Chapter 3
The Total Station and Trimble TSC2 Setup

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3. The Total Station and Trimble TSC2 Setup

A. Pre-Loaded Files
There are many types of files that can be loaded on the Trimble TSC2 data collector prior to collection or stake-out surveys. The most common files are feature code lists, project control files, design alignments, and staking files. However, it is not necessary to upload these files to conduct a survey. Refer to Chapter 7 in this manual for more information on transferring files to the TSC2.

Figure 3-1. The Trimble TSC2 data collector.

Throughout this chapter, the term "tap" is used to illustrate how to select various commands from the TSC2 screen with a stylus. Pressing *Enter* on the keypad when the desired icon is highlighted will achieve the same results.

B. Trimble Desktop Screen
When the TSC2 is turned on, the main Trimble desktop screen will be displayed.
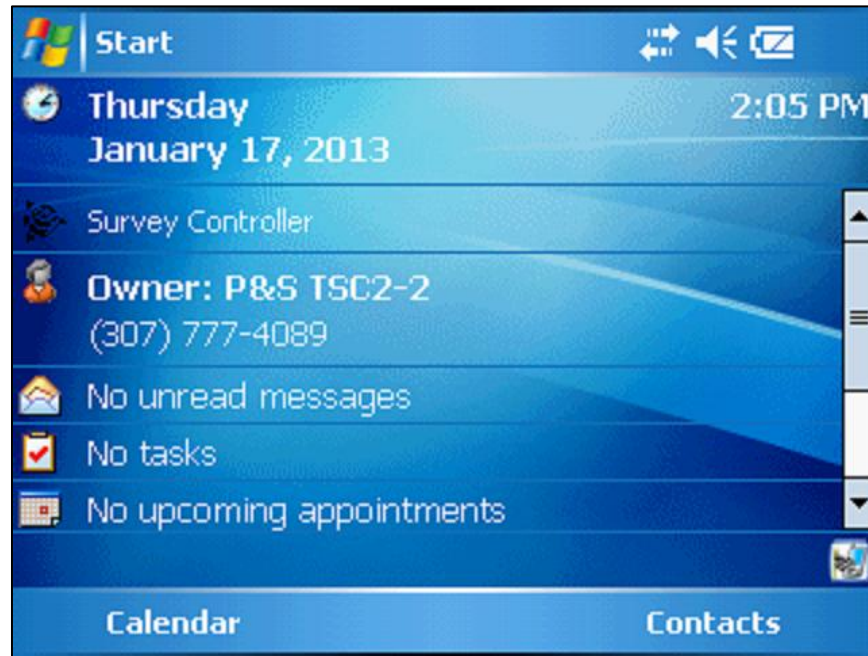

Figure 3-2. The Trimble desktop.

1. Setting the Date and Time
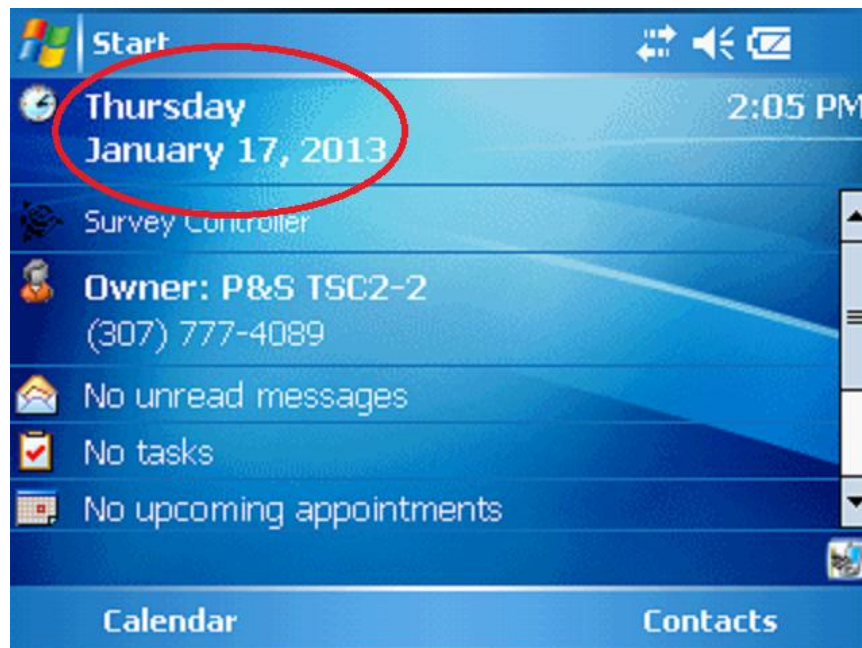To set or check the date and time on the TSC2, tap the stylus on the date and time as indicated by the red oval.

Figure 3-3. Accessing date and time.

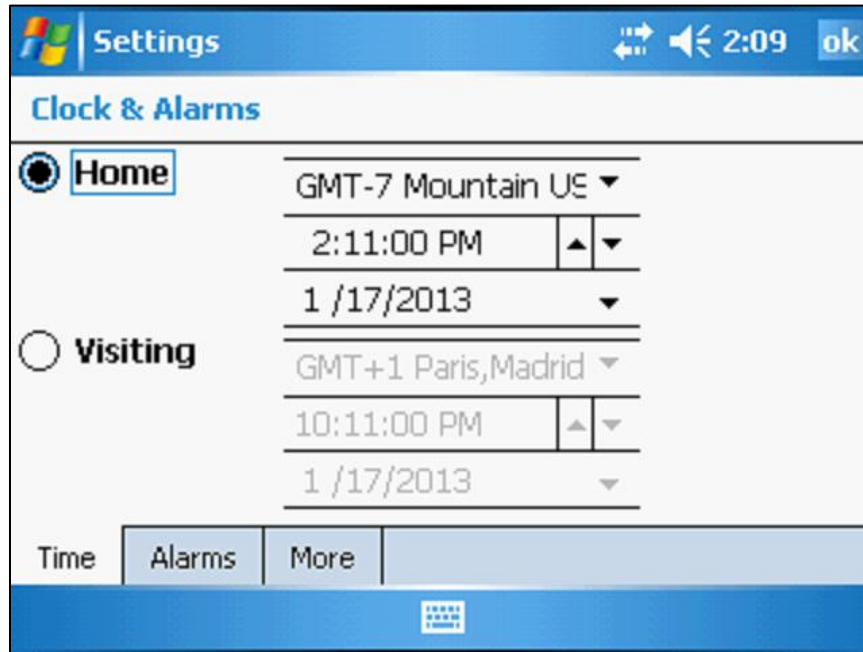The *Settings* screen displays the current time zone, time, and date.

Figure 3-4. Settings screen.

To change any of these parameters, use the stylus to highlight a setting as indicated by the red arrow and then use the up or down arrows (red oval) to make the appropriate change.
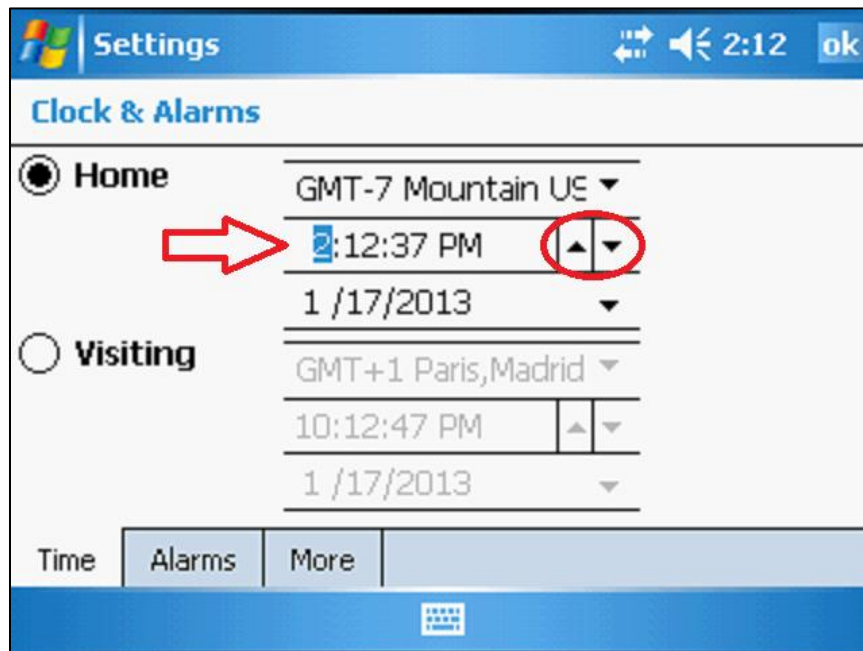

Figure 3-5. Adjust settings.

When the settings have been changed click on the *ok* icon as indicated by the red arrow in the upper right portion of the screen.

Figure 3-6. Settings changed.

Click *Yes* to save the current settings. The data collector will then return to the main desktop screen.

Figure 3-7. Save settings.

C. Total Station Setup

In a conventional survey, a station setup must be performed to orientate the instrument. First the tripod and tribrach are centered over the control point and rough leveled. The total station is then placed and locked onto the tribrach. The TSC2 data collector is then powered up and connected to the total station via cable or bluetooth.

Note: As mentioned in Chapter 2 of this manual, the data collector operations pertain only to conventional surveying. Surveying operations using the TSC2 with GPS equipment will not be covered.

Press the *Trimble Function* key to access the survey controller menu. The *Trimble Survey Controller* screen with the data collector's firmware version is briefly displayed on the TSC2 screen. Next, the *Electronic level* screen depicting three leveling bubbles is displayed. Turn the leveling screws on the tribrach until the digital leveling bubbles, both horizontally and vertically, are centered. After the instrument has been leveled, tap the *Accept* button as indicated by the red oval.
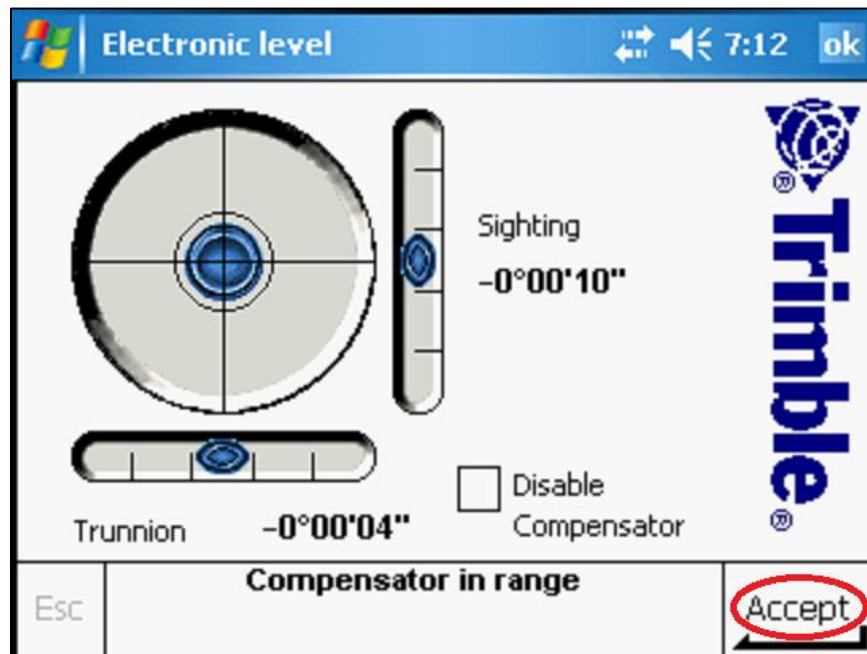

Figure 3-8. The Electronic level screen.

Note: If a Trimble S6 robotic total station is used, then the setup procedure is complete. However, if a Trimble 5600 or older total station is used, then the dual axis compensation routine is initiated when the *Accept* button is tapped. The instrument will turn 180 degrees, emit an audible beep, and turn back. During this procedure, the message, *Compensating instrument*, will be displayed on the data collector screen. There is no operator involvement during the compensating routine.
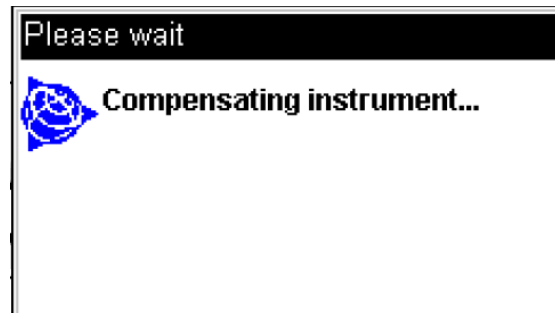

Figure 3-9. The compensating routine.

1. Correction Settings

After the leveling procedure has been completed, the *Corrections* screen is displayed. The current atmospheric conditions are updated each time an instrument setup is performed. Enter a value in the *Pressure* and *Temperature* fields and then tap *Accept*. Ambient temperature and pressure readings can be measured with a hand-held weather meter. The *PPM* (parts per million) correction constant is automatically computed and displayed.
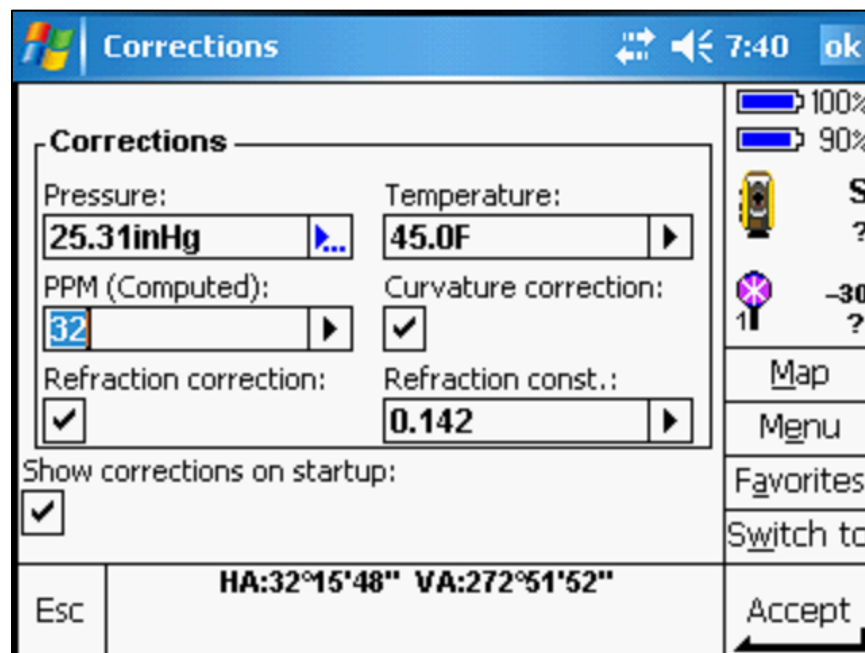

Figure 3-10. Set current atmospheric conditions.

When the *Survey Basic* screen is displayed, tap *Esc* as indicated by the red oval to access the survey controller main menu.
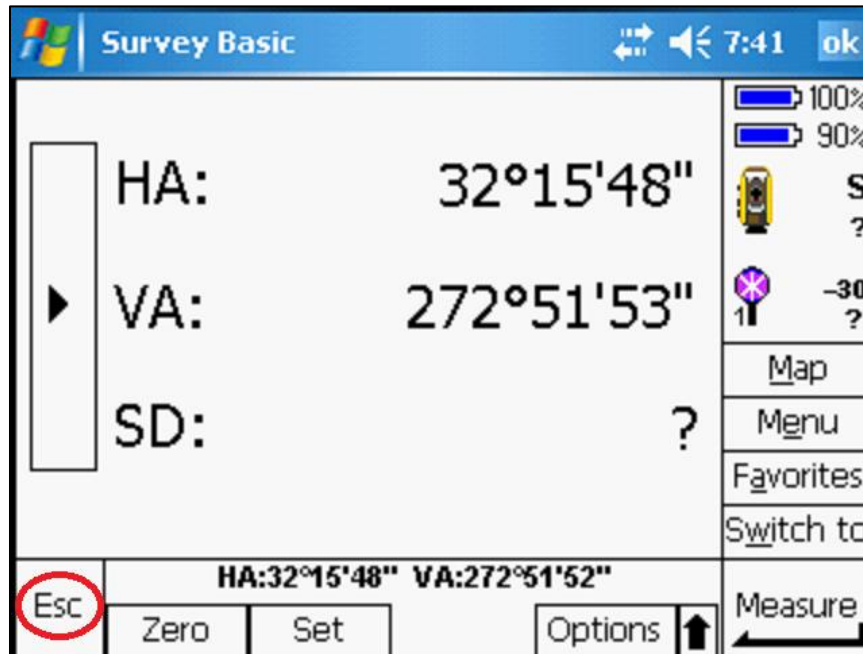

Figure 3-11. Survey Basic screen.

D. Survey Styles

Specific parameters for the total station instrument are now defined. At the survey controller main menu, tap the *Configuration* icon.

Figure 3-12. Survey controller main menu.

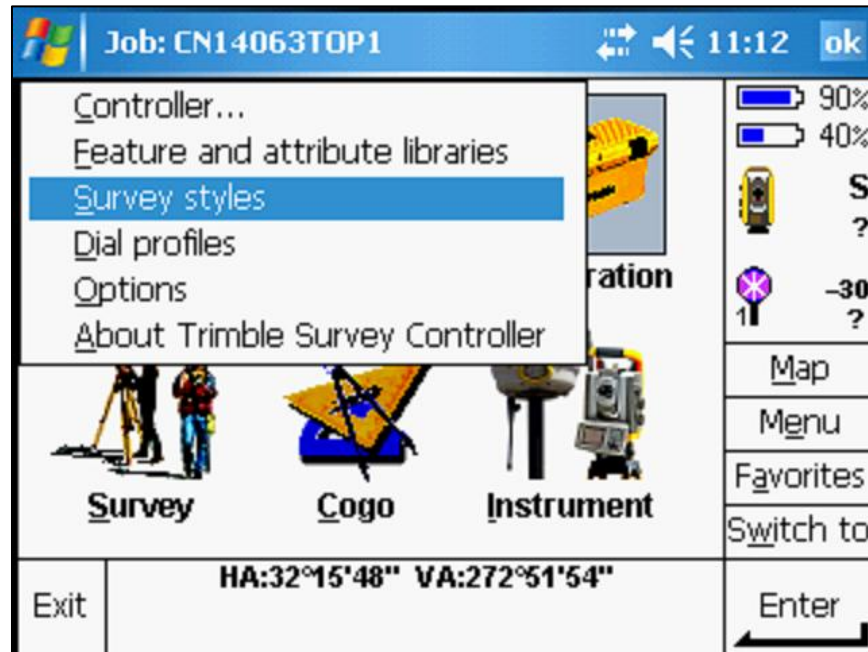Select *Survey styles* from the *Configuration* menu. This option is used to set a new survey style or edit an existing one.

Figure 3-13. Survey styles.

1. Edit an Existing Survey Style
To edit an existing survey style, use the stylus to highlight it and tap the *Edit* button as indicated by the red oval.
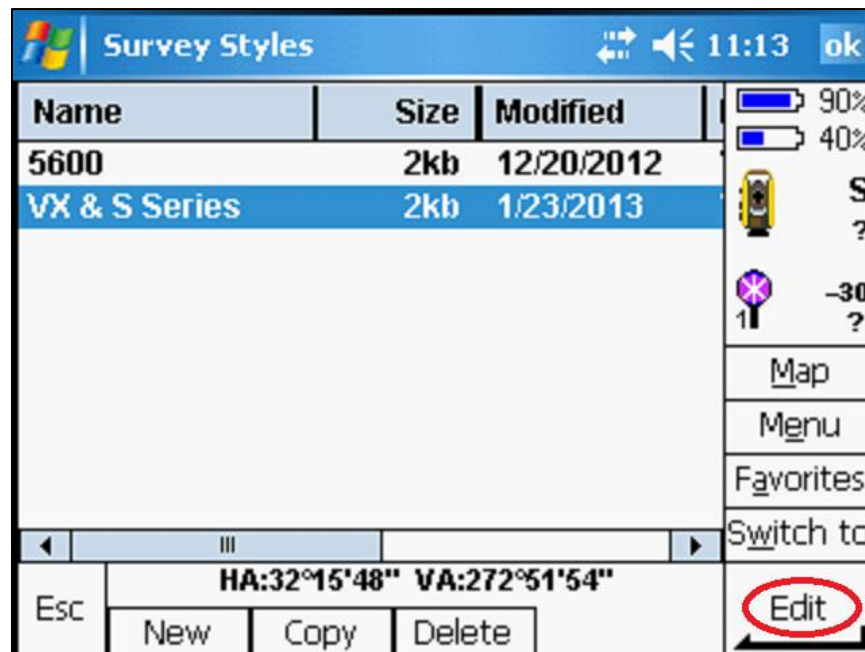
Figure 3-14. Select survey style.

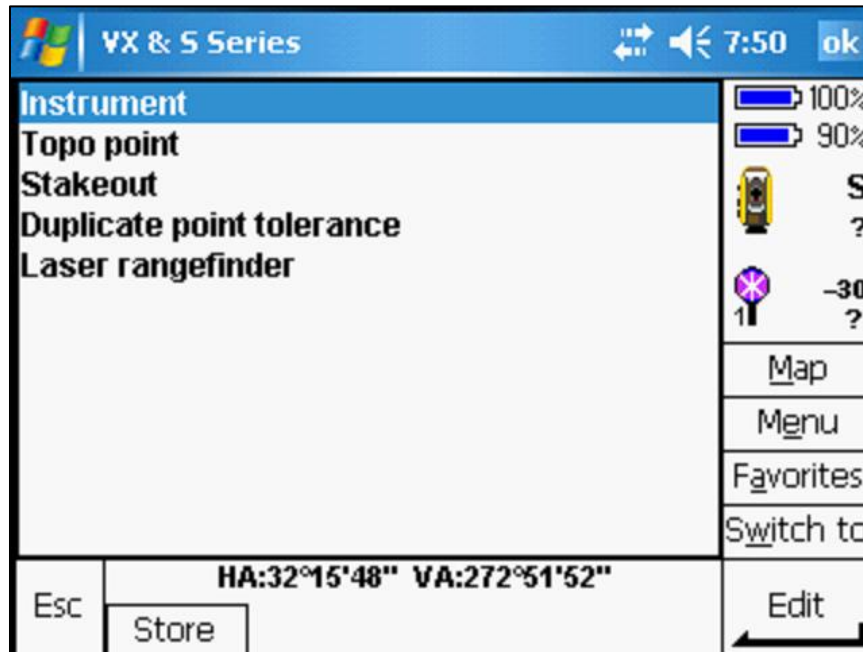Parameters for the *Instrument*, *Topo point*, and *Duplicate point tolerance* can now be selected. Highlight *Instrument* and tap the *Edit* button.

Figure 3-15. Survey style parameters.

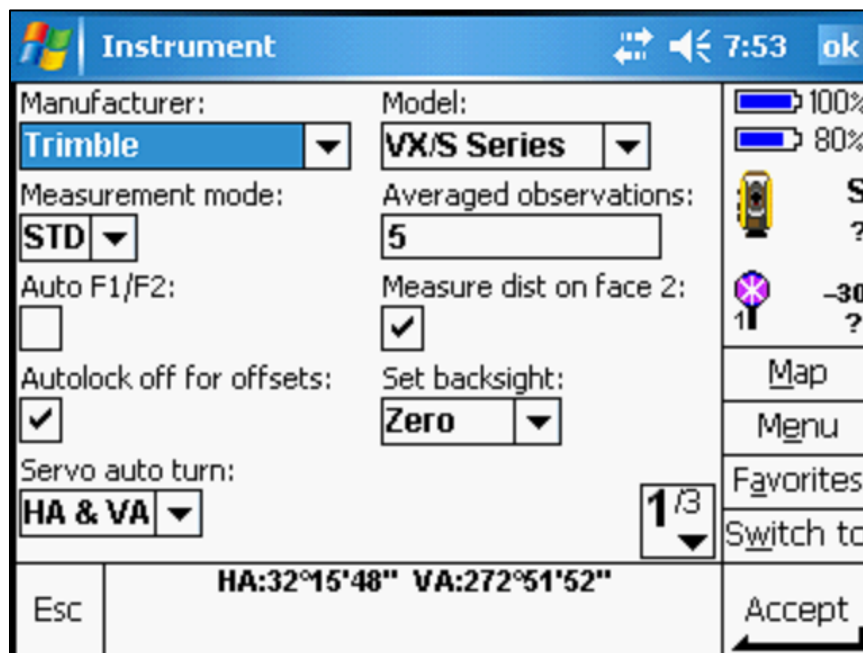At the *Instrument* screen, verify that all of the fields have the appropriate settings.

Figure 3-16. Instrument settings, page 1.

When the Instrument fields on the first page have been set, go to the next page by clicking on the *1/3* button as indicated by the red arrow.

Figure 3-17. Next page.

On the second page, check the additional parameters. When the Instrument fields have been set, go to the last page by clicking on the *2/3* button.

Figure 3-18. Instrument settings, page 2.

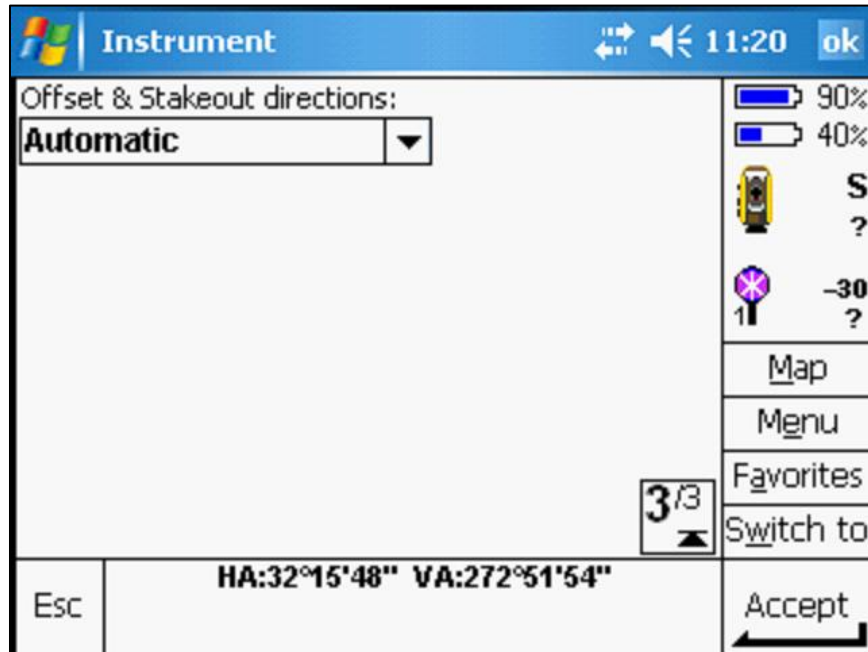Tap on the *Accept* button to save any setting changes.

Figure 3-19. Instrument settings, page 3.
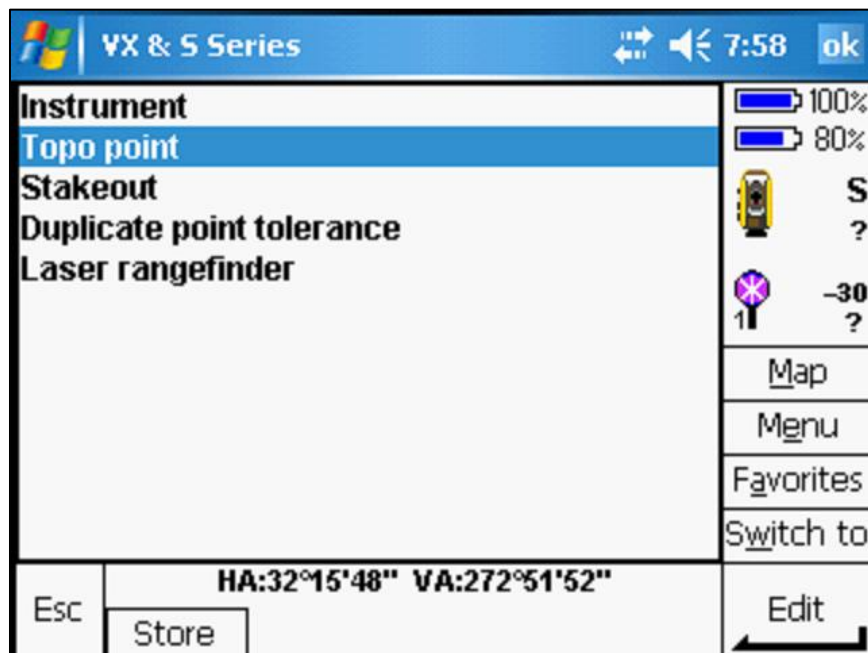
Highlight *Topo point* and tap *Edit*.

Figure 3-20. Survey style parameters.

At the *Topo point* screen, verify that the fields have the appropriate settings. When complete, tap on the *Accept* button.
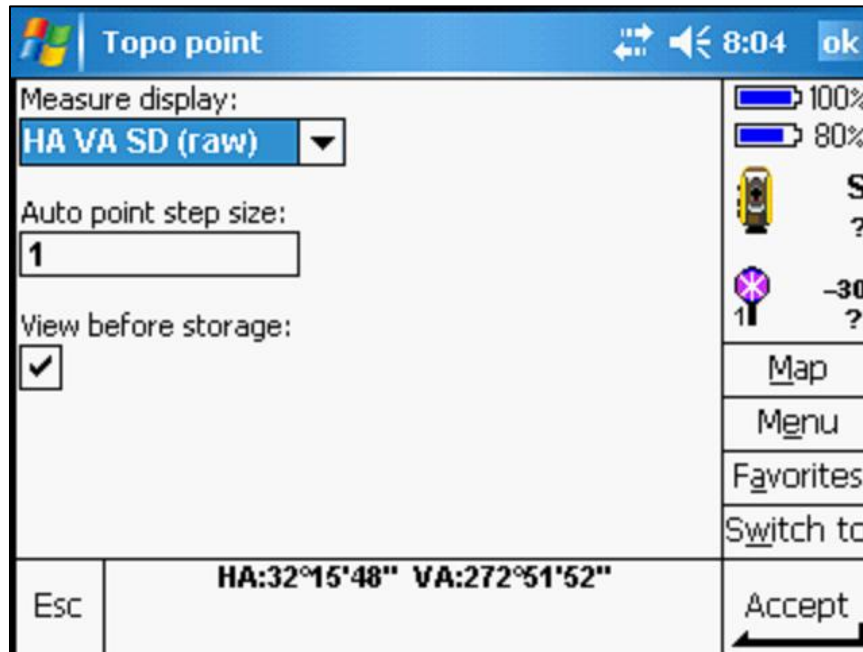

Figure 3-21. Topo point settings.

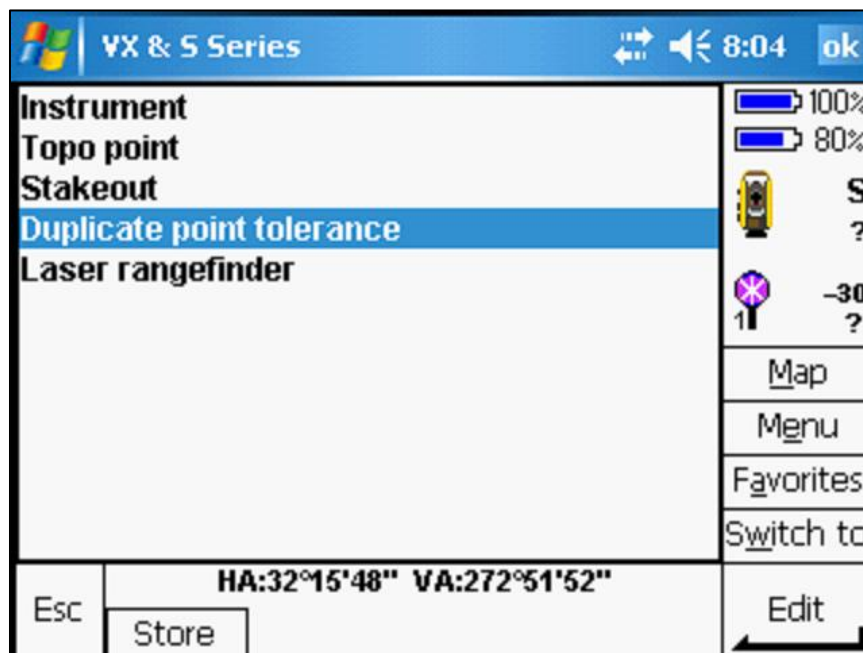Highlight *Duplicate point tolerance* and tap *Edit*.

Figure 3-22. Survey style parameters.

At the *Duplicate point tolerance* screen, verify that the fields have the appropriate settings. When all of the fields on the first page have been set, go to the next page by clicking on the *1/3* button.

Figure 3-23. Duplicate point tolerance settings, page 1.

On the second page, check the additional parameters. When these fields have been set, go to the last page by clicking on the *2/3* button.

Figure 3-24. Duplicate point tolerance settings, page 2.

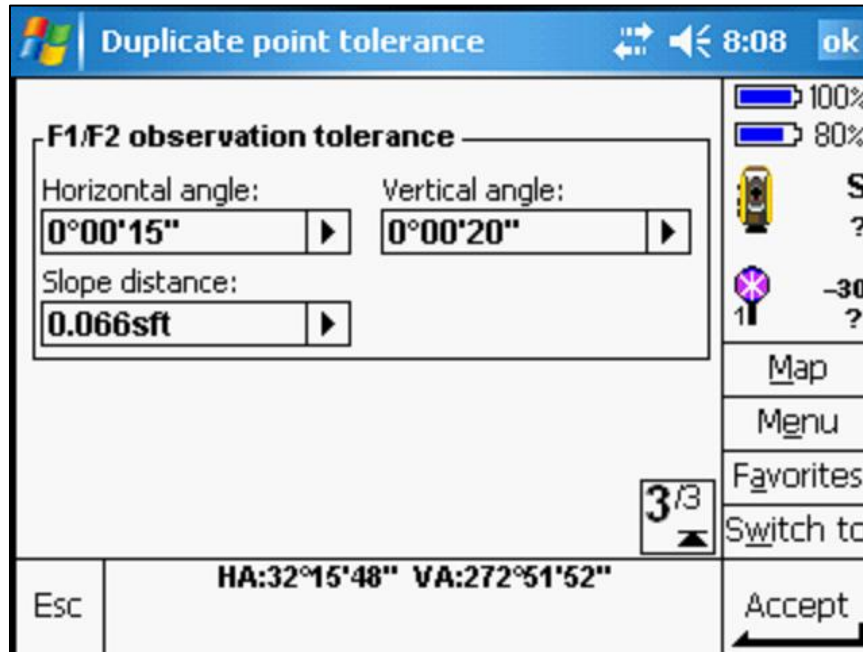Tap on the *Accept* button to save any setting changes.

Figure 3-25. Duplicate point tolerance settings, page 3.

After the *Survey style* parameters have been edited, tap *Store* as indicated by the red arrow to save the changes.
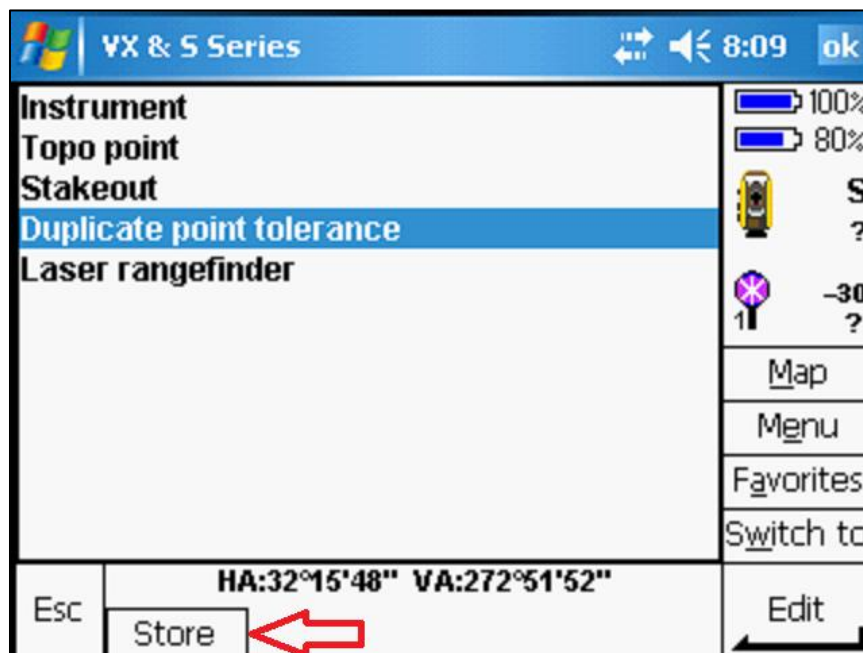

Figure 3-26. Store survey style settings.

2. Create a New Survey Style

To create a survey style, tap the *New* button as indicated by the red arrow at the bottom of the screen.
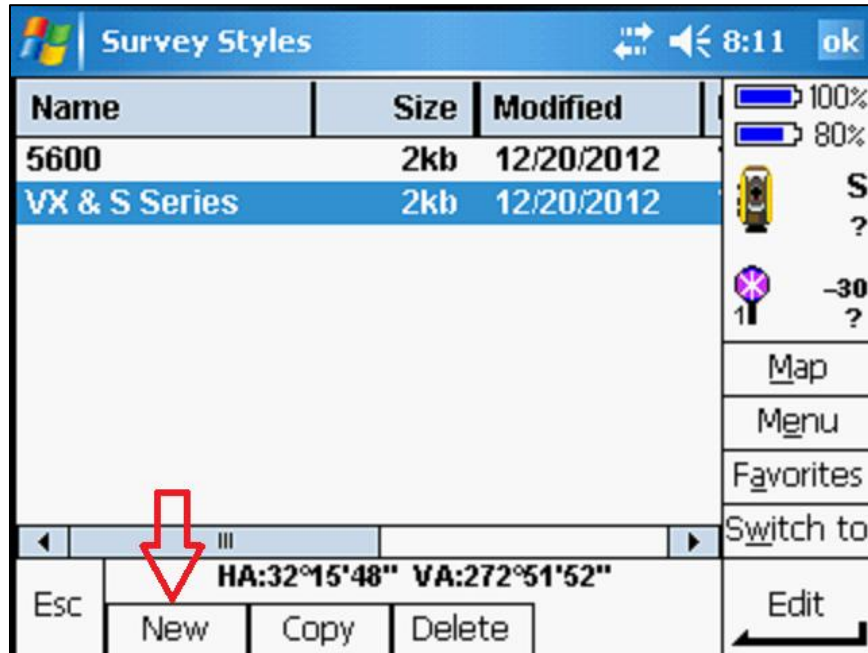

Figure 3-27. New survey style.

At the *Style details* screen, key-in a unique name in the *Style name* field. Verify that the *Style type* is set to *Conventional*.
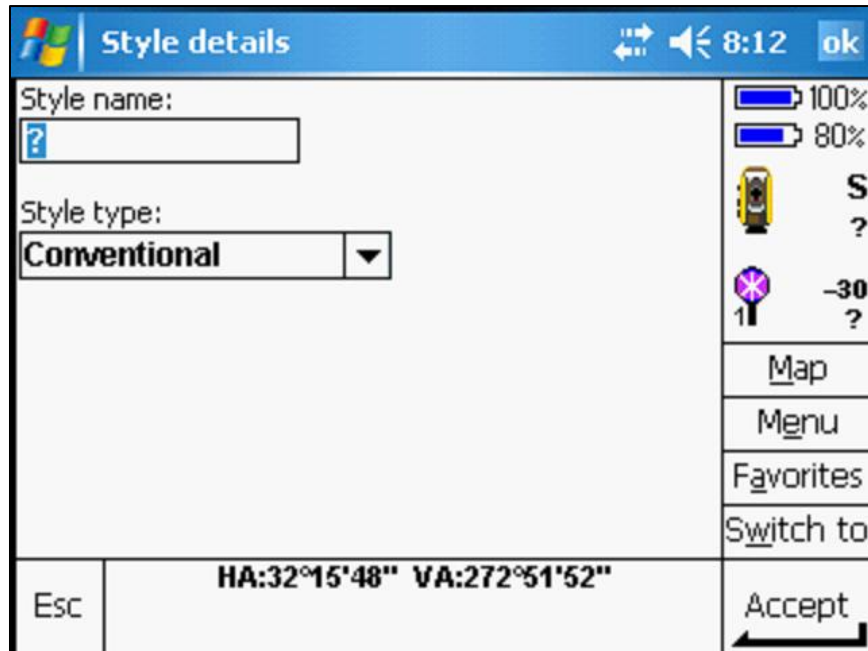

Figure 3-28. New survey style name.

Tap the *Accept* button to save the new style. In this example, the survey style name "Manual" was entered. This is a style setting that allows the operator to use the Trimble data collector simulator (refer to Figure 3-31).
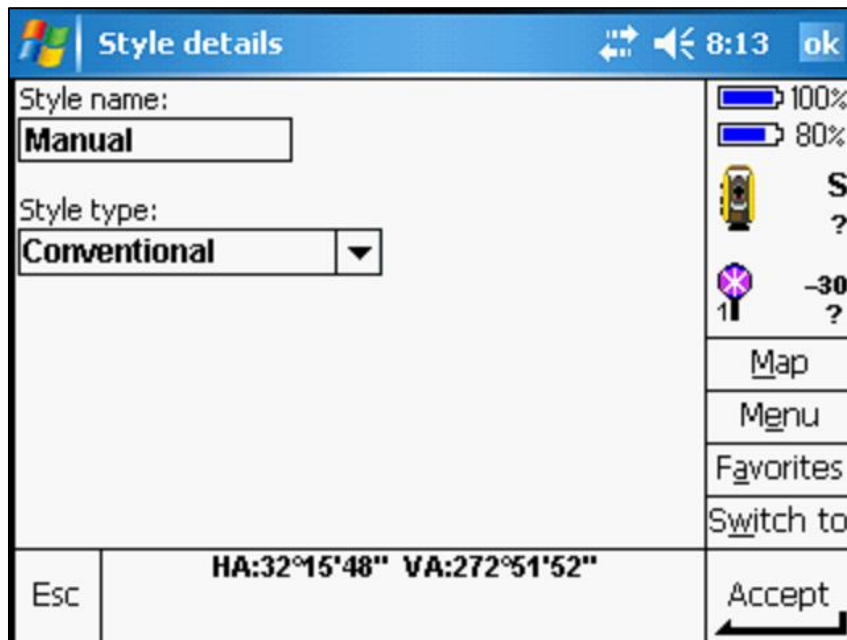

Figure 3-29. Accept new survey style.

At this time, the survey style parameters screen will be displayed. The *Instrument*, *Topo point*, and *Duplicate point tolerance* parameter settings can now be edited. Follow the instructions for setting these survey style parameters as illustrated on pages 3-9 to 3-15.
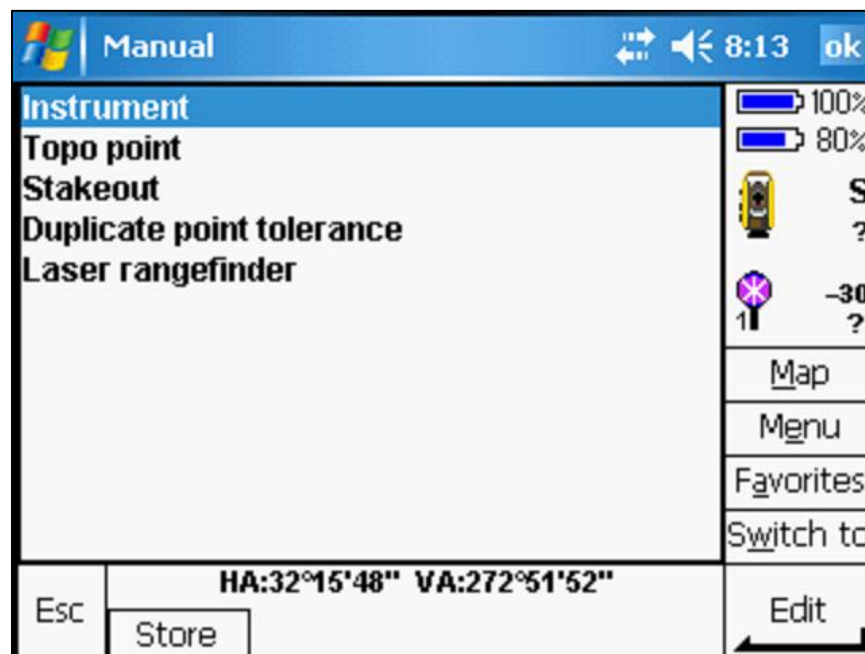

Figure 3-30. Survey style settings.
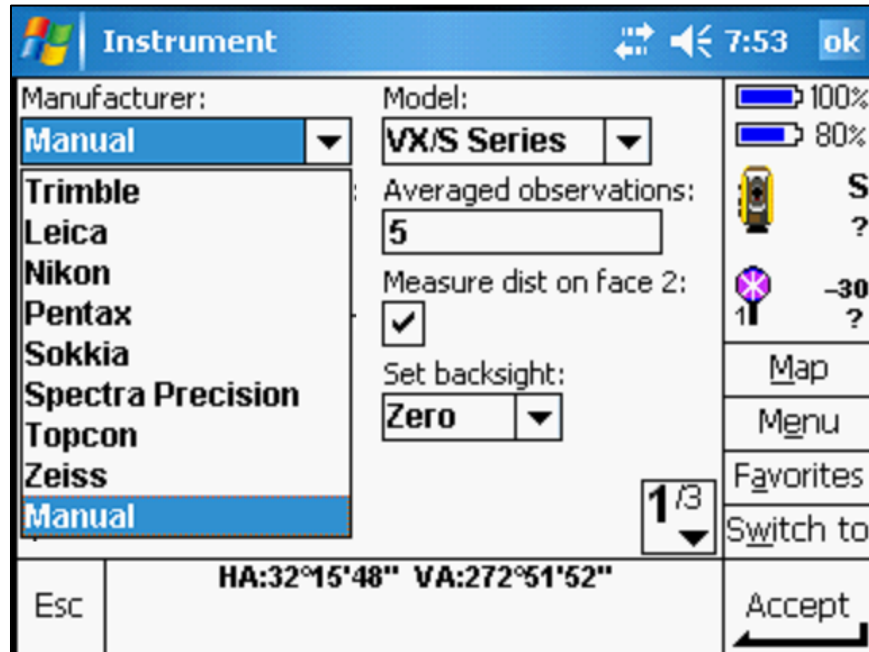
The *Manufacturer* drop down menu.

Figure 3-31. Instrument settings.

E. Data Collector Jobs

1. Create a New Job
To create a new job, go to the survey controller main menu and tap on the *Files* icon.

Figure 3-32. Files icon.
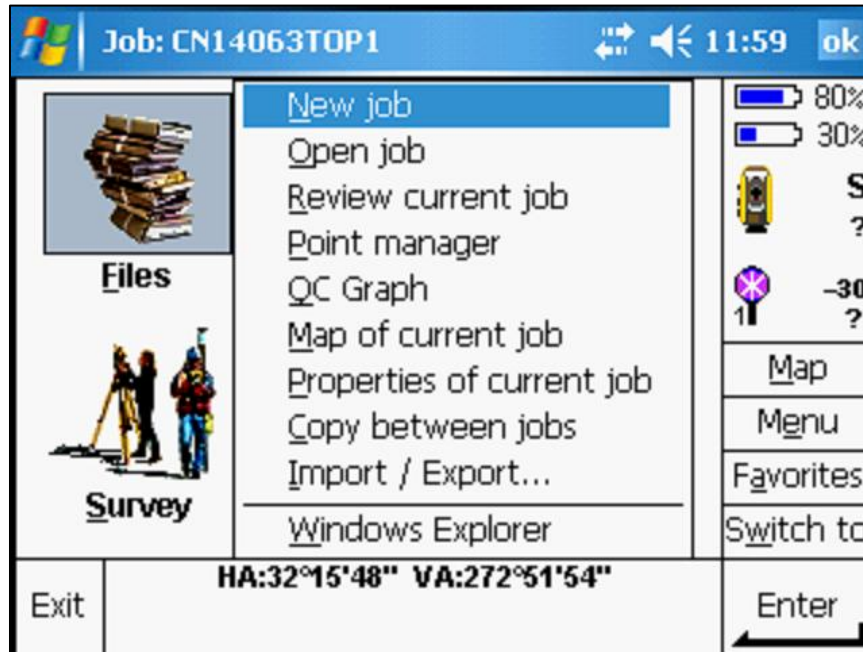
Select *New job* from the menu.

Figure 3-33. Create a new job.

At the *New job* screen (Figure 3-34), enter the appropriate settings:

- The *Job name* setting should follow the WYDOT file naming convention. Refer to Chapter 6 in this manual for more information on file naming conventions.

- The *Coord. sys.* Scale should always be set to "1.0000000000".

- The *Units (Dist.)* field is also always set to "US survey feet".

- The *Linked files* should include the P&S project control file. The project control coordinates in the data collector files are calculated by the Photogrammetry and Surveys Section (P&S).

- The *Feature library* setting should use the appropriate feature code list. Refer to Chapter 4 in this manual for more information on feature code lists.
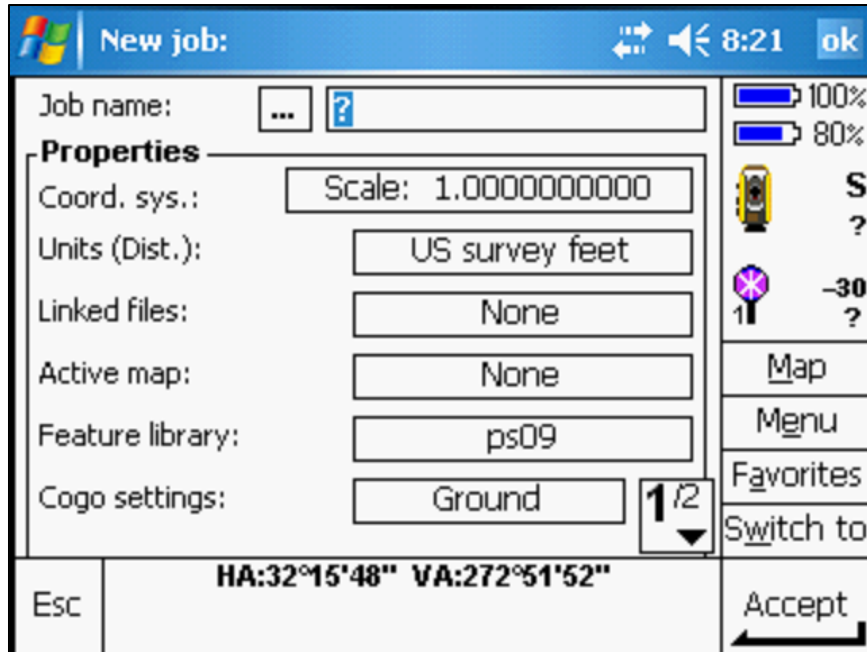
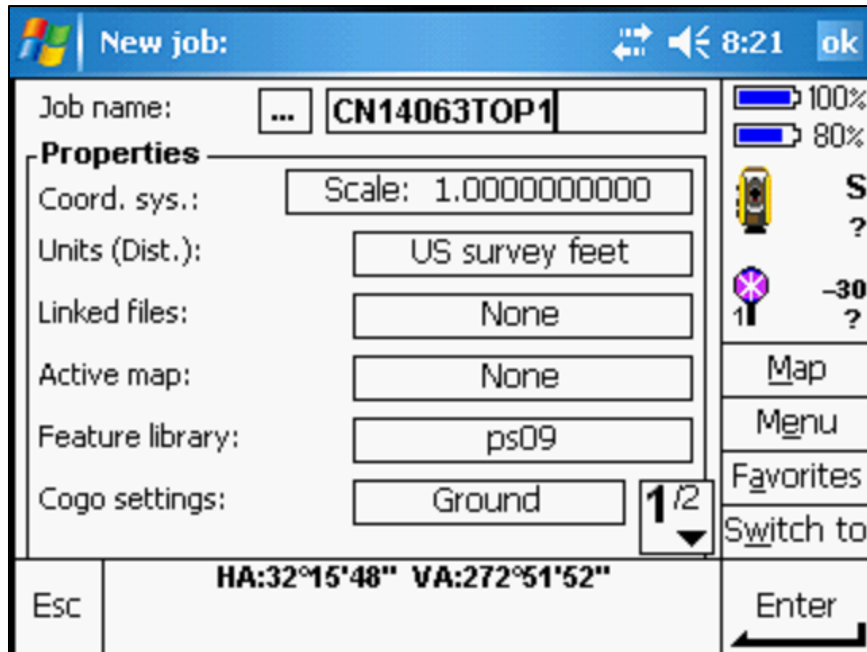*Figure 3-34. New job screen.*

Enter a point name.

Figure 3-35. New job settings.
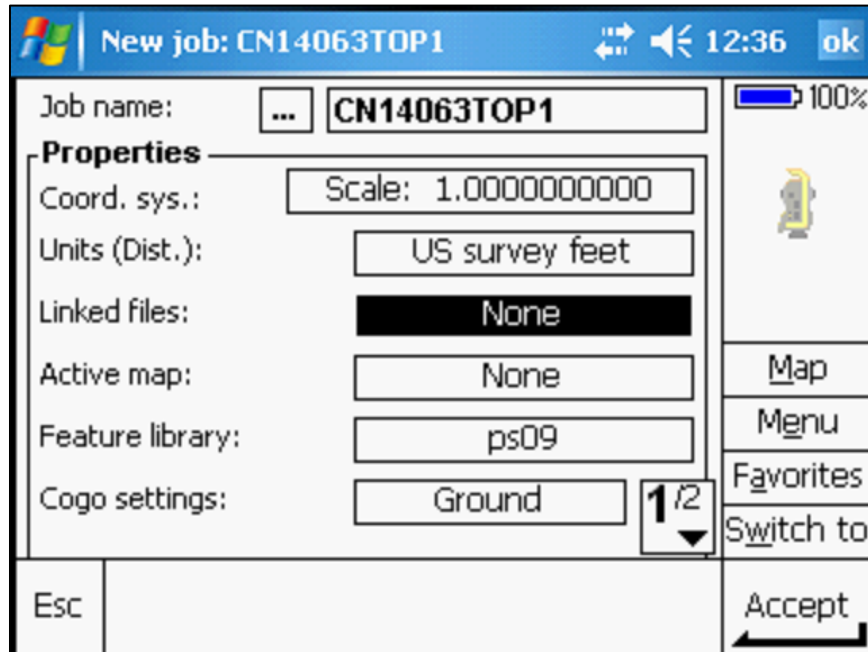
Tap on the *None* button next to *Linked files*.

Figure 3-36. Linked files.

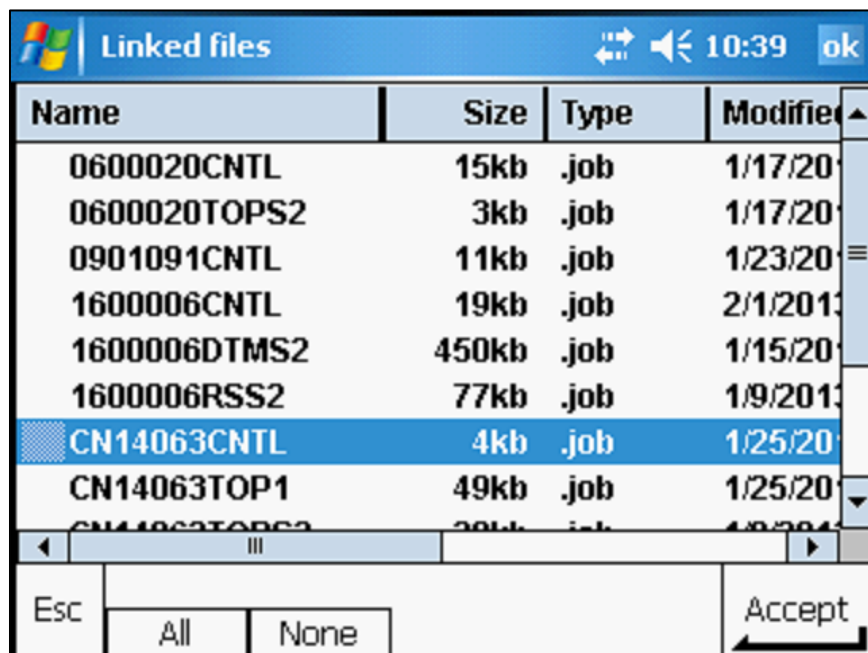Scroll down to the appropriate project control file (e.g. CN14063CNTL) and tap the *Accept* button.

Figure 3-37. Project control file.

The information on page *2/2* does not need to be changed. Tap the *Accept* button when all of the settings are complete.
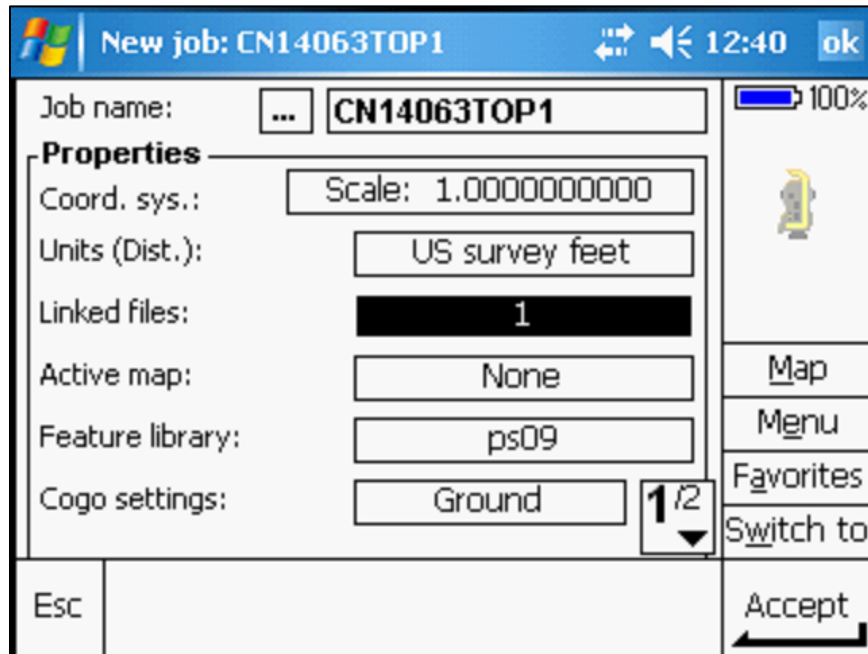

Figure 3-38. File linked.

2. Open an Existing Job

To work in an existing job, tap on the *Files* icon at the survey controller main menu. Select *Open job* from the menu.
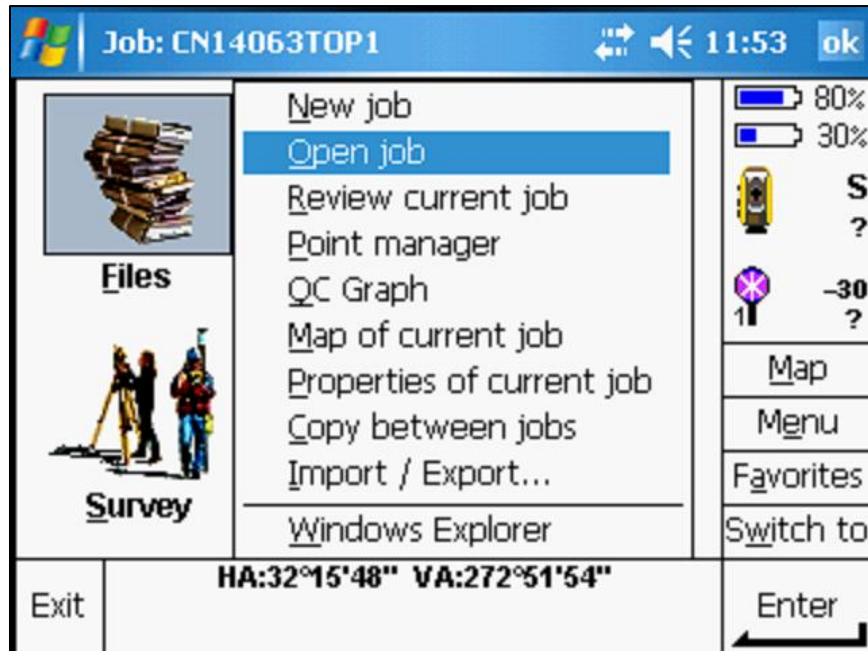

Figure 3-39. Select Open job.

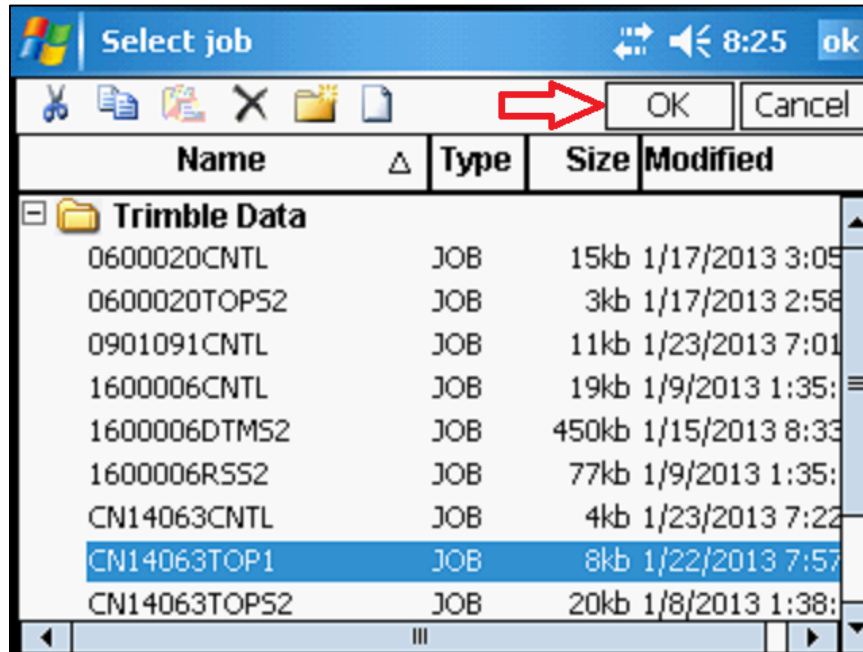Highlight the appropriate job and tap the *OK* button as indicated by the red arrow.

Figure 3-40. Select an existing job.

F. Station Setup

At the survey controller main menu, tap on the *Survey* icon.

Figure 3-41. Survey icon.

Select *Station setup* from the *Survey* menu.

Figure 3-42. Select Station setup.

When the *Corrections* screen is displayed, set the *Pressure* and *Temperature* values and then tap *Enter*. As previously discussed, the temperature and pressure readings can be measured with a hand-held weather meter. The *PPM* (parts per million) correction constant is automatically computed and displayed. Tap the *Accept* button to set the values.
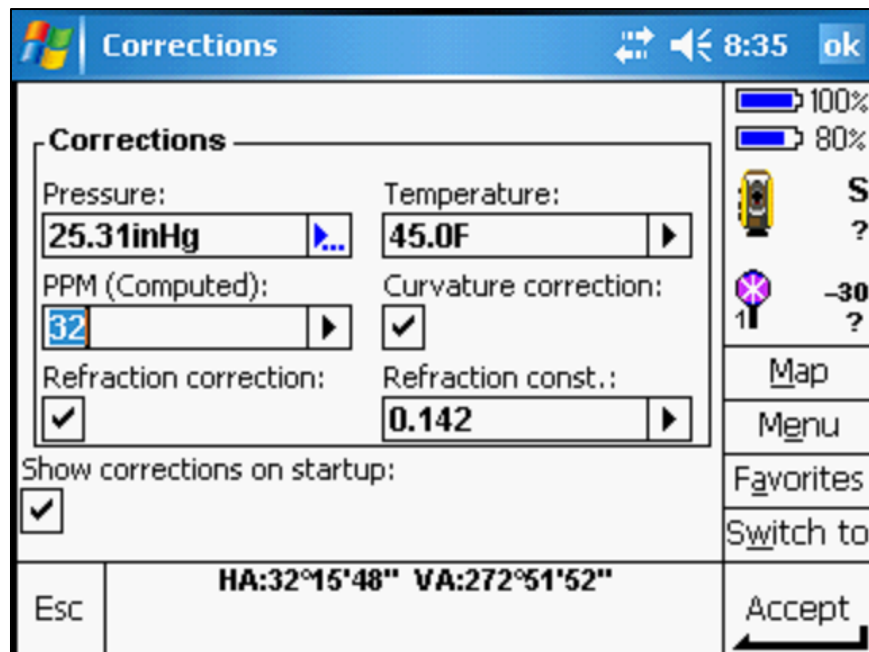

Figure 3-43. Correction settings.

1. Instrument Point

At the *Station setup* screen, enter a point name in the *Instrument point name* field. A point name can also be selected from a pre-loaded project control file. Tap the arrow next to the *Instrument point name* field and select *List* (see Figure 3-45).
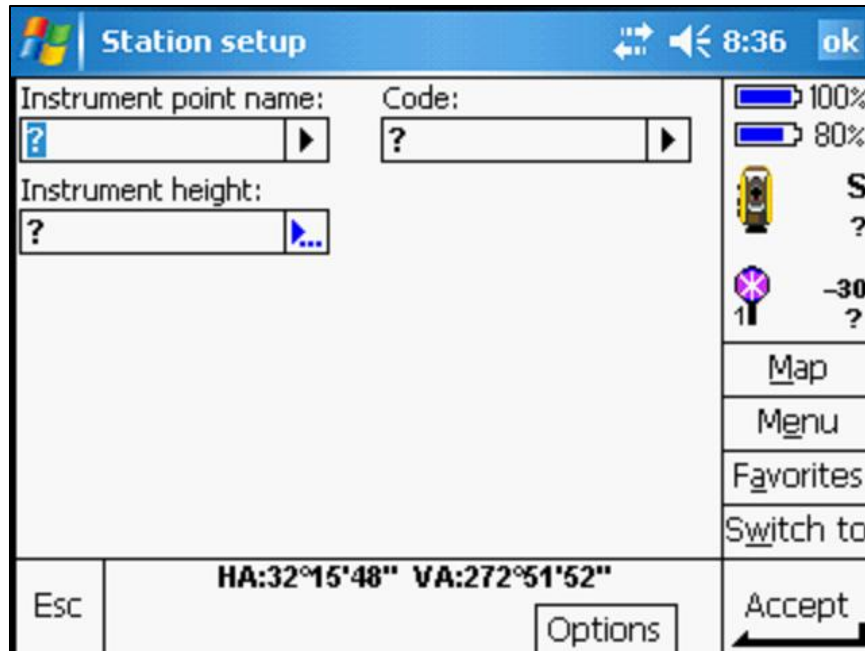

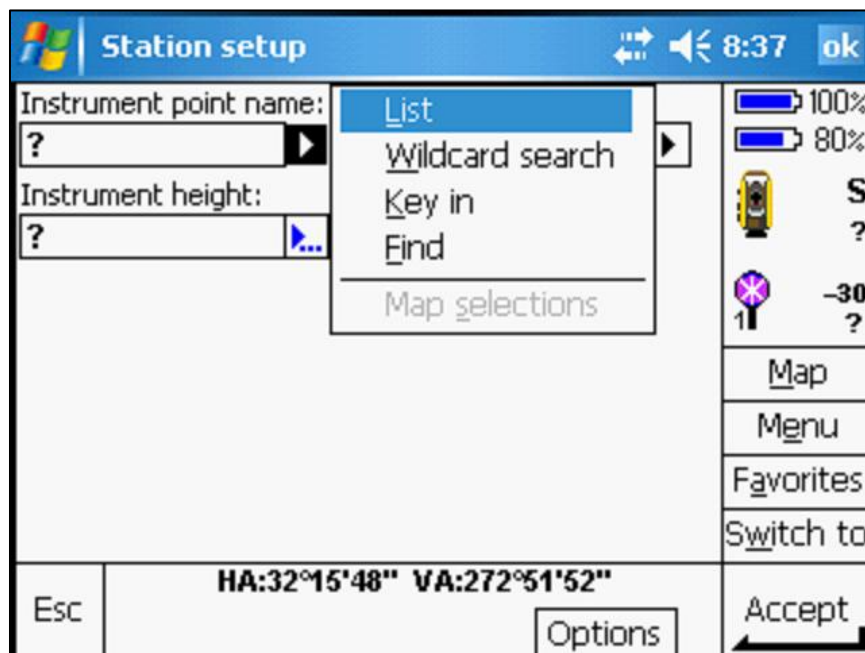*Figure 3-44. Instrument point name.*

Figure 3-45. Select List.

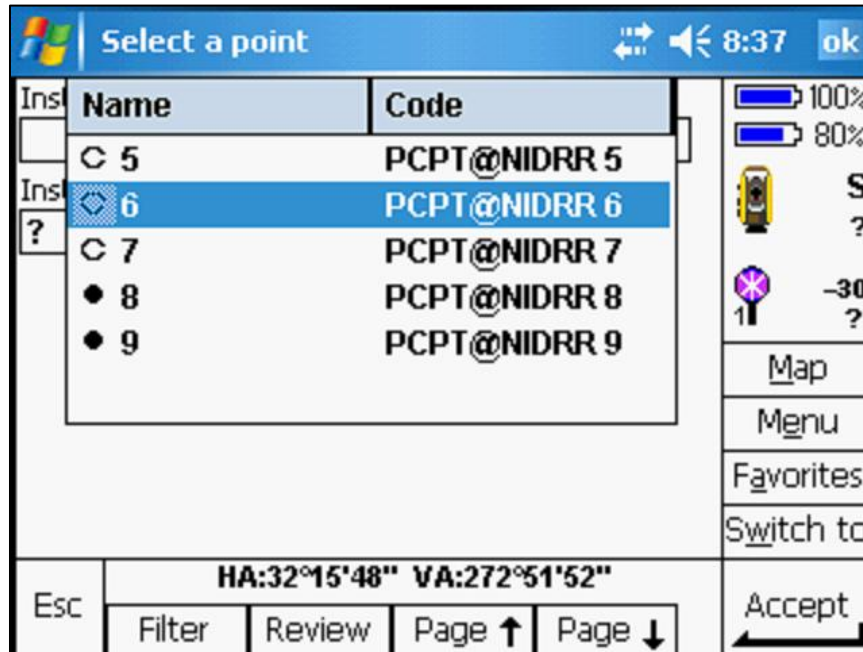Highlight the appropriate control point from the menu and tap *Accept*.

Figure 3-46. Select an instrument point.

Enter a measured value in the *Instrument height* field, and tap *Enter*. Then tap the *Accept* button to set the values.
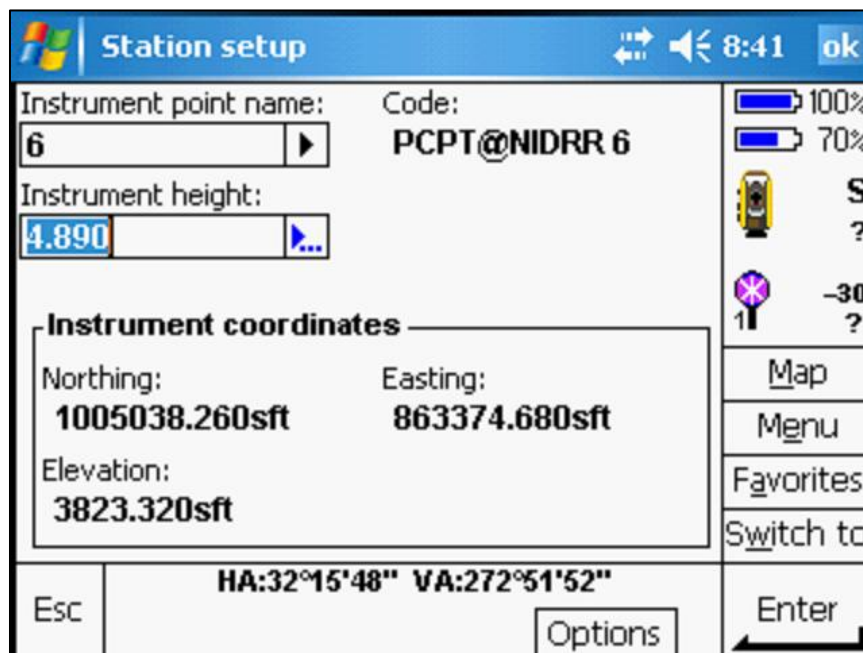

Figure 3-47. Completed instrument setup.

2. Backsight Point

After the instrument setup information has been completed, the backsight information is then entered in the *Station setup* screen.

Figure 3-48. Backsight point name.

Enter a point name in the *Backsight point name* field. A point name can also be selected from a pre-loaded project control file. Tap the arrow next to the *Backsight point name* field and select *List*. Next, enter a measured value in the *Backsight height* field and tap *Enter*. In the *Method* field (red arrow), verify that the *Averaged observations* option is selected.

Figure 3-49. Backsight settings.

Tap on the target icon as indicated by the red arrow to select a backsight target.
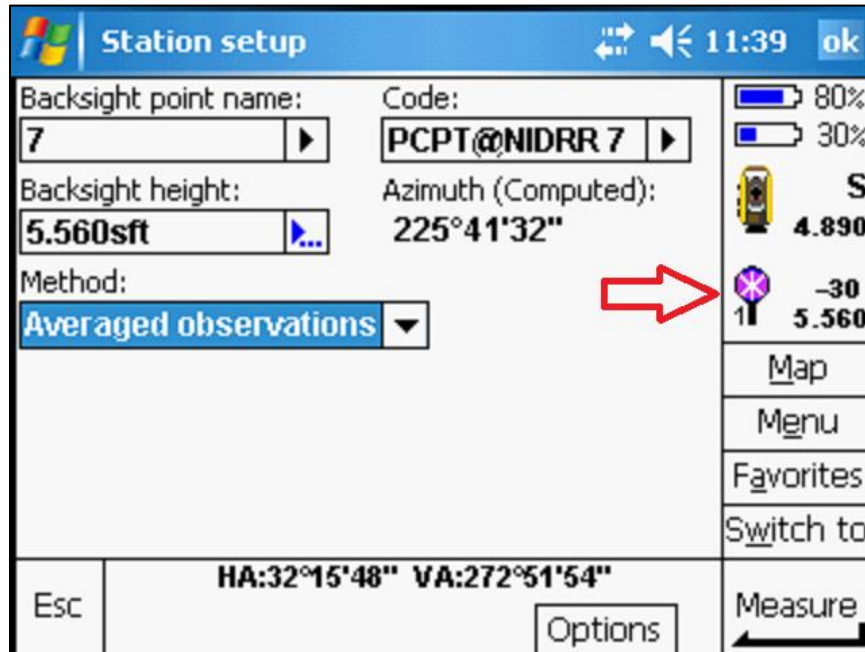

Figure 3-50. Target icon.

Use the stylus to highlight and select the appropriate target, height, and prism offset.
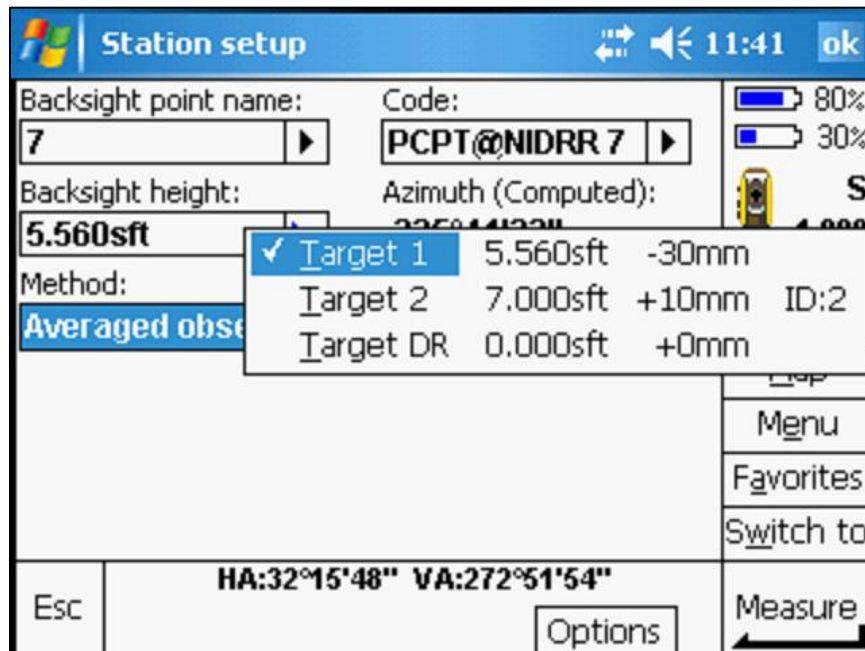

Figure 3-51. Target selection list.

Once the station setup procedure has been completed, carefully align the optical cross hairs on the backsight target. Next, tap on the *Measure* button as indicated by the red oval.
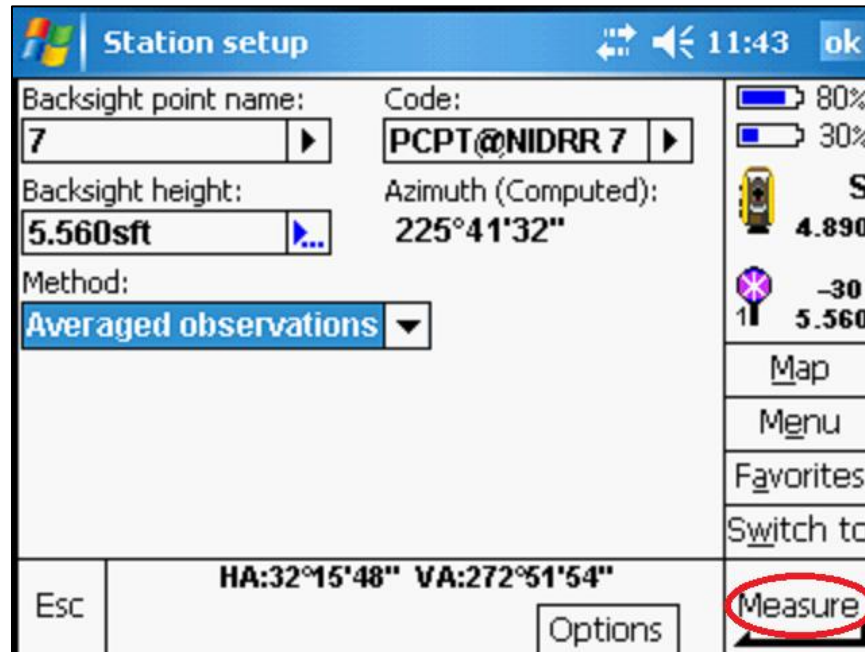

Figure 3-52. Completed backsight setup.

G. Review the Measurement Data

Store the backsight measurement if it is within the tolerance limits set during the survey style configuration. See Figures 3-23 and 3-24 on page 3-14 to review the *Duplicate point tolerance* values. If the backsight measurement does not meet the tolerance limits, several components of the setup must be checked. These are:

- The stability of the instrument setup.

- The stability of the backsight setup.

- The correct point number for the instrument.

- The correct point number for the backsight.

- The correct coordinates for the instrument setup in the pre-loaded control file.

- The correct coordinates for the backsight setup in the pre-loaded control file.

- The backsight prism offset is correct.

- The height of the instrument is measured and entered correctly.

- The height of the backsight is measured and entered correctly.

- The control monuments used for the instrument and backsight setups have not been disturbed.

- Units set correctly (U.S. Survey Feet).

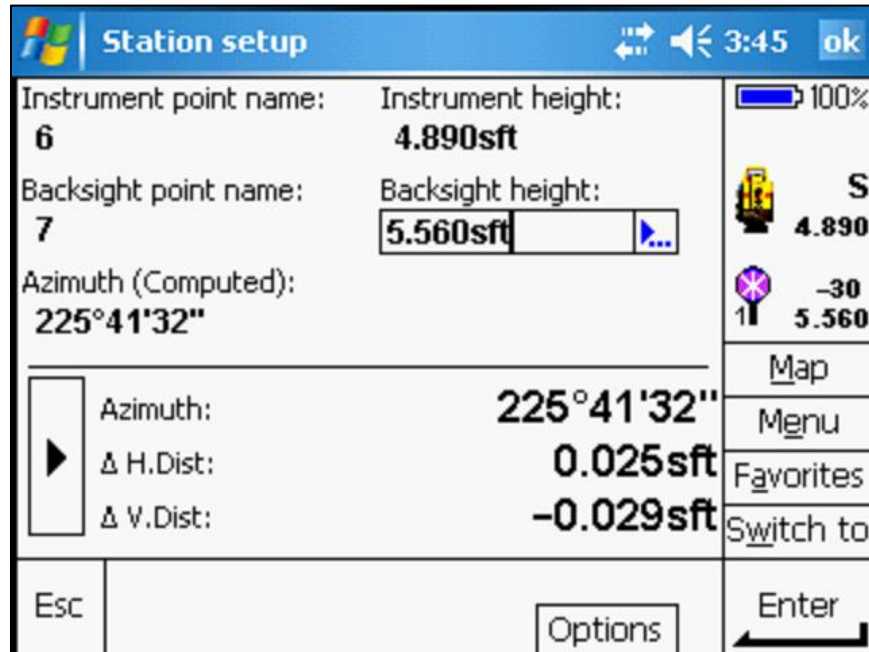The *Station setup* screen after the backsight measurement has been taken.

Figure 3-53. Backsight measurement.

Tap the right arrow as indicated by the red oval to review all of the backsight target measurement misclosures.
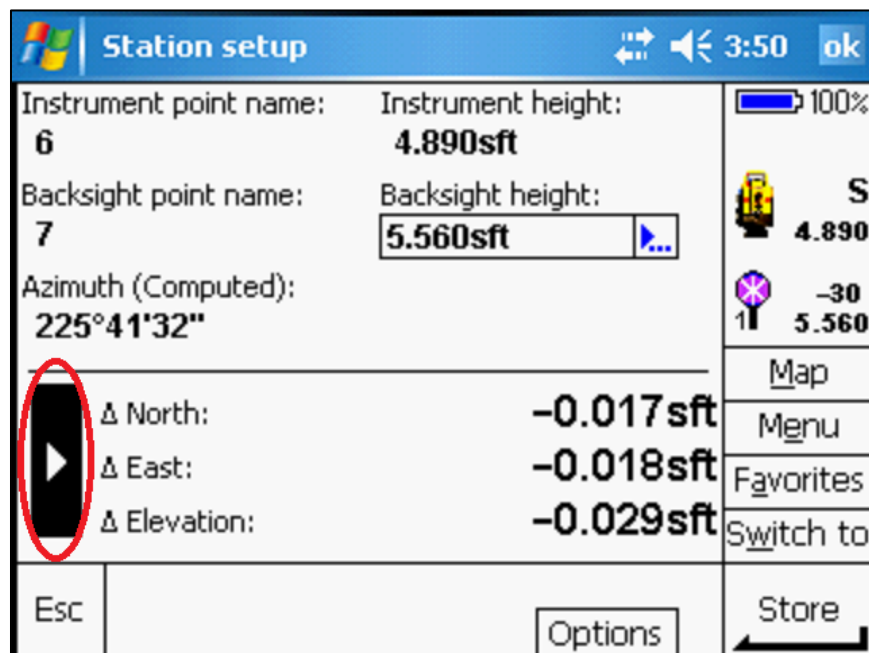

Figure 3-54. Measurement misclosures.

When the measurement parameters are within the acceptable tolerance limits, tap *Store* as indicated by the red oval to complete the instrument setup.
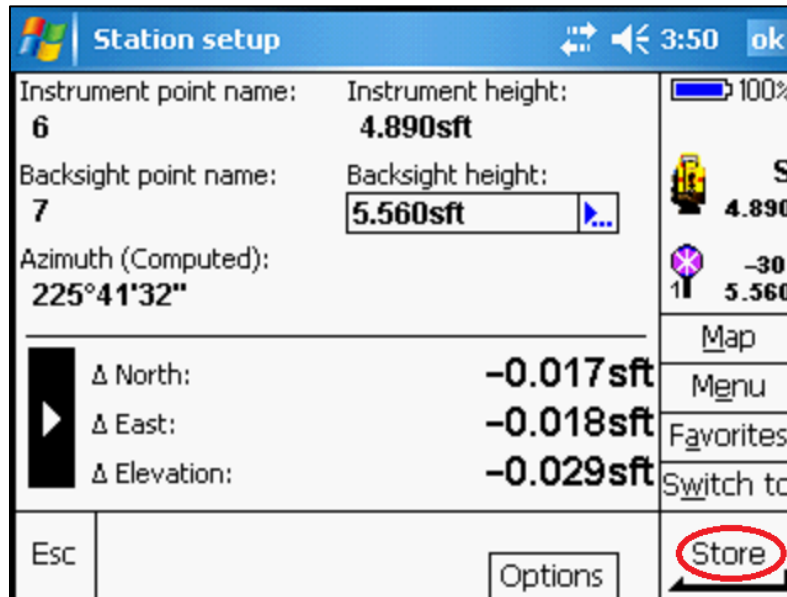

Figure 3-55. Store backsight measurement.

When this process has been completed, there is an audible message "Station setup completed". The TSC2 and total station are now ready to start a data collection or stake-out survey.

1. Error Example
The $\Delta H.Dist$ and $\Delta V.Dist$ values as indicated by the red arrows are much larger than would normally be expected. This could be an indication that the selection of the instrument point setup, backsight point setup, or both are incorrect.
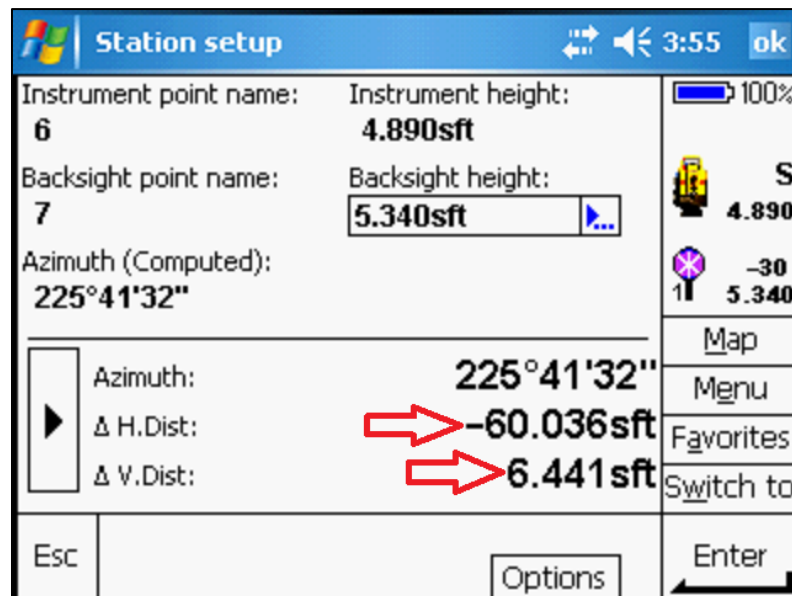

Figure 3-56. Large misclosures.

In this situation, the station setup should be abandoned. The error source must be identified and corrected with another setup before continuing with the assigned task. Check all of the components of the measurement listed on page 3-29. If a distance error persists, make a second setup attempt using another control point for the backsight. If a distance error occurs, record all questionable distances and notify the State Photogrammetry and Surveys Engineer.

2. Compensator out of tolerance
Occasionally, the instrument may get "bumped" by the operator or a sudden gust of wind. If the instrument is no longer "level", the *Electronic level* screen may be displayed (see Figure 3-57). This is an indication that the internal compensator is out of tolerance. This may also occur if a tripod is set on frozen ground and one or more of the tripod legs has settled when the ground thaws.

Reset the tripod legs or turn the leveling screws on the tribrach until the digital leveling bubbles are centered. After the instrument has been leveled, tap the *Accept* button. The operator will then need to exit out of the current survey. At the survey controller main menu, tap on the *Survey* icon and select *Station setup* (see Figure 3-42) to begin a new survey.
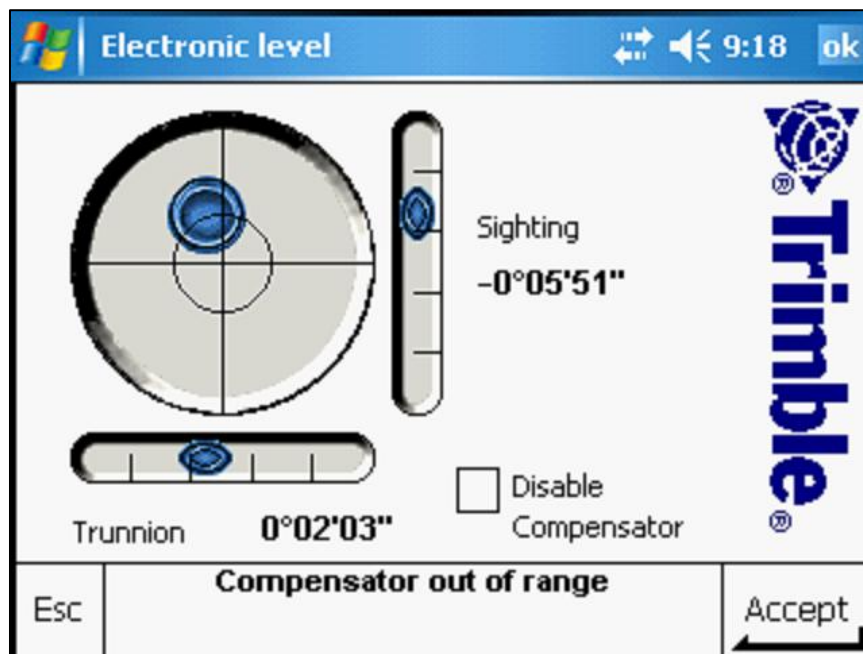

Figure 3-57. Compensator out of range.