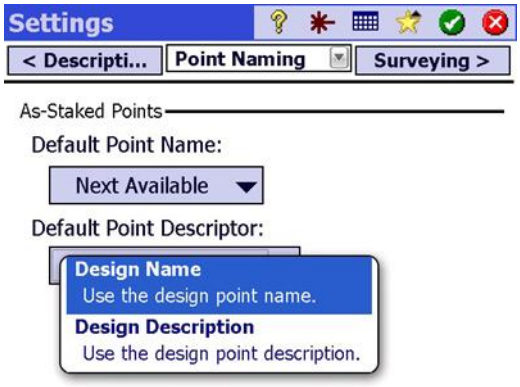
## Step 10: Select Survey Settings

| | | |
|---|---|---|
| 2. | "Survey with True Azimuths" automates the process of adjusting the circle on the total station when traversing so that azimuths will be displayed on the total station rather than angle-right values. The backsight circle will automatically be set to match the backsight azimuth for every setup. This would be the normal mode of operation for surveyors who would typically not set the circle value to zero. |  |

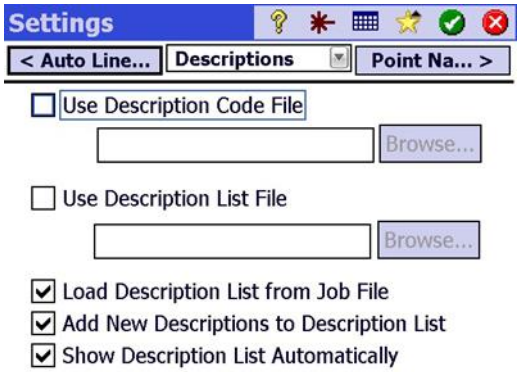
## Step 11: Set Point and Description naming parameters

| | | |
|---|---|---|
| 1. | "As-Staked Points" can be named according to a specified convention. |  |
| 2. | "As-Staked " point naming choices include the next numerically available point in the job's file, a designated prefix along with the design point name, the design point name with a designated suffix or a constant that is applied to every design point name. For example, if the constant is 1000 and point 10 is the design point staked, then the as staked point will be 1010. |  |

## Step 11: Set Point and Description naming parameters

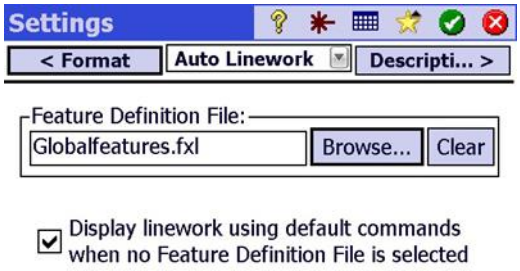
| | | |
|---|---|---|
| 3. | "As-Staked" point description choices include the Design Name or the Design Description. Stationing will be used for all alignment staking. |  |

## Step 12: Select Description file

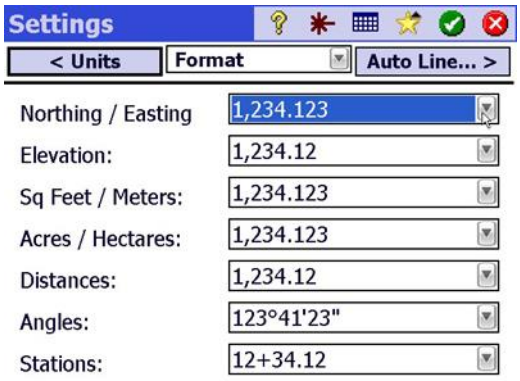
| | | |
|---|---|---|
| 1. | These files are text based only and must have a *.TXT file extension. Description Code Files will display a list of potential descriptions to select when you start typing in a description field. The descriptors shown will match what you've typed in so far. When the proper description is shown, tap on that line and the full description will be added to the field. |  |

The "Description List File," is a pair: a short code followed by the full description. Typing the code into the description field will tell Survey Pro to replace the short code with the full description.
For example, if the DescriptionFile.TXT has a code as follows:
CL Centerline
"CL" is typed into the description field. When the point is stored, "Centerline" will replace the "CL" code.
NOTE: The feature code FXL file is generally a better option moving forward. It allows for a much greater level of functionality than simple descriptor files.

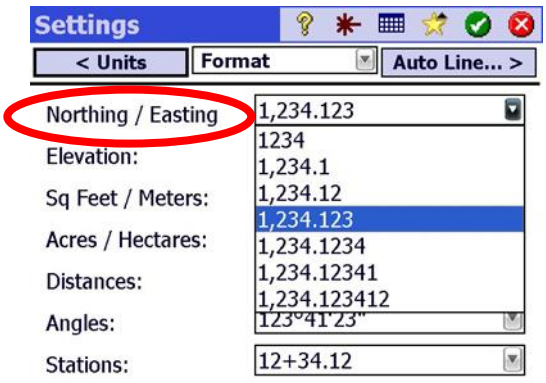
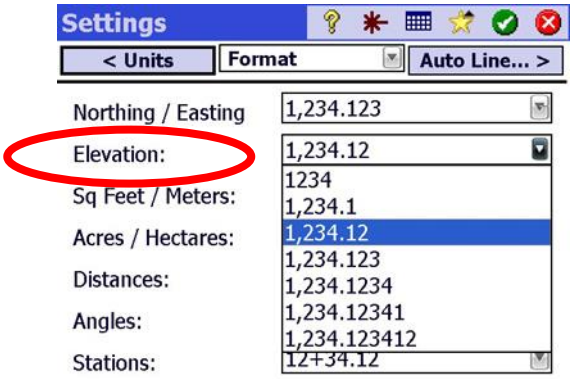
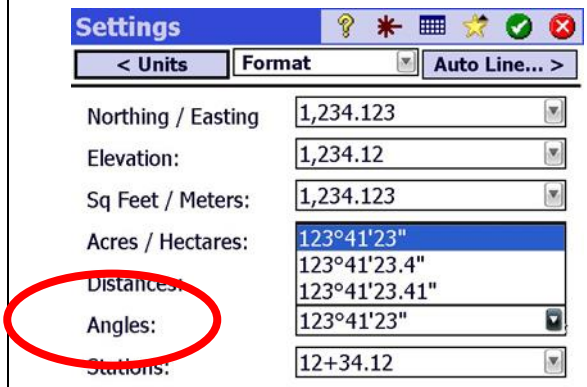
## Step 13: Select Feature file

| | | |
|---|---|---|
| 1. | Globalfeatures.fxl is installed on to every data collector that has Survey Pro also installed. This is a comprehensive "Feature Definition File" that allows for the generation of automatic linework when collecting and coding points with these Feature Definitions. Feature and attribute data can also be collected when using the FXL file. Globalfeatures.fxl can be customized or new feature libraries created using the Spectra Precision Survey Office software utility "Feature Definition Manager." |  |

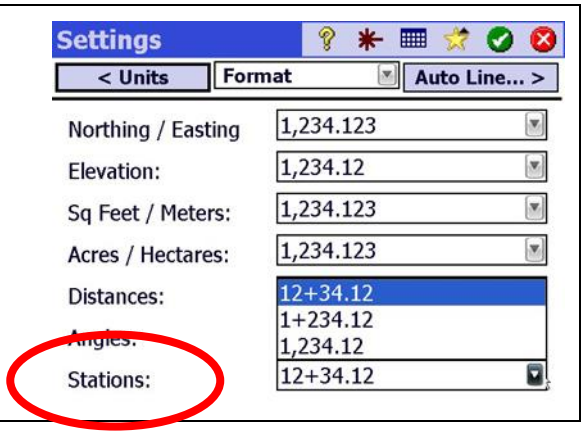
## Step 14: Select numerical formats

| | | |
|---|---|---|
| 1. | Various numerical fields can be formatted. The values selected here will affect the raw data that is recorded. For instance, if "Distances" are rounded to the nearest meter, there will be no information about the centimeters or millimeters involved in the data display. However, full precision is always stored in the raw file. If you change these settings, it only affects what is displayed in the various routines in Survey Pro, not what is being stored in the file. |  |

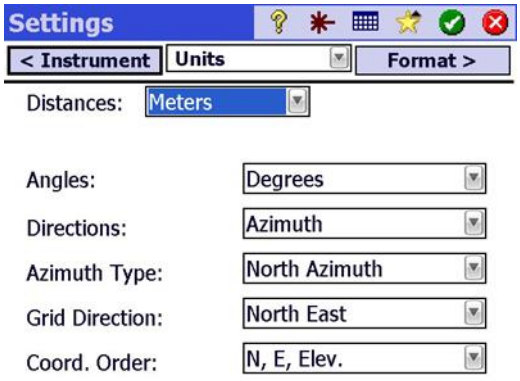
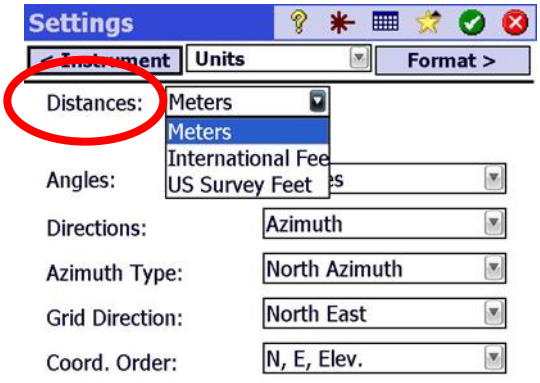
## Step 14: Select numerical formats

| | | |
|---|---|---|
| 2. | Decimal precision of the Northing/Easting coordinates can be selected.<br>Southing/Westing coordinates are displayed if Grid Direction is chosen as "South/West." |  |
| 3. | The precision of the display for the various units can be selected as desired. |  |
| 4. | Decimal precision of the Angles can be selected.<br>This image is showing the angles in degrees, minutes and seconds because "Degrees" was chosen under units. If Grads/Gons had been selected, then these units would be selectable under this "Angles" field. |  |

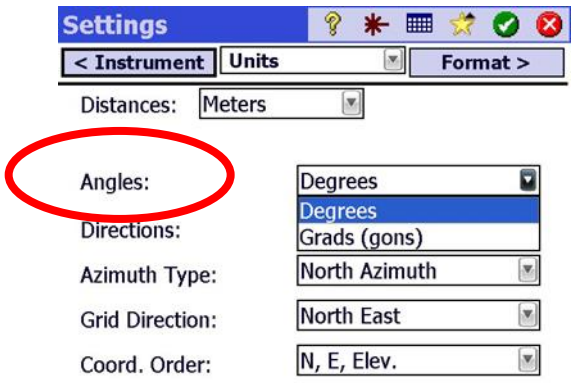
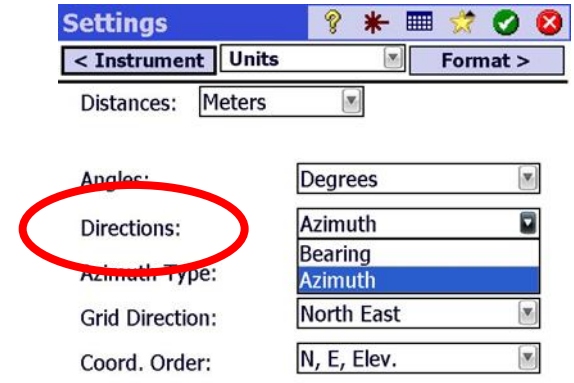
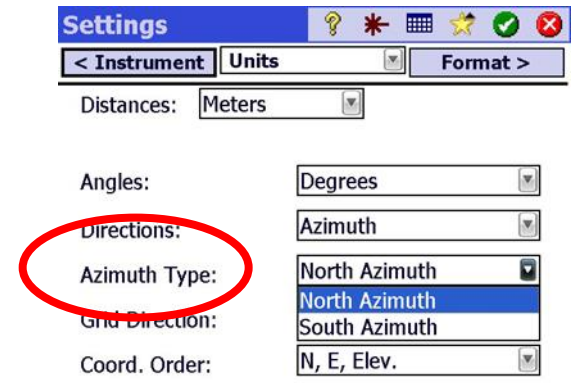
## Step 14: Select numerical formats

| | | |
|---|---|---|
| 5. | Stationing format can be selected. |  |

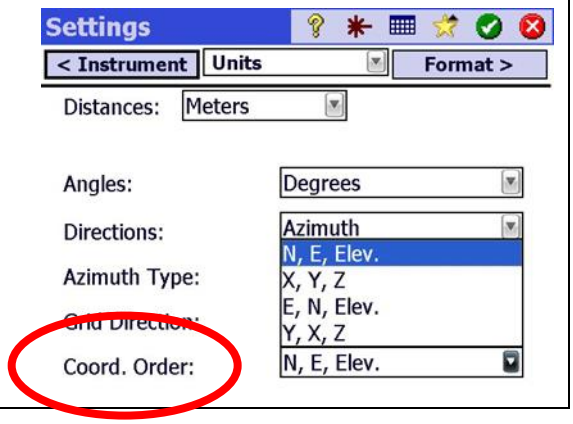
## Step 15: Select units

| | | |
|---|---|---|
| 1. | Various units can be selected. |  |
| 2. | Meters are the default units for new jobs unless a previous unit has been selected. For those users of Feet, an intentional choice must be made between International and U.S. Survey. |  |

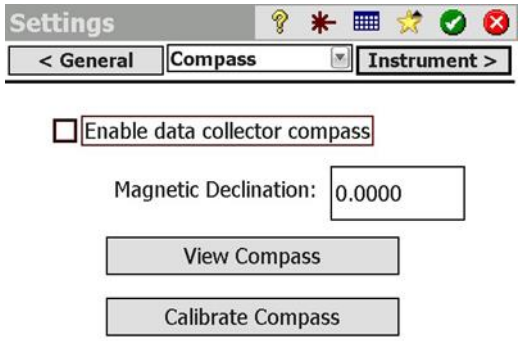
## Step 15: Select units

| | | |
|---|---|---|
| 3. | Angles can be expressed in Degrees or Grads (Gons). |  |
| 4. | Directions can be displayed in Azimuths or Bearings.<br>For example, an azimuth of 103 degrees has a bearing equal to South 77° East. |  |
| 5. | North or South Azimuth can be selected. |  |

## Step 15: Select units

| | | |
|---|---|---|
| 6. | The grid directions can be displayed as either Northings and Eastings or Southings and Westings |  |
| 7. | The coordinate order can be North/East (which equals Y,X,Z) or East/North (which equals X,Y,Z).<br>In all cases, X = the East/West component and Y = the North/South component. |  |

## Step 16: Compass

| | | |
|---|---|---|
| 1. | Survey Pro can access the internal compass of the data collector to facilitate various surveying routines. |  |

# Import Files

In this lesson, you will learn how to:

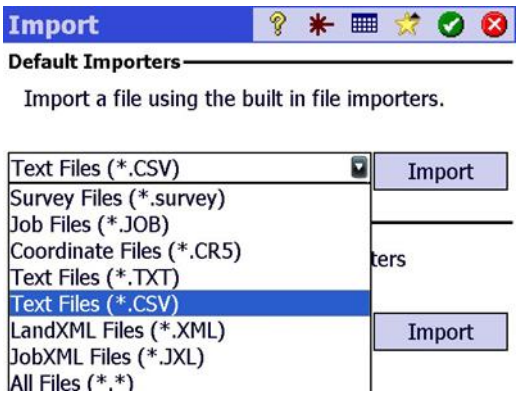
Import a text file containing point names and coordinates into the current job. This lesson will also explain how to import control point data from previous jobs.


| | | ***Page*** |
|---|---|---|
| Step 1: | Navigate to the File\Import page | 52 |
| Step 2: | Select the correct format for the file being imported | 52 |
| Step 3: | Navigate to the file being imported and select it | 53 |
| Step 4: | Assign the points to a job layer | 53 |
| Step 5: | Define the units and columns | 54 |
| Step 6: | Preview the import | 54 |
| Step 7: | Import the data and view the results | 55 |
| Step 8: | Navigate to the File\Import Control page | 55 |
| Step 9: | Navigate to the Control file being imported and select it | 56 |
| Step 10: | Import the control data and view the results | 56 |

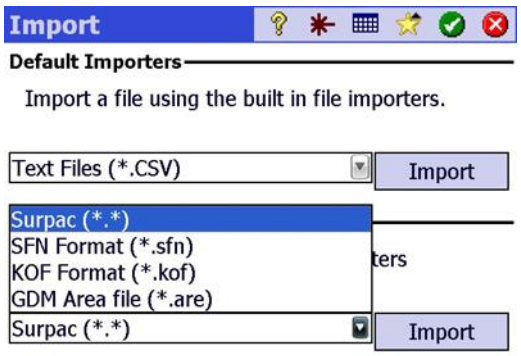
## Step 1: Navigate to the File\Import page

| | | |
|---|---|---|
| 1. | From the main menu, tap on “File” |  |
| 2. | On the “File Page, tap on “Import” |  |

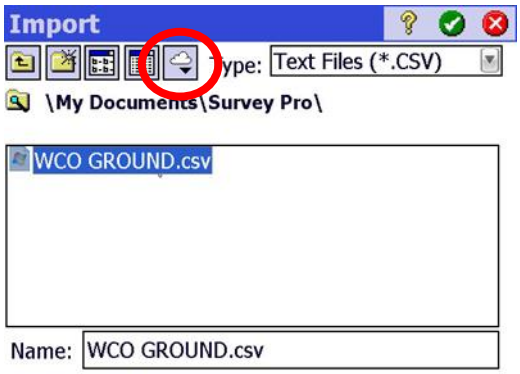
## Step 2: Select the correct format for the file being imported

| | | |
|---|---|---|
| 1. | The file that will be imported is a *.CSV file so this is selected from the list for file “Type” |  |

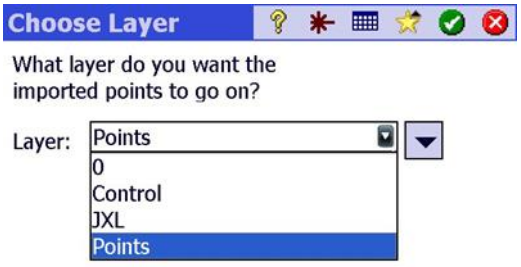
## Step 2: Select the correct format for the file being imported

| | | |
|---|---|---|
| 2. | Custom file formats are also available to meet regional needs. |  |

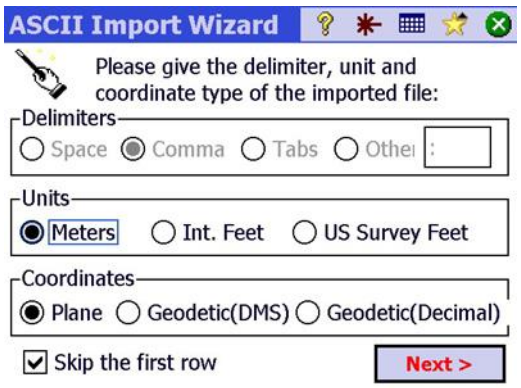
## Step 3: Navigate to the file being imported and select it

| | | |
|---|---|---|
| 1. | Browse to the correct file, highlight it and tap on the green check/tick mark in the upper right hand corner of the page.<br>Notice that Dropbox.com is available which can be a convenient place to store and retrieve survey files. |  |

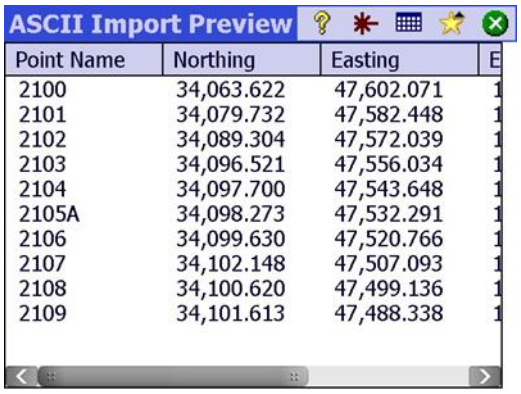
## Step 4: Assign the points to a job layer

| | | |
|---|---|---|
| 1. | The points need to be assigned to an existing layer in the job.<br>The "Manage Layers" utility is accessible by clicking on the down arrow on the right side of the page. |  |

## Step 5: Define the units and columns

| | | |
|---|---|---|
| 1. | By definition, a CSV file is Comma delimited. If this had been an unknown file type, the delimiter between fields would need to be defined.<br>The units and type of coordinates must also be defined.<br>If the file being imported contains a Header row, "Skip the first row" option can be selected. |  |
| 2. | Define the order of the columns. For instance, this image is configured for a file that is in the order of Point Name, Northing, Easting, Elevation, Description.<br>If instead, the file has the eastings before the northings, the numbering sequence would be: 1, 3, 2, 4, 5<br>If "Specify Missing Elevation Threshold" is selected, a numeric value can be used to flag points to be imported that do not have valid elevations. |  |

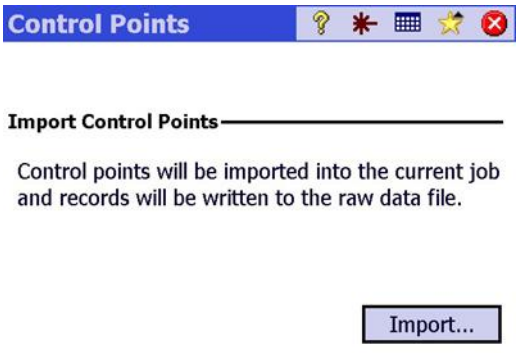
## Step 6: Preview the import

| | | |
|---|---|---|
| 1. | A Preview of the points to be imported can be analyzed for correctness before insertion into the *.survey file. |  |

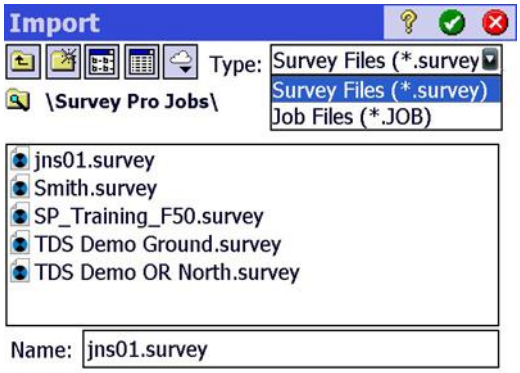
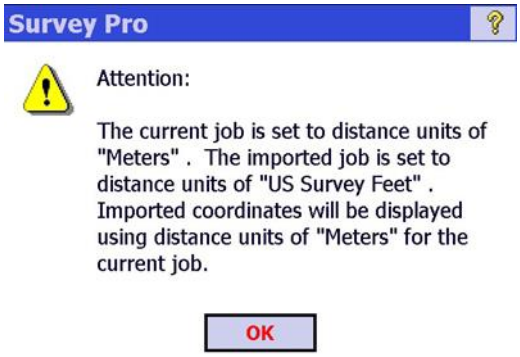
## Step 7: Import the data and view the results

| | | |
|---|---|---|
| 1. | After the “Finish” button is pushed, a statement is provided about what was imported. |  |

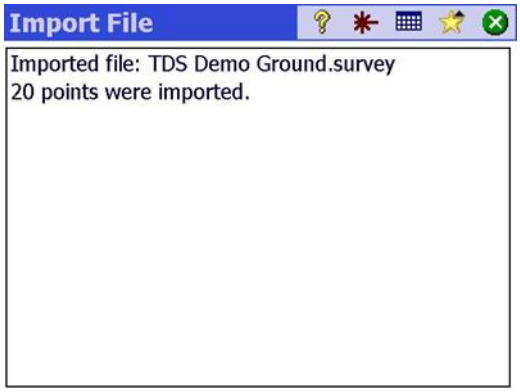
## Step 8: Navigate to the File\Import Control page

| | | |
|---|---|---|
| 1. | Even if a Control File was not attached to the job during the job creation process, it can be added later. Navigate to “Import Control” under the File page. |  |
| 2. | A dialogue box is stating that the Control points selected will be imported into the current job. |  |

## Step 9: Navigate to the Control file being imported and select it

| | | |
|---|---|---|
| 1. | Browse to the location of the Control File being imported. *.Survey and *.Job files are the allowed formats. |  |
| 2. | If Survey Pro detects any compatibility problems between the current job and the Control Points being imported, a warning box will appear with advice on the action the software will take. |  |

## Step 10: Import the control data and view the results

| | | |
|---|---|---|
| 1. | After the file choice has been confirmed by either clicking on the green check/tick mark or hitting the OK button, a statement is provided about what was imported. |  |

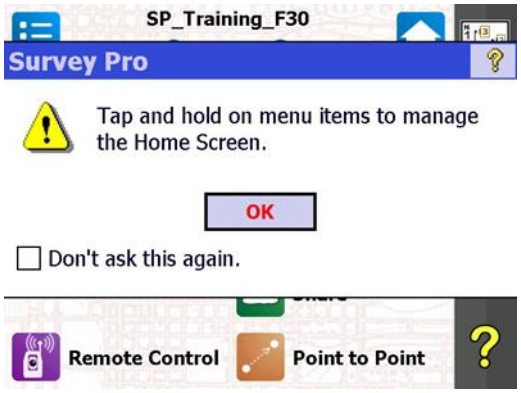
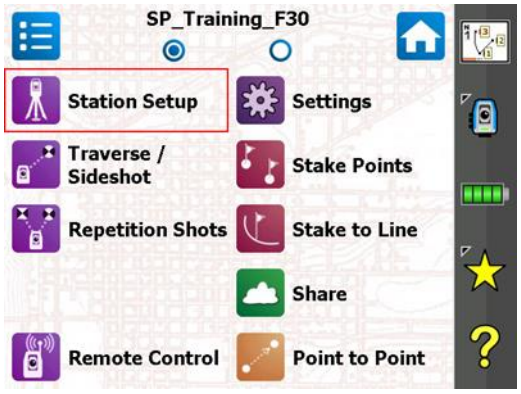
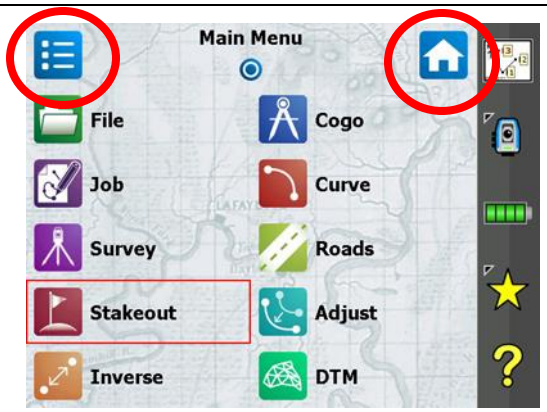
# Customize the Home Page(s)

In this lesson, you will learn how to:

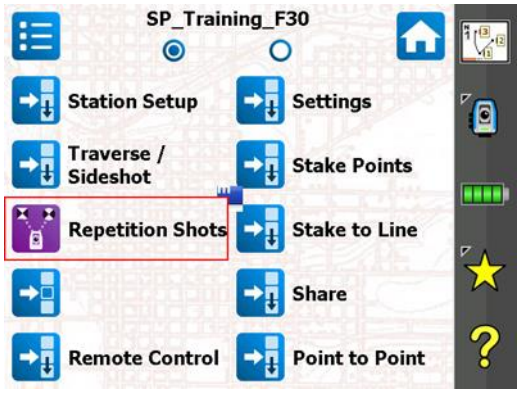
Customize the Home page, create new Home pages, delete Home pages, move icons, insert icons and delete icons.


| | | ***Page*** |
|---|---|---|
| Step 1: | Navigate to Home page(s) | 58 |
| Step 2: | Tap and hold (extended click) on icon to be moved | 59 |
| Step 3: | Drop icon in new location | 59 |
| Step 4: | Tap and hold, then select “Insert Page Before” | 60 |
| Step 5: | Drop icon on new page | 60 |
| Step 6: | Select “Repetition Shots” from Survey page and place on Home page | 61 |
| Step 7: | Remove a Home Page | 61 |
| Step 8: | Create a sample workflow oriented Home page | 62 |

## Step 1: Navigate to Home page(s)

| | | |
|---|---|---|
| 1. | When creating a new job, a dialogue box is presented with instructions for managing the Home Screen(s) |  |
| 2. | Default Home Page for a Total Station |  |
| 3. | The Home Page is accessed by clicking on the blue Home icon in the top right corner of primary menu pages.<br><br>The Main Menu is accessed by clicking on the Blue icon in the top left corner of primary menu pages. |  |

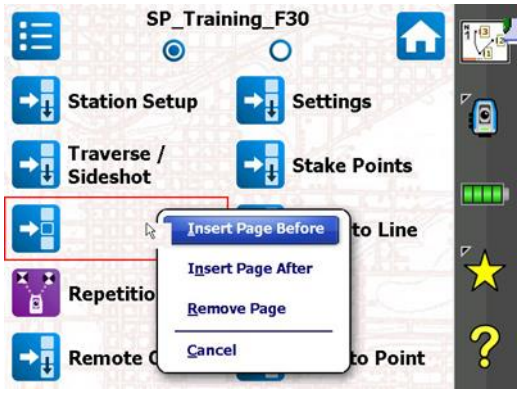
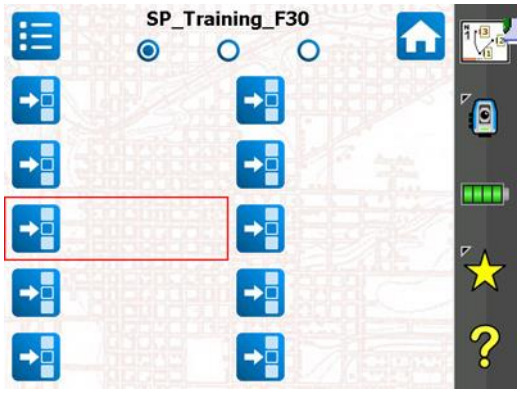
## Step 2: Tap and hold (extended click) on icon to be moved

| | | |
|---|---|---|
| 1. | To move a menu item, perform a tap and hold (same as a right mouse click on a computer) on the menu item to be moved. |  |
| 2. | All icons on the page turn blue except for the menu item that is being selected to be placed on the home page. |  |

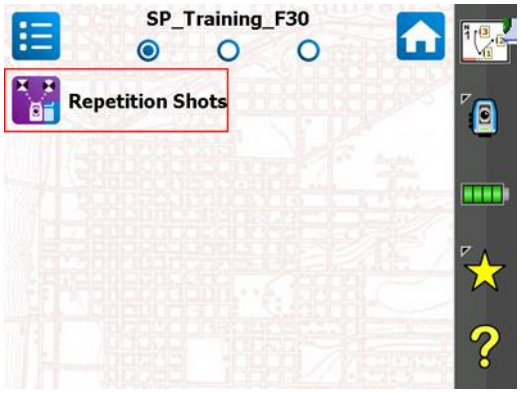
## Step 3: Drop icon in new location

| | | |
|---|---|---|
| 1. | Tap on new location for the menu item. Menu item is copied to the new location and all the other icons return to their normal color. |  |

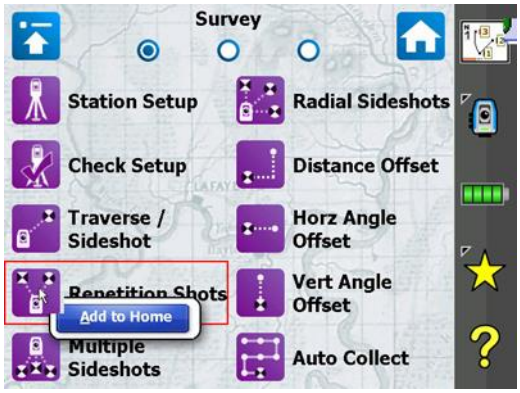
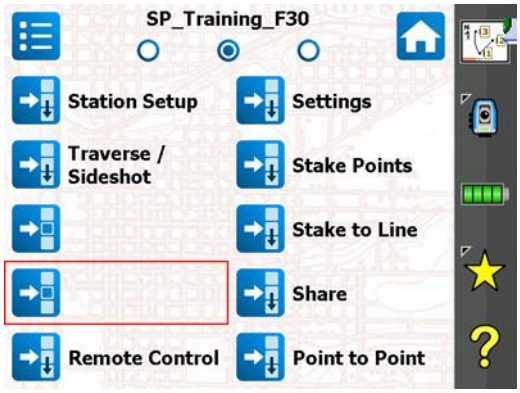
## Step 4: Tap and hold, then select "Insert Page Before"

| | | |
|---|---|---|
| 1. | Select Insert Page Before or Insert Page After to insert a page before or after the current page.<br><br>A total of four Home Pages are currently allowed. |  |
| 2. | A new page is created. |  |

## Step 5: Drop icon on new page

| | | |
|---|---|---|
| 1 | Drop the icon (that was highlighted during the new page creation) anywhere on to the newly created page. |  |

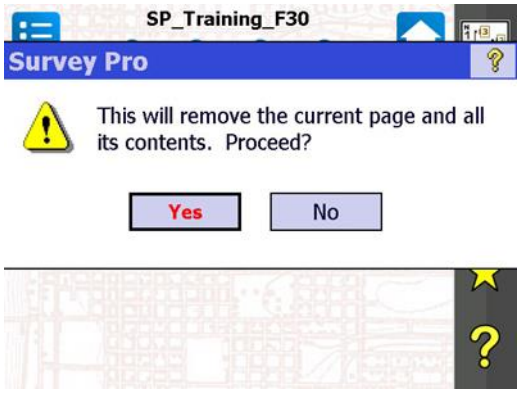
## Step 6: Select "Repetition Shots" from Survey page and place on Home page

| | | |
|---|---|---|
| 1. | To copy "Repetition Shots" to a Home page, tap and hold on the button inside the first Survey Page. Select "Add to Home" |  |
| 2. | Navigate to the desired Home page. Tap on the desired location |  |

## Step 7: Remove a Home Page

| | | |
|---|---|---|
| 1. | Home Pages can be removed. |  |

## Step 7: Remove a Home Page

| | | |
|---|---|---|
| 2. | A warning dialogue will be presented confirming the page deletion. |  |

## Step 8: Create a sample workflow oriented Home page

| | | |
|---|---|---|
| 1. | One example of a workflow oriented approach to Home Page creation. Begin by opening a job, then importing data. Settings come next and any point editing that might be necessary. The station must be set and then data collection and/or stakeout come next. Many times, a couple of COGO calculations will be required. At the end, the data will be shared. Dropbox or email is an option. |  |

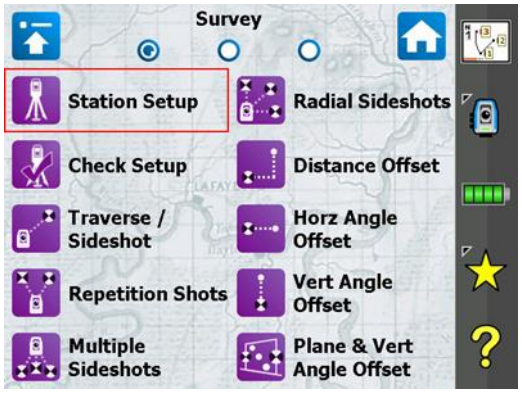
# Station Setup

In this lesson, you will learn how to:

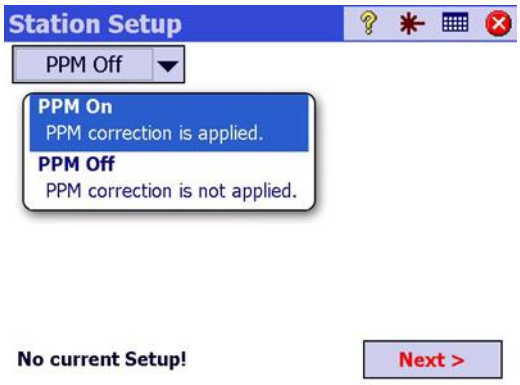
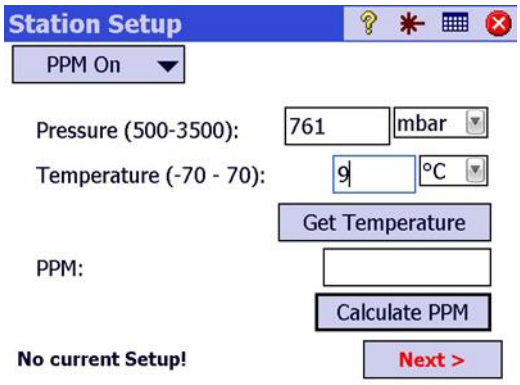
Setup and orient a FOCUS 30 total station on a known point. This lesson will also provide instructions on how to perform a resection or free station to setup on an unknown point.


| | | ***Page*** |
|---|---|---|
| Step 1: | Navigate to Station Setup | 64 |
| Step 2: | Input Temperature and Barometric Pressure (Optional) | 64 |
| Step 3: | Set Station on Known Point | 65 |
| Step 4: | Set Station on Unknown Point (Resection or Freestation) | 71 |
| Step 5: | Use Last Setup | 78 |

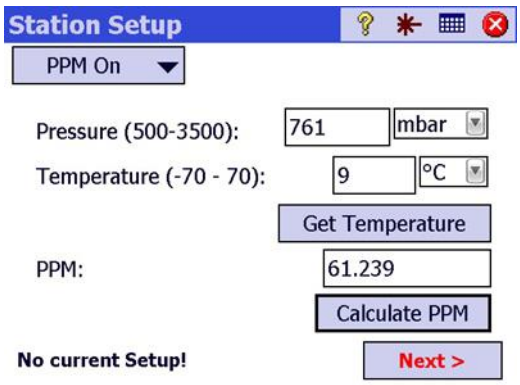
## Step 1: Navigate to Station Setup

| | | |
|---|---|---|
| 1. | Navigate to the Station Setup routine located on the first Survey page. If a user attempts to go directly to measurement routine such as Traverse/Sideshots, they will be directed to the Station Setup routine as well. |  |

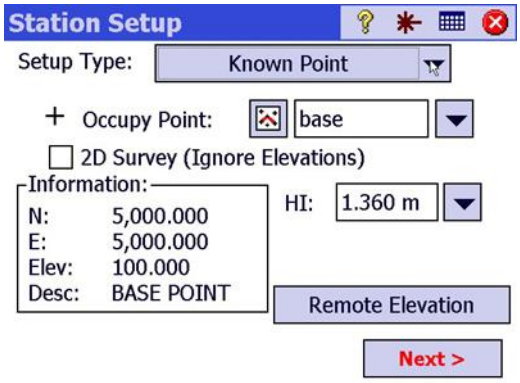
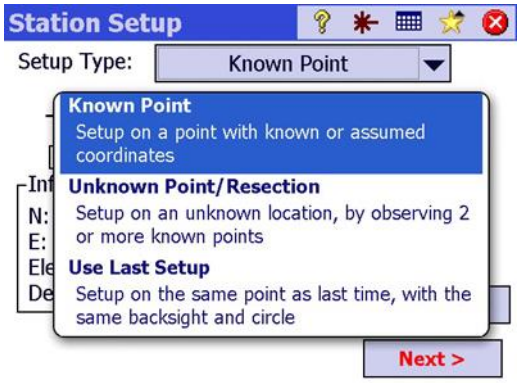
## Step 2: Input Temperature and Barometric Pressure (Optional)

| | | |
|---|---|---|
| 1. | For most surveys with optical equipment, it is a good idea to adjust the EDM calculations for the current atmospheric conditions.<br><br>This option will be shown if Prompt for PPM option is selected in the Surveying section of Settings. |  |
| 2. | Insert the correct temperature and barometric pressure. |  |

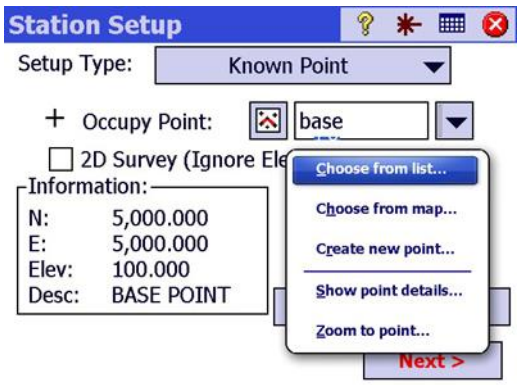
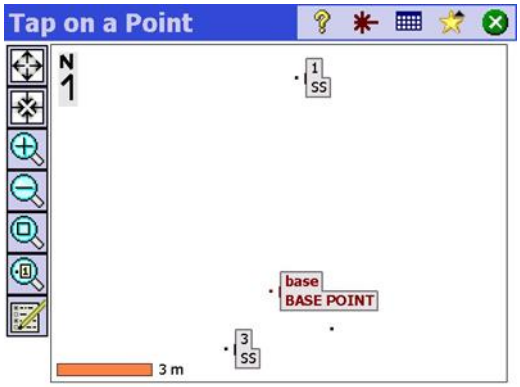
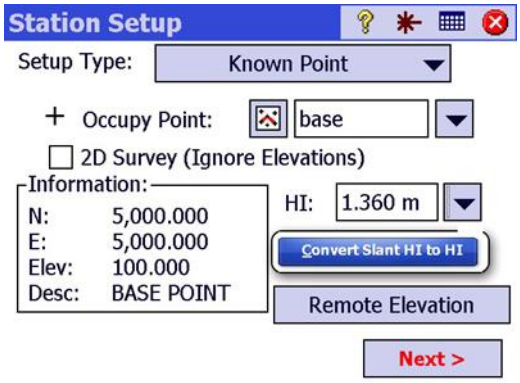
## Step 2: Input Temperature and Barometric Pressure (Optional)

| | | |
|---|---|---|
| 3. | Tap on the "Calculate PPM" to populate the correction value.<br><br>Alternatively, the PPM value can be calculated externally and manually entered into the PPM field. |  |

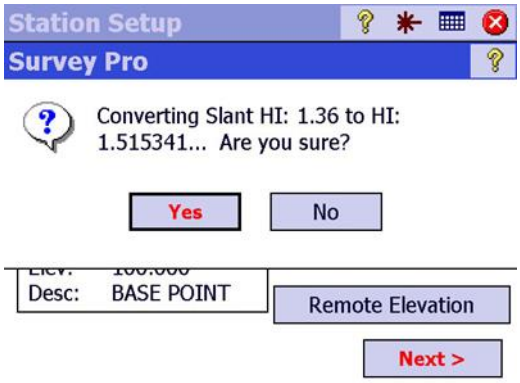
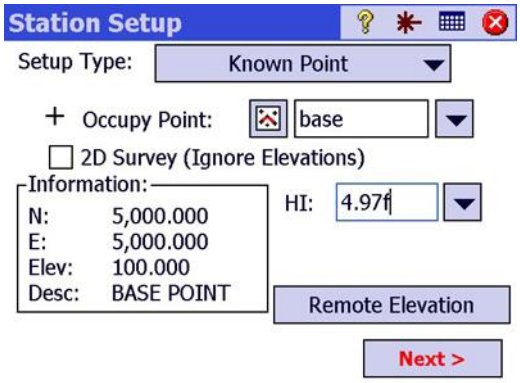
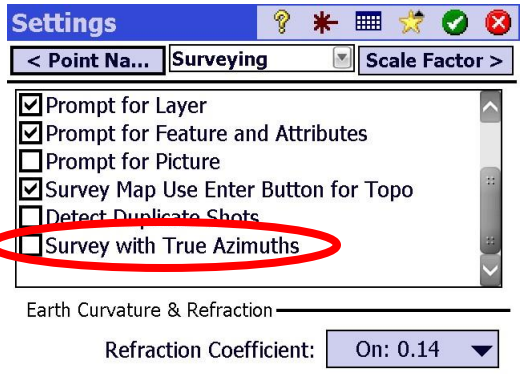
## Step 3: Set Station on Known Point

| | | |
|---|---|---|
| 1. | The Station Setup page will initially display the last setup information.<br>Notice that Survey Pro can support 2D surveys where elevations are ignored and that a Remote Elevation from a benchmark can be observed to calculate the occupied elevation. |  |
| 2. | The Total Station can be set on a Known Point or an Unknown point. If returning to the same location, the "Use Last Setup" option can be used.<br><br>Select Known Point. |  |

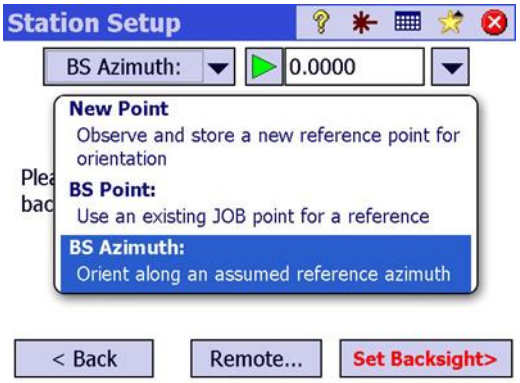
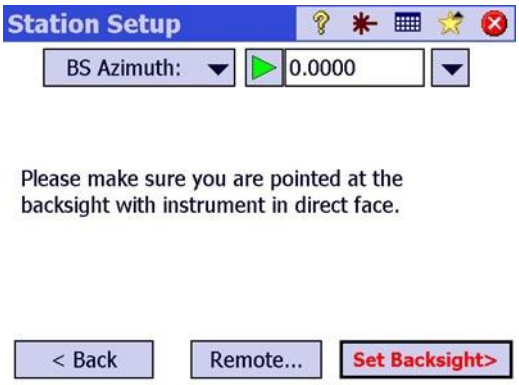
## Step 3: Set Station on Known Point

| | | |
|---|---|---|
| 3. | The Known Point can be chosen from the current job's point list, from the Map display or a new point can be created. |  |
| 4. | Tap on a point to select it. |  |
| 5. | Generally, the instrument height is measured by tape measure to the trunnion mark. However, on some instruments, like the FOCUS 30, there is a slant measure mark as well. To use slant height, measure to the slant measure mark, and enter that value into the HI field. Tap the power menu (down arrow), and tap on Convert Slant HI to HI. |  |

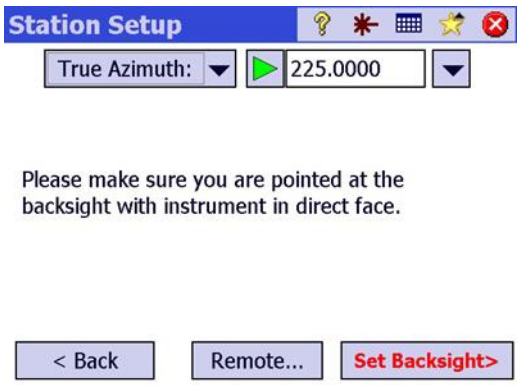
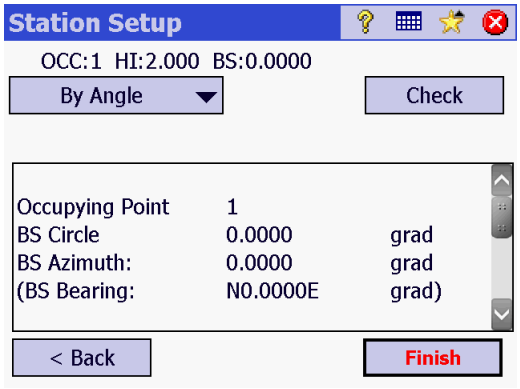
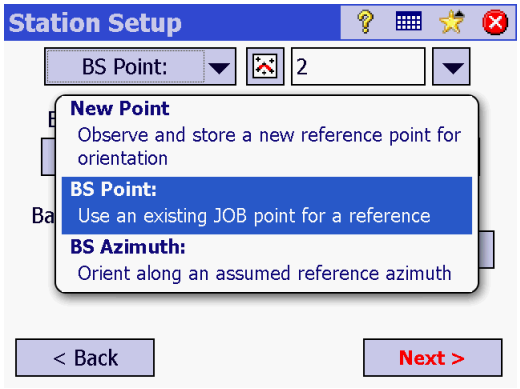
## Step 3: Set Station on Known Point

| | | |
|---|---|---|
| 6. | The 1.36 meter slant height is converted to a vertical value and then the offset to the trunnion axis is applied to derive the correct Height of Instrument (HI). |  |
| 7. | Notice that if the job is metric but the HI measurement is performed in feet, an "f" can be inserted after the number and Survey Pro will manage the conversion. The opposite is true for a job in feet where an "m" after the number will be converted by Survey Pro to feet. (This method works in all distance fields inside Survey Pro) |  |
| 8. | Survey Pro has two modes of operation with regards to the treatment of the setting of the instrument circle (the instrument circle setting is the orientation of the instrument's horizontal angle encoders).<br>The first method that is typical in many regions is to set the instrument's circle to be 0° when pointed at the backsight. This is the default mode for Survey Pro. |  |

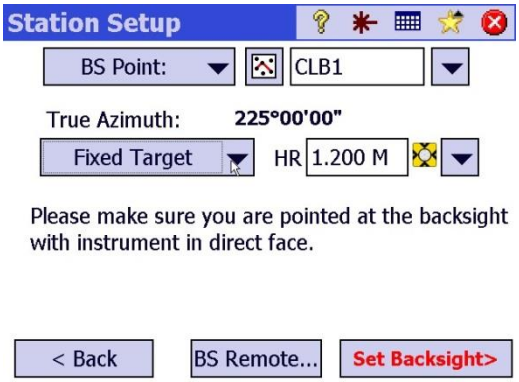
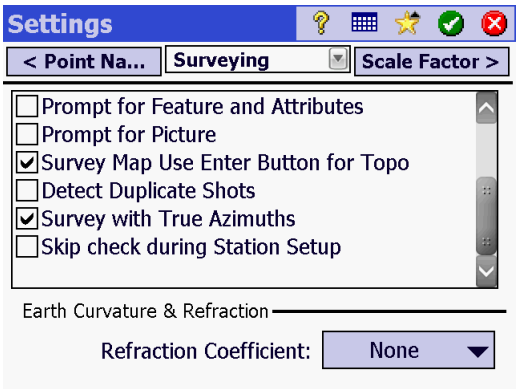
## Step 3: Set Station on Known Point

| | | |
|---|---|---|
| | Survey Pro can also operate in True Azimuth mode. This mode is selected using the "Survey with True Azimuth" setting in the Job/Settings/Surveying page . In this case, Survey Pro will always automatically set the instrument circle to match the backsight azimuth.<br><br>If managing the backsight circle is not important to your survey methods, or if you always want to see azimuths related to a cardinal direction, select the True Azimuth mode and Survey Pro will automatically manage the circle for you.<br><br>It is important to note that the circle orientation that manages the generation of coordinates need not match the backsight azimuth. Survey Pro always manages the differences automatically. Setting the circle is simply a method to make recognition of errors easier. It also enables the instrument display to show the same angle values that are being used in Survey Pro. | |
| 9. | The instrument's backsight aiming can be an Azimuth or a Point. The Point can be an existing point or a new point can be created by measuring the target position while setting the backsight values. The New Point option is nearly the same as the BS Azimuth option except that once the backsight is set, a new point can be measured and stored. |  |
| 10. | To use a backsight azimuth, select BS Azimuth by tapping on the scroll menu. Set the backsight azimuth.<br><br>Ensure the instrument is accurately aimed at the backsight and tap the Set Backsight button to set the circle on the instrument. |  |

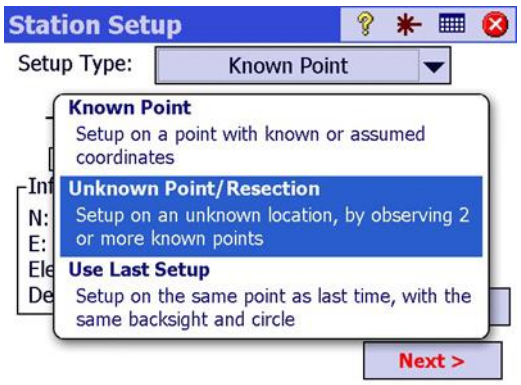
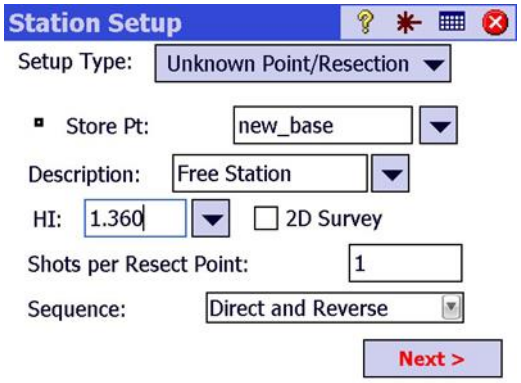
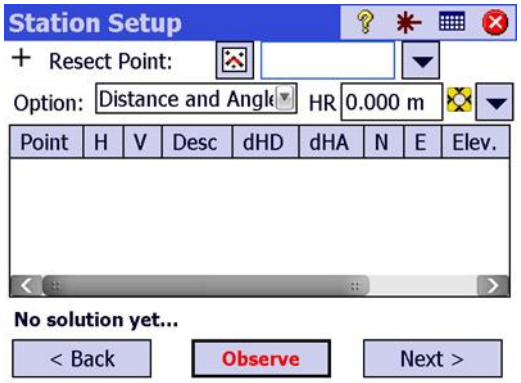
## Step 3: Set Station on Known Point

| | | |
|---|---|---|
| 11. | If the Surveying settings have been set to use "True Azimuth", this value can be keyed in or two points from the job can be selected to compute the True Azimuth. Clicking on the Green Arrow will read the current circle orientation of the instrument. |  |
| 12. | Once the backsight has been set, a final confirmation screen is presented. The station setup can be Checked By Angle, By Distance or By Point. Clicking on Finish launches the Survey menu. |  |
| 13. | To set the backsight using a known point, select BS Point from the scroll menu. Select the point for the backsight.<br>If it is required to use the backsight azimuth for the circle setting, use the True Azimuth setting described in this guide. |  |

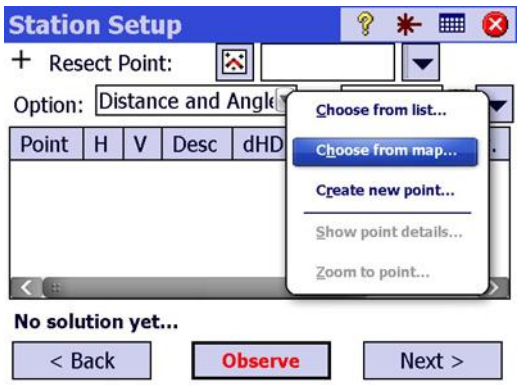
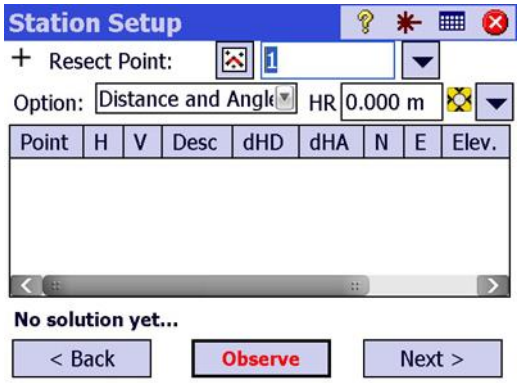
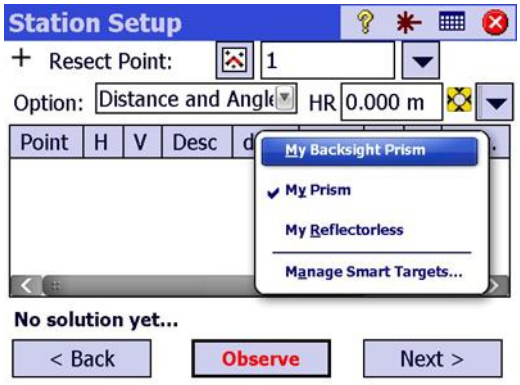
## Step 3: Set Station on Known Point

| | | |
|---|---|---|
| 14. | When backsighting a point, a distance will be measured and the instrument circle will be rotated accordingly. The backsight can be measured with a dedicated prism called a "Fixed Target" that will remain in place throughout the survey. This allows Survey Pro to assume that there will NOT be a change of HR or prism constant. A "Roving Target" can be used if the prism is not left on the backsight point throughout the survey. |  |
| 15. | In the case where the instrument circle must match the backsight azimuth or when the instrument circle reading is not important or not used, then set True Azimuth mode for the backsight setup. This setting is controlled under the Job/Settings/Surveying page. |  |
| 16. | The final screen of the Station Setup is a confirmation page showing the various values involved in the setup. The display of this screen is controlled by the "Skip check during Station Setup" option in the Surveying settings page. If this setting is checked, the final station check page will not be shown. This page can always be accessed by using the Check Setup routine.. |  |

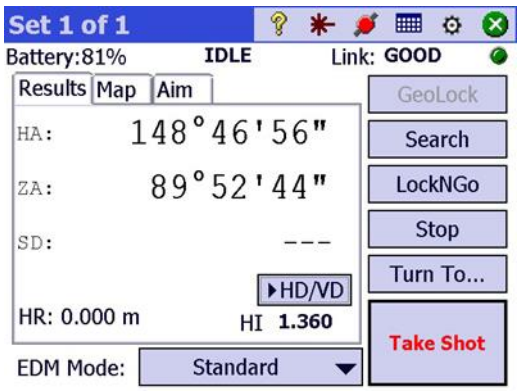
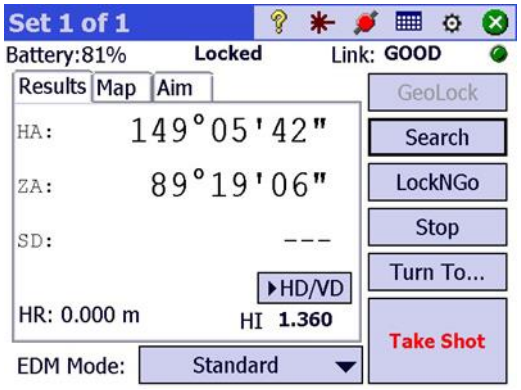
## Step 4: Set Station on Unknown Point (Resection or Freestation)

| | | |
|---|---|---|
| 1. | In the drop-down menu for Setup Type, select “Unknown Point/Resection”. This routine is sometimes called a “Freestation”. |  |
| 2. | The “Store Pt:” field is used to assign a name to the point that is occupied and that is going to be calculated.<br>A Description is optional. Enter the HI and the number of measurements to take to each of the points to be used in the resection.<br>Select either Direct and Reverse (Face 1 and Face 2) or Direct Only for the sequence. Then tap Next. |  |
| 3. | In the “Resect Point:” field, enter the first point that is going to be measured. Distance and Angle or Angle only resections are supported. |  |

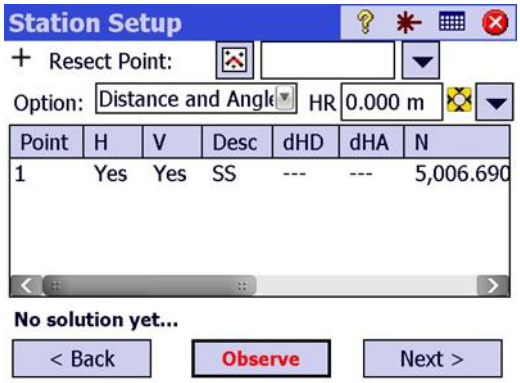
## Step 4: Set Station on Unknown Point (Resection or Freestation)

| | | |
|---|---|---|
| 4. | The point to be observed can be manually entered, selected from the point list or off the map. A new point can also be created. |  |
| 5. | Point number "1" has been selected for the first point observation in the resection. |  |
| 6. | Ensure that the correct Height of Rod (HR) and prism type are defined.<br>Point the instrument at the target. For robotic instruments, either use the Remote Control screen to aim the instrument or use the tracking EDM to track the target to the point.<br>Clicking on Observe will initiate a measurement. |  |

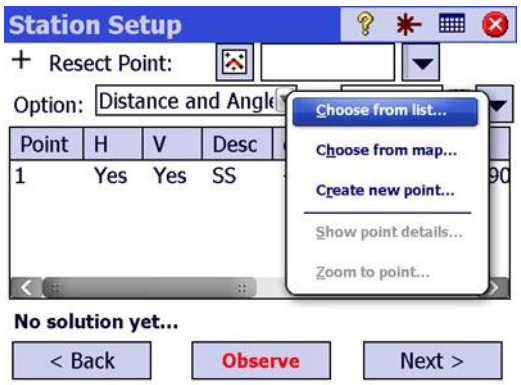
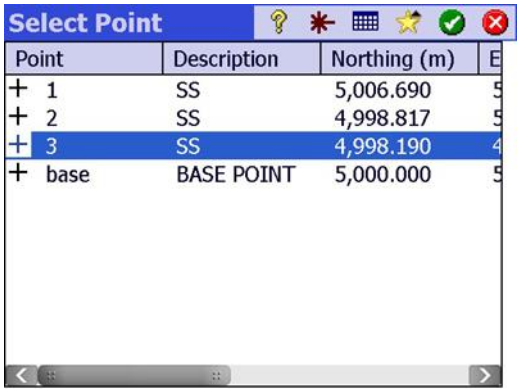
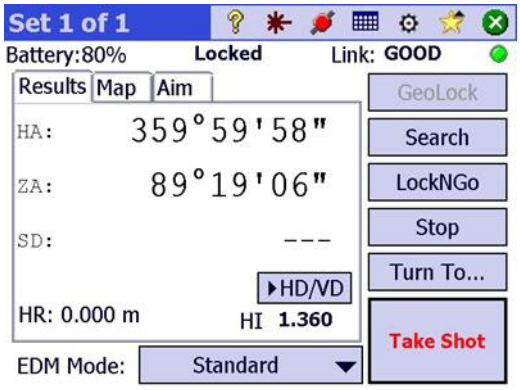
## Step 4: Set Station on Unknown Point (Resection or Freestation)

| | | |
|---|---|---|
| 7. | Use the Ranger's "spider button" to joy-stick the instrument close to the prism (or any other method such as search and then track). |  |
| 8. | Tap on the Search button and allow the LockNGo technology to find the center of the prism. |  |
| 9. | When the instrument has found the prism, the Take Shot page will indicate that it is Locked on the prism.<br>Tap on Take Shot to begin the observation. |  |

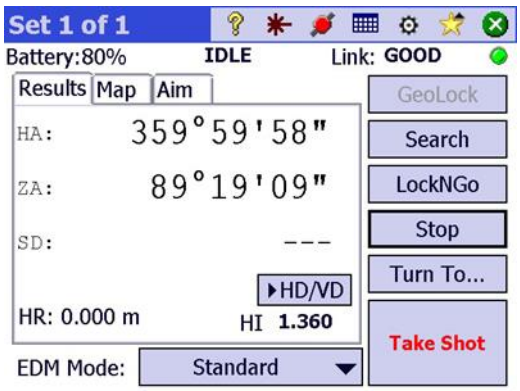
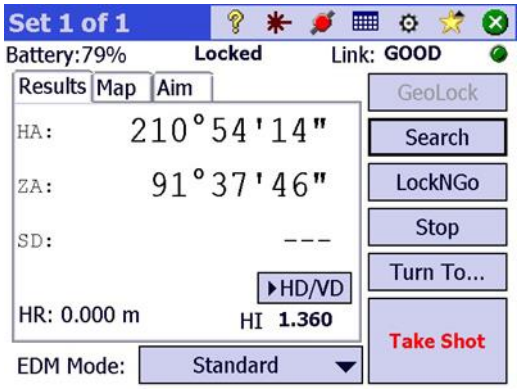
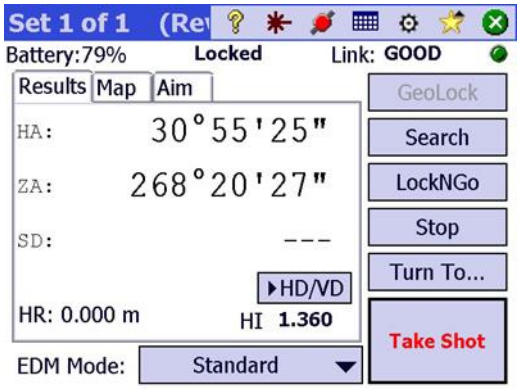
## Step 4: Set Station on Unknown Point (Resection or Freestation)

| | | |
|---|---|---|
| 10. | Survey Pro will report that it is taking a measurement and display the Prism, HR and Prism constant being applied. |  |
| 11. | After the measurement, Survey Pro will prompt the surveyor to turn the instrument if Direct and Reverse was selected for the sequence. If the instrument is robotic, Survey Pro will automatically turn it to the reverse face. The reverse measurement will then be executed.<br>If only Direct was selected for the sequence, Survey Pro will return to the resection screen for selection of the next point.<br>. |  |
| 12. | When the measurements are completed on the first resect point, it is displayed in the analysis box. Select the next point to be used in the resection. |  |

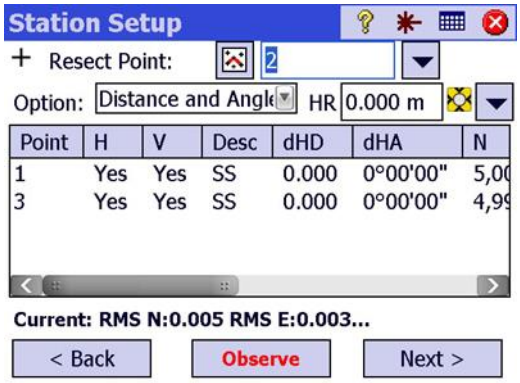
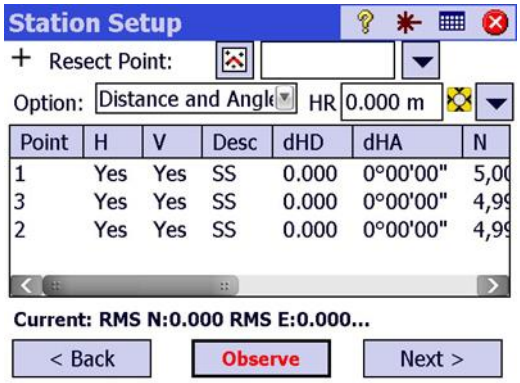
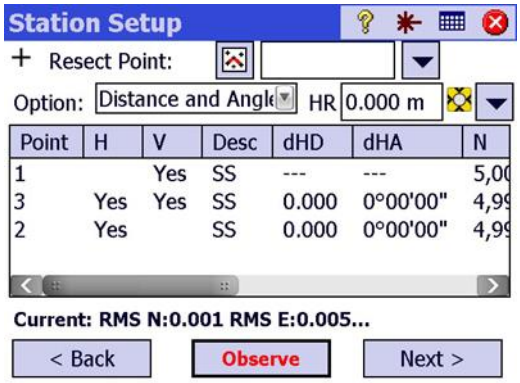
## Step 4: Set Station on Unknown Point (Resection or Freestation)

| | | |
|---|---|---|
| 13. | Select “Choose from list…” |  |
| 14. | Point number 3 will be used next. |  |
| 15. | The instrument is still locked onto the first resect point and must now be aimed towards the second point. |  |

## Step 4: Set Station on Unknown Point (Resection or Freestation)

| | | |
|---|---|---|
| 16. | Clicking on the "Stop" button will stop the instrument from being Locked onto the first resect prism.<br><br>This example assumes that static targets are being used. If a prism/data collector are being used on a rod that is moving between the resection points, Lock on the prism may be retained throughout the entire process. |  |
| 17. | Use the joy-stick feature to get the instrument somewhat aligned to the prism, hit the Search button and the instrument should be able to find and precisely target the second prism as indicated by "Locked" at the top of this page. Tapping on Take Shot will initiate the measurements. |  |
| 18. | The instrument will turn to face two and shoot the point again in the reverse face. (Notice the zenith angle is 180 degrees out of phase.) |  |

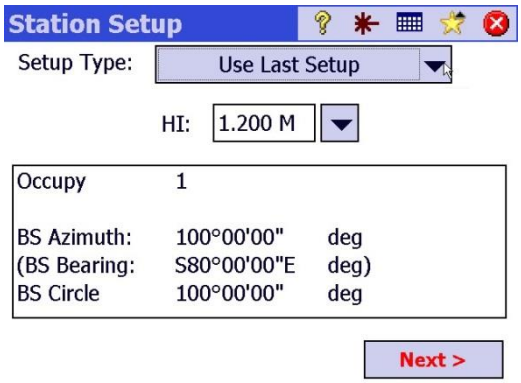
## Step 4: Set Station on Unknown Point (Resection or Freestation)

| | | |
|---|---|---|
| 19. | When the second point has been observed, a choice is provided to add more points to the resection or solving the resection with this minimum of two points.<br>A third point will be added to the resection in the same ways that the first two were added. |  |
| 20. | The resection results are dynamic. As more points are added or deleted, the Root Mean Square (RMS) adjustment values will be displayed. |  |
| 21. | Clicking on the Horizontal Angle and Vertical Angle elements of the points involved in the resection will either enable or disable that element.<br>Tap on Next > to accept the resection. |  |

## Step 4: Set Station on Unknown Point (Resection or Freestation)

| | | |
|---|---|---|
| 22. | A final confirmation screen is presented for final analysis before completing the Station Setup. Notice that Survey Pro has automatically selected a point to be used as a backsight. Another backsight point or azimuth can be chosen at this point by clicking on the "Backsight >" button. |  |
| 23. | Clicking Finish on the Resection confirmation page will launch the Home page and the instrument is setup and ready for use. |  |

## Step 5: Use Last Setup

| | | |
|---|---|---|
| 1. | Use Last Setup is convenient if the instrument has been setup on a point, but work has been interrupted. If nothing has changed since the last Station Setup, this option can be used to facilitate getting back to work. Aim at the backsight, set the backsight, Finish the Station Setup. |  |

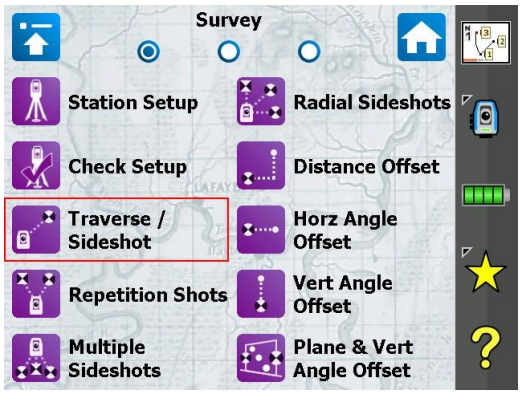
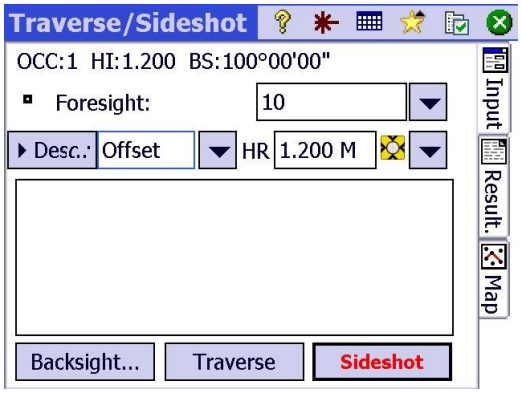
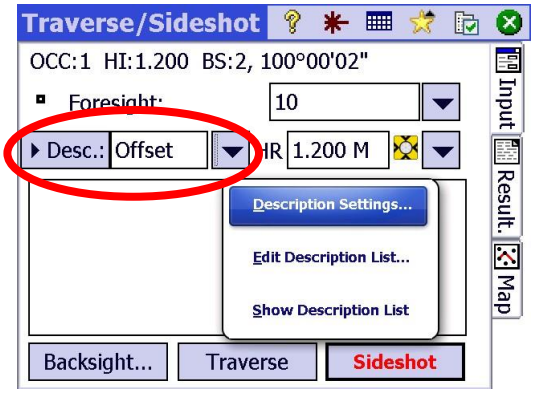
# Data Collection

In this lesson, you will learn how to:

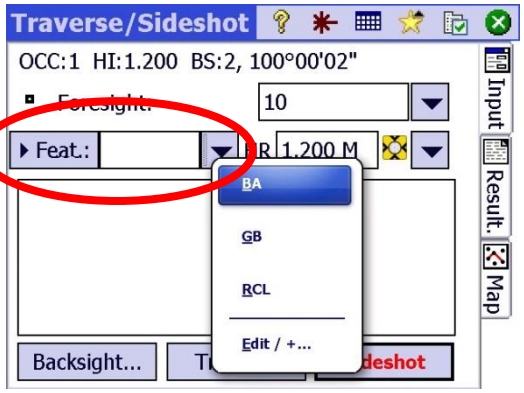
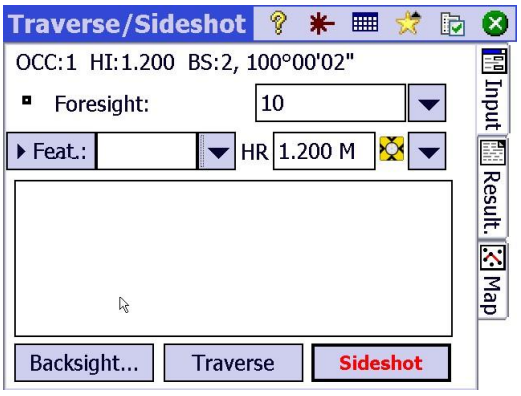
Collect points with features and .descriptions. The lesson will also review the fundamentals of remote controlling the total station, managing the EDM and prism settings and generating linework.


| | | ***Page*** |
|---|---|---|
| Step 1: | Traverse/Sideshot Page Overview | 80 |
| Step 2: | Remote Control | 82 |
| Step 3: | Assigning Feature Codes and Descriptions | 83 |
| Step 4: | Generating Linework | 84 |
| Step 5: | Viewing Results | 85 |

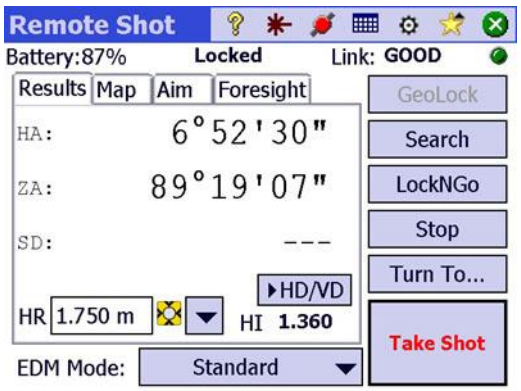
## Step 1: Traverse / Sideshot Page Overview

| | | |
|---|---|---|
| 1. | From the main menu, tap on the Survey Icon and then tap on Traverse/Sideshot |  |
| 2. | OCC = Occupied point.<br>HI = Height of Instrument<br>BS = Backsight (point if being used) and Azimuth.<br>Foresight = Next point to be measured.<br>Traverse = Survey Pro will assume the instrument will be moved ahead to the point just observed and the next backsight will be the currently occupied location. (The instrument does not need to be moved right away).<br>Backsight = Check the backsight orientation.<br>Sideshot = Access the data collection page. |  |
| 3. | The Description of the point can be entered prior to the observation or depending upon the Survey configuration, after the observation. Descriptions can be manually entered or selected from a Description List.<br>The Desc.: power button can be toggled to input Feature Codes. |  |

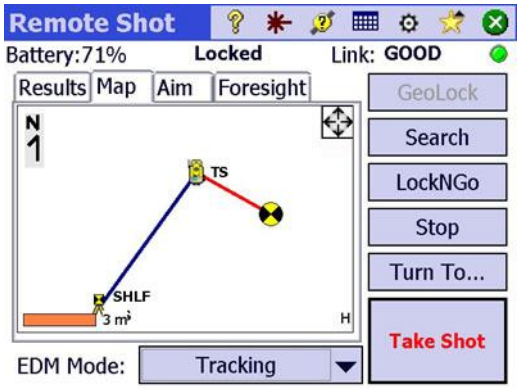
## Step 1: Traverse / Sideshot Page Overview

| | | |
|---|---|---|
| 4. | The foresight's prism HR, (Height of Rod) can be changed at any time. Under the prism drop-down menu, any predefined prism is available for selection. Tapping on "Manage Smart Targets" will open the prism dialogue where additional prism definitions can be created or existing definitions modified. This dialogue is also used to switch the EDM modes between prism and reflectorless. |  |
| 5. | Clicking on the left power button toggles between descriptions and feature codes. Descriptions are text based extensions of the popular PNEHD format. Features are smart codes capable of generating icons and linework. |  |
| 6. | The next point will be named "10" as indicated in the Foresight field. To begin measurements, tap on the "Sideshot" button.<br>Once the remote control screen is entered, as many points as required can be measured. The point names will increment sequentially. If a new point name sequence is required, close the remote control screen which will exit back to the Traverse/Sideshot screen. |  |

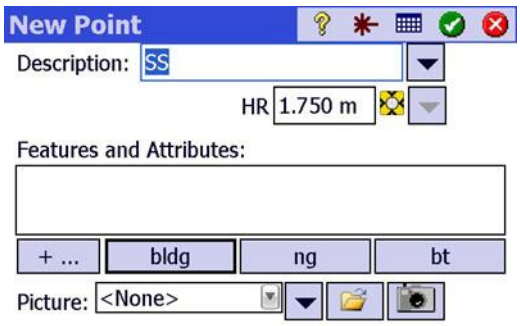
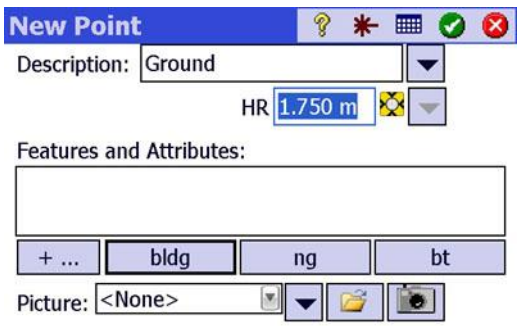
## Step 2: Remote Control

| | | |
|---|---|---|
| 1. | The Remote Control screen can be accessed at any time by pressing the Star key on the Ranger 3 keyboard, using the Quick Pick menu or by navigating to the third page of the Surveying menu.<br>The Remote Control screen is used to control the instrument and collect data. |  |
| 2. | Tapping search in the Remote Control screen will initiate a search to find the prism. |  |
| 3. | Once a prism is found and the instrument has locked onto it and the rod is positioned over the position that needs to be measured, tap on Take Shot and the instrument will initiate the measurements. |  |

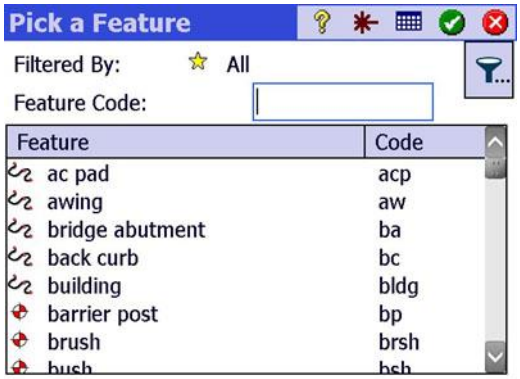
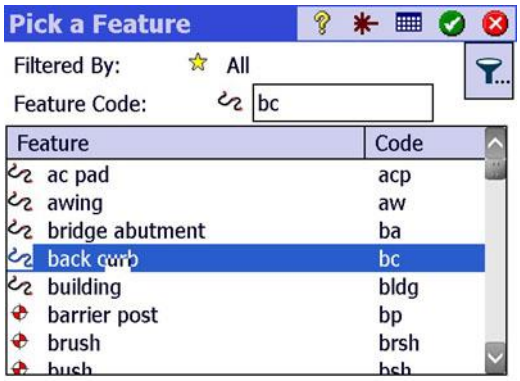
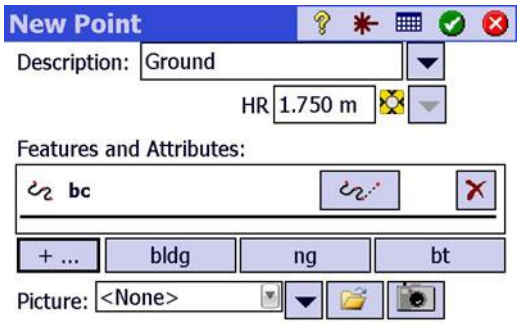
## Step 2: Remote Control

| | | |
|---|---|---|
| 4. | On the Remote Control Map page, the orientation of the instrument against the backsight orientation (blue line) and the current angle to the prism (yellow/black target) can be seen.<br>Notice that the "Tracking EDM" is initiated which indicates the distance meter is continuously triggering measurements to the prism. |  |

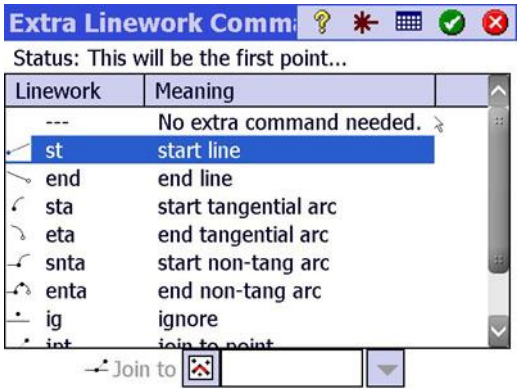
## Step 3: Assigning Feature Codes and Descriptions

| | | |
|---|---|---|
| 1. | Survey Pro Job Settings can be configured to prompt for Description and/or Features and Attributes after each measurement. The Description can be manually entered, selected from the Description list, the field can be cleared or it can be ignored. Descriptions are simply a textual extension of the traditional PNEHD format (Point, Northing, Easting, Height, Description). |  |
| 2. | "GlobalFeatures.fxl" has been attached to the job. This file is a default file of features and attributes that is included with every Survey Pro installation. Linework can be generated using the "Features and Attributes" function of Survey Pro.<br>Clicking on the "+…" will open up the Feature list. |  |

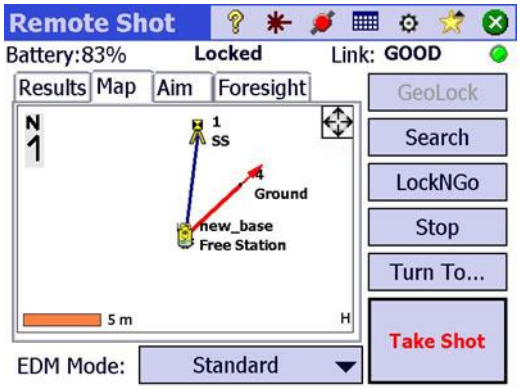
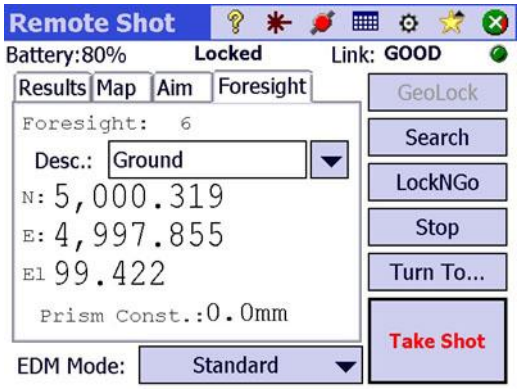
## Step 4: Generating Linework

| | | |
|---|---|---|
| 1. | Features are divided between point and line. Features can be assigned to various layers so that large lists can be filtered. Survey Pro allows layer filters to be applied and signifies the type of feature by either a wavy line or a survey target for point features. These features are part of the GlobalFeatures.fxl file which can be customized in the office using the Feature Definition Manager which is automatically installed with Spectra Precision Survey Office software. |  |
| 2. | Selecting “bc” for “back of curb” will assign this feature to the last point observation. |  |
| 3. | Clicking on the wavy lined icon inside of the Features and Attributes box will allow the user to apply special conditions to the line code that has been assigned. |  |

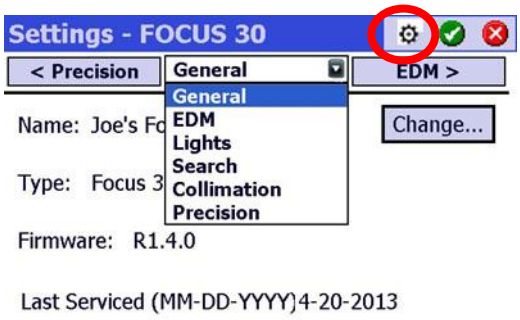
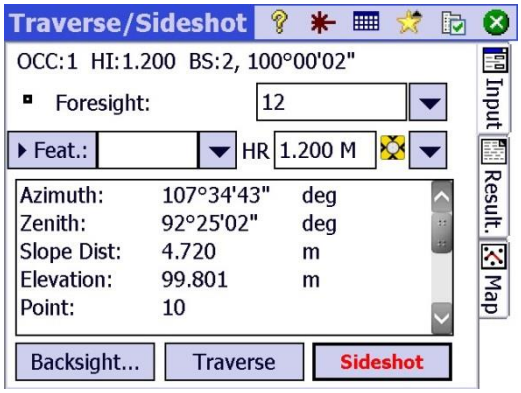
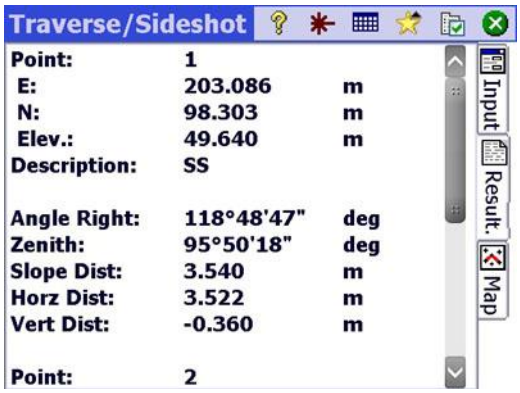
## Step 4: Generating Linework

| | | |
|---|---|---|
| 4. | The “st” or “start line” command is used to instruct Survey Pro to begin the line coded “bc” with this observation.<br>As it can be seen, several other special line commands are also supported. |  |

## Step 5: Viewing Results

| | | |
|---|---|---|
| 1. | After a measurement has been executed, a visual reference of the instrument’s orientation to the point that was just measured can be seen on the Remote Shot Map page. |  |
| 2. | The Foresight page in the Remote Shot routine will display the last measured coordinates for about 15 seconds after the measurement’s conclusion. |  |

## Step 5: Viewing Results

| | | |
|---|---|---|
| 3. | Clicking on the gear/cog icon in the upper task bar will open up the instrument settings directly. This can be quite convenient to quickly turn on the guide lights or to change the Search parameters. |  |
| 4. | The main Traverse/Sideshot page provides information about the last measurement that was stored. |  |
| 5. | The Results tab provides a nice snapshot of the recent measurements. |  |

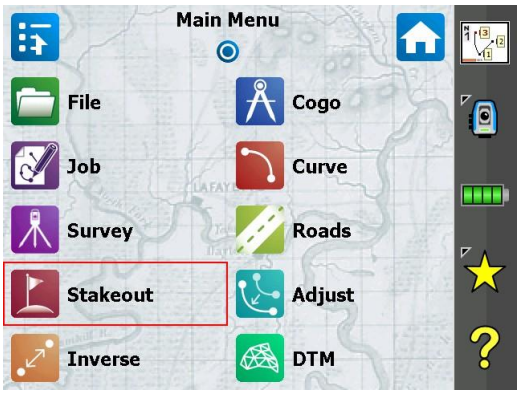
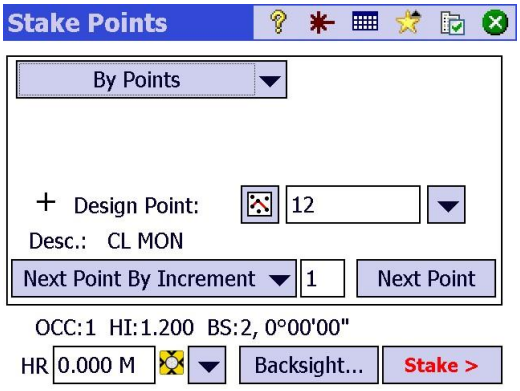
# Stakeout

In this lesson, you will learn how to:

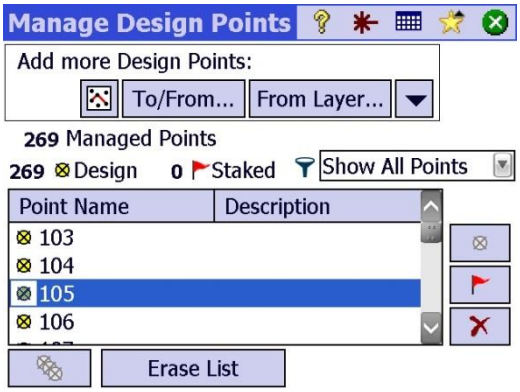
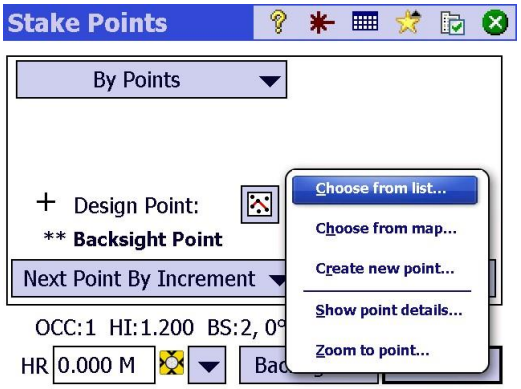
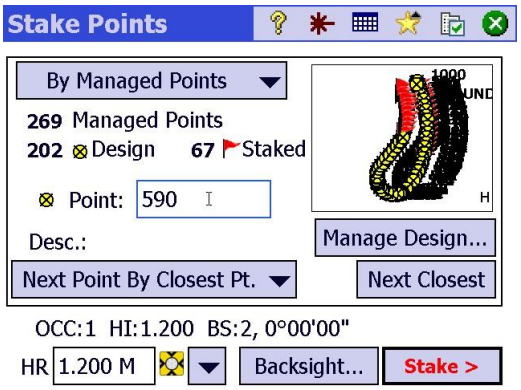
Stakeout points and lines. This lesson will also review various stakeout configuration options including stations and offsets and automatic advancements for cross-section staking.


| | | ***Page*** |
|---|---|---|
| Step 1: | Stakeout Page Overview | 88 |
| Step 2: | Staking Options | 90 |
| Step 3: | Stake Points | 91 |
| Step 4: | Stake Lines | 94 |
| Step 5: | Stake Offset Lines | 97 |

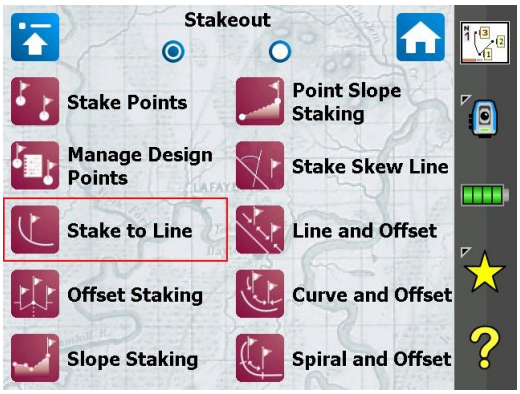
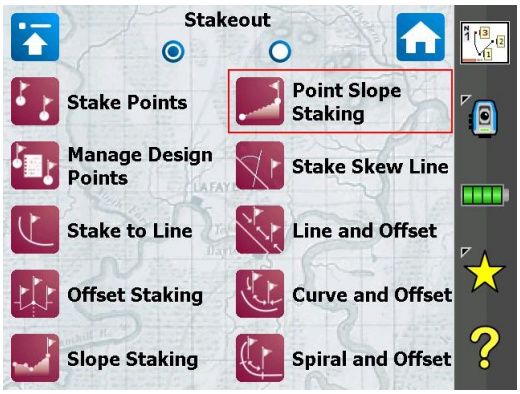
## Step 1: Stakeout Page Overview

| | | |
|---|---|---|
| 1. | The Stakeout Menus are accessed from the Main Menu. |  |
| 2. | Survey Pro supports the most popular stakeout routines.<br>The Manage Design Points screen is used to select a set of job points to be staked out, and then to manage the collection as design points are staked and as staked points are stored. |  |
| 3. | The Stake Points page provides a dialogue for selecting the point to be staked, HR, prism type and point numbering increments as well as a check backsight routine. |  |

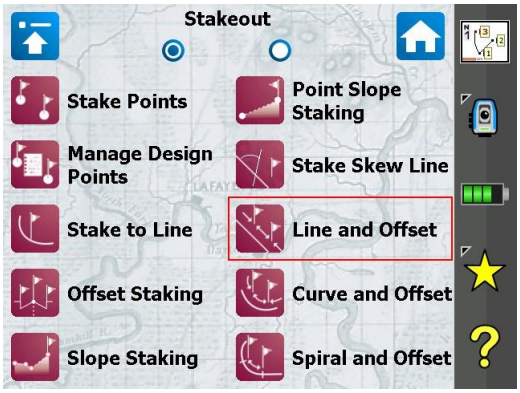
## Step 1: Stakeout Page Overview

| | | |
|---|---|---|
| 4. | A set of "Managed Points" can be defined and selected which allows Survey Pro to flag those points in the list that are from the design, those points that have been staked, and the points that have not been staked.<br>Show Design Points Only or show Staked Points Only filters can be applied.<br>Points can be manually flagged as Staked or deleted from the list. |  |
| 5. | Any point in the job to be staked can be manually keyed in, chosen from the Map View or selected from the point list. |  |
| 6. | Staking By Managed Points provides a visual and textual method for determining the amount of work that has been completed or remains to be accomplished.<br>Survey Pro can also increment the staking by selecting the Next Closest point in the list of points being staked. |  |

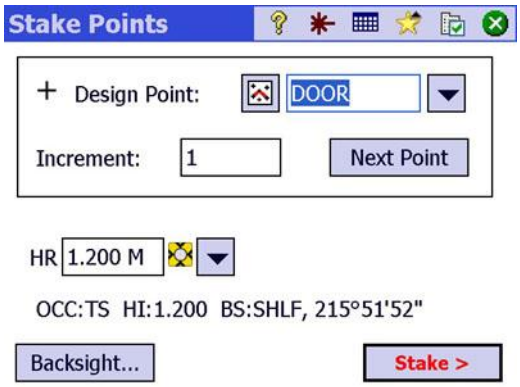
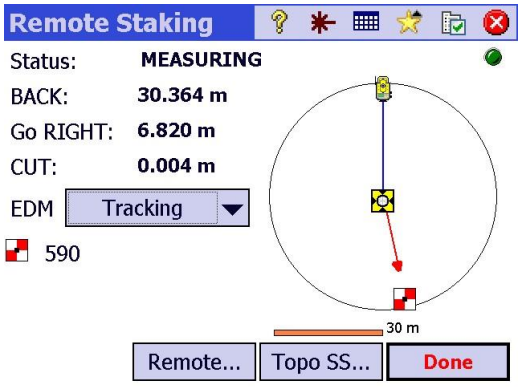
## Step 2: Staking Options

| | | |
|---|---|---|
| 1. | In addition to point staking, Survey Pro supports several line staking routines.<br>Stake to Line allows a line to be defined in several different ways and then station information is provided dynamically.<br>Centerline offsets and Slope Staking from centerlines is also supported. |  |
| 2. | Point Slope Staking is a simplified Slope Staking routine allowing the determination of the location of a catch point from a known hinge point and a specified horizontal direction from that hinge point (whereas the Slope Staking routine requires a centerline alignment with vertical and horizontal offsets at specified stations). |  |
| 3. | Stake Skew Line is used to select or define any alignment and then define a skew angle from this line for staking purposes.<br>A graphical interface is provided to visualize the skewed angle as it relates to the reference line. |  |

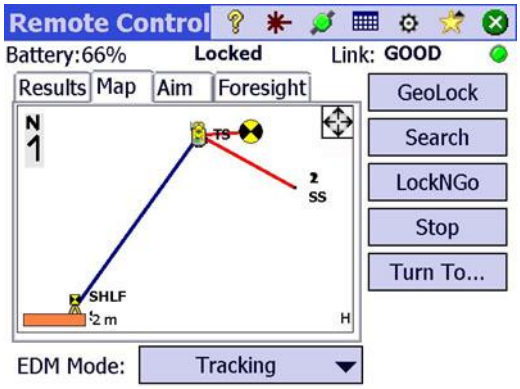
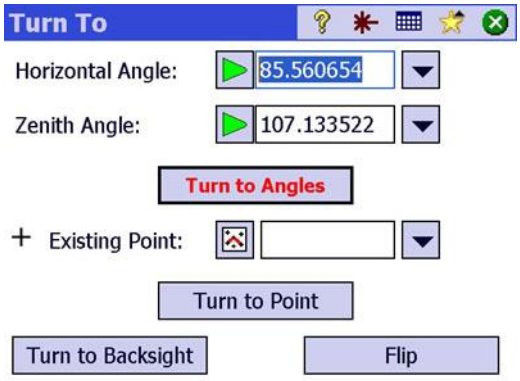
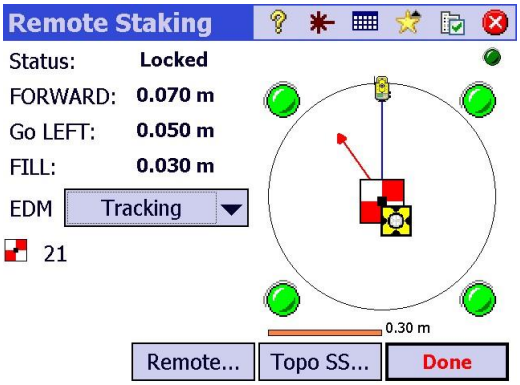
## Step 2: Staking Options

| | | |
|---|---|---|
| 4. | Offsets can be staked from lines, curves, spirals and polylines. |  |

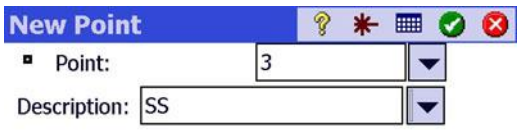
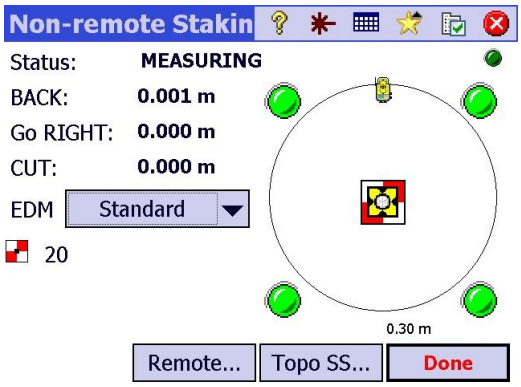
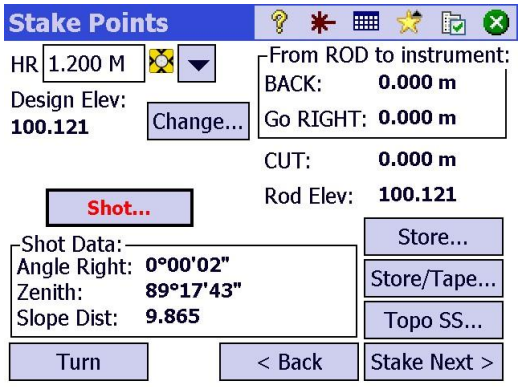
## Step 3: Stake Points

| | | |
|---|---|---|
| 1. | Select the design point in the Stake Points screen. The point to be staked can be manually defined, selected from the Map view or chosen from the point list.<br>The HR and prism type can be defined and the Backsight can be checked for any drift. When ready, select "Stake" to move to the Staking screen. |  |
| 2. | Once the instrument has locked onto the prism, the Tracking EDM will provide dynamic Forward/Backward, Right/Left, Cut/Fill values to the design point location.<br>By default, robotic staking directions are given from the perspective of the rod. This can be optionally changed in the survey settings. The prism/rodman is the yellow/black target. The stake point is the red/white target. |  |

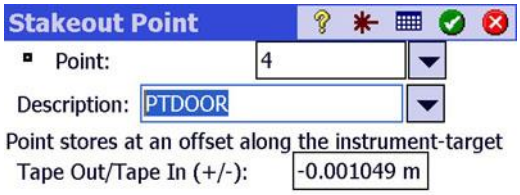
## Step 3: Stake Points

| | | |
|---|---|---|
| 3. | If the "Remote" button is clicked, it launches the Remote Control page. Clicking on the Map tab will also provide a visual reference of the rodman's location in relation to the stake point. |  |
| 4. | The Remote Control page also offers the capability to turn the instrument to any angle or point in the job. It can reverse the instrument (Flip) or to turn to the backsight.<br>Turn to Point is very helpful especially if the orientation of the instrument is unknown . Stand near a known point in the job. Instruct Survey Pro to "Turn to Point" and the instrument's targeting camera should be able to find the prism and lock onto it. |  |
| 5. | As the prism approaches the stake point, the display will refine as seen. As long as the EDM is in a Tracking mode, dynamic positioning information will be displayed.<br>The objective is to place the yellow/black target directly on top of the red/white target. |  |

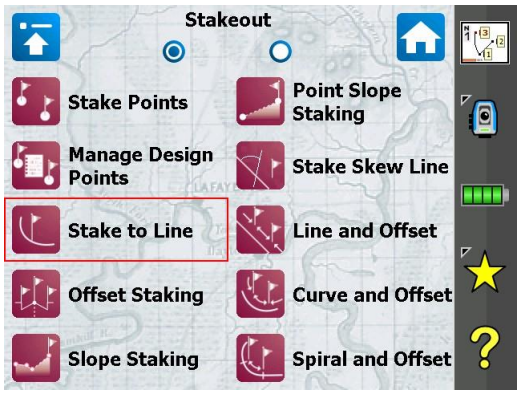
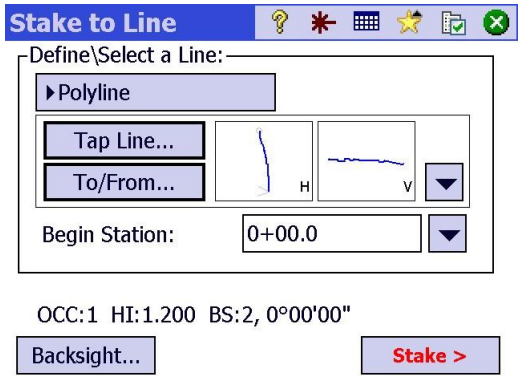
## Step 3: Stake Points

| | | |
|---|---|---|
| 6. | At any time during the Stakeout, the "Topo SS…" button can be tapped to store a point observation using the parameters defined under the Surveying settings.<br>This can be convenient when performing a stakeout mission and then encountering unexpected or uncollected features that need to be recorded. |  |
| 7. | For the most precise measurements, place the EDM into the Standard mode to make the final observations. |  |
| 8. | After the "Done" button is clicked, a results page will be displayed showing the final observation calculations. If there is a vertical offset that needs to be applied, this can be accomplished by clicking on the "Change…" icon.<br><br>Shot = Revert to previous page<br>Turn = Turns the instrument to current design point.<br>Store = Stores point and cut sheet data with currently displayed values. |  <br><br>Topo SS = Collect a sideshot.<br>Stake Next = Stake the next point (by increment or closest).<br>Back = Revert to Stake Point selection page. |

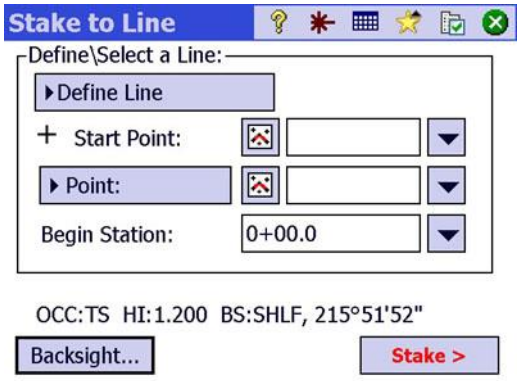
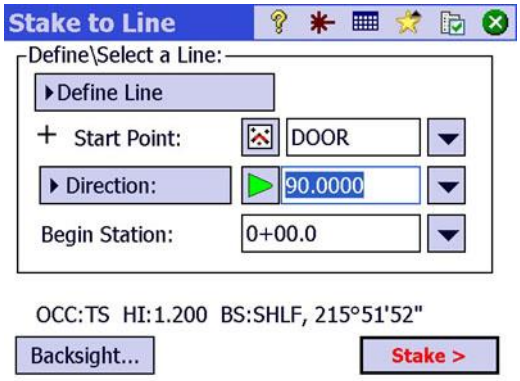
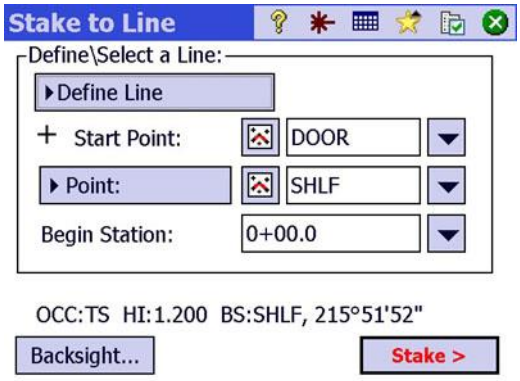
## Step 3: Stake Points

| | | |
|---|---|---|
| 9. | The "Store/Tape" option allows a line to be extended past the prism. This distance can be added/subtracted by a distance measured using another method such as a tape measure. |  |

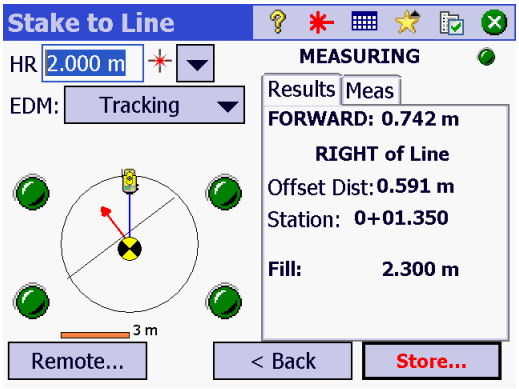
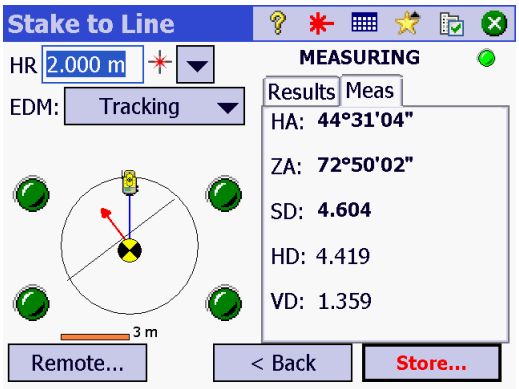
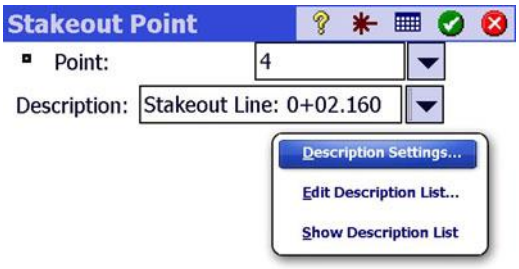
## Step 4: Stake Lines

| | | |
|---|---|---|
| 1. | Stake to Line provides positioning information along any line. The position is expressed in terms of stationing along the line and offsets left or right of the line. Cut/Fill values are also provided. |  |
| 2. | A line must be defined. This can be an existing polyline that is in the currently open job or as part of the basemap attached to the job. Stationing can be in the form 0+00 or 0+000 as defined in the Job Settings/Format page. |  |

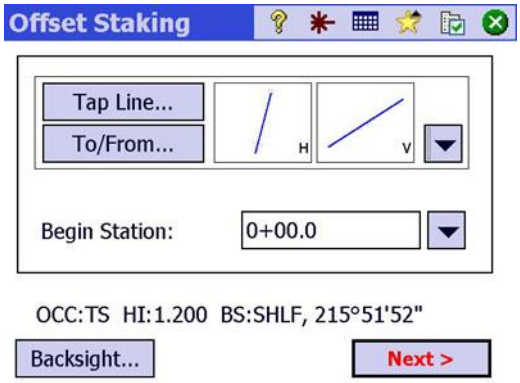
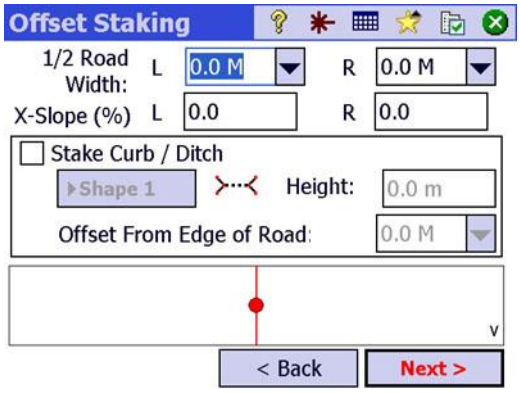
## Step 4: Stake Lines

| | | |
|---|---|---|
| 3. | In this example, the line is being defined by a point of beginning oriented against a second point. |  |
| 4. | In this example, the line is being defined by a point of beginning and a direction.<br>Survey Pro can calculate the direction: If the orientation of the line needs to be the same as the inverse direction between points 10 and 12, "10-12" can be entered into the "Direction" field and this azimuth will be calculated and then inserted. If there was a previous calculation in the job that contains the desired azimuth, this value can be accessed under the "Past Results" in the drop-down menu for the Direction field. |  |
| 5. | In this example, the line has been defined as the azimuth between points "DOOR" and "SHLF" |  |

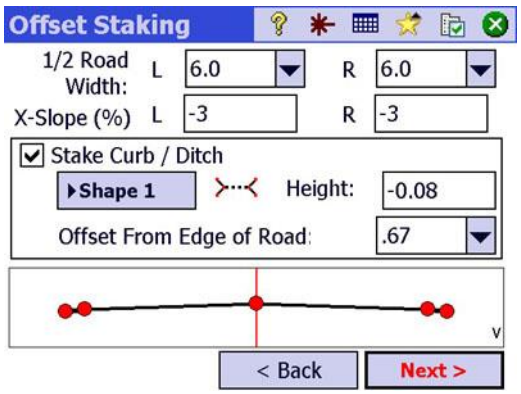
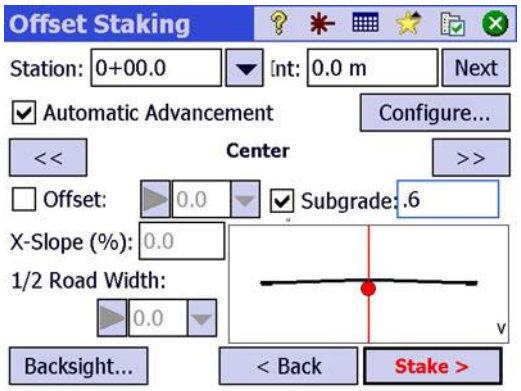
## Step 4: Stake Lines

| | | |
|---|---|---|
| 6. | Tapping on "Stake" will bring up a dynamic page (with Tracking EDM selected) providing directions to the design location. The Results tab shows the prism's position in relation to the stake location. |  |
| 7. | The "Meas" tab provides horizontal and vertical angles at the instrument as well as SD, or Slope Distance the has also been reduced to HD (Horizontal Distance) and VD (Vertical Difference).<br>"Back" will go back one page so that another line can be selected.<br>"Store.." will store the current observation. |  |
| 8. | A description will be assigned to the point record based on its stationing. This can be changed before the point is stored on this page. |  |

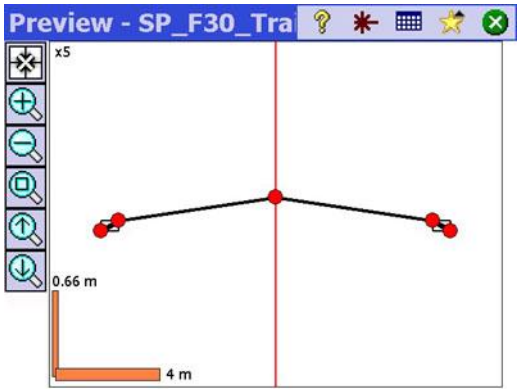
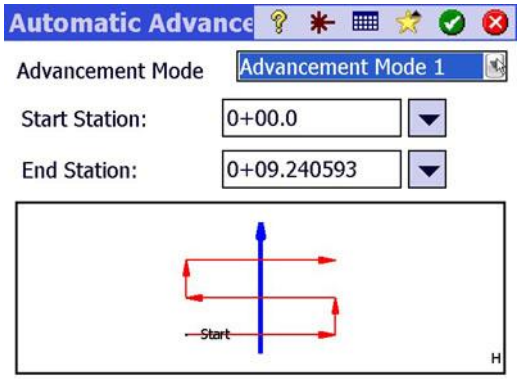
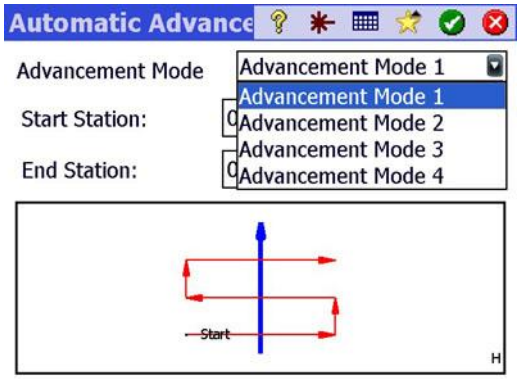
## Step 5: Stake Offset Lines

| | | |
|---|---|---|
| 1. | The Offset Staking routine is a convenient tool for staking cross sections such as simple roads and other corridors. |  |
| 2. | A line must be selected for the offset line staking. Horizontal and Vertical alignments of the selected line are displayed.<br>A "Begin Station" location can be defined. |  |
| 3. | The Line Offset routine provides an interface to define simple cross-sections. A centerline with offsets left and right along with cross-slope percentages are supported. Additionally, curb or ditch features can also be defined. |  |

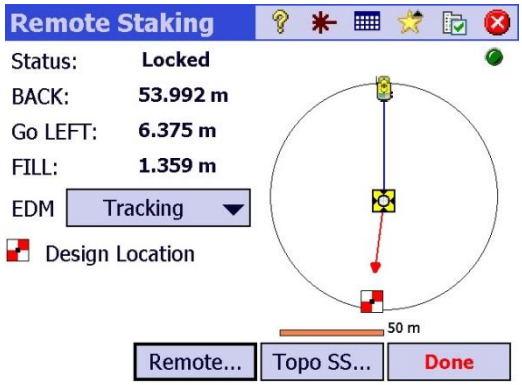
## Step 5: Stake Offset Lines

| | | |
|---|---|---|
| 4. | In this example, the road is defined as being 6 meters wide on each side with a negative 3% cross-slope.<br>On the side of the road, a curb (element in the up direction) or a ditch (element in the down direction) can be defined by an offset from the edge of the road and a distance up or down. This example has a ditch that is 8 centimeters down and has a total offset from the edge of the road of 67 centimeters. There are four different standard shapes that can be used for the curb/ditch feature. A visual representation of the cross-section is provided. |  |
| 5. | Tapping Next advances to a page where the station information and any sub-grade details can be entered.<br>The red dot in the graphic indicates the next position to be staked along the alignment. This can be changed right or left by clicking on the double arrows in either direction.<br>In this case, the check box for Automatic Advancement has been checked. This feature will automatically advance the station and the segment based on the configuration applied. |  |

## Step 5: Stake Offset Lines

| | | |
|---|---|---|
| 6. | Tapping on the graphic of the alignment will bring up a larger image allowing for a closer inspection of the elements of the cross-section. |  |
| 7. | In this example, Advancement Mode 1 is being used allowing the stakeout to be conducted in a serpentine fashion. Survey Pro will drive the positions in the order shown by the arrows and red line. |  |
| 8. | Survey Pro supports four different automatic advancement routines which can greatly improve efficiencies for cross-sectional stakeouts. |  |

## Step 5: Stake Offset Lines

| | | |
|---|---|---|
| 9. | The Stake button advances to the same stakeout screen as for point staking except that now the directions are based on the stationing and offsets.<br>The goal is to place the yellow/black target on top of the red/white target.<br>When the location has been staked, clicking on the Done button will return to the Store/Stake page where the data can be stored and the next station and offset can be selected. |  |

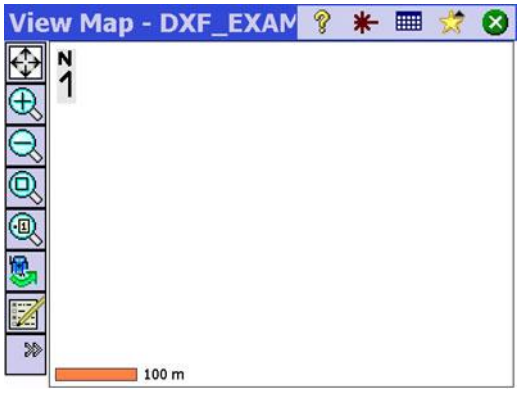
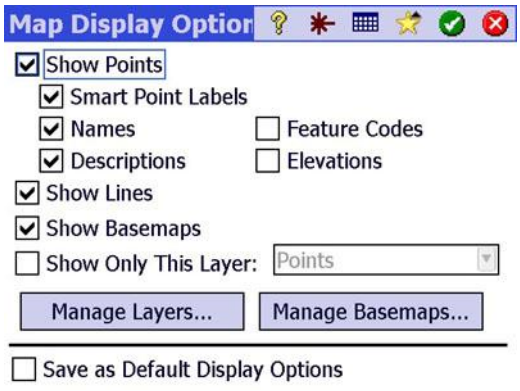
# Map View

In this lesson, you will learn how to:

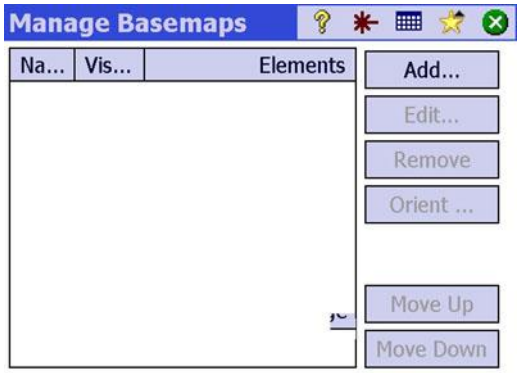
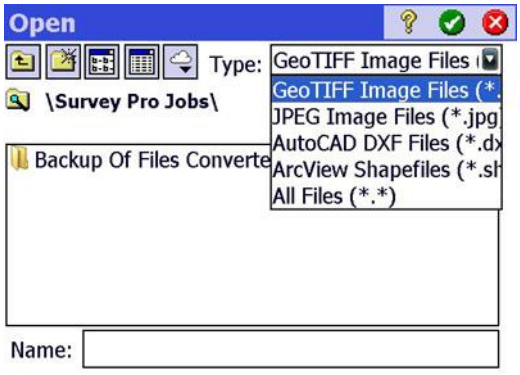
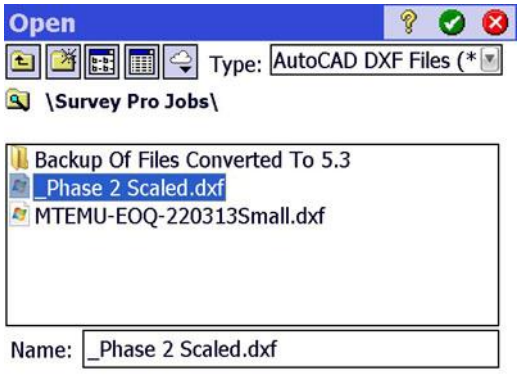
Work directly from the Map page. This lesson will provide instructions for attaching basemaps, performing COGO calculations, managing layers and surveying directly from the Map View page. Data collection with line features attached to the point observations are used to illustrate the possibility of generating linework in the field.


| | | ***Page*** |
|---|---|---|
| Step 1: | Manage the Map View | 102 |
| Step 2: | Insert a Basemap | 103 |
| Step 3: | Manage Layers | 105 |
| Step 4: | Map Page Options | 106 |
| Step 5: | Snap-To Options | 109 |
| Step 6: | Data Collection in the active Map | 110 |
| Step 7: | Create Points | 114 |
| Step 8: | COGO | 116 |
| Step 9: | Stakeout | 117 |
| Step 10: | Miscellaneous Map View Features | 118 |

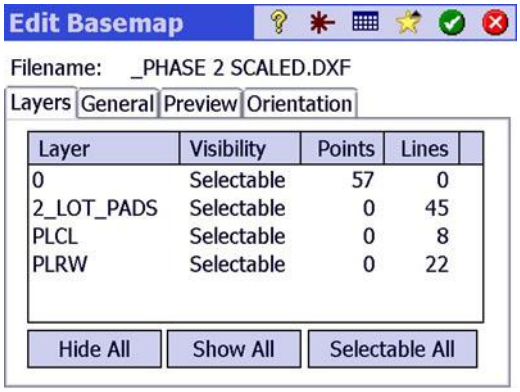
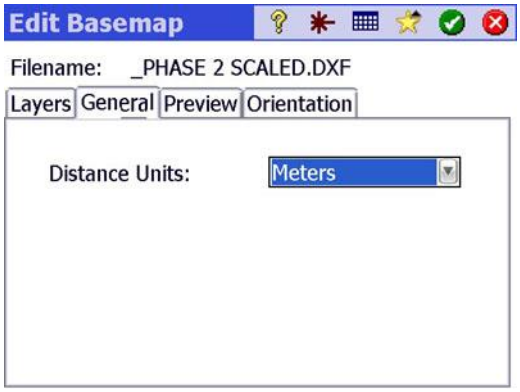
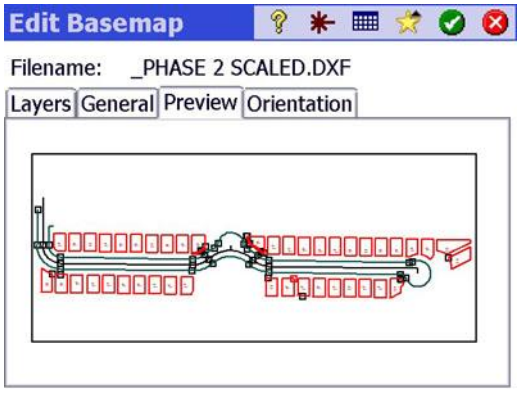
## Step 1: Manage the Map View

| | | |
|---|---|---|
| 1. | The Map View is opened by clicking on the Map icon in the far upper right hand side of the main menu pages. |  |
| 2. | Depending upon the contents of the currently opened job, the Map View will display all visible layers. By default, all layers are visible.<br>The map buttons shown here in order from top to bottom:<br>Zoom All<br>Zoom Out<br>Zoom In<br>Zoom Window<br>Zoom to Point<br>Tap to Turn (robotic only)<br>Map Display Options<br>Flight-Out menu for Snap To actions |  |
| 3. | Clicking on the bottom icon in the Map View will bring up the Map Display options. Various elements of the job can be displayed or hidden.<br>Smart Point Labels is an intelligent approach to displaying more recent elements of the job instead of older elements to reduce screen clutter. |  |

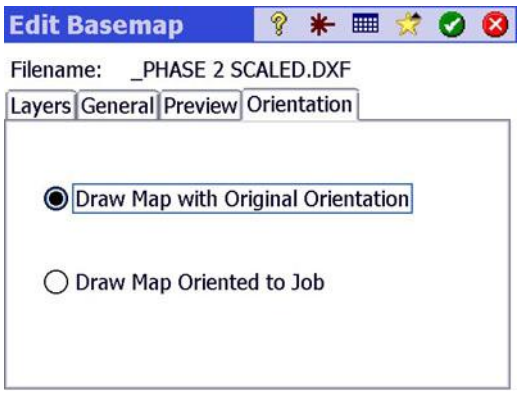
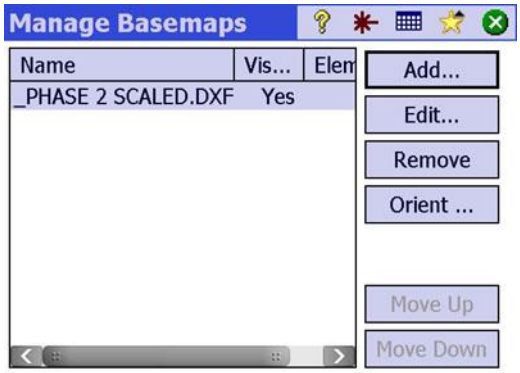
## Step 2: Insert a Basemap

| | | |
|---|---|---|
| 1. | Clicking on the Manage Basemaps icon opens up the Basemap management dialogue. Tap on the Add button. |  |
| 2. | Four different file formats are currently supported. By definition, GeoTIFF files are already rectified to a coordinate system. The same is true for SHP files that have an associated PRJ file. DXF files have an assumed northing/easting datum. In order to use JPF files, an associated JPG World file must be in the same directory. |  |
| 3. | For this example, a DXF file will be attached to the job. |  |

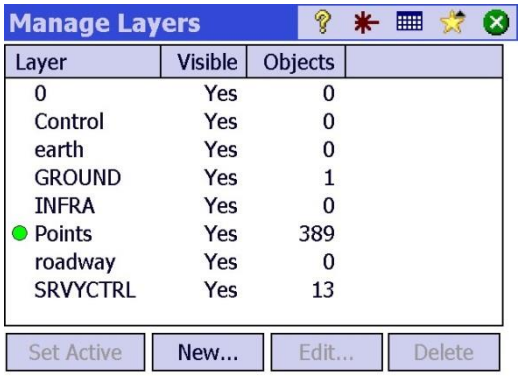
## Step 2: Insert a Basemap

| | | |
|---|---|---|
| 4. | Survey Pro identifies the contents of the different layers and provides a summary. In the "Visibility" column, tap on any row to toggle each item as "Selectable" "Visible" or "Hidden"<br>Selectable: Element can be used within the context of the job for COGO, data collection and stakeout.<br>Visible: Element will be visible on the map screen but not selectable.<br>Hidden: Element will not be visible on the map screen. |  |
| 5. | The units of the basemap must be defined. |  |
| 6. | A preview of the file that is to be attached to the job is provided. |  |

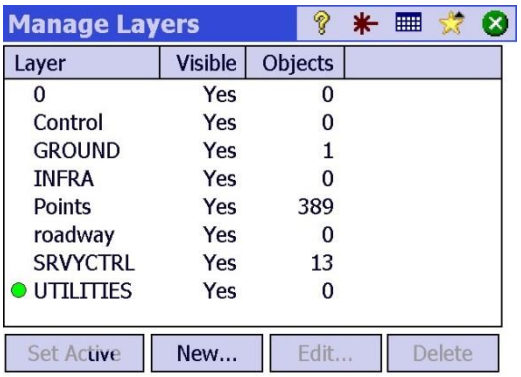
## Step 2: Insert a Basemap

| | | |
|---|---|---|
| 7. | The DXF file will generally be imported with its original orientation. Once attached to the job, the basemap can then be reoriented if necessary. There is the option to toggle the view between the basemap with its original orientation or the job's calibrated orientation. |  |
| 8. | Additional basemaps can be added. Basemaps that have been attached to the job can be oriented by selecting two points from the job and calibrating them against two points in the basemap file. |  |

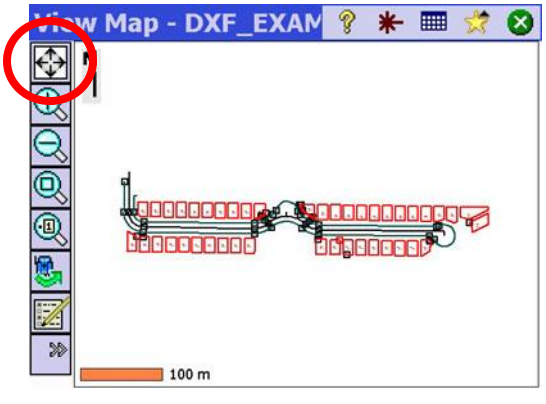
## Step 3: Manage Layers

| | | |
|---|---|---|
| 1. | Each Layer in the current job is listed in the Manage Layers dialogue. One layer is active at any time as indicated by the green dot next to Points. All points that are collected will be placed on the active layer by default. The Prompt for Layer option or Feature Code Definition can be used to define a layer for each stored point. |  |

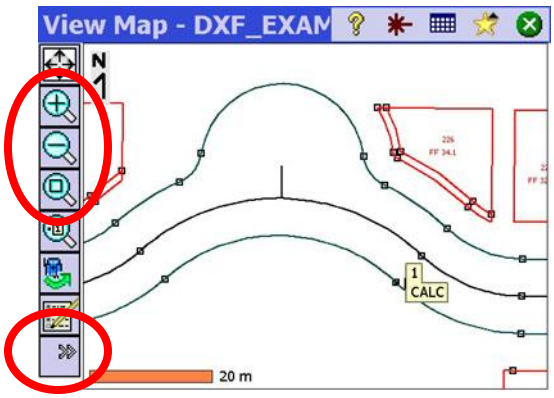
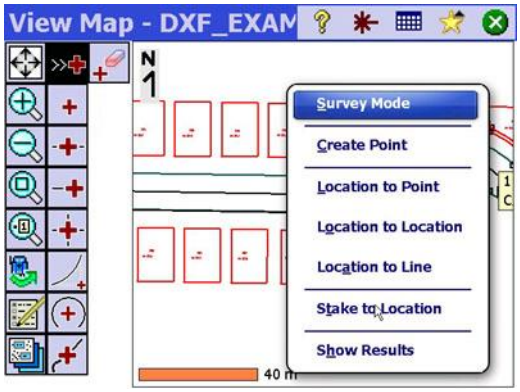
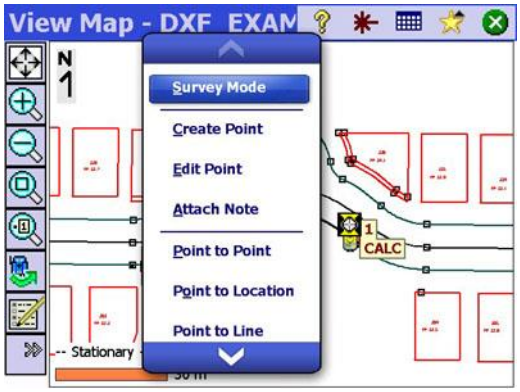
## Step 3: Manage Layers

| | | |
|---|---|---|
| 2. | New Layers can be created on the fly. |  |
| 3. | The number of elements on each layer is displayed. A Layer that is highlighted can be selected to be the Active Layer. |  |

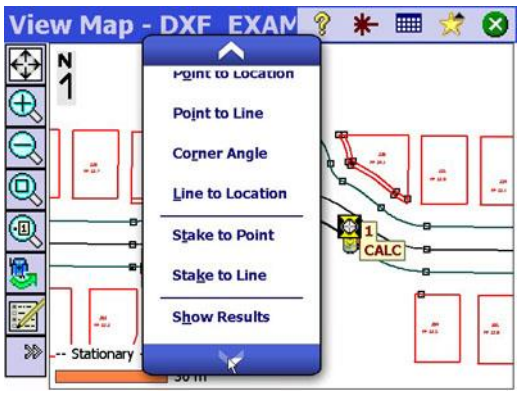
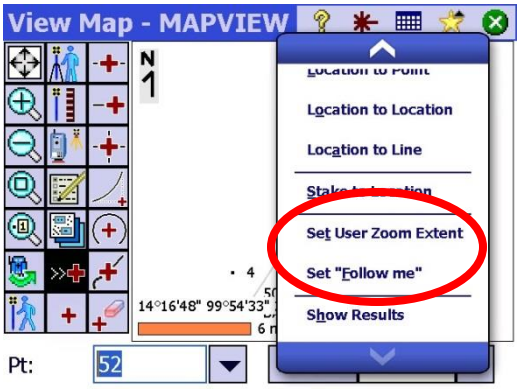
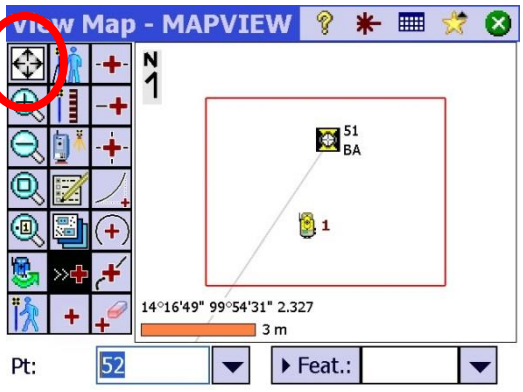
## Step 4: Map Page Options

| | | |
|---|---|---|
| 1. | The Zoom Extents button will zoom to include all elements of the currently opened job. |  |

## Step 4: Map Page Options

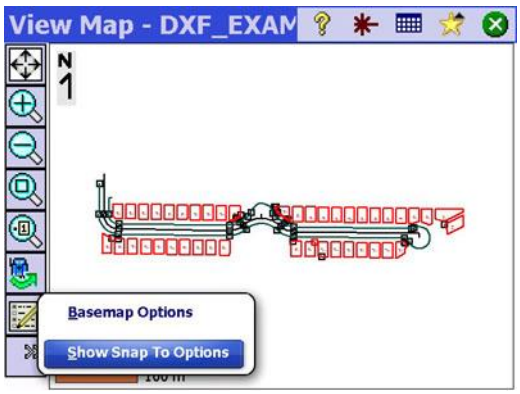
| | | |
|---|---|---|
| 2. | The Zoom In, Zoom Out or Zoom Window buttons can be used to focus on any area.<br>Tap on the double arrows to Show Snap To Options |  |
| 3. | Tap and hold anywhere in the white (blank) areas of the Map View to bring up a menu of additional choices. |  |
| 4. | Tap and hold on top of any specific element in the Map View will bring up a slightly different menu of options. |  |

## Step 4: Map Page Options

| | | |
|---|---|---|
| 5. | Tap and hold on an element in the Map View provides several useful COGO routines. |  |
| 6. | When in the Surveying mode, the Map screen can be configured to keep the prism (or GNSS antenna) centered on the screen using the Set "Follow Me" mode available by an extended click on the Map Page. |  |
| 7. | Set User Zoom Extent will allow the Map Screen to be zoomed to a certain level with a single click on the zoom extents icon. |  |

## Step 5: Snap-To Options

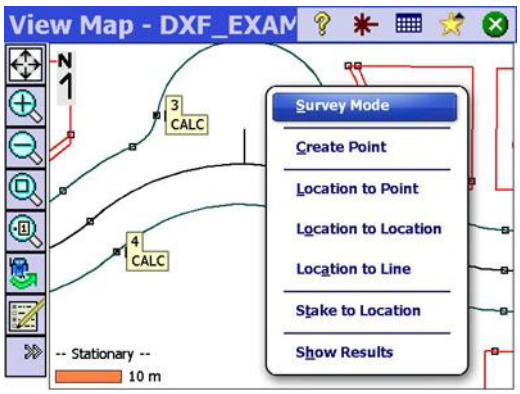
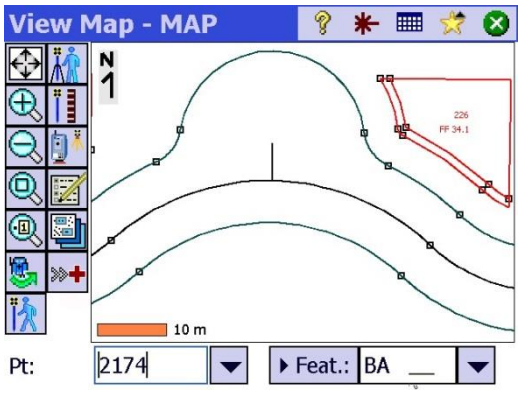
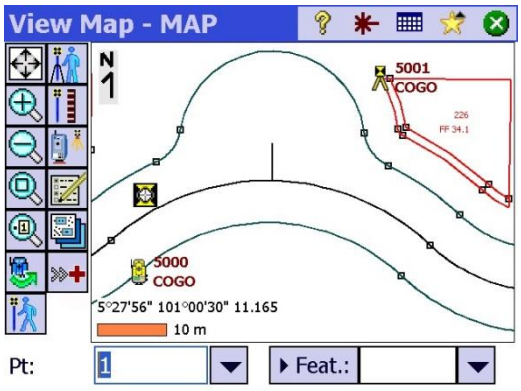
1. Tapping on the double-arrows at the bottom of the toolbar will display the “Snap-To” functions of Survey Pro.



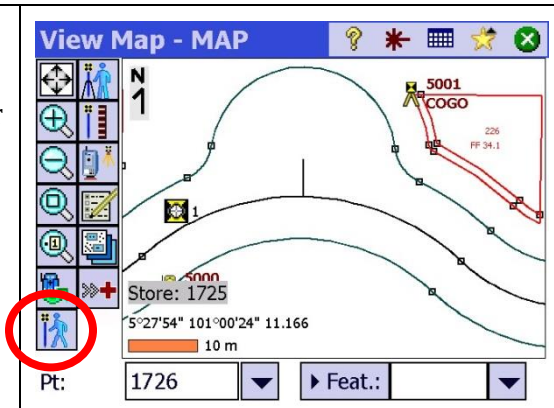
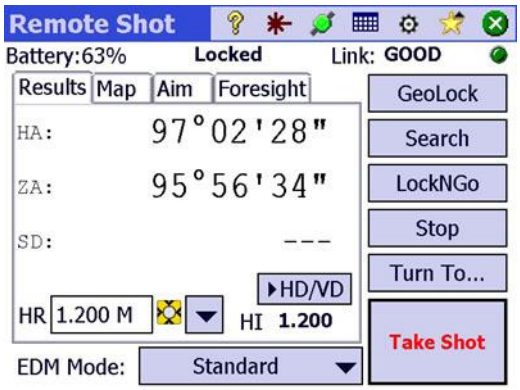
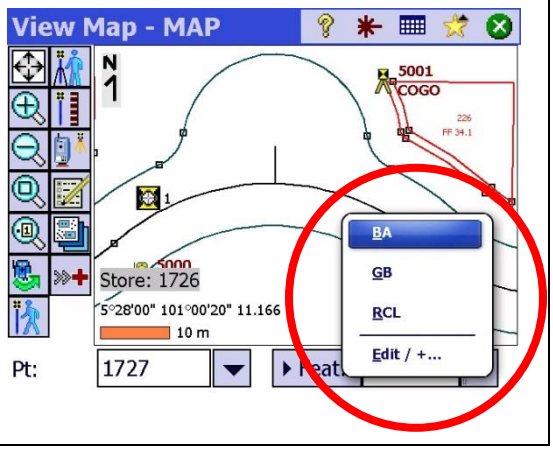

2.

| 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. |

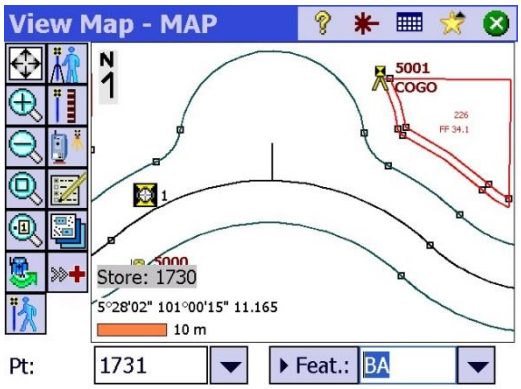
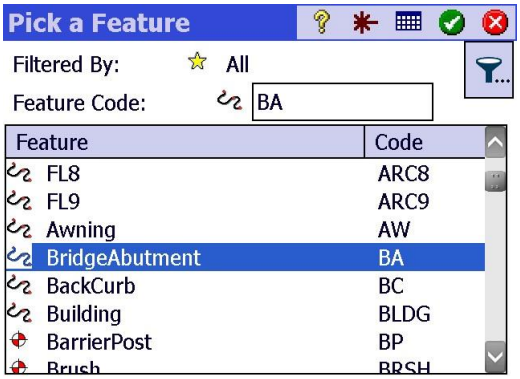
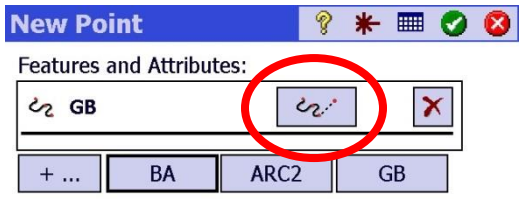
## Step 6: Data Collection in the active Map

| | | |
|---|---|---|
| 1. | The "Survey Mode" can be entered (or exited) by a tap and hold any place inside the Map View and selecting it from the menu choices. |  |
| 2. | The toolbar on the left hand side of the display has changed and there are now surveying appropriate icons. Note that the Features and Attributes toolbar at the bottom is enabled which allows point coding for line generation and other classifications. This field can be toggled for text descriptors. |  |
| 3. | An icon indicating the location of the total station, the prism and the backsight is shown. The blinking red dot in the center of the prism icon indicates that the instrument has tracking lock on the prism. |  |

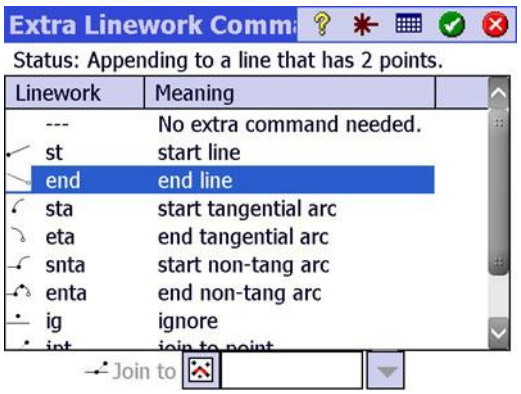
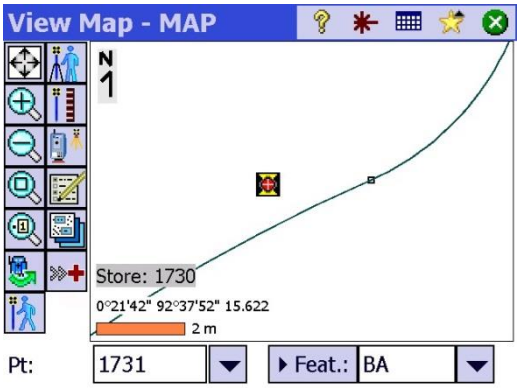
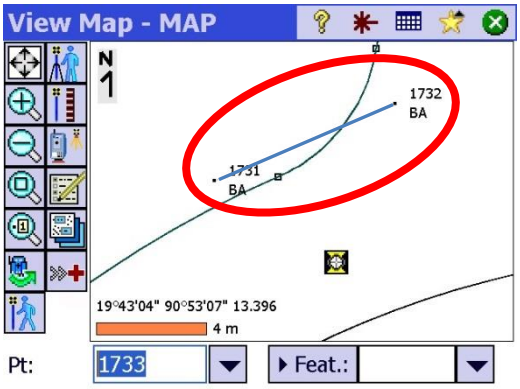
## Step 6: Data Collection in the active Map

| | | |
|---|---|---|
| 4. | Tapping on the icon of a rodman with prism pole will execute a sideshot observation. Hitting Enter on the data collector will accomplish the same thing. The point will be stored and the point number will increment. |  |
| 5. | Tapping on the icon showing a rodman with a bipod on the prism pole will launch the Remote Control page. Full control of the instrument is provided. When the measurement is complete and the point stored, the program will return to the main map screen. |  |
| 6. | Clicking on power arrow next to the Feat.. field will allow quick entry of the last three feature codes and access to the complete feature code definition list including line commands (start, end, arcs, etc.). |  |

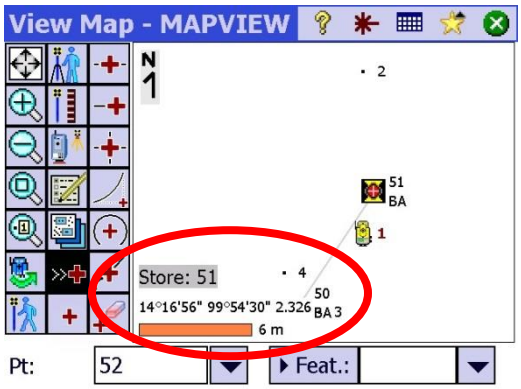
## Step 6: Data Collection in the active Map

| | | |
|---|---|---|
| 7. | Features and Attributes can be processed directly with Spectra Precision Survey Office or be included in a variety of exportable formats.<br>Prior to a measurement being performed, tap on one of the last used feature codes buttons (FH, bc, or fl in the example) or tap the "+…" icon to bring up the list of available features. |  |
| 8. | In this example, the code BA is chosen which represents a line feature described as a BridgeAbutment.<br>This list can be filtered to display a single group or all groups by clicking on the configuration icon near the upper right-hand side of the display. |  |
| 9. | Additional line code commands can be applied to the line feature being recorded. Once a point has been assigned the feature, clicking on the wavy line in the Features and Attributes page will access these additional commands. |  |

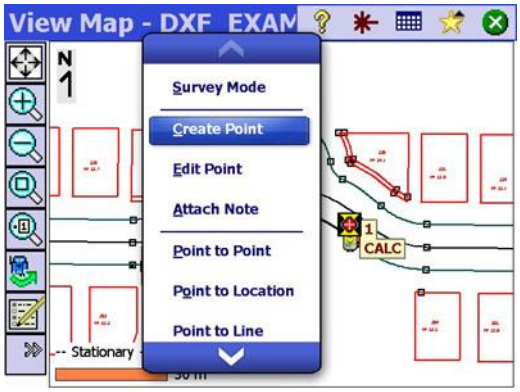
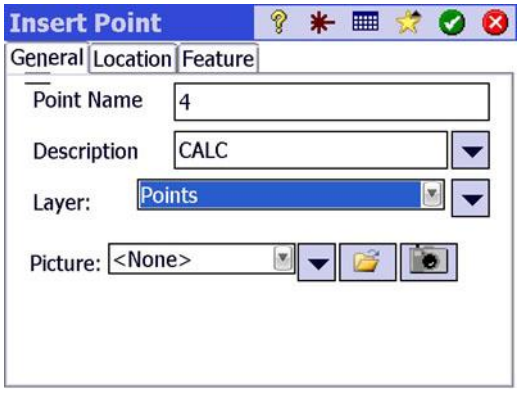
## Step 6: Data Collection in the active Map

| | | |
|---|---|---|
| 10. | Line Commands (applied to Feature codes):<br>sta = start tangential arc will use the incoming tangent line to create a best fit arc through this point and the next observed point.<br>eta = end a two point arc best on the best fit of the exiting tangent leg.<br>Non-tangential arcs use the best fit of an arc without regard to a tangent leg. |  |
| 11. | Point number 1731 is ready to be collected with a BA line feature associated with the point. |  |
| 12. | Point number 1732 has now been collected and is also feature coded BA. Since this is a line feature, Survey Pro has drawn a line between the two points. Points coded with the feature BA will continue to be connected together until an "End" or "Close" command is applied to the feature. |  |

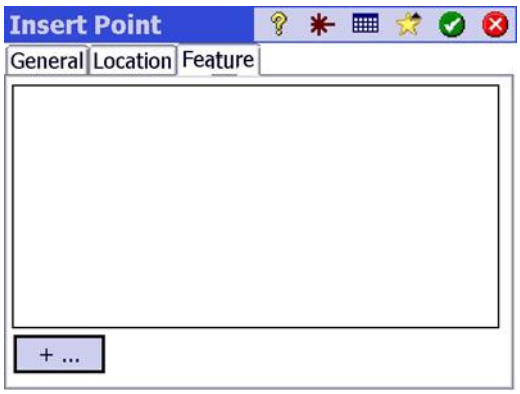
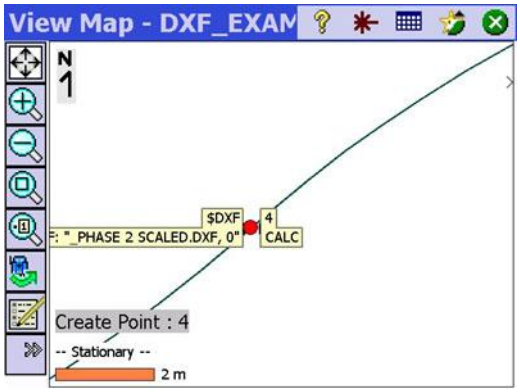
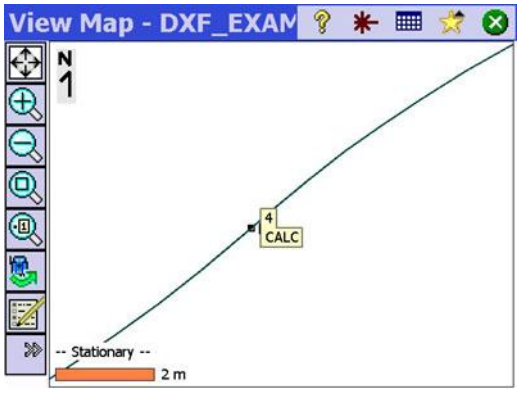
## Step 6: Data Collection in the active Map

| | | |
|---|---|---|
| 13. | After a measurement has been recorded, the Map View will display the point number of the last stored point as well as the current angles and EDM readings from the instrument. |  |

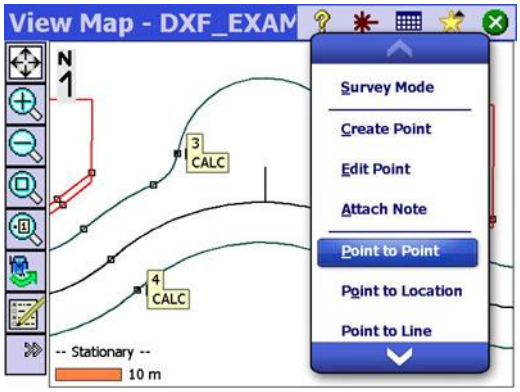
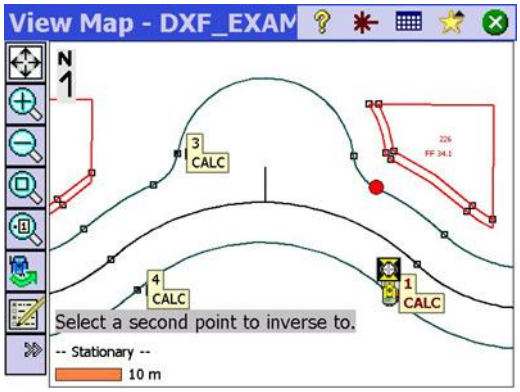
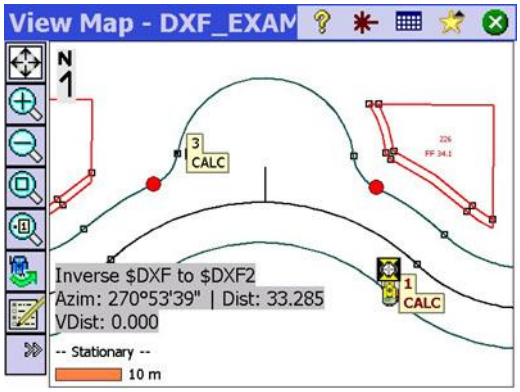
## Step 7: Create Points

| | | |
|---|---|---|
| 1. | Tap and hold anywhere in the Map View and select Create Point. |  |
| 2. | The new point can be assigned to any existing layer or a new layer can be created. Any description can be given. An image file can also be associated with the point. |  |

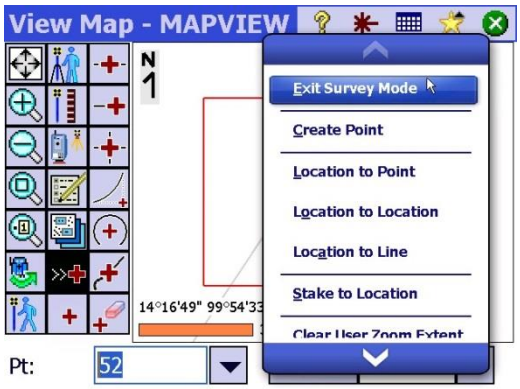
## Step 7: Create Points

| | | |
|---|---|---|
| 3. | Tap on the Feature tab. Tapping on the "+…" button will open up the Feature library where features and attributes can be assigned to the newly created point. The special line commands can also be applied. |  |
| 4. | Points displayed in the Map View that are prefixed with a "$" sign, are temporary points. They can be converted to permanent points by clicking tap and hold on one and selecting "Create Point." Temporary points are created any time a node is clicked on, as a result of certain COGO calculations and clicks and when using the Snap-To functions. |  |
| 5. | Exiting the Map View page and re-entering will erase all of the temporary points.<br>Most Survey Pro COGO routines can also use the Snap features so the temporary snap points are easy to create and easy to access from routines that can use them. |  |

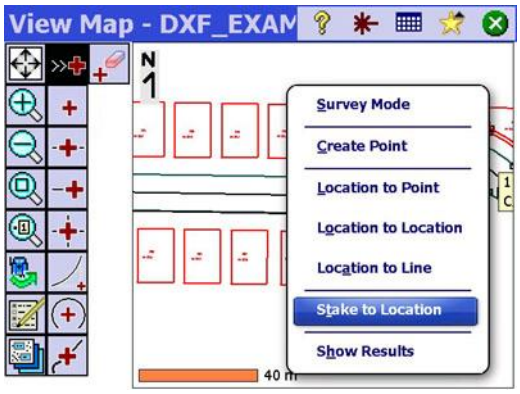
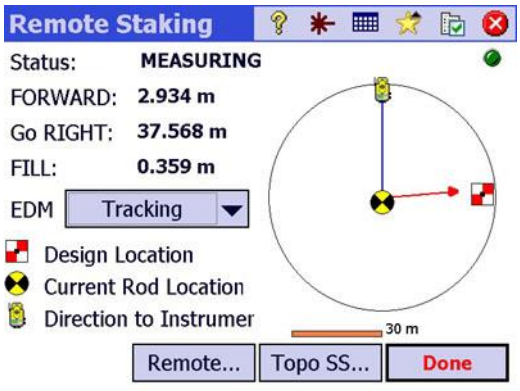
## Step 8: COGO

| | | |
|---|---|---|
| 1. | A tap and hold directly on top of any active element in the basemap or main map will present a more comprehensive set of COGO menu choices.<br>Point to Point allows the inverse between any two points or nodes to be calculated in the currently opened job. |  |
| 2. | The first point of the inverse has been selected as indicated by the red dot.<br>The display is providing by stating "Select a second point to inverse to." |  |
| 3. | The two points included in the inverse are denoted by red dots and results are presented in the Map View. |  |

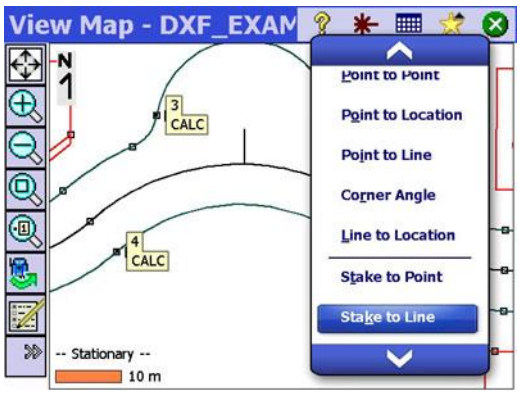
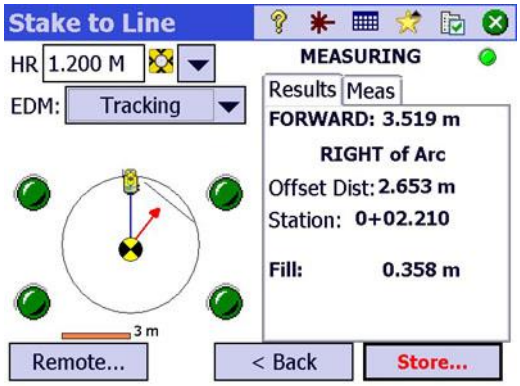
## Step 8: COGO

| | | |
|---|---|---|
| 4. | Depending upon the element that is tapped in the Map View, various COGO calculations can be executed including:<br><br>Point to Point<br>Point to Line<br>Location to Line<br>Location to Point<br>Corner Angles<br>….. |  |

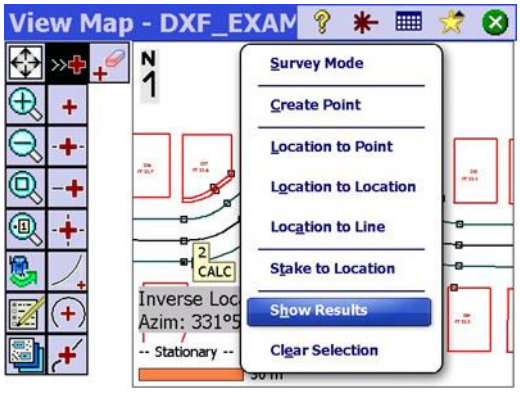
## Step 9: Stakeout

| | | |
|---|---|---|
| 1. | Tapping and holding on a desired location in the Map View will select that location to be staked. |  |
| 2. | After tapping Stake to Location, the Remote Staking screen is shown providing directions to the location. |  |

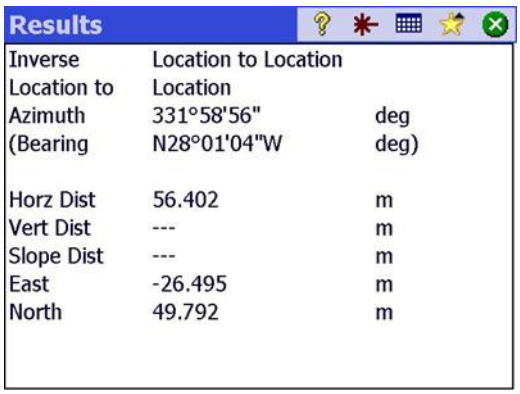
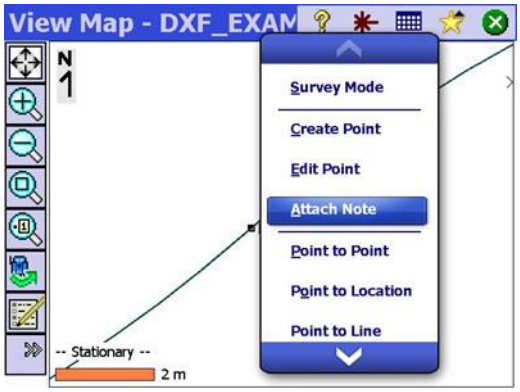
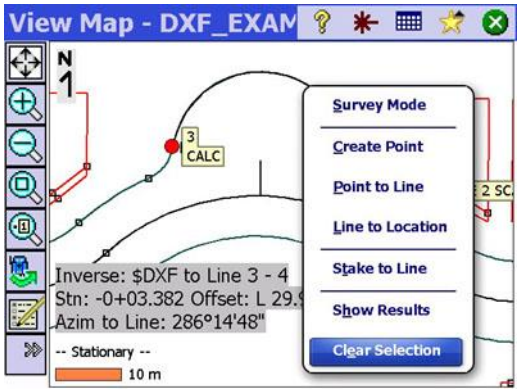
## Step 9: Stakeout

| | | |
|---|---|---|
| 3. | Stake to line is also an option from the Active Map. Tap and hold on any line and tap Stake to Line. |  |
| 4. | The Stake to Line routine provides dynamic position information in relation to the reference line and its station.<br>The graphic indicator shows the rodman's location (yellow/black) in relation to the total station and the reference line.<br>When the desired location has been reached, there is an option to store the location. |  |

## Step 10: Miscellaneous Map View Features

| | | |
|---|---|---|
| 1. | More detailed information on measurements, COGO and staking results can be viewed by tapping and holding and then selecting "Show Results" |  |

## Step 10: Miscellaneous Map View Features

| | | |
|---|---|---|
| 2. | Additional details about the inverse are provided. Since the line that was inversed to did not contain any elevation information, these values are null in this example. If both element of the inverse contain vertical information, these details will also be provided. |  |
| 3. | There is also an Attach Note feature that allows entry of raw data note information for a point. |  |
| 4. | There is an option to Clear Selection.<br>In this example, if Clear Selection is clicked, the Inverse results will disappear and point number 3 will be deselected. |  |

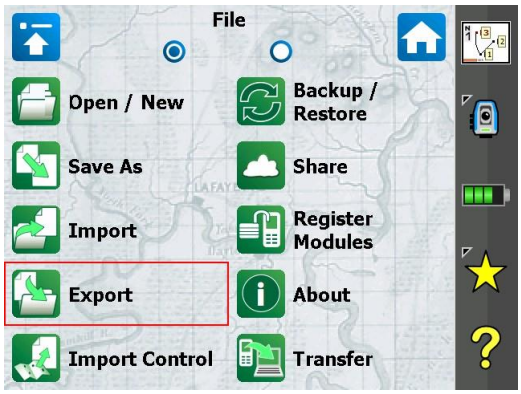
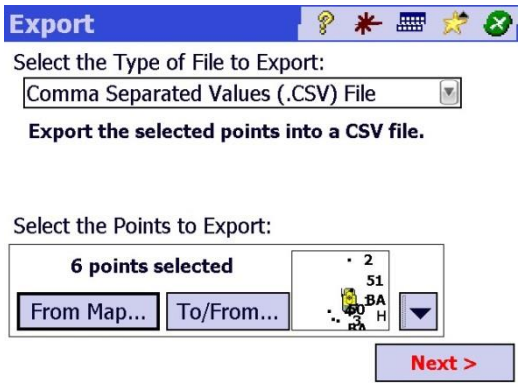
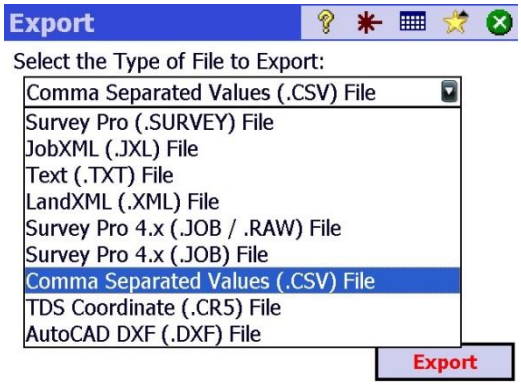
# Export

In this lesson, you will learn how to:

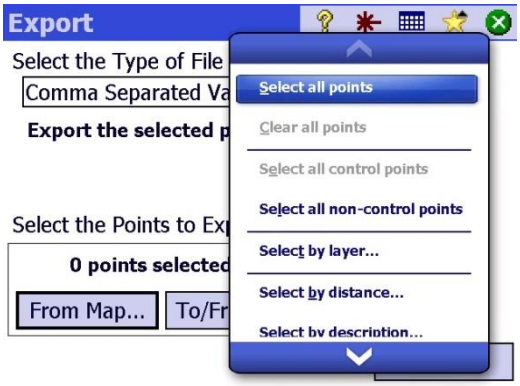
Export data from Survey Pro to a variety of user formats. File Sharing will also be illustrated using dropbox.com which is a non-affiliated, commercial cloud service offered by a third party. This lesson will also show how to backup or restore archived records.


| | | ***Page*** |
|---|---|---|
| Step 1: | View the Available Export Formats | 121 |
| Step 2: | Primary Export Options | 122 |
| Step 3: | Format Dependent Export Options | 122 |
| Step 4: | Archiving and Restoring Data | 123 |
| Step 5: | Sharing | 124 |
| Step 6: | Reports | 127 |

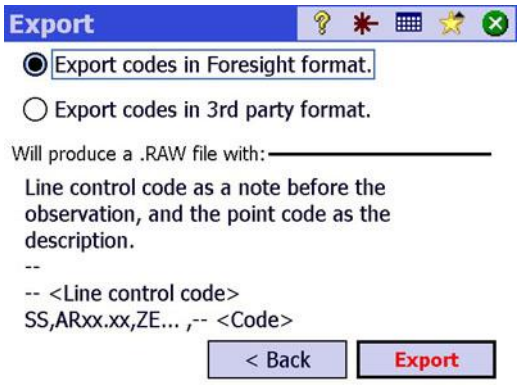
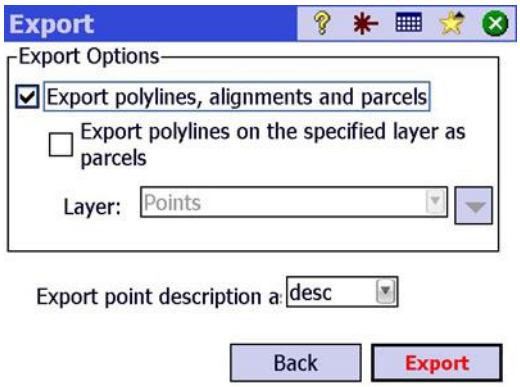
## Step 1: View the Available Export Formats

| | | |
|---|---|---|
| 1. | Data Export routines can be found under the File Menu. |  |
| 2. | Select the points and/or lines to be exported. Selections include date ranges, layers, distance, feature code, etc.<br><br>Select the type of file to be exported. Different file formats support different levels of export choices. |  |
| 3. | Supported export formats are shown to the right. Select the appropriate format and tap on the Export button. |  |

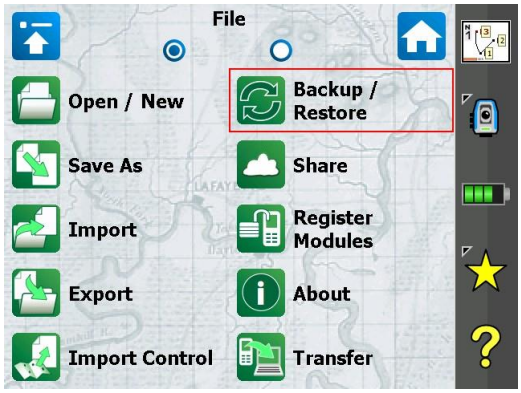
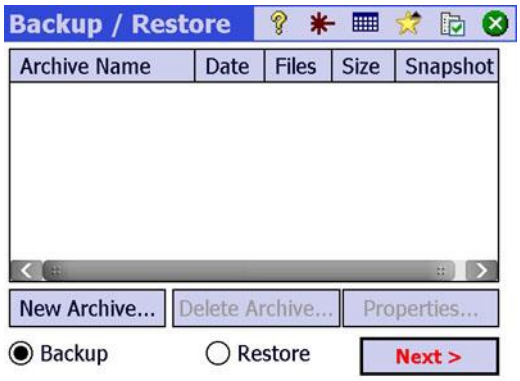
## Step 2: Primary Export Options

| | | |
|---|---|---|
| 1. | For the majority of the supported export formats, points can be selected by layer, range or from the map. |  |

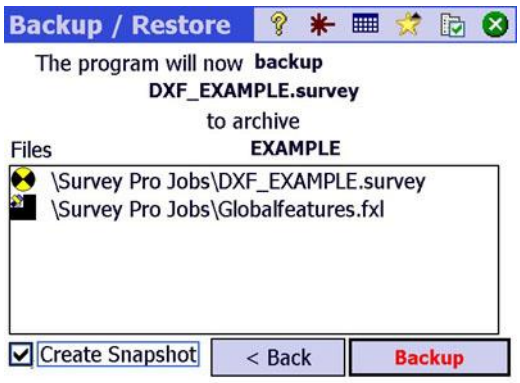
## Step 3: Format Dependent Export Options

| | | |
|---|---|---|
| 1. | Some export formats have different options. When selecting both JOB and RAW data format (from Survey Pro version 4), the entire job and associated measurement data is exported. |  |
| 2. | LandXML export options. |  |

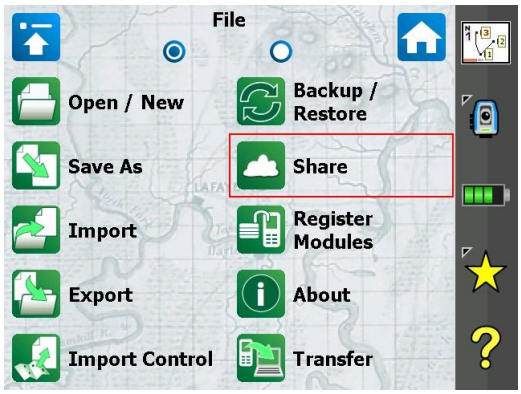
## Step 4: Archiving and Restoring Data

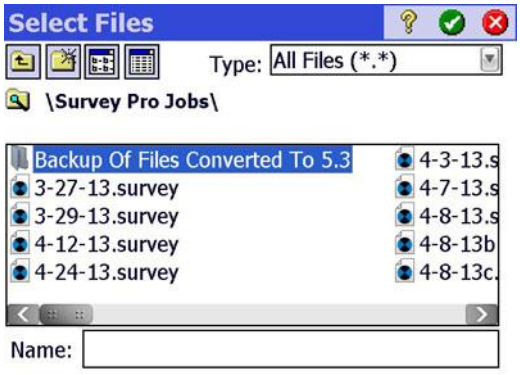
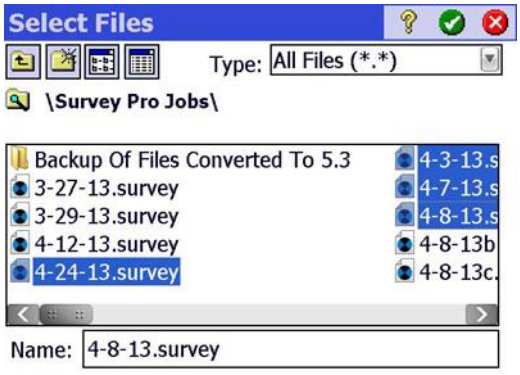
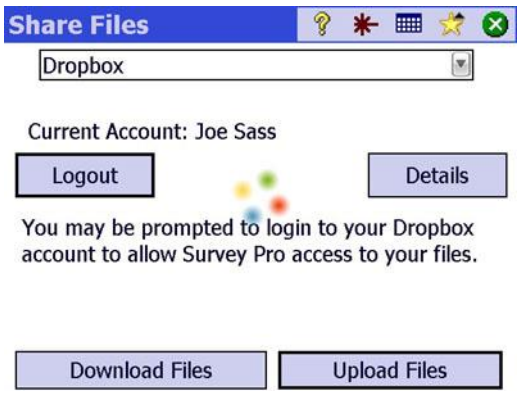
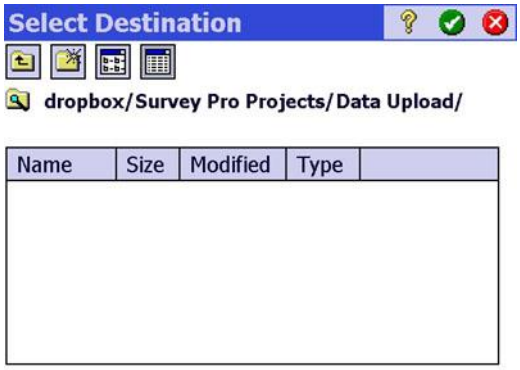
| | | |
|---|---|---|
| 1. | Jobs and data can be backed up for security or archival purposes and can also be restored. The Backup/Restore routine is located under the File menu. |  |
| 2. | Backup is used to create a backup (archive) of the currently open job. Restore is used to restore a previously archived (backed up) job.<br>Select New Archive to create a Backup. |  |
| 3. | An optional description of the backup being made can be inserted. Most often, this would be the job name itself. |  |

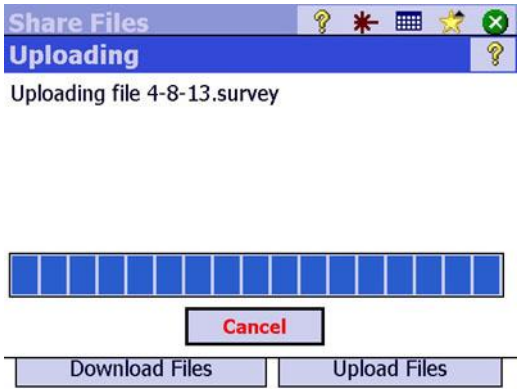
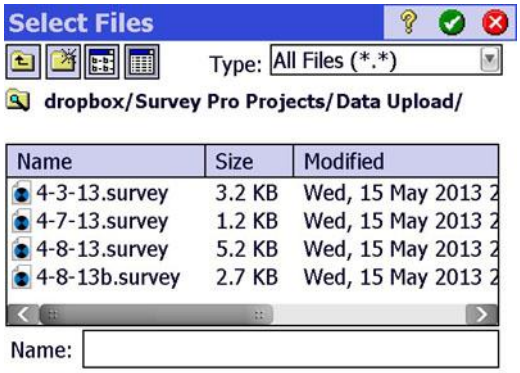
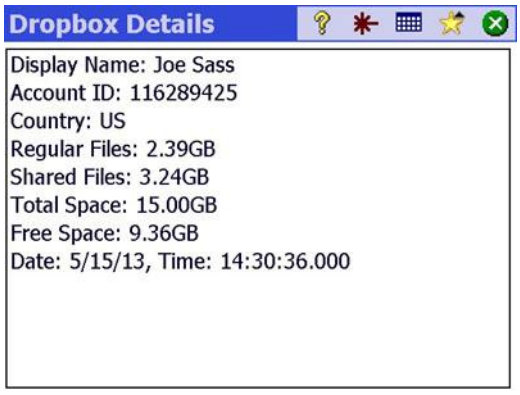
## Step 4: Archiving and Restoring Data

| | | |
|---|---|---|
| 4. | Survey Pro will provide a notification about what is being backed up and the location of the file(s).<br>A Snapshot of the job can be created which provides a screen capture of the project with all the visible layers. |  |

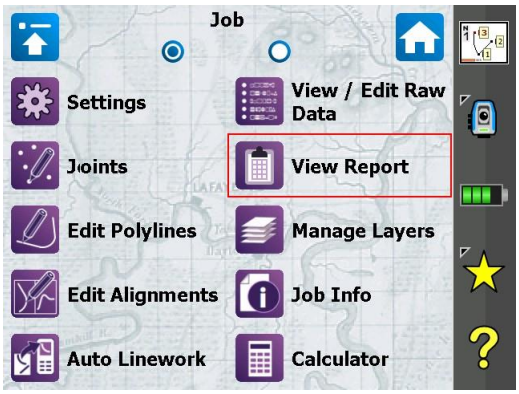
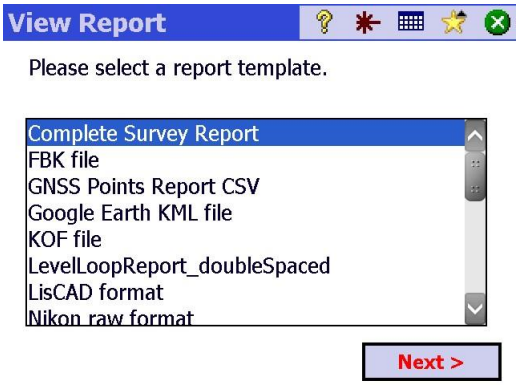
## Step 5: Sharing

| | | |
|---|---|---|
| 1. | Sharing, or backing up data to the cloud (internet based data storage) has become increasingly popular as field users are more electronically connected with their offices.<br>Survey Pro Share services can be accessed from the File menu. |  |
| 2. | Survey Pro supports E-Mail and Dropbox services.<br>Dropbox is a U.S. based commercial company that is not affiliated with Spectra Precision, Trimble or its affiliates. Dropbox offers 2 GB of cloud storage for free. Additional storage space can be earned or purchased. Visit dropbox.com for details. |  |

| | | |
|---|---|---|
| 3. | The data collector must be connected to the internet which can be accomplished simply through WiFi or the embedded cell phone (SIM card and service required). In this example, several Survey Pro files will be copied from the data collector and uploaded to Dropbox. |  |
| 4. | Four jobs are selected for uploading. |  |
| 5. | Survey Pro remembers the last login information used and will automatically reconnect to that account. The Logout button disconnects from the current account and deletes the login information. |  |
| 6. | The desired folder is selected or created to which the data will be uploaded. When satisfied, tap on the check/tick mark in the upper right hand corner of the display. |  |

| | | |
|---|---|---|
| 7. | Data is being copied to the cloud. |  |
| 8. | When completed, Survey Pro will display the files that have been uploaded.<br>Now, all other computers and devices that are associated with the Dropbox folder will get a notification that new files have been added. This gives remote parties the opportunity to see the data as soon as it becomes available in the cloud. |  |
| 9. | From the Sharing main page, the "Details" button can be clicked to see details about the Dropbox.com account being used. This Dropbox customer has either purchased or earned an additional 13 GB of storage space beyond the 2 GB provided for free. |  |

## Step 6: Reports

| | | |
|---|---|---|
| 1. | The Report menu can be accessed from the Job menu. Several popular and regionally specific reporting formats can be generated. |  |
| 2. | A partial list of the supported formats are shown to the right. A GoogleEarth KML file is a convenient tool to visualize data on the ground. At least nine different Stakeout Cut Sheet reports are available to meet most needs. Many of the reports can be filtered by date range which can facilitate daily reporting requirements. |  |