Trimble Digital Fieldbook™

Trimble M3 Total Station

HELP

Version 7.01

Revision A

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Trimble®

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General Operations

Welcome

Welcome to the Trimble Digital Fieldbook software version 7.01 Help.

This help system makes it easy to find the information you need to effectively use the full power and capabilities of the Trimble Digital Fieldbook software.

For information that extends or updates this Help, refer to the Trimble Digital Fieldbook Getting Started Guide and Release Notes. Alternatively, visit the Trimble website (www.trimble.com) or contact your local Trimble dealer.

The Trimble Digital Fieldbook Screen

For an explanation of the buttons and icons on the Trimble Digital Fieldbook screen, see:

Status Bar

Status Line

Trimble Digital Fieldbook Buttons

Trimble M3 total station Keys

About Trimble Digital Fieldbook

Files Menu

Use this menu to view and manage jobs, and transfer data between the office computer and external devices.

For more information, see:

New job

Open job

Review current job

Point manager

Map of current job

Properties of current job

Copy Between Jobs

Windows Explorer / File Explorer

Status Bar

The status bar is located on the top right side of the Trimble Digital Fieldbook screen.

Tap the instrument icon to access Trimble functions, or tap the target icon to change targets or target details.

The following table describes the status bar icons.

Icon	What it shows
	Controller is connected to and drawing power from an external supply.
100% or 50%	Power level is 100% or 50%. The upper battery icon refers to the state of the left hand battery and the lower battery icon to the state of the right hand battery.
1.254	The instrument is in use. If a station setup is completed, the instrument height is shown to the right of the icon.
	The instrument is being used to measure a point.
F	The instrument in Fast Standard (FSTD) mode averages the angles while a fast standard measurement is taken.
S	The instrument in Standard (STD) mode averages the angles while a standard distance measurement is taken.
T	The instrument in Tracking (TRK) mode constantly measures distances and updates in the status line. (TRK is commonly used in stakeout).
	The laser pointer is on.
+0 1.500	The height of a conventional target is shown to the right of the icon. "1" indicates that target 1 is in use.
DR +0 T 0.000	The target icon changes to a DR icon to show that the instrument is in Direct Reflex mode.

Status Line

The status line is displayed on the bottom of the screen. It displays a message when an event or action occurs, and when the Trimble Digital Fieldbook software cannot start or continue with its present function.

Customizing the Startup Screen

You can customize the Trimble Digital Fieldbook software startup screen to display an image of your choice.

1. Create your image 320 pixels wide x 240 pixels high, in the bitmap file format (*.bmp).
2. Save the file with the name [Startup_image.bmp], to the folder: [\Program Files\Digital Fieldbook].

When the Trimble Digital Fieldbook software detects the file [Startup_image.bmp], it uses this file as the startup image, instead of the standard Trimble startup image.

Trimble M3 total station Keys

The following table describes the Trimble Digital Fieldbook functions that are associated with the Trimble M3 total station keys.

tap...	to...
	change between 123, ABC, and abc keyboard entry modes
	modify the action of the other key that you tap in conjunction
	access the *Trimble functions* screen

Trimble M3 total station Face 2 Keys

When taking measurements, the face 2 display shows the same measurement information as the view display button on the *Measure topo* and *Station setup* screens on face 1. This is typically horizontal angle, vertical angle and, after a measurement, the slope distance.

To scroll through the different views, press . Information such as current measurement status appears in the face 2 status line at the bottom of the display.

To take a measurement, press . acts in the same manner as the Enter key on the face 1 keyboard so you can use it to start a measurement.

When a duplicate observation is encountered the face 2 display shows delta Horizontal angle, delta horizontal distance and delta vertical distance.

Note - Before you store the point, confirm the *Store as* action in the face 1 display.

The first button on the face 2 screen controls the backlight and contrast settings.

To change the backlight:

1. Press .
2. Press to switch the backlight on and off.

3. Press to close the backlight control.

To change the contrast:

1. Press .
2. Press to select the contrast icon.
3. Press to display the contrast slider control.
4. Press to increase the contrast, and press to decrease the contrast.
5. Press to close the contrast control.

Controller Keyboard Functions

The controller provides several additional keyboard functions that you can access through the operating system.

- Numeric and Alphanumeric modes
- Input panel
- Transcriber
- Keyboard properties (Repeat, Sticky Ctrl, Key preview, Backlight)

Numeric and Alphanumeric modes

Press the alpha key ( ) to switch between numeric and alphanumeric modes. The current mode appears on the Windows taskbar and on the top right of the Trimble Digital Fieldbook screen.

On the instrument, when you press the alpha key, the controller scrolls through 123 - ABC - abc.

The Trimble Digital Fieldbook software automatically sets the mode to numeric for numeric fields. For fields that can be either alpha or numeric, the software inspects the field and then does one of the following.

If the fields contains the following character type...	the software sets the field to...
alpha	alpha
numeric	numeric
alpha and numeric	match the last character in the field

Input panel

The input panel looks and functions like a PC keyboard. Use it as an alternative to the controller keyboard for entering characters.

To access the input panel through the taskbar icon ( ):

- Tap the icon and then select the keyboard to display.
  To close, tap the icon again and then select [Hide Input Panel].

To open or close the input panel through a keyboard shortcut:

- Press and hold **Ctrl** and then press **7.**

Transcriber

Transcriber recognizes characters that you write on the controller screen with the stylus.

To enable the transcriber:

Tap [Start / Programs / Accessories / Transcriber].

The Transcriber Input Panel appears on screen and the taskbar icon changes to .

To stop using Transcriber, tap the icon on the task bar and select [Hide Input Panel].

Note - When Transcriber is enabled, you need to tap and briefly hold screen buttons or icons to activate them. There is a slight delay while Transcriber determines if you are using the stylus to write with.

Keyboard properties

To set the following:

- Tap [Start / Settings / Control panel / Keyboard].

Repeat

Repeat delay sets the time from when you first press a key to when the character starts repeating. Repeat rate sets the speed at which the character repeats.

Sticky Ctrl

Use this to access a hotkey sequence without having to press and hold the **Ctrl** key while you press the hotkey.

If Sticky Ctrl is enabled, when you press the Ctrl key, it 'sticks' until you press it again. For example, use Sticky Ctrl to copy text **(Ctrl+C)** and paste text **(Ctrl+V)** .

- Sticky Ctrl enabled: Press **Ctrl,** and then press **8** three time (C). Press **Ctrl** and then press **2** three times (V).
- Sticky Ctrl disabled: Press and hold **Ctrl** while you press **8** three times (C). Press and hold **Ctrl** while you press **2** three times (V).

Key preview

When the controller is in alpha mode, a popup window shows the active character. For example, if you press **8** four times, the key preview shows, in succession, a, b, c, 8.

Note - You do not need to wait for the previewed character to be accepted before you press another key, for example **Enter** or another character. When you press another key, the controller accepts the character that is currently in the preview window. This function enables you to enter characters faster.

Alternatively, shorten the key preview to speed up alpha character entry.

Backlight

- Tap [Start / Settings / Display / Backlight] to configure the backlight settings.

Trimble Digital Fieldbook Buttons

Enter Measure	Tapping the *Enter* button on the controller is the same as tapping the **Enter** key on the controller keypad. The actions of the *Enter* button depend on the current screen. In some screens, the caption on the button changes to describe the action for the screen. For example, the *Enter* button changes to the *Measure* button when you are in the *Measure points* screen.
Map	Tap *Map* to display a map of the current job.
Favorites	Tap *Favorites* to access a list of commonly used screens. See the *Favorites* menu below.
Switch to...	Tap this button to switch between active windows (screens).

Note - The up arrow softkey appears if there are more than four softkeys associated with a screen. Tap the arrow or press the **Shift** key to see the other softkeys.

Tip - To highlight a field without selecting it, tap and hold briefly with the stylus.

Favorites menu

The *Favorites* menu provides quick access to commonly used screens and to various commands. Access a screen or command from the *Favorites* list, or use the *Switch to* button to access previously viewed screens.

To access a screen or command from the *Favorites* list, tap the *Favorites* button and then select the screen you want.

To add a screen to the Favorites list, view it and select *Favorites / Add to favorites.*

To add a command to the Favorites list:

1. Tap *Favorites / Customize / Add a command to Favorites menu.*
2. Tap the command you want to add.

To remove a command or form:

1. Tap *Favorites / Customize / Remove command from Favorites menu.*
2. Tap the item you want to remove.

Softkeys

Softkeys are displayed on the bottom line of the Trimble Digital Fieldbook screen as on-screen buttons. They relate to particular screens and change when the screens change.

To access the softkeys using the keyboard:

- Press **Ctrl** and then **1, 2, 3,** or **4** for softkeys *F1, F2, F3,* or *F4* respectively. To display the second row of softkeys, press **Ctrl** and then **5.**

Entering Quadrant Bearings

1. Make sure the system units are quadrant bearings.
   For more information, see System Units.
2. Enter the bearing in any *Bearing* field.
3. Select NE, NW, SE, or SW from the popup list.
   The quadrant bearing is inserted in the field.

Example

To enter the quadrant bearing N25° 30' 30"E in a bearing field:

- Key in **25.3030 .**
- Select NE from the popup list.

Calculator

To perform a calculation from within a dialog field:

1. Select Calculator from the pop-up menu.
2. Enter the numbers and functions.
3. Tap = to calculate the result.
4. Tap Accept to return the result to the field.

To use the calculator at any time, select Cogo / Calculator from the main Trimble Digital Fieldbook menu.

Tap ☑ (Options) to set the angle method, calculator mode (Reverse Polish Notation (RPN) or Standard), and decimal place display.

The calculator functions are shown below.

Calculator symbol	Function

+	Add
−	Subtract
X	Multiply
÷	Divide
+/−	Change sign of number being entered
=	Equals
π	Pi
↵	Enter
▼	Show all values on the stack
⇦	Back space
☑	Options
Y^X	Raise Y to the power of X
X^2	Square
$\sqrt{X}$	Square root
10^X	Raise 10 to the power of X
E±	Enter exponent or change exponent sign
$1/X$	Reciprocal
X$Y	Swap X with Y
SIN	Sine
SIN^{-1}	Arc Sin
COS	Cosine
COS^{-1}	Arc Cosine
TAN	Tangent
TAN^{-1}	Arc Tangent
LOG	Log base 10
SHIFT	Switch SHIFT state
(	Open parenthesis
)	Close parenthesis
C	Clear all
CE	Clear entry
Mem	Memory functions
P>R	Polar to rectangular coordinate conversion

R>P	Rectangular to polar coordinate conversion
R↓	Rotate stack down
R↑	Rotate stack up
° ' "	Insert degrees, minutes, or seconds separator
DMS-	Subtract angles of the form DD.MMSSsss
DMS+	Add angles of the form DD.MMSSsss
>D.dd	Convert from DD°MM'SS.sss or DD.MMSSsss to angle units
>DMS	Convert from current angle units to DD°MM'SS.sss

When accessing the calculator with the pop-up arrow, if the numeric field already contained a number that number is automatically pasted into the calculator. At the end of the calculator operations the last solution is pasted back into the numeric field when *Accept* is selected.

Time/Date

To set the time and date on the instrument:

1. Press **Ctrl, Esc** to present the Start Menu and taskbar then double-tap the clock on the right of the taskbar.
2. Change the date and time as required. Press **Enter** to accept the new settings or **Esc** to cancel.

A time stamp is stored with every record in the job and output to the DC file every 30 minutes.

Sound Events

Sound events are prerecorded messages that notify you of an event or action that has occurred. They correspond with status line messages, and common error and warning messages.

Sound events are stored as .wav files. You can customize your own sound events by replacing or deleting the existing .wav files located in the [Program Files\Digital Fieldbook\Languages\English\] folder.

To turn all sound events on or off:

1. From the main menu, select *Configuration / Controller / Sound events.*
2. Select the *Play sound events* check box to turn on sound events, or clear it to turn them off.

Language

To change the language of the Trimble Digital Fieldbook software:

1. Use the Trimble Data Transfer utility to transfer a language file to the controller.
2. From the main menu of the Trimble Digital Fieldbook software, select *Configuration / Controller / Language.*
3. Choose the required language from the list.
4. Restart the Trimble Digital Fieldbook software.

Windows Explorer / File Explorer

Use Microsoft Windows CE Explorer to view and manage files stored on the instrument.

To start Windows Explorer, tap [Start / Programs / Windows Explorer].

For more information, refer to the Windows Help provided on the controller.

Deleting files

Use *Files / Open job* to copy and delete job files.

Use Microsoft Explorer to delete all other file types.

Warning - Files deleted in Explorer cannot be recovered.

Trimble Controller - General Operation

Use the links below to find out how to operate the controller:

Calibrate the Touch Screen

Disable the Touch Screen

Use the keyboard to run programs

Perform a Hard Reset (Cold boot) on Instrument

File Storage on Instrument

Change the speaker volume

Calibrate the Touch Screen

Open the Control Panel (**Ctrl, Esc, [Settings / Control Panel]**) then select the [Stylus] icon. In the [Stylus Properties] dialog select the [Calibration] >tab. Tap [Recalibrate] and follow the prompts, using the stylus to tap the target as it moves from the center of the screen, to each corner. If the calibration is successful, you are prompted to press **Enter** to accept the new settings. If the calibration was not successful, the target returns to the center of the screen and the process must be repeated.

Disable the Touch Screen

To disable the touch screen, press [Ctrl]+ key.
This disables the screen, but not the keypad. The touch screen will remain disabled until [Ctrl]+ key is pressed again or the instrument is reset.

Use the keypad to run programs

To do this...	**Use this keyboard shortcut...**
Move between fields	Up and down **Arrow** keys
Move between buttons	**Arrow** keys
Click a check box	**Space** Key
Select a radio button	**Space** key

Use the keyboard to run programs, as follows :

- To run a program from the desktop:

  Use the arrow keys to navigate to the icon for the program that you want to run. Press **Enter** to run the program.

- To run a program from the [Start] menu:

  Press **Ctrl** then **Esc** to display the [Start] menu, then use the arrow keys to select [Programs]. Press **Enter** to display a list of programs, then use the arrow keys to select the program that you want to run. Press **Enter** to run the program.

Perform a Hard Reset (Cold boot) on Instrument

After a hard reset, the operating system is reloaded into RAM from the Flash memory. Some software programs may also store shortcuts or database information in RAM; this is erased during a hard reset.

Press the power button and tap the Options button on the *Power Key!* dialog presented. Tap the Reset button on the *Power Option* dialog then tap Yes on the *Restart* dialog to carry out the reset. This will shut down the instrument and then automatically restart it. You can also tap the Shutdown button on the *Power Option* dialog and then confirm the shutdown. The instrument will then do a full restart when the power button is pressed. Removing both batteries also results in an instrument shutdown and a full restart when the batteries are replaced and the instrument is switched on.

File Storage on Instrument

The RAM storage in the instrument is volatile and is shared between Storage memory and Program memory.

- Storage memory is required for such things as the Operating System, and installing programs.

- Program memory is required to run programs. When Program memory is low, programs may run slowly, become unresponsive, or even crash.

Flash memory is permanent, so data is not lost if the instrument loses power or after a hard reset. However, as with a computer hard disk, this storage may occasionally fail.

- On the instrument, folders and files that appear in Explorer are those from Flash storage.

Change the speaker volume

Open the Windows CE Control Panel (**Ctrl** , **Esc** , **S** , **C**) then select the Volume and Sounds icon. Use the slider to increase or decrease the volume. You can also use this dialog to turn on or off individual sounds, such as tapping the screen.

Power Indicators

The remaining battery power is displayed as a battery symbol in the status bar.

The symbol on the top represents the power remaining in the left hand battery on the instrument and the lower battery symbol represents the power remaining in the instrument's right hand battery.

The level of shading in the symbol reduces as the power reduces.

Instrument Standby Mode

When you press the power key on the instrument to switch it off you get the option to place the instrument in stand-by mode. Stand-by mode shuts down the instrument but provides enough power to retain all settings and allow you to resume working from the same place in the software that you were before entering stand-by mode.

If you remove both batteries from the instrument, or they run completely flat, after replacing the batteries and switching on the instrument, the Microsoft Windows operating system will boot up and the Trimble Digital Fieldbook software will start up automatically.

Registration

Please remember to register your Trimble Digital Fieldbook software by selecting the Register Software option on the CD. Registration gives you access to:

- News about software updates and specials
- New product information

Registration gives Trimble information that is used to develop the product and improve customer support.

Legal Notices

About

To access the *About* dialog, tap *Configuration / About Trimble Digital Fieldbook.*

The dialog contains the program version number, serial number, authorization key, software warranty expiry date, copyright, and patent information for the Trimble Digital Fieldbook software.

Tap *Upgrade* to install a new option key for upgrading the software options.

Troubleshooting

No coordinates in Review
Check the *Coordinate view* setting. Tap *Options* to change the coordinate view.

To see grid coordinates in review, this setting must be grid. Also, to display grid coordinates, a projection and datum transformation must be defined.

In conventional surveys, check that the instrument and/or backsight point has been coordinated.

In conventional surveys, an observation is displayed with null coordinates until the observation to the backsight is stored.

No grid coordinates
Check that a projection and datum transformation have been defined. Also check that the *Coordinate view* setting is Grid. To do this, select *Files / Properties of current job* / *Units.*

Job Repair Wizard

The Job repair wizard runs when Trimble Digital Fieldbook detects damage in the job file. You can cancel the wizard at any point or go back to any previous step.

The wizard retrieves job data up to the point of the damage, discards anything beyond this point, and informs you of the time and date of the last good item in the job.

As a safety measure, the wizard can make a copy of the job before anything is discarded. Before proceeding with the copy, check that the file system has enough space for a copy of the entire job.

Once the repair is completed, use *Files / Review current job* to check what (if anything) has been discarded from the end of the job. Because the job is stored in chronological order, anything discarded is timed later than the last good record reported by the wizard.

Be aware that discarded data may include changes made to the job such as deletions (the item may no longer be deleted), changes to target heights, coordinate systems, and new items such as points, observations, and lines.

Damage to Job files may be caused by a hardware problem, a failure to properly shut down the Trimble Digital Fieldbook program, or an unexpected power failure due to a flat battery. When the Job wizard reports a problem, review the controller' s operating procedure, and/or check the hardware. If you repeatedly experience corruption problems, there may be a fault in your controller hardware. For more information, contact your local Trimble dealer.

Job Operations

Job

A job can contain several different surveys. Select a job before you measure any points or make any calculations.

Jobs can be saved in the [Trimble data] folder, or in the project folders below [Trimble data].

To create a new job:

1. From the main menu, select *Files / New job.*
2. Enter a name for the new job.
3. Tap ... to create a new folder or select an existing folder.
4. Tap the *Coord. sys.* button and choose a coordinate system for the job. Tap *Next.*
5. Configure the coordinate system settings required for the job and tap *Store.*
6. Tap the *Units* button to specify the units and various other settings for the job. Tap *Accept.*
7. Tap the *Linked files* button to select a linked file(s) for the job. Tap *Accept.*
8. Tap the *Active map* button to select an active map file(s) for the job. Tap *Accept.*
9. Tap the *Feature library* button to associate a feature library with the job. Tap *Accept.*
10. Tap the *Cogo settings* button to set the cogo settings for the job. Tap *Accept.*
11. Optionally, tap the *Page down* button to enter *Reference*, *Description* and *Operator* details, and any *Notes.*
12. Tap *Accept* to save the job.

To open a job:

1. From the main menu, select *Files / Open job.*
2. Tap ⊞ to expand a folder and display the files within the folder.
3. Tap the job name, or highlight the job name and tap *OK.*
   The job name appears in the title area of the main menu.

To delete a job:

1. From the main menu, select *Files / Open job.*
2. Tap ⊞ to expand a folder and display the files within the folder.

   If the job you want to delete is not highlighted, use the arrow keys to highlight it, or tap and hold it with the stylus.

   Note - If you tap with the stylus without holding, the job that you highlight opens automatically.

3. Tap ✕ to delete the file.
4. Tap *Yes* to confirm deletion, or *No* to cancel.

Tip - You can also use [Ctrl + Del] to delete jobs from the *Select job* screen.

To copy a job:

1. From the main menu, select *Files / Open job.*
2. Highlight the name of the job to be copied and tap .
3. Browse and highlight the folder to paste the file into and tap .

Tip - You can also use *Windows/File Explorer* to copy, rename, or delete a file.

To create a new job with all the defaults (including Coordinate System settings) from another job:

1. From the main menu, select *Files / Open job.*
2. Tap ... to select the folder, if required.
3. Select and open the job that contains the settings to use as the defaults for the new job.

   Note - To use the settings in the **current** job as defaults for the new job, omit steps 1 and 2. New jobs always use the settings from the previous job as defaults.

4. From the main menu, select *Files / New job.*
5. Enter a name for the new job.
6. Tap the appropriate button to change job settings as required.
7. To save the job, tap *Accept.*

File management and Project folders

The [Trimble data] folder is treated as the system folder and contains all the 'system' type files. If you do not use project folders, the [Trimble data] folder will also contain all your project files, and in this case can also be referred to as the project folder.

When you create files using *Export fixed format files* or *Export custom format files*, you can save the new format files to an existing folder on the controller, or create a new one. The default folder is the [Export] folder below the current project folder. If you change the project folder, the system creates an export folder under the new project folder, and gives it the same name as the previous export folder.
Tap ... to select an existing folder or create a new one.

The following table shows the file extension on the office computer, the file extension on the controller (which changes if the file is converted during transfer), the file description, and the location the file is saved to if you use project folders.

Computer file extension	Controller file extension	Description	Resides in [Trimble data]	Resides in Project folder
.dc	.job	Trimble Digital Fieldbook job files	-	*
.csv	.csv	Comma Delimited (CSV) files	-	* 1
.txt	.txt	Comma Delimited (TXT) files	-	* 1

.fcl	.fal	Feature and Attribute Library files (TGO)	*	-
.fxl	.fxl	Feature and Attribute Library files (TBC)	*	-
.ddf	.fal	Data Dictionary files	*	-
.ggf	.ggf	Geoid Grid files	*	-
.cdg	.cdg	Combined Datum Grid files	*	-
.pjg	.pjg	Projection grid files	*	-
.sgf	.sgf	Shift grid files	*	-
.pgf	.pgf	UK National Grid files	*	-
.dxf	.dxf	Map files	-	* 1
.shp	.shp	ESRI map Shapefiles	-	*
.lng	.lng	Language files	- 2	- 2
.wav	.wav	Sound files	- 2	- 2
.jxl	.jxl	JobXML files	-	* 1
.ixl	.ixl	Custom ASCII Import file definitions	*	-
.xsl	.xsl	XSLT Custom ASCII Export Stylesheet files	* 3	-
.sss	.sss	XLST Custom Stakeout Stylesheet files	* 3	-
.rxl	.rxl	Alignment files	-	*
.csd .csw	.csd	Coordinate System Database files	*	-

Notes

1. .csv, .txt and JobXML files that are transferred to the controller should be transferred to the Project folder.
   Files that are exported on the controller are stored in the Export folder below the project folder. To link an exported .csv file, copy the file into the project folder using Explorer.
2. Language files (.lng) and Sound files (.wav) are stored in the appropriate language folder.
3. Stakeout stylesheet files (.sss) and Custom Export stylesheet files (.xsl) can be located in both the language folder or [Trimble data]. Translated Stakeout stylesheet files and translated Custom Export stylesheet files are typically stored in the appropriate language folder.
4. To create new project folders or move files from one folder to another, use the Trimble Digital Fieldbook software or Windows Explorer.

Properties of Current Job

Use this menu to configure settings for the current job.

For more information, see:

Coordinate system

Units

Linked files

Active map files

Feature library

Cogo settings

Descriptions

Each button displays the current settings. When you create a new job, settings from the previous job are used as the defaults. Tap a button to change the settings.

Tap *Accept* to save any changes.

Review Current Job

To see the records stored in the job database:

1. From the main menu, select *Files / Review current job.*
2. Use the arrow keys, stylus, or softkeys to navigate the database.

   Tip - To move to the end of the database quickly, highlight the first record and press the up arrow key.

   Tip - To highlight a field without selecting it, tap and hold briefly with the stylus.

3. To see more information about an item, tap the record. Certain fields, for example, *Code* and *Target height,* can be edited.

   Note - When you change a target height record in the database, stakeout deltas, Cogo points, averaged points, resections, and traverse results are not automatically updated. Re-observe staked out points, and re-calculate Cogo points, averaged points, calibrations, resections, and traverses.

   To search for a particular item, tap *Search* and select an option.

   Tip - To review features from the *Map of current job* screen, select the required feature(s), tap and hold on the screen and choose *Review* from the shortcut menu.

To change the coordinate view display in *Review current job:*

1. From the main menu, select *Files / Review current job.*
2. Use the arrow keys, stylus, or softkeys to navigate the database.
3. Do one of the following:
   - Tap + to expand the point tree list.

     To change the coordinate display, tap one of the ordinates and then select the appropriate coordinate view from the list.

- Tap the point name to view details about the point.
  To change the ordinate display:
  a. Tap *Options* and then select the appropriate *Coordinate view* from the list;
     As Stored, WGS84, Local, Grid, ECEF (WGS84), Station and offset, Az VA SD, HA VA SD (raw), Az HD VD, HA HD VD, delta Grid.

     If you selected *Station and offset*, select the entity type (Line, Arc or Alignment) and the name of the entity the points position will be referenced from.

  b. Tap *Accept.*

Inserting notes

To store a note in the database:

1. Highlight a record.

   Tip - To highlight a field without selecting it, tap and hold briefly with the stylus.

2. Tap *Note.* The *Note* screen that appears displays the date and time that the current record was created.
3. Enter the note and then tap *Accept.* The note is stored with the current record. In *Review current job*, the note appears below the record with the note icon.

Editing target records using Review current job

Select *Review current job* to edit existing target height records. These edits change the target height for all observations using that target height.

To edit a target record:

1. Tap the target record. The current target details appear.
2. Enter the new details and then tap *Accept.*

   The current record is updated with the new details, which apply to all subsequent observations using that record.

   A note with a timestamp is attached to the record. This note documents the old details, including when the changes were made.

Editing target records using Point manager

Use Point manager to easily change the target height of a single observation or any number of observations.

Editing codes using Review current job

If you have only a single code to edit, you can use *Review current job.*

To edit a code:

1. From the main menu, select *Files / Review current job.*
2. Tap the observation record that contains the code you want to edit.
3. Change the code and then tap *Accept* to store the changes.

The Note stored with the observation is a record of the old code and the date and time it was modified.

Editing codes using Point Manager

You can use *Point manager* to edit single or multiple codes.
When you edit multiple codes, the *Point manager* is easier to use than *Review current job.*

For more information, see Point manager.

Editing point names and point coordinates using Point Manager

You can use *Point manager* to edit point names or point coordinates.
You cannot edit point names and point coordinates using *Review current job.*

Deleted points, lines, and arcs

A deleted point, line, or arc is not used in calculations, but it is still in the database. Deleting points, lines, or arcs does not make a job file smaller.

When you transfer a file that contains deleted points, the deleted points are not transferred to the office software. If you transfer a file using the Trimble Data Transfer utility, however, the deleted points are recorded in the Data Collector (.dc) file. They have a classification of Deleted.

Some points, such as some computed intersection and offset points, are stored as vectors from a source point. If you delete a source point, any point stored as a vector from that point has null (?) coordinates when you review the database point record.

To delete a point, line, or arc in the Trimble Digital Fieldbook database:

1. From the main menu, select *Files /Review current job.*
2. Highlight the point, line, or arc to be deleted and tap *Details.*
3. Tap *Delete.* For points, the search class changes to Deleted (normal), Deleted (control), Deleted (staked), Deleted (backsight), or Deleted (check), depending on the original search classification.
4. Tap *Accept.* The Trimble Digital Fieldbook software records a note with the original point, line, or arc record, showing the time it was deleted.

When you delete a point, line, or arc, the point symbol changes. For example, for a topo point, the ⊘ symbol replaces the × symbol.

When you delete an observation that has been recorded during a Station setup plus, a Resection, or Measure rounds operation, the mean turned angle records and station or round residuals records will not be updated. Deleting an observation that has been used to compute an average does not automatically update the average. Use *COGO / Compute average* to recompute the average.

Tip - To delete features from the *Map of current job* screen, select the required feature(s), tap and hold on the screen and choose *Delete* from the shortcut menu. Select the feature(s) to delete and then tap *Enter*.
You cannot delete points from a linked file.

Use Explorer to delete alignment files, map files, or any other file type stored on the controller.

Note - You cannot delete points, lines or arcs from a linked map file (for example, a DXF or SHP file).

To restore a point, line, or arc in the Trimble Digital Fieldbook database:

1. From the main menu select *Files/Review current job.*
2. Tap the point, line, or arc record to be restored.
3. Tap *Undelete.*
4. Tap *Accept.*

Point Manager

As an alternative to *Review current job*, use the *Point manager* to manage your data.

You can easily review:

- Point coordinates
- Observations
- The best point and all duplicate points
- Target heights
- Codes and notes
- Descriptions
- Notes

You can easily edit:

- Target heights (single or multiple)
- Point names
- Point coordinates
- Codes (single or multiple)
- Descriptions (single or multiple)
- Notes

Using Point manager

To open *Point manager*, select *Files / Point manager* from the main menu. The screen that appears shows a tabulated tree structure of all points and observations in the job database and linked files.

Viewing the data

When there are duplicate points of the same name, the best point always appears first. All occurrences of

points of the same name, including the best point, appear in a list below the best point.
However, when the data is in the *Target height* view, all observations in the database appear in the order that they occur in the database.

To change the view of the data, select *Display*. For example, to view coordinates, set *Display* to Grid; to view or edit target heights, set *Display* to Target height.

To sort the data, tap the column heading.
To change the width of the column, or to hide the column, tap and drag the separator between headings.
Use the scroll bars to scroll horizontally or vertically through the data.

Tip - To freeze the Point name column, tap and hold the Point name column heading. To unfreeze the column, tap and hold the heading again.

To filter the displayed information using wildcard matching, tap . The screen that appears contains *Point name*, *Code*, and *Note* fields and, if enabled, two *Description* fields.

To filter the fields appropriately, use * (for multiple characters) and ? (for a single character). The filters specified for the separate fields are processed together and only points that meet the criteria of all the filters will appear. Use * in any field that you do not want to filter. Filtering is not case sensitive.

Filter examples:

Point name	Code	Description 1	Description 2	Note	Example results
1	*	*	*	*	1, 10, 2001, 1a
1*	*	*	*	*	1, 10, 1a
1?	*	*	*	*	10, 1a
1	Fence	*	*	*	All points with a name that contains a 1 and where code = Fence
1	*Fence*	*	*	*	All points with a name that contains a 1 and a code that contains Fence
1???	*	*	*	wrong*	All points with a name that starts with 1 and is 4 characters long and a note that starts with wrong
*	Tree	Aspen	25	*	All points where code = tree and Description 1 = Aspen and Description 2 = 25

To disable the filter, tap *Reset*, or set all fields to *.

Filter settings are remembered, but are not applied if Point manger is closed. To reactivate the filter, tap ▽ and then tap *Accept.*

Note - To see a complete list of the icons and their descriptions used in the Trimble Digital Fieldbook software see the filter table.

To view more information on a point do one of the following:

- To reveal all associated points and observations, tap + to expand the point tree list. Expand the subtree to view individual point information. These records can include the point coordinates, observations or target details.
- To open the same point form as seen in *Review current job,* tap a point, or highlight a point and tap *Details.* This allows you to edit information such as the point code and attributes.

To change the format of the indented coordinates or the observations that appear when you expand the point tree, tap the coordinates or observations displayed, or highlight them and press the space key. In the list that appears, select the new data view.
This allows you to review the raw conventional observations and the Grid coordinates at the same time.

Reviewing and editing target heights

To change a target height record and update **all** observations using that target height record, edit the target height in Review current job.

To change an individual target height, or group of target heights, in *Point manager:*

1. From the main menu, select *Files / Point manager.*
2. Tap *Display* and then select *Target height.* In the screen that appears, the point name, from point, target height, code, and note are listed in the order they exist in the database.

- To change the record order, tap the appropriate column heading.
- To filter the list, tap *Filter,* select the appropriate column and then enter the filter details.

  Tip - If you enter a filter value of 2 for a point name, the system will show all points with 2 in their name, including 2, 1002, 2099, or 2day. To filter for a point name "2", select the Match whole word check box.

3. To select a target or multiple targets for editing, do one of the following:

- Tap the *Target* field.
- Use the arrow keys to highlight the record to edit and then tap *Edit.*
- To select multiple fields, press and hold *Ctrl* and then tap the required fields. Then tap *Edit.*
- To select a range of fields, tap the first required field, press and hold *Shift* and then tap the last required field. Then tap *Edit.*

4. In the *Target details* form enter the new *Target height* and/or *Prism constant.* To store the changes, tap *OK.*

Point manager now displays the corrected target details. In *Review current job*, view the inserted target records with notes that record the old target details.

Group editing Target heights

You can use the *Point manager* to edit details of target heights for multiple-selected points. This function is available when the *Display* softkey setting in the *Point manager* is set to *Target height*. Use the standard Windows selection methods of *Ctrl-click* and *Shift-click* to choose the points to apply the target height edits to.

- When you edit target heights, you can edit the measured target height value and the prism constant.
- You do not need to select contiguous target heights to edit.
- You can edit a selection of different targets. In such a case, the new target heights are applied to each of the different targets but the target numbers remain unchanged.
- Some conventional measurements use calculated (system) targets, which have a zero height and zero prism constants, for example, Dual-prism offset. You cannot edit the target heights for system targets.
- You can sort *Point manager* columns to help you find and select groups of target heights to edit. Tap the column heading to sort that column.
- When you edit points, the *Point manager* automatically inserts notes into the job database to record what was edited, the original measurement data, and the time of the edit.

Editing Point Coordinates using Point manager

You can use the *Point manager* to edit the coordinates of imported or keyed in points.

To edit the coordinates of a point:

1. From the main menu, select *Files / Point manager*.
2. To select the record to edit, tap and hold the stylus on the record.
3. Tap *Edit* and then select *Coordinates*.
4. Edit the coordinates and then tap *OK* to save the changes.

You cannot edit the coordinates of:

- raw observations
- points in linked files
- a range of records at one time

A record of the changes made are saved to the *Note* record.

Renaming point names using Point manager

You can use the *Point manager* to edit the names of points and observations.

To rename a point or observation:

1. From the main menu, select *Files / Point manager*.

2. To select the record to edit, tap and hold the stylus on the record.
3. Tap *Edit* and then select *Point names.*
4. Edit the name and then tap *OK* to save the changes.

You cannot edit the name of

- points in linked files
- an observation to the current station if a survey is running
- a backsight observation

A record of the changes made are saved to the *Note* record.

Editing point names and point coordinates in a dynamic database

The Trimble Digital Fieldbook software uses a dynamic database. If you change the name or coordinates of a record, the positions of other records that rely on that record could change or disappear.

The rest of this section describes how changes to a station setup, or backsight position can affect other positions. In addition to these record types, changes to resections, lines, arcs, compute inverse records, and others may also affect other positions For more details on specific records that may change, see the table below.

If you rename the station setup position, and another record with the same name **does not** exist, then the positions of all records that are computed from that station setup position cannot be computed, and those records will no longer be displayed in the map.

If you rename the station setup position, and another record with the same name **does** exist, then the positions of all records that are computed from that station setup position may change, as they will now be computed from the next best point with the same name.

If you edit the station setup position, then the positions of all records that are computed from that station setup position will change.

If you edit the azimuth in an a station setup with a keyed-in azimuth to the backsight, then the positions of all records that are computed from that station setup will change.

If you edit or rename the point record that is used as a backsight in a station setup with a computed azimuth to the backsight, then the positions of all records that are computed from that station setup may change.

If you select a range of records and change their name, all the selected records are renamed to the new name that you entered.

If you rename or edit the coordinates of points, all records that contain computed deltas to other points, for example as-staked, check, and backsight observations, are not updated.

In the following table, the * symbol against a record type shows the dynamic database records that may change if the name or the coordinates of the record that was used to derive their position is modified.

Record	Names	Coordinates
Rapid points	*	*
F1 Topo points (Conv.)	*	*
F2 Topo points (Conv.)	*	*
Mean turned angle	*	*
As-staked points	*	*
Check points	*	*
Construction points	*	*
Lines	*	*
Arcs	*	*
Compute inverse	*	*
Resection points	-	-
Adjusted points	-	-
Averaged points	-	-
Cogo points (computed) (see note below)	* 1	* 1
Intersection points	-	-
Alignments	-	-
Compute area	-	-

1 - Cogo points can change if the point they are computed from is modified, but it depends on how the Cogo points were stored. If they were stored as a vector, for example Az HD VD and the base point is moved, then the Cogo point will also move.

Adding or editing codes using Point manager

To enter a code or change an existing code, tap the *Code* field. Enter the code details, and the attributes, if required. Tap *Accept* to store the changes.

Group editing codes using Point Manager

You can use the *Point manager* to edit code details for more than one point at a time.

1. Use the standard Windows selection methods; press **Ctrl** or **Shift** and tap the records for which you want to change the code.
2. Tap *Edit* and then select *Codes*.
3. Enter the new code and then tap *Enter*.

   If the code has attributes, you are prompted to enter them.

The new codes are updated and displayed in the *Point manager*. A note with the old code value is stored for each modified record.

Tip - You can edit Descriptions in the same way.

Adding or editing notes using Point manager

To enter a note or change an existing note, tap the *Note* field. Enter the note details and then tap *Accept* to store the changes.

Map of Current Job

The *Map of current job* screen is a graphical representation of features from multiple sources:

- points, lines, and arcs from the current job database
- points, lines, and arcs from linked jobs and linked CSV files
- points, lines, arcs, polylines, and other map entities from map files (for example DXF and SHP files)
- alignments defined as .rxl files and stored in the current project folder

Use the following links to learn more about using the map:

- Accessing the map
- Using the map softkeys and options
    - Zoom previous and zoom default
    - Widescreen mode
    - Point type filtering
- Selecting a feature in the map
- Deselecting a feature in the map
- Tap and hold shortcut menu
    - Current job
- Autopan
- Linked files (.csv .txt .job)
    - Transferring linked files
    - Stakeout points from a linked file
- Active map
    - Layers and selectability
    - Colors in the map
    - Transferring and selecting maps
    - Notes on active maps, including supported map entity types

To access the *Map of current job* screen:

1. Tap *Map*. The current orientation of a conventional instrument is shown by a dotted line extending from the instrument to the end of the screen. The location of the prism is shown as a cross when a distance is measured.
2. Use the map softkeys to navigate around the map.

If there is a point with the same name as another point in the database, the point with the higher search class is displayed. For more information about how the Trimble Digital Fieldbook software uses search classes, see Database search rules.

Notes

- Only grid coordinates are displayed. If you have not defined a projection, only points stored as grid coordinates appear.
- If the *Grid coords* field in the Cogo settings screen is set to Increase South-West or Increase South-East, this screen is rotated by 180°. The letter N on the north arrow denotes Grid 0°.

Map Softkeys

Use the map softkeys to:

- navigate around the map
- change the map display options

Some softkeys can operate in an "active" mode. The effect of tapping on the map depends on the active softkey selected.

The functions are described in the following table:

Softkey	Function
+	Tap this softkey to zoom in. Tap and hold the softkey to make it active. Tap the area of the map to zoom in on, or drag to create a box around the area of interest.
-	Tap this softkey to zoom out. Tap and hold the softkey to make it active. Tap the area of the map to zoom out from.
Pan	Tap this softkey to shift the center of the map area to another part of the map. Tap the softkey to make it active. Tap an area of the map to center on, or tap and drag the map area to where you want to pan.
	Tap this softkey to show all features on the screen. Tap the softkey to make it active.

Click the up arrow to access more softkey functions. The additional functions are described in the following table.

Filter	Shows a legend for the feature symbols and lets you choose which features are displayed.
Pan to	Displays the *Pan to point* screen. Enter a point name and scale value.
Options	Controls how name or code labels appear next to points in the map.
	Controls the options to display alignment stationing.
	Controls the options to display the points symbols and coded features for each point. If the *Display coded features* check box is selected, Trimble Digital Fieldbook software draws lines between points that have feature codes with the *Feature type* configured to *Line.* When you create or edit a feature code, set the *Feature type* to Line and specify a *Line style.*
	Controls the option to display points from the stakeout list in the map. To do this, set the *Display stakeout list* points field to Yes.

	Controls the Automatic pan to your current position option.
	Tap the automeasure option to automatically start a measurement when you press the measure key.
	Controls the option to display elevations in the map.
	Controls the option to display the map in Widescreen mode.
Layers	Controls the display of one or more active map files or layers.
	Controls the display of alignment files.

Zoom previous and Zoom default

In the map view, tap and hold the map softkey to display more navigation options:

- Zoom to the previous view
- Zoom to a default scale and location
- Set a default scale and location

Widescreen mode

The map appears in widescreen mode across the entire width of the screen.

To access the status bar while the map is in widescreen mode, tap the mini status bar icon in the upper right corner of the map. The status bar appears for approximately three seconds, after which time the map returns to widescreen.

To change the widescreen mode, do one of the following:

- Tap and hold in the map window and then select *Widescreen*
- Tap *Options* within the map screen and then select the *Widescreen* setting
- Press the '.' key on the controller

Filter

Use the *Filter* softkey to control:

- features to display. For example, tap *Map / Filter*.
- points to select. For example, tap *Stakeout / Points / Add / Select from list / Filter*.

Tap an item to select it. Tap it again to clear it. A check mark beside an item shows that it is selected.

Use the *All* and *None* softkeys to aid selection.

The icons that appear in many parts of the Trimble Digital Fieldbook software are shown below. For example, point lists, map graphics, point manager, and job review.

Icon	Description	Icon	Description
	F1 Topo points (Conv.)		Rapid points

	F2 Topo points (Conv.)		Resection points
	Mean turned angle		Check points
	Construction points		Copied construction points
	Keyed in points (normal)		Copied normal points
	Keyed in points (control)		Copied control points
	As-staked points		Copied as staked points
	Adjusted points		Copied adjusted points
	Cogo points (computed)		Linked file points
	Intersection points		Deleted points
	Offset points		Lines
	Arcs	-	-

Note - Face 1 and Face 2 Topo points may be suffixed by a number 1 to 5, for example . The number represents the target number used with that observation.

Tip - The display of maps (.dxf and .shp) and Alignments (.rxl) can be controlled through:

- Select *Files / Properties of current job / Active map.*
- Tap the *Map* button, tap the Up softkey to access additional softkey functions and then tap *Layers.*

Using the Map for Common Tasks

To select a feature from the map, do one of the following:

- Tap the required feature(s) from the map area. If there is more than one feature in the highlighted area, a list of features in this area appears. Select the features as required and then tap *OK* to return to the map.

  Tip - When selecting a line or arc to stakeout, tap near the end of the line or arc that you want to designate as the start. Arrows are then drawn on the line or arc to indicate the direction.

  If the direction of the line or arc is incorrect, tap the line or arc to deselect it and then tap it at the correct end to reselect the direction required.

  Note - The offset directions are not swapped when the line direction is reversed.

- Drag a box around the features you want to select.

  When multiple features are selected in this way they are typically sorted in the order in which they are stored in the database. If the order of the entities in the selection is important, you should select them one by one.

To deselect a feature from the map, do one of the following:

- Tap the selected feature to deselect it. If there is more than one feature within the highlighted area, a list of features within this area appears. Deselect the features as required. Tap *OK* to return to the map.
- Tap and hold on the map and select *List selection* from the shortcut menu. A list of the selected features appears. Deselect the features as required.
- To clear the entire selection, double-tap off the selected features. Alternatively, tap and hold on the map and select *Clear selection* from the shortcut menu.

To carry out a task using the selected feature(s), do one of the following:

- Measure
  - ♦ If there are no features selected, tap *Measure* to measure the current position.

  Tip - To change the code and/or descriptions when using *Measure* from the map, select a point in the map whose settings you want to be the default, tap and hold on the map briefly and then select *Set point details.*
  Alternatively, if you want to change defaults values, but do not want to use the default from an existing point, make sure that there are no features selected before you set point details.

- Stakeout
  - ♦ If one or more features are selected, tap *Stakeout* to stake out the selected feature(s).
    If more than one point is selected, the points are added to the *Stake out points* list, from where you can select them for stakeout.
  - ♦ If more than one line or arc is selected, the first item selected is the one used for stakeout.
  - ♦ Double-tap a feature to stake out.
    If there is more than one feature within the highlighted area, a list of features within this area appears. Select the feature to stake out.

  Tip - If two points are selected, tap and hold on the map and then select *Stake out line* to stake a line defined by the two selected points.

  If the selection contains different feature types (points, lines, arcs), only features of the first type selected can be staked out from the map. To stake out other feature types, clear the selection then reselect the other features.

Setting default point details

Tap and hold briefly on the map and then select *Set point details* from the menu.

Use *Set point details* to set the *Next point name, Code, and Description 1 and Description 2* (if enabled) that will be used as the defaults the next time you measure a point.

If you select a single point in the map when you select *Set point details,* the next available point name, and the code and descriptions of the selected point, become the defaults.

Tap and hold shortcut menu in the map

Tap and hold on the map area to access a shortcut menu. The shortcut menu provides quick access to common tasks. The tasks depend on the number and type of features selected.

In the following table, the * symbol against a task shows that you can access it through the shortcut menu for the feature at the top of that column.

Tap and hold menu options that are available for features in the current job, linked jobs, or linked CSV files:

Task	Feature					
	No Features	**One point**	**Two points**	**Three or more points**	**Line**	**Arc**
Review	-	*	*	*	*	*
List section	-	*	*	*	*	*
Clear section	-	*	*	*	*	*
Widescreen	*	*	*	*	*	*
Delete	-	*	*	*	*	*
Stake out points	-	*	*	*	-	-
Stake out line	-	-	*	-	*	-
Stake out arc	-	-	-	*	-	*
Create/Stake out alignment	-	-	*	*	*	*
Compute inverse	-	-	*	*	-	-
Compute + subdivide area	-	-	-	*	*	*
Subdivide a line	-	-	-	-	*	-
Subdivide an arc	-	-	-	-	-	*
Key in point	*	-	-	-	-	-
Key in line	-	-	*	-	-	-
Key in arc: 3 points	-	-	-	*	-	-
Key in arc: 2 points + center	-	-	-	*	-	-
Set point details	*	*	-	-	-	-

Notes

- If you select a point with the same name as another point in the database, then select the *Review* or *Delete* option from the shortcut menu, a list of the duplicate points appears. Select the point you want to review or delete.
- Field fill-in. Enter feature names into fields by selecting from the map. Select the feature(s) from the map then select a survey function, such as Cogo or Stakeout. The selected feature(s) are automatically entered into the appropriate fields.
- Map selection list. The *Map selections option* is available on the right side of the feature name field when you have selected features from the map. Tap it to access the list of the selected features. Only features that are specific to the field are shown.

- You cannot use Trimble Digital Fieldbook to delete points from linked files. Points from linked files do not appear in the *Review* screen list of deleteable points.

Autopan

The Autopan function automatically centers the map using the current position. Autopan only operates when the current position appears within the selected map view.

To automatically view your current position:

1. In the Map of current job screen, tap the Up arrow.
2. Tap *Options.*
3. Select the *Automatic pan to current position* check box.
4. Tap *Accept.*

Units

You can specify the units, such as degrees and meters, used by the Trimble Digital Fieldbook software.

You can also specify the order of the displayed coordinates, the type of coordinates, the way a slope grade is displayed, and how stationing values are displayed.

To configure the units display, select *Files / Properties of current job / Units* and change the fields as required.

The order for the displayed coordinates can be set to:

- North-East-Elev
- East-North-Elev
- Y-X-Z
- X-Y-Z

For the Y-X-Z and X-Y-Z options the convention used defines that the Y axis is the East axis and the X axis is the North axis.

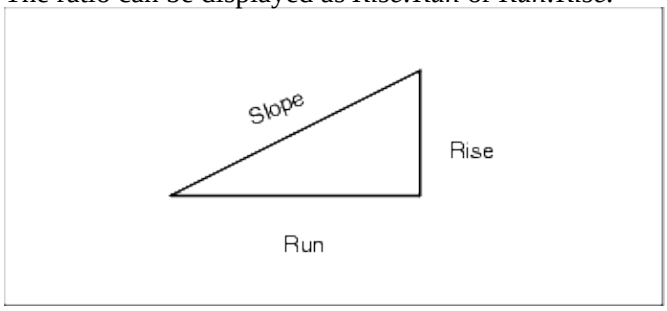
The following table describes the coordinate view options.

Option	Description
WGS-84	View as WGS-84 Latitude, Longitude, and Height
Local	View as local ellipsoidal Latitude, Longitude, and Height
Grid	View as Northing, Easting, and Elevation
Station and Offset	View as station, offset, vertical distance relative to a line, arc or alignment
ECEF (WGS-84)	View as Earth-Centered-Earth-Fixed WGS-84 X, Y, Z coordinates
Az VA SD	View as azimuth, vertical angle, and slope distance

HA VA SD (raw)	View as horizontal angle, vertical angle, and slope distance
Az HD VD	View as azimuth, horizontal distance, and vertical distance
HA HD VD	View as horizontal angle, horizontal distance, and vertical distance
Delta Grid	View as differences in Northing, Easting, and Elevation from the instrument point

In some fields (for example, *Azimuth)*, you can enter a value in units other than the system units. The *Units* softkey appears in these fields. When you tap *Enter* to accept the field, the value is converted to the system units.

The grade of a slope can be displayed in one of the following formats: angle, percent, or ratio.
The ratio can be displayed as *Rise:Run* or *Run:Rise.*



Linked Files

You can link files (*.csv, *.txt, or *.job) to your current job to provide easy access to additional data.

Use a linked file to access points that do not exist in the current job, or that you do not want to import into the current job. Linked CSV points appear as a comma (**,**). Linked points from another job appear with their original point symbol. All linked points appear blue. You can use points from a linked file to:

- stake out without having the design points in the job
- enter values into *Point name* fields, such as for Cogo functions
- navigate to control or check shots from previous surveys

Notes

- A linked file must be saved to the same folder as the job that you are trying to link it to.
- In a linked job, you cannot access lines, or arcs.
- You can only review points in a linked file from the map. Once you select a linked point and copy it into the current job, it appears as a "c" in the map.
- You can link multiple files (*.csv *.txt *.job). When the point does not exist in the current job, but does exist in multiple linked files, the point in the first linked file is used. If multiple points of the same name exist in a linked job, the search rules work within that job to find the best point.

Transferring linked files

You can transfer linked CSV files from the office computer, transfer files between controllers, or export points to a CSV file from a previous job.

Linked files must be saved to the same folder as the job that you are trying to link them to. If you export a CSV file using the Trimble Digital Fieldbook software, it is saved to the [Export] folder. To link the file, use Explorer to move or copy the file to the appropriate project folder.

Before you transfer a CSV file, make sure the data in the file is in the format: Point name, First ordinate (Northing or Easting), Second ordinate (Northing or Easting), Elevation, Point code.

Note - The coordinate order (Northing and Easting ordinates) in the comma delimited file must be the same as the setting in the *Coordinate order* field in the *Units* screen.

Use the Data Transfer utility or Microsoft ActiveSync technology to transfer the file from the office computer to the Trimble controller. For more information, see Transferring files between the controller and the office computer.

To select linked files:

1. From the Trimble Digital Fieldbook main menu, select *Files / Properties of current job* and tap the *Linked files* button. The *Linked files* screen appears.
2. Tap the file(s) that you want to use for the current job or tap *All* to select all files.
3. Tap *Accept* to save any changes.

When using points from linked files, make sure that they use the same coordinate system as the job that they are being brought into.

Staking out points from a linked file

To stake out a point from a linked file, do one of the following:

- From the map, select a point to stake out.
- Add a point to the *Stake out points* list using the *Select from file* option.
- From *Stake out points* tap > *Point* and then enter the point name to stake. You can use this method to stake a point in a linked file as long as a point of the same name does not exist in the current job.

Tip - When you add points to the stakeout list using the *Select from file* option, you can now add points to the stakeout list from the linked file even if the point in the linked file already exists in the current job. The *Select from file* option is the only way you can stake a point from a linked file when a point of the same name exists in the current job.

Entering point name fields

To enter a point from a linked file into a *Point name* field, access the field and key in the point name. A linked point entered into a point name field is copied into the current job database.

Active Map

The Trimble Digital Fieldbook Map is a powerful feature that can be used to perform many tasks that are also available from the menu system. You can link other jobs and csv and txt files under the *Linked files* setting in *Properties of current job* and you can also attach other external files to the Active Map, either from *Properties of current job* or from within the Map using the *Layers* softkey.

Trimble Digital Fieldbook software supports the display of the following active map files:

- AutoCAD (ASCII) files (.dxf)
- ESRI Shapefiles (.shp)
- Alignments files (.rxl)

Layers

Files that support layers enable you to control the visibility of each layer. If there are no layers, you can control the visibility of the entire file.

The following file types support layers:

- AutoCAD (ASCII) files (.dxf)

The following file types do not support layers:

- ESRI Shapefiles (.shp)
- Alignments files (.rxl)

Selectable features in map files can be used in the following operations:

- Navigate to a point
- Stakeout - points
- Stakeout - lines
- Stakeout - arcs
- Cogo calculations - points only
- Active map lines and arcs cannot be used in Cogo calculations
- Review from the map

Colors in the Map

Points, lines, and arcs in the current job database appear in black.
Lines and arcs appear in the colors defined in the map file.

Feature code processing colors appear in the color defined in the Feature code file (.fxl files from Trimble Business Center only).

Transferring and selecting maps

1. To transfer the files to the controller, use the Trimble Data Transfer utility or Microsoft ActiveSync technology.
2. To select a map to view in the Map of current job screen, do one of the following:
   - Select *Files / Properties of current job / Active map.*
   - Tap the *Map* button, tap the Up softkey to access additional softkey functions and then tap *Layers.*

   All map files appear in a tree list view.

   Note - A map file must be saved to the same folder as the job you are trying to link it to.

3. The following table shows how to display and disable active map files and layers:

Tap...	
+	to expand the file to display all layers
-	to minimize the file and hide all layers
the file name	once to display all layers within the map file
	again to disable all layers within the map file
the layer name	once to display all layers within the map file
	again to disable all layers within the map file
All	once to display all layers within the map file
None	to deselect all files and layers

Once the file is loaded, you can switch between the map view and the select map file screen and then select or deselect the layers you want to view.

The following table explains the icons that appear beside the file names.

File icon	**Layer icon**	**indicates...**
No icon	-	the file is not selected
✓	-	all layers with supported entities are visible in the map, but nothing can be selected
-	No icon	the current layer is not visible in the map
-	×	there are no supported entities in the layer to display
-	✓	the current layer is visible in the map

Notes on active maps

- Only grid coordinates are displayed. If you have not defined a projection, only points stored as grid coordinates appear.
- Map files are loaded into the job when the map is opened or when the map selection screen is opened.
- You can display more than one map at a time.
- Supported DXF entities are:
  - 3D FACE, ARC, CIRCLE, INSERT, LINE, LWPOLYLINE, POINT, POLYLINE, SPLINE, SOLID, ATTRIB, TEXT, MTEXT.
  - Control characters: C - diameter symbol, D - degree symbol, P - plus/minus symbol, % - percentage symbol.

- Supported Shapefile entities are:
    - Null shape, Point, PolyLine, Polygon, MultiPoint, PointZ, PolyLineZ, PolygonZ, MultiPointZ, PointM, PolyLineM, PolygonM, MultiPointM, MultiPatch.

Using a Feature and Attribute Library

To select a code in a survey, first select the library that you want to use:

1. From the main menu, select *Files / Properties of current job.*
2. Tap the *Feature library* button and select the library that you want to use.

Note - Feature and attribute libraries cannot be used in Description fields.

To choose a code from the library:

1. In the *Code* field, enter the first character of the required feature code. The feature code list is filtered according to the Auto-complete setting:

Auto-complete on	Auto-complete off
You do not need to put the controller into alpha mode to select an alpha code. The feature code list is filtered according to the characters available on the controller key that you pressed. For example, if you press "2", the list is filtered on a "2", and the associated keypad characters "T", "U", and "V". The first available code that starts with one of these characters appears.	The Trimble Digital Fieldbook software maintains the alpha or numeric setting. Only the character that you enter appears and is used to filter the feature code list.

2. To further filter the feature code list, enter additional characters. Use the arrow keys to scroll to the required code, or if the required code is already displayed, tap *Enter* to accept this code and move to the next field.

   When you select a code from the list, filtering is disabled and the entire feature code list appears, which allows you to select another code.

   To enter multiple codes, select each code in turn from the list.
   As you select multiple codes from the list, the system automatically enters a space to separate the codes. If you enter codes through the controller keypad, you must enter a space after each code to display the entire code list again before you enter the next code.

   Note - An individual Feature code cannot contain more than 20 characters. But the maximum number of characters in a code field is 42.

Note - If a feature code list is already selected for the job, you can use codes from the list when keying in a note. From the *Note* screen, press *Space* to display the feature code list. Select a code from the list or type the first few letters of the code.

How to use the Code field when using feature code libraries

If you use a feature and attribute library, when you access the code field on forms in the Trimble Digital Fieldbook software, a *Code list* dialog appears with special controls to help you select codes from the feature code list.

Selection improvements in the code field:

- To select the entire code in the code list window, click anywhere in the code field, or press the controller left or right arrow when on a code field.
- A partial selection made in the code field is retained in the *Code list* dialog.

When the *Code list* dialog is active:

- To replace the code:
  - Select a code from the list when the entire code is highlighted (with an unfiltered list)
  - Select a code from the list when the highlight or cursor is within a code (with a filtered list).
- To add a code:
  - Select a code from the list when the cursor is at the start or end of a code (with an unfiltered list).

Note - Spaces are automatically entered to separate multiple codes.

Filtering improvements in the *Code list* dialog:

- The code list is filtered according to the characters to the left of the cursor or highlight.
- If the cursor is at the beginning or end of the code field and editing is not in progress, the code list is not filtered.

Using a touch screen to replace a code:

1. Tap in the code field. The code field is highlighted.
2. Use the scroll bar to scroll to the new code and then tap to select the new code you want to replace the old code.
3. To exit the *Code selection* dialog, tap *Enter*.

Using a touch screen to add to an existing code:

1. To open the *Code list* dialog, tap in the code field.
2. To remove the highlight on the code field before you select the new code, tap at the beginning or end of the code field.

   The Trimble Digital Fieldbook software automatically inserts spaces to separate multiple codes.

Using a keyboard to replace code:

1. Use the up or down arrows to move to the code field.

2. Press the key representing the first character of the code. The code list is filtered on that first character.
3. Depending on the size of your code library, do one of the following:

    - If the required code is not visible, press the key(s) representing the next character(s) of your code to further filter the list.
    - If the required code is visible, arrow down to the code, press *Enter* to select the code and then press *Enter* again to exit the dialog.

Using a keyboard to add to an existing code:

1. To open the *Code list* dialog, press the right arrow.
2. To remove the highlight on the code field before you select the new code, press the right arrow again.

The Trimble Digital Fieldbook software automatically inserts spaces to separate multiple codes.

Tips

- To edit an existing code, use the arrow keys to navigate to the correct position and then use the backspace key to remove unwanted characters. As the code is modified, the code list filters accordingly.
- When auto-complete is turned off, recently used codes appear at the top of the code list. Multiple entry codes are remembered as a single entry in the recently used list. This allows you to quickly select recently used codes, especially multiple code entries.
- To enter a code that is not in the library, but which has a similar entry in the library, press the space key to accept the code that you enter not the similar code from the library. Alternatively, turn off auto-complete.

When you use a feature code that has attributes, the Trimble Digital Fieldbook software prompts you to enter the attribute data.

Using Feature Codes with Predefined Attributes

You can use feature and attribute libraries that were created using the Trimble Geomatics Office software, the Feature and Attribute Editor or Data Dictionary Editor utilities, to store additional attribute information for feature codes. In the Trimble Digital Fieldbook software, these feature codes have an attribute icon (Ⓐ) next to the feature code in the library.

The following office software packages can store additional attribute information for feature codes in feature and attribute libraries and transfer these to the Trimble Controller.

To create a library, use ...	To transfer a library, use ...
Feature and Attribute Editor	Trimble Geomatics Office
Feature Manager (Trimble Business Center)	Feature Manager

In the Trimble Digital Fieldbook software, feature codes with attributes have an attribute icon (Ⓐ) next to the feature code in the library.

Note - Feature codes created using the Trimble Digital Fieldbook software do not have attributes associated with them.

Note - Feature classifications defined in feature and attribute libraries as Point, Line, or Area in the office software all appear as *Point features* in the Trimble Digital Fieldbook software.

Tip - To capture attribute data more efficiently, use the office software to predefine default values, minimum and maximum ranges, auto-generated times and dates, and well-structured menu options. If you use auto-generated times, make sure that the time is set correctly on your Trimble controller. For information on setting the Trimble controller time and date, refer to Time and date.

Note - If you specify in the office software that field entry is not permitted for an attribute, you cannot use the Trimble Digital Fieldbook software to enter that attribute data.

Note - You can now change the feature and attribute library assigned to a job after the attributes have been stored. If the feature and attribute library that was used to assign the attributes is no longer linked to the job, the attributes can be viewed but they cannot be changed. However, you can select a new code from the library and then change the attributes.
When you change feature and attribute libraries assigned to a job, please ensure that the appropriate library is assigned to the office software so that the feature codes and attributes can be correctly processed.

> In the Trimble Geomatics Office software, the database tables that hold the attribute information are created when you assign the feature and attribute library to the project. If you assign a new feature and attribute library to a Trimble Digital Fieldbook job, and the library includes features and attributes that were not present in the library that you used to set up the Trimble Geomatics Office project, the system ignores these features and attributes when it imports the library to the project.

To enter attributes before measuring a point:

1. Enter the feature code and tap the *Attrib* softkey. A screen with the feature code and attribute fields appears.
2. Enter values in the attribute fields.

   The maximum number of characters in text attribute fields is usually 100. Your definition of a feature and attribute library can specify fewer.

Tip - If the feature has been used in the current job, the last stored set of attributes for the current feature are the defaults. Tap *Default* to set the defaults from the library.

The *Prev* and *Next* softkeys appear when there are multiple feature codes with attributes in the *Code* field. Use them to swap between attributes.

To enter attributes while measuring a point:

1. Enter the feature code. The *Attrib* softkey appears.

2. Tap *Measure* to start measuring the point.

   A screen with the feature code and attribute fields is displayed.
3. Enter values in the attribute fields. Tap *Store* to accept the attributes.

Tip - The Trimble Digital Fieldbook software can automatically store the point while you are still entering attribute data. To enable this, select the *Auto store point* check box in the survey style.

Prompt for attributes option
When you store points with attributes in *Measure topo,* you can disable the *Prompt for Attributes* check box in the *Options* screen. This stops the Trimble Digital Fieldbook software from prompting you to enter the attributes on every point that you store in the *Measure topo* screen (and when you measure a topo point from the map). The software completes the attributes with the default values or the previously used attributes for a particular feature code. To change the attributes, use the *Attrib* softkey. Subsequent points that have the same feature code will use the newly entered attributes. If there are any feature codes that have required attribute fields without default values or previously defined values, the software prompts you for attributes the first time that you store a point with that particular feature code.

Notes

- During normal operation, the Trimble Digital Fieldbook software always prompts you to enter point attributes. The option to turn off *Prompt for Attributes* is available when you measure conventional topo points from *Measure topo* or from the map.

Entering attributes for a point using feature codes without predefined attributes

You can enter several attributes for one point. For a point that has a feature code of Tree, for example, you can enter its type, height, girth, and spread as attributes.

To enter attributes for a point using the colon (:) key:

1. Measure, key in, or compute the point.
2. Tap *Favorites* and select *Key in note.*
3. Enter the first attribute and press the colon key (:). Enter the data and press : again.
   If a feature code and attribute library is selected for the job, the code list appears when you press the space key.
4. Enter the next attribute and press the colon (:) key. The attributes for a tree, for example, could be:
   Type:Oak:Girth:1.0:Height:15:Spread:12
5. Repeat step 4 until all attributes are entered and then tap *Enter.*

Tip - Use the *Switch to* softkey to return to the screen where you stored the point without closing this window.

Note - Attributes collected using note records with ":" separators are processed as note records in the Trimble Geomatics Office software. For more flexibility in the office software, collect attributes using attribute subrecords or features from the feature and attribute libraries created in the office software.

To edit a Code once a point has been measured:

1. Select *Files / Review current job* or *Files / Point manager*.
2. Edit the code field for the point.

Resurveying points that already have attributes

To stake out and re-measure points for which you already have attribute data:

1. If the job is not yet in the Trimble Digital Fieldbook software, transfer it from the Trimble Geomatics Office software.

   Note - Transfer relevant features and attributes as well as the points.

2. From the main menu, select *Survey / Survey style / Stakeout.*
3. Tap *Options* and set the as-staked point details:
   - Set the *As-staked* name field to *Design name*.
   - Set the *As-staked* code field to *Design code*.
4. Stake out the point.
5. Measure the as-staked point.

   The attribute data displayed for the point is the attribute data that you entered previously. The defaults in the feature and attribute library are not used. Update the values as required.

Using Description Fields

You can choose to display two additional description fields in many functions within the Trimble Digital Fieldbook software.

The description fields are similar to code fields because they enable you to add additional information to data. They do not use feature code libraries, and they do not support attributes.

The description field data is available in Trimble DC files as Note records.

You can also use Export Fixed Format Files or Export Custom Format Files to export the data stored in the description fields.

To enable and customize the description fields:

1. From the main menu, select *Files / Properties of current job.*
2. Tap the *Page down* button and then tap the *Descriptions* button.
3. Select the *Use descriptions* check box.
4. If required, enter a new name for *Description 1 label* and *Description 2 label.*
5. Tap *Accept.*

Once the additional descriptions fields are enabled, they are available in the following features of the Trimble Digital Fieldbook software:

- Station setup
- Measure topo
- Stakeout
- Point manager
- Review current job
- Key in point, line, and arc
- Compute point
- Compute average
- Traverse
- Wildcard search

Each of the two description fields remembers the descriptions that are entered. To view the stack of previously used descriptions, tap the arrow on the description field.

The description stack is unique for each description field. The description stack is stored to the [descriptions.xml] file in the Trimble data folder on the controller. You can edit it with a text editor, and copy it to another controller.

Copy Between Jobs

You can copy the following items from one job to another job on the controller:

- All control points
- Points

To do this:

1. Select *Files / Copy between jobs.*
2. Select each of these items:
   - a job name in the *Job to copy from* field.
   - a job name in the *Job to copy to* field.
   - the items to be copied in the *Copy* field.

   If you select the *Copy duplicate points* check box, the option to *Overwrite* appears.

3. If you want to copy duplicate points, and overwrite and delete the duplicate points in the job you are copying to, select the appropriate check boxes.
4. When the *Copy* field is set to Points, various point selection options become available in the *Select Point* menu. Select the appropriate option.

When copying points between jobs, make sure that the points you are copying use the same coordinate system as the job that the files are being brought into.

Note - You can only copy information between jobs that are in the current project folder. If the file(s) you want to copy data between are not available, use Job open to change the current project folder, or use Explorer to copy the file(s) to the current project folder.

To create a new job with **all** the defaults (including Coordinate System settings) from another job, see Job operations.

Key In

Key in Menu

This menu lets you enter data into the Trimble Digital Fieldbook software from the keypad. You can key in points, lines, arcs, alignments and notes.

For more information, see:

Points

Lines

Arcs

Alignments (polylines)

Notes

Key in - Points

With this function, you can enter coordinates to define a new point:

1. From the main menu, select *Key in / Points.*
2. Enter the point name.
3. Enter the values.
4. Tap *Store* to calculate or store the point.

To key in the point using a variety of different methods, configure *Coordinate view* from the *Options* menu. When the coordinate view is set to *Station and offset* additional information is required.

To enter a point from the map:

1. Make sure the current selection is cleared.
2. Tap and hold on the area of the map to which you want to add the point.
3. From the shortcut menu, select *Key in point.* The *Key in / Point* screen appears.
4. Complete the fields as required.

Key in - Lines

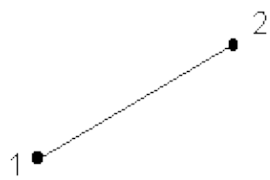
Use this function to define a new line by one of the following methods:

Two points

Brng-dist from a point

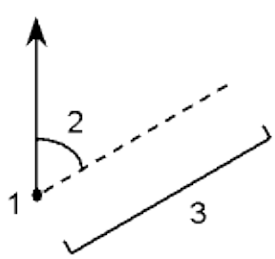
To define a new line by the Two points method:

1. Do one of the following:
   - From the map, select the *Start point (1)* and the *End point (2).* (See the diagram below.) Tap and hold on the map and select *Key in line* from the shortcut menu.
   - Select *Key in / Line* from the main menu. In the *Method* field, select Two points. Enter the names of the *Start point* and the *End point.*
2. Use *Options* to specify ground, grid, or sea level distances.
3. Enter the name of the line.
4. For stationing, enter a value for the *Start station* and the *Station interval.*



To define a new line by the Brng-dist from a point method:

1. From the main menu, select *Key in / Line.*
2. Use *Options* to specify ground, grid or sea level distances.
3. Enter the name of the line.
4. In the *Method* field, select *Brng-dist from a point.*
5. Enter the name of the Start point (1), the azimuth (2), and the length of line (3). See the diagram below.
6. Specify the *Grade* between the start and end points.
7. For stationing, enter a value for the *Start station* and the *Station interval.*



Key in - Arcs

Use this function to define a new arc by one of the following methods:

Two points and radius

Arc length and radius

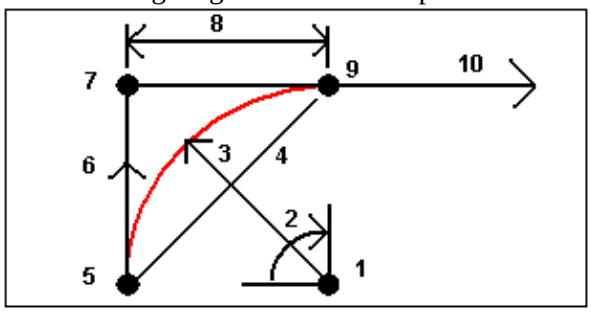
Delta angle and radius

Intersect point and tangents

Two points and center point

Three points

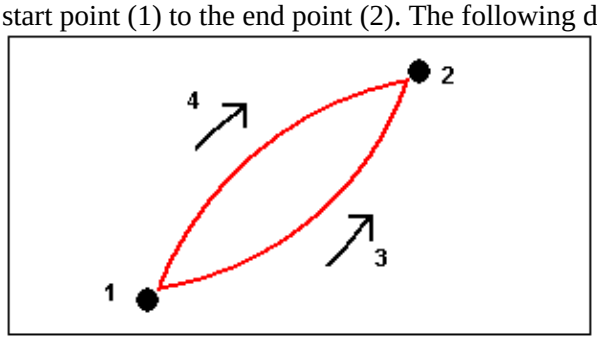
The following diagram and table explains the terms used to define features of an arc.



1	Center point	6	Back tangent
2	Delta angle	7	Intersection point
3	Radius	8	Tangent length
4	Chord length	9	Forward tangent
5	From point	10	To point

The back tangent value (6) is related to the direction (right in the above diagram) in which the stationing or chainage increases. For example, when you stand at the intersection point (7) looking in the direction of increasing stationing or chainage, the forward tangent (9) is in front of you and the back tangent (6) is behind you.

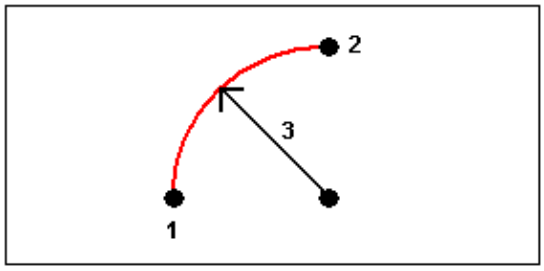
The direction field defines whether the arc turns to the left (counterclockwise) or right (clockwise) from the start point (1) to the end point (2). The following diagram shows both a left (3) and right (4) arc.



To define an arc using the Two points and radius method:

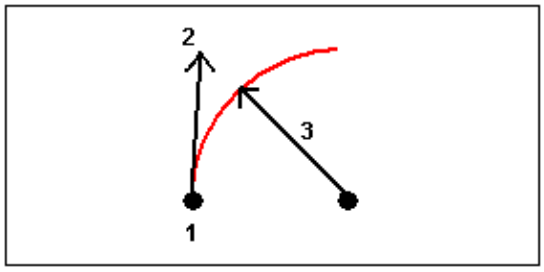
1. From the main menu, select *Key in / Arcs.*

2. Use *Options* to specify ground, grid, or sea level distances.
3. Enter the name of the arc.
4. In the *Method* field, select *Two points and radius.*
5. As shown in the diagram below, enter the name of the start point (1), the name of the end point (2), and the radius (3) of the arc.
6. Specify the direction of the arc.
7. For stationing, enter a value for the start station and the station interval.
8. If required, select the *Store center point* check box and then enter a point name for the centre point.



To define an arc using the Arc length and radius method:

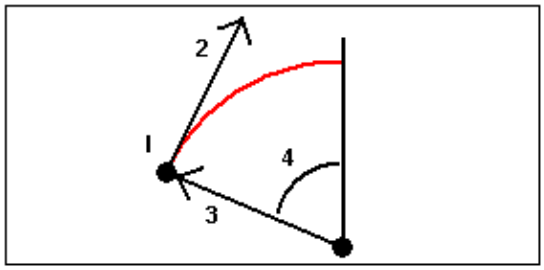
1. From the main menu, select *Key in / Arc.*
2. Use *Options* softkey to specify ground, grid, or sea level distances and the grade entry method.
3. Enter the name of the arc.
4. In the *Method* field, select *Arc length and radius.*
5. As shown in the diagram below, enter the name of the start point (1), the back tangent (2), the radius (3)and the length of the arc.
6. Specify the direction of the arc and the grade between the start and end points.
7. For stationing, enter a value for the start station and the station interval.
8. If required, select the *Store center point* check box and then enter a point name for the centre point.



To define an arc using the Delta angle and radius method:

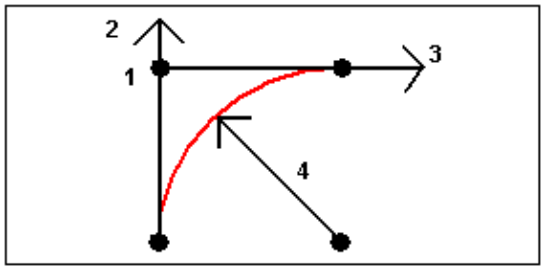
1. From the main menu, select *Key in / Arc.*
2. Use *Options* to specify ground, grid, or sea level distances and the grade entry method.
3. Enter the name of the arc.
4. In the *Method* field, select *Delta angle and radius.*
5. As shown in the diagram below, enter the name of the start point (1), the back tangent (2), the radius (3) and the turned angle (4) of the arc.
6. Specify the direction of the arc and the grade between the start and end points.
7. For stationing, enter a value for the start station and the station interval.

8. If required, select the *Store center point* check box and then enter a point name for the centre point.



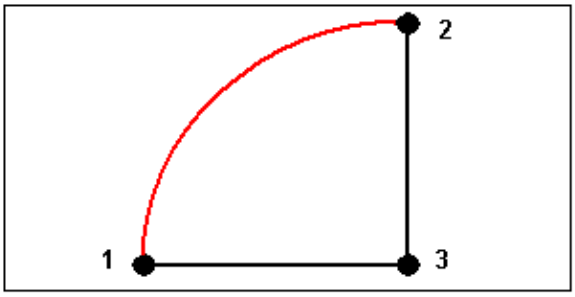
To define an arc using the Intersect point and tangents method:

1. From the main menu, select *Key in / Arc.*
2. Use *Options* to specify ground, grid or sea level distances.
3. Enter the name of the arc.
4. In the *Method* field, select *Intersect point and tangents.*
5. As shown in the diagram below, enter the name of the intersection point (1), the back tangent (2), the forward tangent (3) and the radius (4) of the arc.
6. For stationing, enter a value for the start station and the station interval.
7. If required, select the *Store center point* check box and then enter a point name for the centre point.



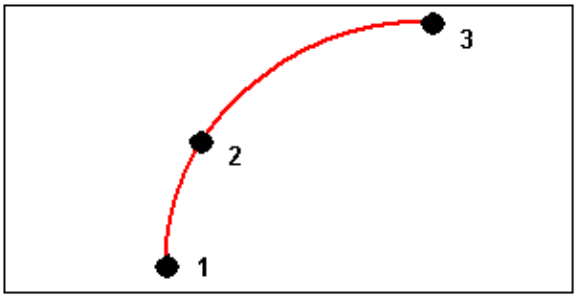
To define an arc using the Two points and center point method:

1. From the main menu, select *Key in / Arc.*
2. Use *Options* to specify ground, grid or sea level distances.
3. Enter the name of the arc.
4. In the *Method* field, select *Two points and center point.*
5. Specify the direction of the arc.
6. As shown in the diagram below, enter the name of the *Start point* (1), the *End point* (2), and the *Center point* (3) of the arc.
7. For stationing, enter a value for the start station and the station interval.



To define an arc using the Three points method:

1. From the main menu, select *Key in / Arc.*
2. Use *Options* to specify ground, grid or sea level distances.
3. Enter the name of the arc.
4. In the *Method* field, select *Three points.*
5. As shown in the diagram below, enter the name of the *Start point* (1), the *Point on arc* (2), and the *End point* (3) of the arc.
6. For stationing, enter a value for the start station and the station interval.
7. If required, select the *Store center point* check box and then enter a point name for the centre point.



The grade of the arc is determined by the elevations of the arc start and end points.

Key in - Alignments

To key in an alignment by a point name range:

1. From the main menu, select *Key in / Alignments.*
2. To key in a new alignment, enter the point names that define the alignment (if the *Key in alignment* screen is displayed). If the *Select an alignment* screen is displayed, tap *New* to enter the point range.

   The following name range techniques are supported:

Enter	Result
1,3,5	Creates a line between points 1 to 3 to 5
1-10	Creates lines between all points from 1 through 10

1,3,5-10	Creates a line between points 1 to 3, to 5, and 5 through 10
1(2)3	Creates an arc between points 1 and 3, through point 2
1(2,L)3	2 (Radius point), L (left) or R (right) Creates a **Left** hand arc between points 1 and 3, with point 2 as the radius point
1(100,L,S)3	1 to 3, radius=100, L (left) or R (right), L (large) or S (small) Creates a **Left** hand **Small** arc between points 1 and 3 with a radius of 100

3. To store the alignment, enable the *Store alignment* check box, enter an *Alignment name*, enter a *Code* and *Station interval* if required, and then tap *Store*.

   Alignments are stored as RXL files. If you save the alignment, you can easily stake it again, view it in the map, and share it with other jobs and with other controllers.

   Alignments always have a horizontal component; the vertical component is optional. If an alignment is created using entities that have elevations, the alignment will have a vertical component.

4. To offset an alignment, tap *Offset*.
5. Enter the offset distance.
   To offset to the left, enter a negative value.
6. To store the offset alignment, enable the *Store alignment* check box, enter an *Alignment name*, enter a *Code*, if required, and then tap *Store*. The alignment is stored as an RXL file.
7. To store node points at the vertices of the offset alignment, enable the *Store points at nodes* check box, enter a *Start point name*, enter a *Code*, if required, and then tap *Store*.

   An offset alignment will have a vertical component if the vertical geometry of the original alignment is coincident with the horizontal geometry and the vertical geometry consists only of points. The offset vertical geometry cannot include curves. If the vertical geometry of an alignment cannot be offset, only the horizontal component will exist in the offset alignment. You cannot offset an alignment that includes spirals.

For more information, see:

- Stakeout - alignments (polylines)

Key in - Notes

You can enter a note in the Trimble Digital Fieldbook database at any time. To do this:

1. To access the *Key in note* screen, do one of the following:
   - From the main menu, select *Key in / Notes.*
   - Tap *Favorites / Key in note.*
   - Tap *Switch to / Key in note.*
   - On the controller keyboard, press **CTRL** + **N.**
2. Type in the details to be recorded. Alternatively tap *T/Stamp* to generate a record of the current time.
3. To store the note do one of the following:
   - Tap *Store* to store the note in the database.

- Tap Prev to attach the note to the previous observation.
- Tap Next to attach the note to the next observation to be stored.

Note - When you use Next, the note is only stored with the next observation if another observation is stored during the current survey. If the survey is ended without storing another observation the note is discarded.

4. To exit *Key in notes*, tap *Esc*. Alternatively, if the *Note* form is empty, tap *Store*.

Note - If a feature code list is already selected for the job, you can use codes from the list when keying in a note. From the *Note* screen, press Space to display the feature code list. Select a code from the list or type the first few letters of the code.

In *Review*, tap *Note* to add a note to the current record.

In *Point manager*, scroll to the right and tap in the *Note* field to add a note to the point record.

Cogo

Cogo Menu

This menu lets you carry out Coordinate Geometry (Cogo) functions. You can use the menu options to calculate distances, azimuths, and point positions by various methods.

For some calculations, you must define a projection, or select a Scale factor-only coordinate system.

You can display ellipsoid, grid, or ground distances by changing the *Distances* field in the Cogo settings screen.

To perform Cogo calculations in a *No projection / No datum* coordinate system, set the *Distances* field to *Grid.* The Trimble Digital Fieldbook software then performs standard Cartesian computations. If the grid distances you enter are distances on the ground, the new computed grid coordinates will be ground coordinates.

Note - When the *Distances* field is set to *Ground* or *Ellipsoid*, the Trimble Digital Fieldbook software attempts to perform calculations on the ellipsoid. Because there is no relationship established at this point, the system cannot compute coordinates.

For more information, see:

Compute Inverse

Compute Point

Compute and Subdivide Area

Compute Azimuth

Compute Distance

Compute Average

Subdivide a Line

Subdivide an Arc

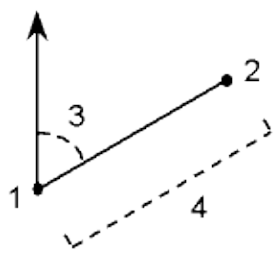
Traverse

Calculator

Cogo - Compute Inverse

To calculate the azimuth, horizontal, vertical, and slope distances between two existing points:

1. From the map, select the From point (1) and To point (2), as shown in the diagram below.
2. Tap and hold on the map and select *Compute inverse* from the shortcut menu. Alternatively, select *Cogo / Compute inverse* from the main menu.
3. The azimuth (3), horizontal distance (4), change in elevation, slope distance and grade are shown.



Cogo - Compute Point

Use this Cogo function to calculate the coordinates of an intersection point from 1 or 2 existing points. You can store the results in the database.

Use *Options* to specify ground, grid, or sea level distances.

Note - When entering an existing point name you can select from the list, perform a fast fix or measure a point. Fast fix stores an automatic rapid point with a temporary point name.

Warning - In general, do not compute points and then change the coordinate system. If you do, these points will be inconsistent with the new coordinate system. An exception to this is points computed using the *Brng-dist from a point* method.

Note - If you use the *Four point intersection* method or the *From a baseline* method and then change the target height for one of the source points, the coordinates of the point will not be updated.

Note - For all methods when the point is stored use the *Store as* field to specify if the calculated point is to be stored as WGS84, Local or Grid coordinates values.

Note - You can compute an azimuth from two points in the database directly in an azimuth field. To do this, enter the point names in the *Azimuth* field, separated by a hyphen. For example, to compute the azimuth from point 2 to point 3, enter "2-3". This method works with most alphanumeric point names, but it does not support point names that already contain a hyphen.

Tip - You can compute a distance between two points in the database directly in a distance field. To do this, enter the point names in the distance field, separated by a hyphen. For example, to compute the distance between points 2 and 3, enter "2-3". This method works with most alphanumeric point names, but it does not

support point names that already contain a hyphen.

Calculate coordinates using one of the following methods:

Brng-dist from a point

Turned angle and distance

Brng-dist intersect

Brng-brng intersect

Dist-dist intersect

Four point intersection

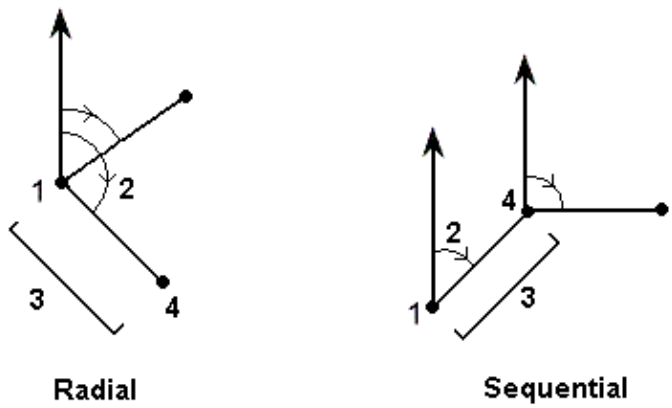
From a baseline

Vertical plane and angle

Brng-dist from a point

To calculate the coordinates of an intersection using the Brng-dist from a point method:

1. From the main menu, select *Cogo / Compute point.*
2. Enter a *Point name.*
3. In the *Method* field, select Bearing and distance.
4. In the *Start point* field, use the advanced pop-up arrow ( ) to select either a Radial or Sequential measurement method. When *Sequential* is selected the *Start point* field is automatically updated to the last stored intersection point (see diagrams below).
5. Set the *Azimuth origin* to either Grid 0°, True or Magnetic.
6. As shown in the diagrams below, enter the name of the Start point (1), the azimuth (2) and the horizontal distance (3).
7. Tap *Calc* to calculate the intersection point (4).
8. Store the point in the database.



To compute the misclosure of a loop of points:

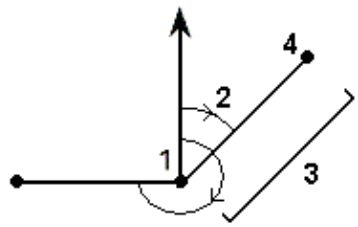
1. Give the last point the same name as the first start point.
2. Tap *Calc* for the point coordinates.

When you tap *Store*, the loop misclosure appears on the screen. Store the last point as a check to avoid overwriting the first point.

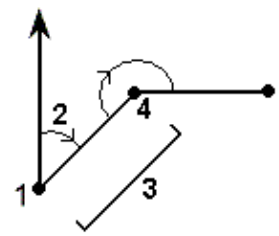
Turned angle and distance

To calculate the coordinates of an intersection using the turned angle and distance method:

1. From the main menu, select *Cogo / Compute point.*
2. Enter a *Point name.*
3. In the *Method* field, select Turned angle and distance.
4. In the *Start point* field, tap the advanced pop-up arrow ( ), then select either a *Radial* or *Sequential* measurement method. When *Sequential* is selected, the Start point name automatically updates to the last stored intersection point (see diagrams below).
5. In the *End point* field, tap the advanced pop-up arrow ( ), then select either an *Azimuth* or *End point* to define a reference orientation.
   When using the sequential method, the reference orientation for new points moving forward is the computed reverse azimuth from the previous turned angle.
6. As shown in the diagrams below, enter the name of the Start point (1), the azimuth (2) and the horizontal distance (3).
7. Tap *Calc* to calculate the intersection point (4).
8. Store the point in the database.



Radial

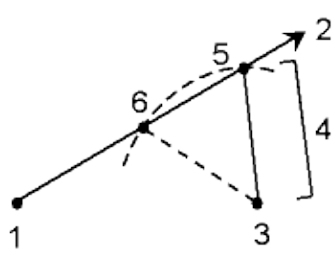


Sequential

Brng-dist intersect

To calculate the coordinates of an intersection using the Brng-dist intersect method:

1. From the main menu, select *Cogo / Compute point.*
2. Enter a *Point name.*
3. In the *Method* field, select Brng-dist intersection.
4. As shown in the diagram below, enter the name of Point 1 (1), the azimuth (2), the name of Point 2 (3) and the horizontal distance (4).
5. Tap *Calc.*
6. There are two solutions (5,6) for this calculation; tap *Other* to see the second solution.
7. Store the point in the database.

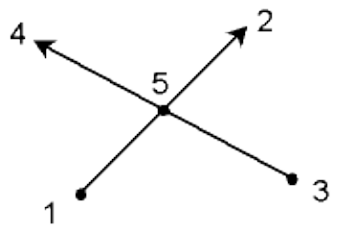


Brng-brng intersect

To calculate the coordinates of an intersection using the Brng-brng intersect method:

1. From the main menu, select *Cogo / Compute point.*
2. Enter a *Point name.*
3. In the *Method* field, select Brng-brng intersect.
4. As shown in the diagram below, enter the name of Point 1 (1), the azimuth from point one (2), the name of Point 2 (3), and the azimuth from point two (4).
5. Tap *Calc* to calculate the intersection point (5).

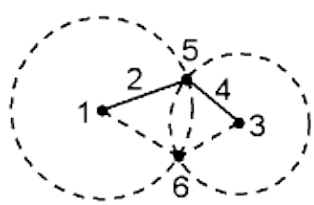
6. Store the point in the database



Dist-dist intersect

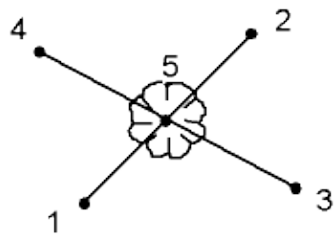
To calculate the coordinates of an intersection using the Dist-dist intersect method:

1. From the main menu, select *Cogo / Compute point.*
2. Enter a *Point name.*
3. In the *Method* field, select Dist-dist intersect.
4. As shown in the diagram below, enter the name of Point 1 (1), the horizontal distance (2), the name of Point 2 (3) and the horizontal distance (4).
5. Tap *Calc.*
6. There are two solutions (5,6) for this calculation; tap *Other* to see the second solution.
7. Store the point in the database.

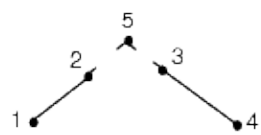


To create a point using the Four point intersection method:

1. From the main menu, select *Cogo / Compute point.*
2. Enter a *Point name.*
3. In the *Method* field, select Four point intersection.
4. As shown in the diagram below, enter the names of the start point of line 1 (1), the end point of line 1 (2), the start point of line 2 (3) and the end point of line 2 (4).
5. Enter any change in the vertical position as a vertical distance from the end of line 2.
6. To calculate the offset point (5), tap *Calc.*

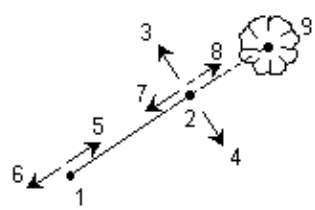


Note - The two lines do not have to intersect, but they must converge at some point, as shown below.



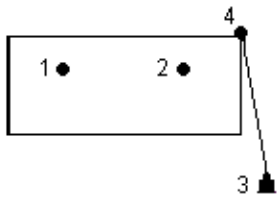
To create a point using the From a baseline method:

1. From the main menu, select *Cogo / Compute point.*
2. Enter a *Point name.*
3. In the *Method* field, select From a baseline.
4. As shown in the diagram below, enter the names of the start point (1) and the end point (2) of the baseline.
5. Enter a *Distance* and select the *Distance direction* method (5, 6, 7, or 8).
6. Enter the offset distance and select the *Offset direction* (3 or 4).
7. Enter the vertical distance from the end of the line.
8. To calculate the offset point (9), tap *Calc.*



To calculate the coordinates of a point using the Vertical plane and angle method:

1. From the main menu, select *Cogo / Compute point.*
2. Enter a *Point name.*
3. In the *Method* field, select Vertical plane and angle.
4. As shown in the diagram below, enter the names of the points (1) and (2) that define the vertical plane, for example, the side of a building. Name and measure new points, or enter the names of existing points.
5. Tap *Meas HA VA* to measure the angle from the instrument (3) to the required point (4).
   The intersection of the vertical plane and the measured angle is used to calculate coordinates for the required point.
6. Tap *Store* to store the point in the database.



Cogo - Compute + Subdivide Area

Compute + subdivide area is a graphical utility that enables you to compute an area and then to subdivide that computed area. When subdividing areas, new intersection point(s) are computed and stored.

The following methods can be used to subdivide the area:

- Parallel line
- Hinge point

The easiest way to define the area to be computed and subdivided is to tap and hold the *Compute + subdivide area* option from the Map. You can then use the following entities:

- points, lines, and arcs from the current job
- points, lines, arcs, and polylines from active map files
- points from a linked job, CSV and TXT files
- a combination of the above

Note - You can also start *Compute + subdivide area* from the Cogo menu. However, you can then only use points to define the area.

When you select entities to define the area, you must select them in the correct order.
When you select lines, arcs, or polylines, you must select them in the correct direction.

When you select entities to define the area, you must select them in the correct order.

To compute and then subdivide an area enclosed by points displayed in the map:

1. From the map, select the points on the perimeter of the area to be calculated. Use the order that they occur on the perimeter.
2. Tap and hold on the map and then select *Compute + subdivide area* from the menu.

   The computed area and the perimeter appear. The arrows on the lines indicate the order in which the points were selected.

   Note - The computed area varies according to the Distance display setting.

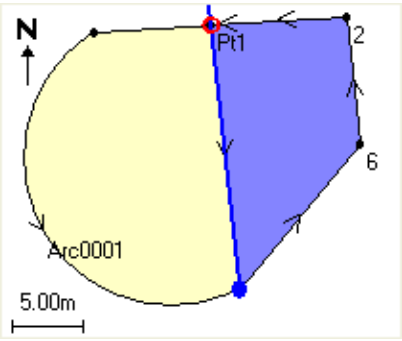
3. Do one of the following:

- To store the area, enter a name, if required, and then tap *Store*. The area is saved and you exit Compute + subdivide area.
- To subdivide the area:

    a. Tap the subdivide method - *Parallel* or *Hinge*.
    b. Enter the *New area* to subdivide from the total area.
    c. If you use the *Parallel* method, tap the line that defines the parallel line.
    If you use the *Hinge* method, tap the point that defines the hinge point.
    The *New area* that you entered is shaded blue. New points are displayed with a red circle, and labeled Pt1, Pt2, and so on.
    d. If the subdivided area you require is the complement of the area displayed, tap the *Swap area* button to switch areas.
    e. Tap *Continue*.
    f. To store the intersection point(s), enter their name(s) and then tap *Save*.
    If you do not want to save the intersection point(s), do not name them.
    g. Tap *Close*.

To see details about the original area and perimeter, new area and perimeter, new intersection points, and an image of the area, go to *Review current job*.

The following figure shows an example of a subdivided area using the *Hinge* method.



Notes

- In area calculations, you can use polylines from a DXF file, but you cannot use Trimble Digital Fieldbook alignments or roads.
- If lines intersect or cross over, the Trimble Digital Fieldbook software attempts to compute the correct area and subdivide the area, but in some cases may give the wrong results.
  Make sure that the graphical image looks correct and then double-check the results if you have concerns that they may not be correct.
- For details on how the area is computed, see Area Calculations.

Cogo - Compute Azimuth

You can use keyed-in data, and points stored in the database, to calculate an azimuth by various methods. You can also store the results in the database. For some methods, you have to tap *Calc* to display the results.

The data that you enter can have different units. For example, you can add an angle in degrees to an angle in radians-the answer is returned in whatever format you specified in the job configuration.

Calculate an azimuth using one of the following methods:

Between two points

Bisected azimuths

Bisected corner

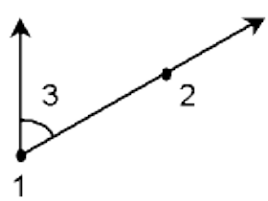
Azimuth plus angle

Azimuth to line offset

Between two points

To calculate the azimuth between two points:

1. From the main menu, select *Cogo / Compute azimuth.*
2. In the *Method* field, select Between two points.
3. As shown in the diagram below, enter the name of the From point (1) and the To point (2).
4. The azimuth between them (3) is calculated.

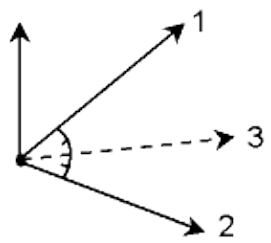


Tip - You can compute an azimuth from two points in the database directly in an azimuth field. To do this, enter the point names in the *Azimuth* field, separated by a hyphen. For example, to compute the azimuth from point 2 to point 3, enter "2-3". This method works with most alphanumeric point names, but it does not support point names that already contain a hyphen.

Bisected azimuths

To calculate bisected azimuths:

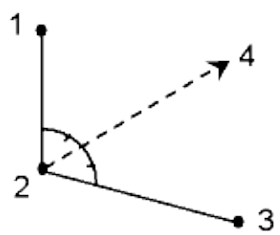
1. From the main menu, select *Cogo / Compute azimuth.*
2. In the *Method* field, select Bisected azimuths.
3. As shown in the diagram below, enter values for *Azimuth 1* (1), and *Azimuth 2* (2).
4. The azimuth halfway between them (3), is calculated.



Bisected corner

To calculate a bisected corner azimuth:

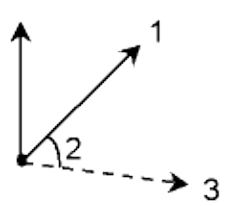
1. From the main menu, select *Cogo / Compute azimuth.*
2. In the *Method* field, select Bisected corner.
3. As shown in the diagram below, enter the names of the *Side point 1* (1), the *Corner point* (2), and *Side point 2* (3).
4. The azimuth (4), halfway between Side point 1 and Side point 2, from the Corner point, is calculated.



Azimuth plus angle

To calculate the azimuth plus angle:

1. From the main menu, select *Cogo / Compute azimuth.*
2. In the *Method* field, select Azimuth plus angle.
3. As shown in the diagram below, enter the *Azimuth* (1) and the *Turned angle* (2).
4. The sum of the two (3) is calculated.



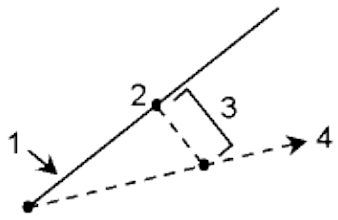
Azimuth to line offset

To calculate the azimuth to line offset:

1. From the main menu, select *Cogo / Compute azimuth.*
2. In the *Method* field, select Azimuth to line offset.
3. As shown in the diagram below, enter the name of the line (1), the stationing (2) and the horizontal offset (3).

   Tip - If the line does not already exist, tap the advanced pop-up arrow and then select *Two points.* You can then enter the start point and end point to define the line.

4. The azimuth (4), from the start point of the line to the offset point is calculated.



Cogo - Compute Distance

You can use keyed-in data, and points stored in the database, to calculate a distance by various methods. You can also store the results in the database.

The data that you enter can have different units. For example, if you add a distance in meters to a distance in feet, the answer is returned in whatever format you specified in the job configuration.

For some methods you have to tap *Calc* to display the results.

Between two points

Between point and line

Between point and arc

Between two points

To compute the distance between two points:

1. From the main menu, select *Cogo / Compute distance.*
2. In the *Method* field, select Between two points.
3. Enter the *From point* and the *To point.*
4. The distance between the two points is calculated.

Tip - You can compute a distance between two points in the database directly in a distance field. To do this, enter the point names in the distance field, separated by a hyphen. For example, to compute the distance

between points 2 and 3, enter "2-3". This method works with most alphanumeric point names, but it does not support point names that already contain a hyphen.

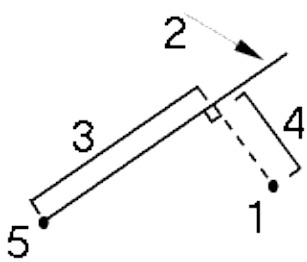
Between point and line

To compute the distance between a point and a line:

1. From the main menu, select *Cogo / Compute distance.*
2. In the *Method* field, select Between point and line.
3. As shown in the diagram below, enter the *Point name* (1) and the *Line name* (2).

   Tip - If the line does not already exist, tap the advanced pop-up arrow and select *Two points.* You can then enter the start point and end point to define the line.

4. The distance along the line (3) and the perpendicular distance (4) to the line is calculated. The distance along the line is from the point specified (5).



Between point and arc

To compute the distance between a point and an arc:

1. From the main menu, select *Cogo / Compute distance.*
2. In the *Method* field, select Between point and arc.
3. As shown in the diagram below, enter the *Point name* (1) and the *Arc name* (2).
4. The distance along the arc (3) and the perpendicular distance (4) to the arc is calculated. The distance along the arc is from the point specified (5).

Cogo - Compute Average

Use the *Compute average* option to compute and store the average position for a point that has been measured more than once.

Two or more angles only observations from two different known points can be 'averaged' to compute the coordinates of the intersection point. To 'average' the observations they must be stored with the same point name.

Enter the name of the point to compute the average position for into the *Point name* field. You can select the point name from a list using the pop-up menu for the field.

If the point you entered has only one position fix, or has been stored as a control point, then an error message appears to tell you that an average position cannot be computed.

Once you enter a point name for which an average position can be computed, Trimble Digital Fieldbook searches the database to find all the positions for that point. Once computed, the average point grid position appears, along with the standard deviations for each ordinate.

If there are more than two positions for the point, a *Details* softkey appears. Tap *Details* to view the residuals from the average position to each individual position. You can use this residuals form to include or exclude specific positions from the average computation.

Tip - Trimble Digital Fieldbook averages all positions in the current job database with the same name (except Control points). Tap *Details* to ensure that only the required positions are averaged.

To store the computed average position for the point, tap *Store*. If an averaged position for the point already exists in the database, the existing point is automatically deleted when the new average position is stored.

Notes

- An averaged position is not automatically updated if the positions used to compute the average are changed. For example, if the calibration is updated, if observations are transformed or deleted, or if new observations of the same name are added, re-compute the averaged position.
- Averaging uses Least squares to average all points/observations in the current job that have the same name.
    - If the average includes anything other than ECEF or WGS84 positions, the average is stored as a grid.
    - Conventional observations that include a measured slope distance are resolved to grid and then averaged using Least squares. The intersections of angles only conventional observations are averaged using Least squares.
    - Conventional angle-only observations are only added to the solution if there are no other positions or observations.
    - When the average includes only ECEF or WGS84 positions, the averaged grid position is converted back to WGS84 and stored as a WGS84. When the average contains only grid positions and conventional observations, or a mixture of position types, then the averaged grid position is stored as a grid.
- Any Mean Turned Angle (MTA) observed to the point is ignored and the original observations are used to compute the average position.
- Points in an average are weighted as follows:
    - For conventional observations that include a measured slope distance, horizontal and vertical standard errors are computed based on the standard errors of the components of the observation.

The standard error used for weighting the horizontal position is a combination of those used for the horizontal direction and horizontal distance weights from the resection calculation. For more information, see [Resection Computations] at www.trimble.com.

- To automatically average duplicate points, enable *Auto average* in the *Duplicate point tolerance* section of the survey style.

Cogo - Subdivide a line

Use this function to subdivide a line into segments. The points created are automatically stored in the database and the point names are automatically incremented from the Start point name.

You can predefine the code of a subdivided point. For more information, see Subdivide Pts Code.

Subdivide a line using one of the following methods:

Fixed segment length

Fixed number of segments

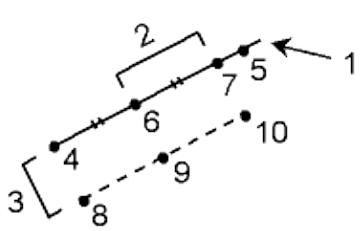
Tip - If the line does not already exist, tap the advanced pop-up arrow and then select *Two points.* You can then enter the start point and end point to define the line.

Fixed segment length

To subdivide a line into segments of fixed length:

1. Do one of the following:
   - ♦ From the map, select the line to be subdivided (1). Tap and hold on the screen and then select the *Subdivide a line* option from the shortcut menu.
   - ♦ From the main menu, select *Cogo / Subdivide a line*. Enter the name of the defined line.

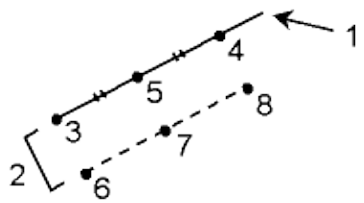
2. In the *Method* field, select Fixed segment length.
3. Enter the segment length (2), and any horizontal offset (3) and vertical offset from the line.
4. Enter the names of the *Start at station* (4), the *End at station* (5), and the *Start point name.*
5. Tap *Start* to calculate the new points (4, 6, 7, or 8, 9, 10).



Fixed number of segments

To subdivide a line into a fixed number of segments:

1. Do one of the following:
    - From the map, select the line to be subdivided. Tap and hold on the screen and then select the *Subdivide a line* option from the shortcut menu.
    - From the main menu, select *Cogo / Subdivide a line*. Enter the name of the defined line.
2. In the *Method* field, select Fixed number of segments.
3. Enter the number of segments, and any horizontal offset (2) and vertical offset from the line.
4. Enter the names of the *Start at station* (3), the *End at station* (4), and the *Start point name.*
5. Tap *Start* to calculate the new points (3, 5, 4, or 6, 7, 8).



Cogo - Subdivide an arc

Use this function to subdivide an arc using one of the following methods:

Fixed segment length

Fixed number of segments

Fixed chord length

Fixed angle subtended

The points created are automatically stored in the database and the point names are incremented from the Start point name.

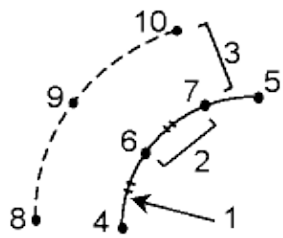
You can predefine the code of a subdivided point. For more information, see Subdivide Pts Code.

Fixed segment length

To subdivide an arc into segments of fixed length:

1. Do one of the following:
    - From the map, select the arc to be subdivided. Tap and hold on the screen and select the *Subdivide an arc* option from the shortcut menu.
    - From the main menu, select *Cogo / Subdivide an arc* . Enter the name of the defined arc.
2. In the *Method* field, select Fixed number of segments.
3. Enter the segment length (2), and any horizontal offset (3) and vertical offset from the arc.

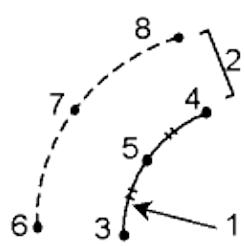
4. Enter the names of the *Start at station* (4), the *End at station* (5), and the *Start point name.*
5. Tap *Start* to calculate the new points (4, 6, 7, or 8, 9, 10).



Fixed number of segments

To subdivide an arc into a fixed number of segments:

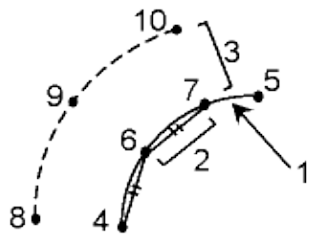
1. Do one of the following:
   - ♦ From the map, select the arc to be subdivided. Tap and hold on the screen and select the *Subdivide an arc* option from the shortcut menu.
   - ♦ From the main menu, select *Cogo* / *Subdivide an arc* . Enter the name of the defined arc.
2. In the *Method* field, select Fixed number of segments.
3. Enter the number of segments, and any horizontal offset (2) and vertical offset from the arc.
4. Enter the names of the *Start at station* (3), the *End at station* (4), and the *Start point name.*
5. Tap *Start* to calculate the new points (3, 5, 4, or 6, 7, 8).



Fixed chord length

To subdivide an arc into segments of fixed chord length:

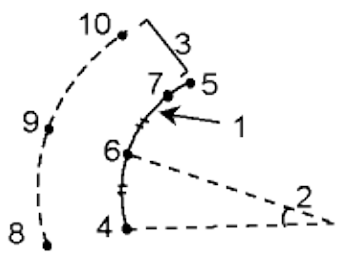
1. Do one of the following:
   - ♦ From the map, select the arc to be subdivided. Tap and hold on the screen and select the *Subdivide an arc* option from the shortcut menu.
   - ♦ From the main menu, select *Cogo* / *Subdivide an arc* . Enter the name of the defined arc.
2. In the *Method* field, select Fixed chord length.
3. Enter the chord length (2), and any horizontal offset (3) and vertical offset from the arc.
4. Enter the names of the *Start at station* (4), the *End at station* (5), and the *Start point name.*
5. Tap *Start* to calculate the new points (4, 6, 7, or 8, 9, 10).



Fixed angle subtended

To subdivide an arc into fixed angle subtended segments:

1. Do one of the following:
   - From the map, select the arc to be subdivided. Tap and hold on the screen and select the *Subdivide an arc* option from the shortcut menu.
   - From the main menu, select *Cogo / Subdivide an arc*. Enter the name of the defined arc.
2. In the *Method* field, select Fixed angle subtended.
3. Enter the *Angle subtended* (2), and any horizontal offset (3) and vertical offset from the arc.
4. Enter the names of the *Start at station* (4), the *End at station* (5), and the *Start point name.*
5. Tap *Start* to calculate the new points (4, 6, 7, or 8, 9, 10).



Cogo - Traverse

Use this function to calculate a traverse misclosure, and adjust a conventional traverse. The software helps you select the points to be used, calculates the misclosure, and then lets you compute either a Compass or Transit adjustment.

Note - The Compass adjustment is sometimes known as the Bowditch adjustment.

You can calculate closed-loop traverses and closed traverses that start and end on pairs of known points.

To calculate a traverse:

1. Enter the *Traverse name.*
2. In the *Start station* field, tap *List.*
3. Select a point from the list of valid traverse points that can be used as the start station. Tap *Enter*.

A valid start station has one or more backsights and one or more observations to the next traverse station.

4. Tap *Add* to add the next point in the traverse.
5. Select the next station in the traverse.

   A valid traverse station has one or more backsight observations to the previous traverse station, and one or more observations to the next traverse station. When there is only one valid traverse station, it is added automatically.

   Note - To view the observed azimuth and distance between two points in the list, highlight the first point and tap the Info softkey.

6. Repeat steps 4 and 5 until all points in the traverse have been added.

   A valid end station has one or more backsights, and one or more observations to the previous traverse station.

   If you need to remove any points from the list, highlight the point and tap *Delete*. When you delete a point, all points after it are deleted as well.

7. Tap *Close* to compute the traverse misclosure.

   Note - You cannot add more points after selecting a control point, or a station with more than one backsight.

   Note - To compute a traverse closure, there must be at least one distance measurement between successive points in the traverse list.

   Note - The *Azimuth* fields do not have to be completed.

   If the backsight azimuth is null:

   - the traverse cannot be oriented.
   - adjusted coordinates cannot be stored.
   - an angular adjustment cannot be computed on an open traverse. (A distance adjustment can be computed.)

     If the foresight azimuth is null in a loop traverse, and if all angles have been observed, you can compute an angular and distance adjustment.

The backsight and foresight points that provide the orientation for the traverse are shown.

If necessary, tap *Enter* to edit the fields as follows:

1. Inspect the results of the traverse and do one of the following:
   - To store the closure results, tap *Store*.
   - To adjust the traverse, go to the next step.

2. Tap *Options* to check the traverse settings. Make any changes as required, then tap *Enter*.
3. Tap *Adj. Ang.* to adjust the angular misclosure. The angular misclosure is distributed according to the setting in the *Options* screen.
4. Inspect the results of the traverse, then do one of the following:
    - To store the angular adjustment details, tap *Store*.
    - To adjust the distance misclosure, tap *Adj. dist.* The distance misclosure is distributed according to the setting in the *Options* screen and the traverse is stored.

When the traverse is stored, each point used in the traverse is stored as an adjusted traverse point with a search classification of adjusted. If there are any previously adjusted traverse points of the same name, they are deleted.

Pop-Up Menu Controls

To insert a feature name into a field, enter the name or tap the pop-up menu button and select one of the following options from the list that appears:

List	select features from the database
Key in	key in details
Measure	measure a point
Fast fix	automatically measure a construction class point
Map selections	select from a list of the features currently selected in the map
Calculator	shortcut to the Calculator
Units	select units for the field

To change the method of data entry, tap the advanced pop-up menu button . The first two or three fields change.

Cogo Settings

Use this screen to configure the distance type (grid, ground, or ellipsoid), and the grid coordinate system orientation to be used by the Trimble Digital Fieldbook software.

You can disable the *Sea level (ellipsoid) correction.*

You can select a south azimuth, or set the grid coordinates to increase in north-east, south-west, north-west, or south-east directions.

When you select *Scale factor only* in a conventional instrument only survey, grid and ground distances can be displayed.

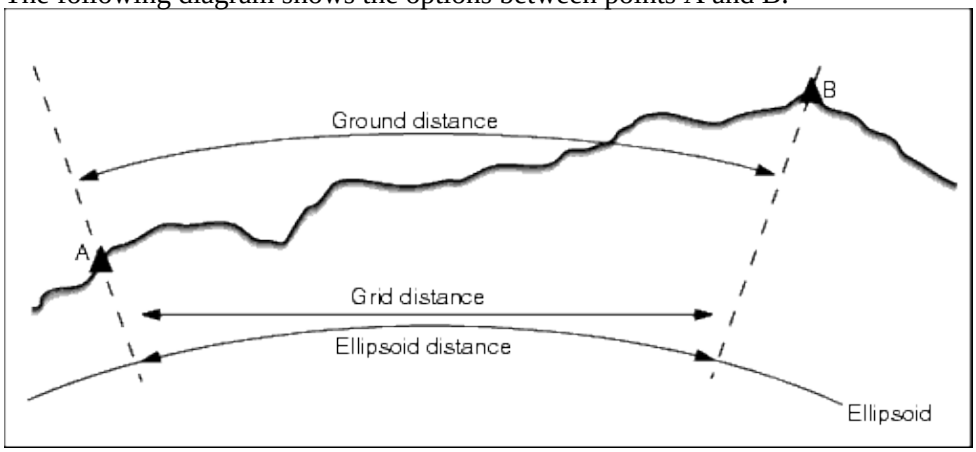
To configure the Cogo settings, select *File / New job / Cogo settings* when creating a new job. For an existing job select *File / Properties of current job / Cogo settings.*

Distance Display

The *Distances* field defines how distances are displayed and which distances are used for calculations in the Trimble Digital Fieldbook software. Select one of the following options:

- Ground (the default setting)
- Ellipsoid
- Grid

The following diagram shows the options between points A and B.



Ground distance

A ground distance is the horizontal distance calculated between the two points at the mean elevation parallel to the chosen ellipsoid.

If an ellipsoid has been defined in the job and the *Distances* field is set to *Ground*, the distance is calculated parallel to that. If no ellipsoid has been defined, the WGS84 ellipsoid is used.

Ellipsoid distance

If the *Distances* field is set to *Ellipsoid* then a correction is applied and all distances are calculated as if on the local ellipsoid, which usually approximates to sea level. If no ellipsoid has been specified, the WGS84 ellipsoid is used.

Note - If the coordinate system for a job is defined as *Scale factor only*, ellipsoid distances cannot be displayed.

Grid distance

If the *Distances* field is set to *Grid*, the grid distance between two points is displayed. This is the simple trigonometrical distance between the two sets of two-dimensional coordinates. If the coordinate system for the job is defined as *Scale factor only*, and the *Distances* field is set to *Grid*, the Trimble Digital Fieldbook software displays ground distances multiplied by the scale factor.

Curvature Correction

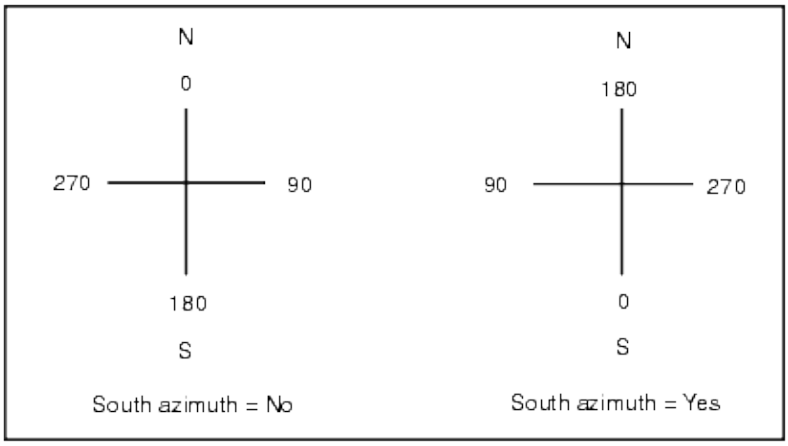
In the Trimble Digital Fieldbook system, all ellipsoid and ground distances are parallel to the ellipsoid.

Azimuth Display

The azimuth displayed and used by the Trimble Digital Fieldbook software depends on the coordinate system that you defined for the current job:

- If you defined both a datum transformation and a projection, or if you selected *Scale factor only* , the grid azimuth is displayed.
- If you defined both a datum transformation and a projection, the grid azimuth is displayed.
- If you defined no datum transformation and/or no projection, the best available azimuth is displayed. A grid azimuth is the first choice, then a local ellipsoidal azimuth, then the WGS84 ellipsoid azimuth.

  If a south azimuth display is required, set the *South azimuth* field to *Yes.* All azimuths still increase clockwise. The following diagram shows the effect of setting the *South azimuth* fields to No or Yes.

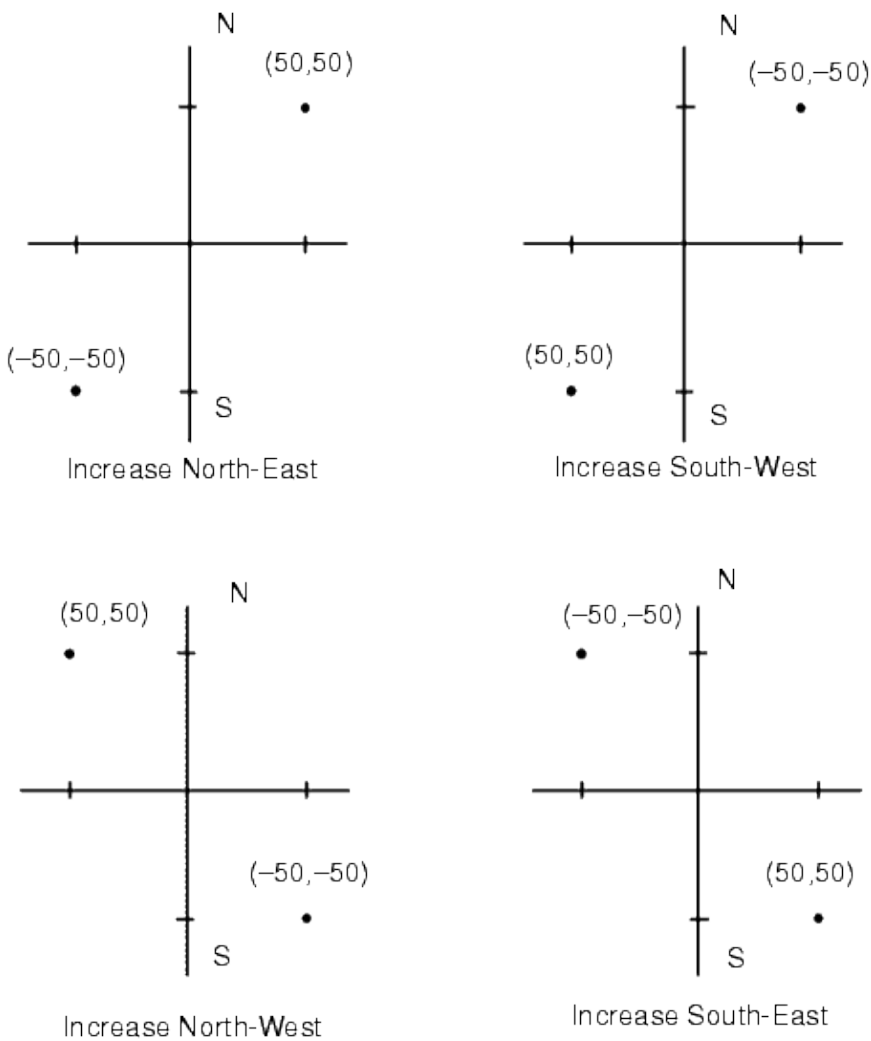


Grid Coordinates

Use the *Grid coords* field to set the grid coordinates to increase in one of the following sets of directions:

- north and east
- south and west
- north and west
- south and east

  The following diagram shows the effect of each setting.



Sea level (ellipsoid) correction

The *Sea level (ellipsoid) correction* check box enables you to choose whether or not the horizontal components of distances measured with a conventional total station should be corrected to their equivalent length on the ellipsoid.

In most case, select the *Sea level (ellipsoid) correction* check box to compute the correct geodetic grid coordinates from the total station observations.
However, if the local ellipsoid was inflated to provide computed ground coordinates, but the point heights were not changed to be in terms of the inflated ellipsoid, do not select sea level correction; for example, when using jobs with Minnesota county coordinate systems.

The sea level correction is carried out using the average height (not elevation) of the line above the local ellipsoid. If both ends of the line have null heights, the default height specified for the job is used to compute this correction.

The formula used for the computation is:

Ellipsoid horizontal distance = HzDist *x* Radius / (Radius + AvHt)

HzDist	Horizontal component of measured distance
Radius	Ellipsoid semi-major axis
AvHt	Average height above local ellipsoid of the measured line

Notes

- In jobs where the coordinate system is configured to provide ground coordinates, the *Sea level (ellipsoid) correction* is always enabled and cannot be edited. This is because the sea level correction is already applied in the computation of the ground coordinates.
- In a Scale only job, there is no local ellipsoid available because this is not a geodetic projection. In this case, the correction computation defaults to using the semi-major axis of the WGS84 ellipsoid (6378137.0 m) as the radius value. The sea level correction in Scale only jobs also uses the point elevations because there are no ellipsoidal heights available.
- You cannot set a default height for Scale only jobs. This means that if the *Sea level (ellipsoid) correction* is enabled in a Scale only job, you must use 3D points, or null coordinates will be computed because it is not possible to compute the sea level correction.

Magnetic Declination

Set the magnetic declination for the local area if magnetic bearings are being used in the Trimble Digital Fieldbook software. You can use magnetic bearings if you choose the *Cogo / Compute* point using the Brng-dist from a point method.

The magnetic declination defines the relationship between magnetic north and grid north for the job. Enter a negative value if magnetic north is west of grid north. Enter a positive value if magnetic north is east of grid north. For example, if the compass needle points 7° to the east of grid north, the declination is +7° or 7°E.

Note - Use the published declination values if available.

Note - If grid north in the job has been rotated away from true north due to the coordinate system definition then this must be allowed for in the magnetic declination specified.

Survey - General

Survey Menu

Use this menu to measure and stake out points using the Survey Styles defined in the Trimble Digital Fieldbook software.

For more information, see:

Conventional Surveys

Note - If there is only one survey style, it is automatically selected when you choose *Survey* from the main menu. Otherwise, select a style from the list that appears.

Getting Started

All surveys in Trimble Digital Fieldbook are controlled by a Survey Style. Survey Styles define the parameters for configuring and communicating with your instruments, and for measuring and storing points. This whole set of information is stored as a template and used each time you start a survey.

Configure the style only if the defaults do not suit your needs. To change the configuration of the Trimble Digital Fieldbook software for different types of survey, select *Configuration / Survey Styles* from the main menu.

After this, whenever you want to use a particular survey style, you can select it from the *Survey* menu.

Note - If there is only one survey style, it is automatically selected when you choose *Survey* from the main menu. Otherwise, select a style from the list that appears.

Conventional Surveys

Note - If there is only one survey style, it is automatically selected when you choose *Survey* from the main menu. Otherwise, select a style from the list that appears

The Trimble Digital Fieldbook software provides a default style for use with a conventional instrument. Configure this type of survey when you create or edit a survey style, then follow these steps to carry out a conventional survey.

1. Configure your survey style
2. Perform a station setup
3. Begin the survey
4. End the survey

Configure your survey style

To configure a survey style:

1. From the main menu, select *Configuration / Survey styles / <Style name>*.
2. Select each of the options in turn, and set them to suit your equipment and survey preferences.
3. Once you configure all the settings, tap *Store* to save them, and then tap *Esc* to return to the main menu.

For more information, see:

Instrument

Duplicate point tolerance

Traverse options

Perform a station setup

To get the most out of the Station setup routine, tap *Options* to configure *Station setup* to match the way that you prefer to work.

You can configure the default point names, default heights, default instrument coordinates, and the default azimuth. Default instrument coordinates and default azimuth are used only if the instrument point is not already coordinated, and an azimuth to the backsight cannot be computed.

The *Default point names* option determines the default values for the instrument and the backsight point name fields each time you perform a station setup:

- If you always use the same names for your instrument and backsight points, select *Last used.* Use this method if you always use the default instrument coordinates, or if you repeatedly set up on the same known point.
- If you are performing a traverse type survey, select *Traversing.* When you start a new station setup, by default, the instrument uses the first foresight point observed from the last station setup for the *Instrument point name,* and the instrument point name used in the last station setup for the *Backsight point name.*
- If you want to key in or select the instrument and backsight point names each time you perform a station setup, select *All null.*

Note - These are only default values. You should select the option that matches your normal workflow. You can override the default values for any particular station setup.

Note - Do not confuse the *Last used* option with the *Use last* survey menu option.
The *Last used* option applies to a new station setup. The last values are used even across different jobs.
The *Use last* menu option reinstates the last station setup. No new station setup is performed.

The *Default heights* option determines the default values for the instrument and the backsight point height fields each time you perform a station setup.

- If you always use the same heights for your instrument and backsight points, select *Last used.* This option is available only if you set the *Default point names* option to *Last used.*
- If you are using the Trimble traverse kit (so that the last measured foresight and instrument heights can be used as the new instrument and backsight heights), select *Move forward.* This option is available only if you set the *Default point names* option to *Traversing.*
- If you want to key in a new instrument and backsight height for each station setup, select *All null.*

If the instrument point does not exist, the default instrument coordinates are used. This is particularly useful if you work in a local coordinate system, and always set up your instrument on coordinate (0,0,0) or (1000N, 2000E, 100El), for example. If you leave the *Default instrument coordinates* set to null, you can key in coordinates for instrument points that do not exist when you perform a station setup.

If an azimuth cannot be computed between the instrument and backsight points, the *Default azimuth* is used.

Note - If you always set up your instrument on a known point, and use a known azimuth, then leave the *Default instrument coordinates* and *Default azimuth* fields set to null. This ensures that you do not accidentally use default values if you incorrectly enter the name of the instrument and/or the backsight point names.

The Trimble Digital Fieldbook software normally expects you to measure a backsight point to orient your survey. If your survey practice does not require you to measure to the backsight, clear the *Measure backsight* check box on the second page of options. The software automatically creates a virtual backsight, *Backsightxxxx* (where xxxx is a unique suffix, for example, *Backsight0001),* using the current instrument orientation as the azimuth.

Tip - If the instrument is correctly set up and oriented, you are satisfied that the last station setup is still valid, and you wish to continue observing points from this station, select Survey / Use last to use the last completed station setup.

To perform a station setup:

1. From the main menu, select *Survey / Station setup* , *Station setup plus* , *Resection* , or *Refline.*

   Note - If you have only one style, it is automatically selected.

   Set the corrections associated with the instrument.

   If the *Corrections* form does not appear, set the corrections by selecting *Options* from the *Station setup* screen. To have the *Corrections* form display on startup, select the *Show corrections on startup* option.

2. Enter the instrument point name and the instrument height.

   Note - For a 2D or planimetric survey, leave the *Instrument height* field set to null (?). No elevations will be calculated. Unless you are using a *Scale only* projection, you must define a project height in the coordinate system definition. The Trimble Digital Fieldbook software needs this information to reduce measured ground distances to ellipsoid distances, and to compute 2D coordinates.

3. Enter the backsight point name.

   Tip - If the point is available from a linked file, select the linked file for the job and enter the point name in the Instrument point name or *Backsight point name* field. The point is automatically copied to the job.

4. Choose an option in the *Method* field. The options are:
   - *Angles and distance* - measure horizontal and vertical angles and slope distance
   - *Averaged observations* - measure horizontal and vertical angles, and slope distance for a predefined number of observations
   - *Angles only* - measure horizontal and vertical angles
   - *H. Angle only* - measure horizontal angle only
   - *Angle offset* - measure the slope distance first, the instrument can then be repointed and then measure the horizontal and vertical angles
   - *H. Angle offset* - measure the vertical angle and slope distance first, the instrument can then be repointed and then measure the horizontal angle
   - *V. Angle offset* - measure the horizontal angle and slope distance first, the instrument can then be repointed and then measure the vertical angle
   - *Distance offset* - enter the left/right, in/out or V.Dist offset from the target to the object when a point is inaccessible and then measure horizontal and vertical angles and slope distance to the offset object
5. If necessary, enter the target height for the backsight.
6. Sight the center of the backsight target and tap *Measure*.

   Select the *View before storage* check box to view observations before they are stored.

7. If you are performing a resection or station setup plus , you can add more backsight points/observations to the station setup.
8. If the residuals for the station setup are acceptable, tap *Close* and then tap *Store.*

Station Setup is complete.

Begin the survey

To do this:

1. From the main menu, select either *Survey / Measure points* or *Survey / Stakeout.*

   If you chose *Measure points:*

a. Enter a point name and code.
b. Choose one of the methods of observation.
c. Enter a target height, if required.
d. Tap *Measure* to observe the point.
e. Tap *Store* to save the observation to the database.
f. Tap *Check* to measure check shots to any known points.
g. Move to the next point and measure it.

If you chose *Stakeout:*

a. Tap *Add* to add the points you want to stake out to the stakeout list.

   To key in a point name, instead of building a stakeout list, tap > *Point* and then enter the point name to stake.

b. Select the point to stake out now, and use the graphics and text to stake out the point.
c. When the instrument is within the angular tolerance (as indicated by two hollow/outline arrows), tap *Measure*.
d. Tap *Accept* to view the stakeout deltas.
e. Tap *Store* to save the point.
f. Continue until all points have been staked out.
g. To review stored points, select *Review current job* from the *Files* menu.

End the survey

To do this:

1. From the main menu, select *Survey / End survey*.
2. Tap *Yes* to confirm.
3. Turn off the controller.

Warning - The current station setup is lost when you select *End Survey*.

If a survey is running, end it before editing the current survey style or changing survey styles. You must also end the survey before accessing job functions such as copying. For more information, see Job.

For more information, see:

Station Setup - Single backsights

Station Setup Plus

Resection

Refline

Target

Prism constant

Measure Points

Remote Object

Measure a point in two faces

Measure Rounds

Stakeout

End Survey

Conventional Surveys

In conventional surveys, you can measure the following types of points:

- *Measure topo*
- *Check points*

If a point is inaccessible, you can also measure horizontal angle and distance offsets to the point.

To measure a point that cannot be observed directly with a pole in a plumb position use the Dual prism measurement method.

To calculate a center point of a circular object such as a water tank or silo, use the *Circular object* option.

To measure multiple sets of observations, select *Measure rounds* from the *Survey* menu.

To calculate the height of a remote object if the instrument does not support DR mode, or you cannot measure a distance, use the *Remote Object* method.

You can also Measure a point on two faces.

Tip - In *Point name* fields there is a *Find* softkey that lets you search for the next available point name. For example, if your job contains points numbered in the 1000s, 2000s and 3000s, and you want to find the next available point name after 1000:

1. In the *Point name* field, tap *Find.* The *Find next free point name* screen appears.
2. Enter the point name you want to start searching from (in this example, 1000) and tap *Enter*.

The Trimble Digital Fieldbook software searches for the next available point name after 1000 and inserts it in the *Point name* field.

Stakeout - Overview

In a conventional survey, you can stake out points, lines, arcs and alignments.

To stake out an item:

- Define the item to be staked out.
- From the map, or from *Survey / Stakeout*, select the item to be staked out.

- Navigate to the point, or direct the person holding the rod to the point.
- Mark the point.
- Measure the point (optional).

You can define the item to be staked out in the *Key in* menu, or you can use a linked file to add the points to the stakeout list.

You can define the item to be staked out:

- in the *Key in* menu
- with a linked CSV or job file
- from lines and arcs uploaded with the job file
- from an active map file
- from an alignment (.rxl)

To stake out a line between two points without keying the line into the job database, you can select two points from the map, tap and hold in the map to access the pop-up menu and then select *Stake out line.*

Warning - Do not change the coordinate system after you have staked out points.

For more information, see:

Arcs

Lines

Points

Alignments (polylines)

Stakeout - Display mode

Stakeout - Options

Using the Graphical display

Fast Fix

Tap *Fast fix* to quickly measure and automatically store a construction point. Alternatively, select *Fast fix* from the pop-up menu in the *Point name* field.

Note - In a conventional survey, *Fast fix* uses the current measurement mode.
If you need more flexibility, select *Measure* from the pop-up menu in the *Point name* field.

Typically, a construction point is used in *Cogo - compute points* or *Key in - lines and arcs.*

Construction points are stored in the Trimble Digital Fieldbook database with autopoint names that increment from Temp0000. They are classified higher than as-staked points and lower than normal points. For more information, see Database Search Rules.

To view construction points in a map or list, tap *Filter* and select them from the *Select filter* list.

Topo Point

This is a previously configured method of measuring and storing a point. Configure this type of point when you create or edit a Survey Style.

Use the *Auto point step size* field to set the increment size for automatic point numbering. The default is *1*, but you can use larger step sizes and negative steps.

Check Point

Conventional

In a conventional total station survey, tap *Check* to measure a check class point.

To measure a check point:

1. In the *Point name* field, enter the name of the point to check.
2. In the *Method* field, select a measurement method and enter the required information in the fields that appear.
3. In the *Target height* field, enter the height of the target and then tap *Measure.*

   If you did not select the *View before storage* check box, the point is stored with a classification of *Check.* If you selected the *View before storage* check box, the check shot deltas appear on the *Check shot* screen.

   When you observe the point, if the station setup is the same as when you originally measured the point, the deltas are the difference in values between the original observation and the check observation. The deltas displayed are horizontal angle, vertical distance, horizontal distance, and slope distance.

   If the station setup is different from when you originally measured the point, the deltas are in terms of the best coordinates from the original point to the check point. The deltas displayed are azimuth, vertical distance, horizontal distance, and slope distance.

4. Tap *Enter* to store the check point. Tap *Esc* to abandon the measurement.

Tap *Chk BS* to display the *Check backsight* screen. This is similar to the *Check point* screen, but the *Point name* field shows the backsight of the current station setup. You cannot edit this field.

To observe a check shot to the backsight, use the same procedure as described above.

To return to the *Check point* screen, tap *Chk topo.*

End Survey

To end the current survey, select *End conventional survey* from the *Survey* menu.

Warning - The current station setup is lost when you select *End conventional survey.*

Survey - Conventional

Measuring topo points in a Conventional Survey

To measure a topographic point using a conventional instrument:

1. From the main menu, select *Survey* and then perform a station setup,station setup plus,resection, or refline.
2. From the *Survey* menu, select *Measure topo.*
3. Enter a value in the *Point name* field.
4. If necessary, enter a feature code in the *Code* field.
5. In the *Method* field, select a measurement method.
6. Enter a value in the *Target height* field and then tap *Measure.*

If you selected the *View before storage* check box in the survey style, the measurement information appears on the screen. If necessary, edit the target height and code. Tap the view display button on the left of the measurement information to change the display and then do one of the following:

- To store the point, tap *Store.*
- Turn the instrument to the next point and then tap *Read.* The last point is stored and a measurement is made to the next point.

If you did not select the *View before storage* check box, the point is stored automatically and the point name increments (based on the *Auto point step size* setting). The Trimble Digital Fieldbook software stores the raw observations (HA, VA, and SD).

Notes

- If you selected the *Auto average* option, and an observation to a duplicate point is within the specified duplicate point tolerances, the observation and the computed average position (using all the available point positions) are automatically stored.
- Two angles only observations from two different known points can be 'averaged' to compute the coordinates of the intersection point. To average the observations, they must be stored with the same point name. When the *Duplicate point: Out of tolerance* screen appears, select *Average.* Alternatively, average the observations using *Cogo / Compute average.*

To change the settings for the current survey, tap *Options.* You can not change the current survey style or the system settings.

Tips

- You can tap *Enter* while measuring an *Averaged observations* to accept the measurement before the required number of observations has been completed.
- You can tap *Enter* while measuring a *Direct Reflex (DR)* point with a defined standard deviation to accept the measurement before the standard deviation has been satisfied.

Measurement Methods

For more information on the different measurement methods see the following:

Angles and distance

Angles only, H.Angle only

Angle Offset, H. Angle Offset, and V. Angle Offset

Distance offset

Dual Prism

Circular Object

Remote Object

You can also Measure a point on two faces.

Use the *Auto point step size* field to set the increment size for automatic point numbering. The default is *1*, but you can use larger step sizes and negative steps.

Select the *View before storage* check box to view observations before they are stored.

Station Setup

In a conventional survey, you must complete a station setup to orientate the instrument:

1. From the main menu, select *Survey / (Selected survey style) / Station setup.*

   The menu that appears varies according to whether or not you have a current station setup.

   Note - If you have only one style, it is automatically selected.

2. Set the corrections associated with the instrument.

   If the *Corrections* form does not appear, tap *Options* from the *Station setup* screen to set the corrections.
   To make the *Corrections* form appear on startup, select the *Show corrections on startup* option.

3. Enter the instrument point name and the instrument height. If the point is not already in the database, you can key it in or leave it as null.

   Notes

- If the coordinates for the instrument point are not known, perform a resection to known points to coordinate the point.
- For a 2D or planimetric survey, leave the *Instrument height* field set to null (?). No elevations are calculated. Unless you are using a Scale only projection, a project height must be defined in the coordinate system definition. Trimble Digital Fieldbook software needs this information to reduce measured ground distances to ellipsoid distances and to compute 2D coordinates.

4. Enter the backsight point name and the target height. If there are no coordinates for the point, you can key in an azimuth.

   Notes

   - If you do not know the azimuth, you can enter an arbitrary value and then edit the azimuth record later, in review.
   - When you enter the instrument point later, make sure that you choose to overwrite the original instrument point in the *Duplicate point* form. The coordinates of any points measured from that station are then computed.
   - You can use the Point manager to edit the coordinates of the instrument point. If you do, then the positions of all records that are computed from that station setup position may change.
   - You can use Point manager to edit the coordinates of the backsight point. If you edit the point record that is used as a backsight in a station setup with a computed azimuth to the backsight, then the positions of all records that are computed from that station setup may change.

   Tip - If the point is available from a linked file, select the linked file for the job and then enter the point name in the *Instrument point name* or *Backsight point name* field. The point is automatically copied to the job.

5. Choose an option in the *Method* field. The options are:
   - Angles and distance - measure horizontal and vertical angles and slope distance
   - Averaged observations - measure horizontal and vertical angles and slope distance for a predefined number of observations
   - Angles only - measure horizontal and vertical angles
   - H. Angle only - measure horizontal angle only
   - Angle offset - measure the slope distance first, the instrument can then be repointed and then measure the horizontal and vertical angles
   - H. Angle offset - measure the vertical angle and slope distance first, the instrument can then be repointed and then measure the horizontal angle
   - V. Angle offset - measure the horizontal angle and slope distance first, the instrument can then be repointed and then measure the vertical angle
   - Distance offset - enter the left/right, in/out or V.Dist offset from the target to the object when a point is inaccessible and then measure horizontal and vertical angles and slope distance to the offset object
     When you use an offset method, tap *Options* and then set the *Offset & Stakeout directions* perspective.

6. Sight the center of the backsight target and then tap *Measure*.
7. If the residuals for the station setup are acceptable, tap *Store*.

Tip - To change the display, tap the view display button on the left of the measurement information.

Note - The residuals are the differences between the known position and the observed position of the backsight point.

Station setup is complete.

Tip - To get the most out of the Station setup routine, tap *Options* to configure *Station setup* to match the way that you prefer to work. For more information, see Perform a station setup.

Note - If you want to measure more than one backsight point, use Station setup plus.

For more information, see:

- Conventional surveys
- Station setup plus
- Resection
- Traverse

Station setup plus

In a conventional survey, use *Station setup plus* to perform a station setup on a known point by making observations to one or more backsight points.

Warning - If the station setup point is a traverse station that you plan to adjust, do not measure more than one backsight point. Clear the *Backsight* check box for any additional points so that they are measured as foresights.

For more details, see:

- **Performing a Station setup plus**
- **Station setup - Residuals screen**
- **Point - Residuals screen**
- **Point details screen**
- **Station setup results screen**

Performing a Station setup plus

To perform a Station setup plus:

1. From the main menu, select *Survey / Station setup plus.*
2. Set the corrections associated with the instrument.

   If the *Corrections* form does not appear, tap *Options* and then select the *Show corrections on startup* check box.

3. Enter the instrument point name. If the point is not already in the database, key it in or leave it as null.

   If the coordinates for the instrument point are not known, perform a Resection to known points. This will provide the coordinates.

4. If applicable, enter the instrument height and then tap *Accept.*

   - For a 2D or planimetric survey, leave the *Instrument height* field set to null (?). No elevations is calculated.
   - Once the station setup is started, you cannot enter a different instrument height.

   Warning - Before you continue, tap *Options* and make sure that the *Face order* setting is correct. You cannot change this setting after you start measuring points.

5. Enter the first backsight point name and the target height, if applicable. If there are no coordinates for the point, you can key in an azimuth.

   If the point is available from a linked file, select the linked file for the job and then enter the point name in the *Instrument point* name or *Backsight point name* field. The point is automatically copied to the job.

   Note - To include foresight points during Station setup plus, clear the *Backsight* check box. Foresight points do not contribute to the station setup result.

6. Choose an option in the *Method* field.
7. Sight the target and then tap *Measure.*

   The *Station setup residuals* screen appears.

   See the following sections for more information on what do next.

Station setup - Residuals screen

The *Station setup residuals* screen lists the residuals for each point observed in the station setup.

Use the *Station setup residuals* screen to do the following:

- To observe more points, tap + *Point.*
- To view the Station setup results, tap *Results.*
- To store the station setup, tap *Results* and then tap *Store.*
- To view/edit the details of a point, highlight the point and then tap *Details.*
- To view/edit the residuals of each individual observation to a point, tap the point in the list once.
- To start measuring rounds of observations to the points, tap *End face.*

Tips

- To highlight an item in a list, tap and hold the item for at least half a second.

- To sort a column in ascending or descending order, tap the column header. Tap the *Point* column header to sort the point in ascending or descending observed order.
- To change the residual display view, select an option from the drop-down list in the *Residuals* screen.
- To navigate to a point, tap + *Point* and then tap *Navigate.*

Notes

- A residual is the difference between the known position and the observed position of the backsight point(s).
- A foresight point that does not yet exist in the database has null residuals in the *Residuals* form.
- You cannot add the same point to a station setup more than once. To take further measurements to points already measured, select *End Face.* For more information, see Measuring Rounds in Station setup plus or Resection.
- Within Station setup plus or Resection, the maximum number of points in a round is 25.

Point - Residuals screen

The *Point residuals* screen lists the residuals for each observation to a point in the station setup.

Use the *Point residuals* screen to do the following:

- To disable an observation, highlight it and then tap *Use.*
- To view the details of an observation, highlight it and then tap *Details.*
- To return to the *Station setup residuals* screen, tap *Back.*

Note - If you have measured face 1 and face 2 observations to a point, turning off the observation for one face will also turn off the observation for the other face.

Warning - If you turn off some (but not all) of the observations to a backsight point, the solution for the resection will be biased. There will be a different number of observations to each backsight point.

Point details screen

Use the *Point details* screen to:

- view the mean observation for a point in the station setup
- change the target height and/or prism constant for all observations to a point

Station setup results screen

The *Station setup results* screen shows information about the station setup solution.

Use the *Station setup results* screen to:

- return to the *Station Setup Residuals* screen (tap *Esc)*
- store the station setup (tap *Store)*

Note - During a *Station setup plus*, nothing is stored in the job until you tap *Store* in the *Results* screen.

Station setup is complete.

For more information, see:

- Measuring Rounds in Station setup plus or Resection
- Conventional surveys
- Resection
- Traverse

Measuring Rounds in Station setup plus or Resection

This topic describes how to measure multiple sets (rounds) of observations during a *Station setup plus* or *Resection.*

A round can consist of either:

- a set of single face 1 observations
- a set of matched face 1 and face 2 observations

Using *Station setup plus* or *Resection,* measure the points that you want to include in the rounds. When the rounds list has been built, tap *End Face.*

Trimble Digital Fieldbook software:

- Directs you to change face when required.
- Defaults to the correct point details for each observed point.
- Displays the results. This allows you to delete bad data.

For more details, see:

- **Building a rounds list**
- **Measuring rounds of observations**
- **Skipping observations**
- **Residuals screen**
- **Point - Residuals screen**
- **Point details screen**

Building a rounds list

The rounds list contains the points used in the rounds observations. As each point is added to a *Station setup plus* or *Resection,* Trimble Digital Fieldbook software automatically builds this list. For more information, see Station setup plus or Resection.

When the rounds list is complete, tap *End face* . Trimble Digital Fieldbook software prompts you for the next point to be measured in the rounds of observations.

Notes

- You can not edit the rounds list. Before you tap *End face*, be sure to observe all points to include in the rounds observations.
- The top of the *Measure rounds* screen shows which face the instrument is on, the number of the current round, and the total number of rounds to be measured (shown in brackets). For example, Face 1 (1/3) shows that the instrument is on face 1 of the first round of three.

Measuring rounds of observations

Once the rounds list has been built, tap *End face*. Trimble Digital Fieldbook software enters the default point name and target information for the next point in the rounds. To measure a point, tap *Measure*. Repeat this until all observations in the round are completed.

When all observations are complete, Trimble Digital Fieldbook software shows the *Residuals* screen.

Notes

- If you tap *Esc* in the *Measure* screen, the current round is discarded.

Skipping observations

When the Trimble Digital Fieldbook software reaches the end of a rounds list in which points have been skipped, the following message appears:

Observe skipped points?

Tap *Yes* to observe the points that were skipped during that round. The observations can be skipped again if required. Tap *No* to end the round.

If a point is skipped in one round, all subsequent rounds continue to prompt for observations to that point.

When one observation from a pair of face 1 and face 2 observations has been skipped, the unused observation is automatically deleted by the Trimble Digital Fieldbook software. Deleted observations are stored in the Trimble Digital Fieldbook database and can be undeleted. Undeleted observations can be processed in the office software, but are not automatically used to recompute Mean Turned Angle (MTA) records in the Trimble Digital Fieldbook software.

Backsight observations cannot be skipped using the *Skip obstructed foresights* option.

Residuals screen

At the end of each round, the *Residuals* screen appears. For more information, see Station setup plus or Resection.

After you measure rounds, *Std Dev* becomes available in the *Residuals* screen. To view the standard deviations of the observations for each point, tap *Std Dev*.

Notes

- To change the residual display view, use the drop-down list in the *Residuals* screen.
- During a station setup plus or resection, nothing is stored to the job until you tap *Close* and *Store* to complete the station setup.

Point - Residuals screen

The *Point - Residuals* screen shows the residuals for the individual observations to a particular point. For more information, see Station setup plus or Resection.

Note - If you have measured both face 1 and face 2 observations to a point, when you turn off a face 1 observation, you also turn off the corresponding face 2 observation. Similarly, when you turn off a face 2 observation, you also turn off the corresponding face 1 observation.

Point details screen

The *Point details* screen shows the point name, code, backsight status, target height, prism constant, mean observation, and standard errors for the observed point. For more information, see Station setup plus or Resection.

Station Elevation

In a conventional survey, use the station elevation function to determine the elevation of the instrument point by making observations to points with known elevations.

Note - Use only points that can be viewed as grid coordinates. (The station elevation calculation is a grid calculation.)

A station elevation needs at least one of the following:

- one angles and distance observation to a known point, or
- two angles only observations to different points

To perform a station elevation:

1. From the main menu, select *Survey* and then perform a station setup , station setup plus , resection , or refline.
2. Select *Survey / Station elevation.* The instrument point name and code appear. If you entered the instrument height during the station setup, that also appears. Otherwise, enter the instrument height now. Tap *Accept.*
3. Enter the point name, code, and target details for the point with the known elevation. Tap *Measure.* Once the measurement is stored, the *Point residuals* appear.
4. From the *Point residuals* screen, tap one of the following softkeys:

    - ♦ + *Point*, to observe additional known points

- ♦ *Details*, to view or edit point details
- ♦ *Use*, to enable or disable a point

5. To view the station elevation result, tap *Close* in the *Point residuals* screen. To accept the result, tap *Store*.

Note - The elevation determined through this station elevation method overwrites any existing elevation for the instrument point.

Resection

In a conventional survey, the resection function is used to perform a station setup and determine coordinates for an unknown point by making observations to known backsight points. The Trimble Digital Fieldbook software uses a least-squares algorithm to compute the resection.

Note - To determine the elevation of a point with known 2D coordinates, perform a station elevation once you have completed a station setup.

A resection needs at least one of the following:

- Two angles and distance observations to different backsight points
- Three angles-only observations to different backsight points
- One angles and distance observation to a close-by point and one angles-only observation to a backsight point. This is a special case called eccentric station setup.

Warning - Do not compute a resection point using WGS84 control and then change the coordinate system or perform a site calibration. If you do, the resection point will be inconsistent with the new coordinate system.

For more details, see:

- **Performing a resection**
- **Resection - Residuals screen**
- **Point - Residuals screen**
- **Point details screen**
- **Resection results screen**
- **Eccentric station setup**

Performing a resection

To perform a resection:

1. From the main menu, select *Survey / Resection.*

   Note - If you have only one style, it is automatically selected.

2. Set the corrections associated with the instrument.

If the *Corrections* form does not appear, tap *Options* and then select the *Show corrections on startup* check box.

3. Enter an instrument point name and instrument height, if applicable.

   Note - Once the resection is started you cannot enter a different instrument height.

4. Set the *Compute station elevation* check box and then tap *Accept.*

   Note - For a 2D or planimetric survey, clear the *Compute station elevation* check box. No elevations is calculated

   Warning - Before you continue, tap *Options* and make sure that the *Face order* setting is correct. You cannot change this setting after you start measuring points.

5. Enter the first backsight point name and the target height, if applicable.

   Note - In a resection, you can only use backsight points that can be viewed as grid coordinates. This is because the resection calculation is a grid calculation.

6. Choose an option in the *Method* field.
7. Sight the target and then tap *Measure.*
8. Measure further points.

   Note - To include foresight points during resection, clear the *Backsight* check box. Foresight points do not contribute to the resection result.

   When two measurements have been completed, the Trimble Digital Fieldbook software can provide navigation information for further points, and a *Navigate* softkey is available. Tap *Navigate* to navigate to another point.

9. When there is enough data for the Trimble Digital Fieldbook software to calculate a resected position, the *Resection residuals* screen appears.

Resection - Residuals screen

The *Resection residuals* screen lists the residuals for each point observed in the resection.

Use the *Resection residuals* screen to do the following:

- To observe more points, tap + *Point.*
- To view the resection results, tap *Close.*
- To store the resection, tap *Close* and then tap *Store.*
- To view/edit the details of a point, highlight the point and then tap *Details.*
- To view/edit the residuals of each individual observation to a point, tap the point in the list once.
- To start measuring rounds of observations to the points, tap *End face.*

Tips

- To highlight an item in a list, tap and hold the item for at least half a second.
- To sort a column in ascending or descending order, tap the column header. Tap the *Point* column header to sort the point in ascending or descending observed order.
- To change the residual display view, select an option from the drop-down list in the *Residuals* screen.

Notes

- A residual is the difference between the known position and the observed position of the backsight point(s).
- A foresight point that does not yet exist in the database has null residuals in the *Residuals* form.
- You cannot add the same point to a resection more than once. To take further measurements to points already measured, select *End Face.* For more information, see Measuring Rounds in Station setup plus or Resection.
- Within Station setup plus or Resection, the maximum number of points in a round is 25.

Point - Residuals screen

The *Point residuals* screen lists the residuals for each observation to a point in the resection.

Use the *Point residuals* screen to do the following:

- To disable an observation, highlight it and then tap *Use.*
- To view the details of an observation, highlight it and then tap *Details.*
- To return back to the *Resection residuals* screen, tap *Back.*

Note - If you have measured face 1 and face 2 observations to a point, turning off the observation for one face will also turn off the observation to the other face.

Warning - If you turn off some (but not all) of the observations to a backsight point, the solution for the resection will be biased because there will be a different number of observations to each backsight point.

Point details screen

The *Point details* screen shows the mean observation for a point in the resection.

Use the *Point details* screen to do the following:

- change whether the horizontal component or the vertical component of a point will be used in the resection calculation
- change the target height and/or prism constant for all observations to that point

Note - You can only change which components of a point will be used in the resection calculation if you have selected the compute station elevation option, and the observed point has a 3D grid position.

The *Used for* field shows the point components used in the resection calculation. See the following table.

Option	Description

H (2D)	Use only the horizontal values for that point in the calculation
V (1D)	Use only the vertical values for that point in the calculation
H,V (3D)	Use both the horizontal and vertical values for that point in the calculation

Resection results screen

The *Resection results* screen shows information about the resection solution.

Use the *Resection results* screen to do the following:

- To return to the *Resection residuals* screen, tap *Esc*.
- To store the resection, tap *Store*.

Note - During a resection, nothing is stored in the job until you tap *Store* in the *Results* screen.

Resection is complete.

Eccentric station setup

You can use the resection function to perform an eccentric station setup, where the station setup is performed in view of a close-by control point and in view of at least one backsight point. For example, use this setup if you cannot set up over the control point, or you cannot see any backsight points from the control point.

An eccentric station setup needs at least one angles and distance observation to a close-by control point, and one angles-only observation to a backsight point. Additional backsight points can also be observed during an eccentric station setup. You can measure backsight points with angles-only observations or with angles and distance observations.

For more information, see:

- Measuring Rounds in Station setup plus or Resection
- Conventional Surveys
- Station setup plus
- Traverse

Refline

Refline is the process of establishing the position of an occupied point relative to a baseline. To perform a refline station establishment, take measurements to two known or unknown baseline definition points. Once this occupation point is defined, all subsequent points are stored in terms of the baseline using station and offset. This method is often used when setting out buildings parallel to other objects or boundaries.

To perform a Refline station setup:

1. From the main menu, select *Survey / Refline*.

2. Set the corrections associated with the instrument.

   If the *Corrections* form does not appear, tap *Options* and then select the *Show corrections on startup* check box.

3. Enter an *Instrument point name* and *Instrument height,* if applicable.

4. Tap *Accept.*
5. Enter the *Point 1 name,* and *Target height.*

- If point 1 has known coordinates, the coordinates are displayed.
- If point 1 does not have known coordinates, default coordinates are used. Select Options to change the default coordinates.

6. Tap *Meas 1* to measure the first point.
7. Enter the *Point 2 name,* and *Target height.*

- If point 1 has known coordinates, a point with known coordinates can be used for point 2.
- If point 1 does not have known coordinates then a point with known coordinates can not be used at point 2.
- If point 1 does not have known coordinates, the default coordinates are used. Select Options to change the default coordinates.
- If point 1 and point 2 had known coordinates the computed refline azimuth is displayed, otherwise the default azimuth 0° is displayed.

8. Enter a *Refline azimuth,* if applicable.
9. Tap *Meas 2* to measure the second point.

   The instrument point coordinates are displayed.

10. Tap *Store* to complete the refline station establishment.

    Once the Refline setup is stored, all subsequent points are stored in terms of the baseline as a station and offset.

    If a line does not already exist, one is automatically created between the two points, using the naming scheme "<Point 1 name>-<Point 2 name>". You can enter the *Start station* and *Station interval.*
    If the line between the two points does already exist, the existing stationing is used and cannot be modified.

Note - In a refline station establishment, you can only use existing points that can be viewed as grid coordinates. This is because the refline calculation is a grid calculation. You can use 2D and 3D grid coordinates to define the baseline.

Measure Rounds

This topic describes how to measure multiple sets (rounds) of observations with a conventional instrument.

A round can consist of one of the following:

- a set of single face 1 observations
- multiple sets of single face 1 observations
- a set of matched face 1 and face 2 observations
- multiple sets of matched face 1 and face 2 observations

Rounds can be used in a number of different ways depending on your equipment, the accessibility of points, and the procedures to observe the points, such as the order in which the observations are made.

To measure rounds of observations:

1. From the main menu, select *Survey* and then perform a station setup , station setup plus , resection , or refline.
2. From the *Survey* menu, select *Measure rounds.*
3. Tap *Options* to configure the rounds options.
   Before you start measuring points, make sure that the *Face order* and *Sets per point* settings are correct. You cannot change these settings after you start measuring points.
4. Manually build the rounds list by observing each point to include in the round on the first face.

5. When all observations are complete, Trimble Digital Fieldbook software shows the *Standard deviations* screen.
6. Tap *Close* to save and exit rounds.

Notes

- If you tap *Esc* in the *Measure* screen, the current round is discarded.
- The top of the Measure rounds screen shows the following:
  - the current face observations
  - when you use more than one set per point, the number of the current set and the total number of sets to be measured (shown in brackets)
  - the number of the current round the total number of rounds to be measured (shown in brackets)

  For example, "Face 1 (2/2) (1/3)" shows that the instrument is on face 1 of the second set of two sets and the first of three rounds.

Building the rounds list

The Trimble Digital Fieldbook software automatically adds each point to the internal rounds list as it is measured for the first time. The rounds list contains all the information about each point such as point name, code, target height, prism constant, and target ID.
To add a point to the rounds list, and then measure rounds:

1. Choose to include or exclude the backsight observation.
   See also Including/excluding the backsight.
2. Follow the same procedure as for measuring a topo point.

   Note - To specify the prism constant or the height of the target for each observation in the rounds list, tap the target icon. If the prism constant is to be subtracted from measured distances, enter a negative value. You cannot alter the prism constant or the target height for subsequent rounds. Instead, Trimble Digital Fieldbook uses those values stored when building the rounds list.

3. When the rounds list is built, tap *End Face*. The Trimble Digital Fieldbook software:

   - Defaults to the correct point details for each observed point.
   - Directs you to change face when required.
   - Displays the results. You can then delete bad data as required.

Notes

- You cannot add the same point to the rounds list more than once. To take more measurements to points already measured, tap *End face*.
- You cannot edit the rounds list. Before you tap *End face*, be sure to observe all points to include in the rounds observations.

Include/exclude the backsight from a set of rounds

- If the station setup has a single backsight point (from station setup or station setup plus), you can choose to include or exclude the backsight point in the rounds list.
- If the station setup has multiple backsights (from station setup plus or resection), the backsight points are excluded from the rounds list.
- If you do not include the backsight point in your rounds, and export a rounds list, then the backsight point is not included in the rounds list file.
- Trimble recommends observing the backsight on both faces if you are taking foresight observations on both faces.
  If you exclude the backsight:
  - the backsight observation(s) taken during the station setup is used to compute the MTA.
  - if you do not measure the backsight on face 2 and there is only one single face observation to the backsight, and the rounds include observations on both faces, then the horizontal angle face 2 measurements observed using *Measure rounds* will not be used when calculating the MTAs.

Rounds - maximum number

The following limits apply in rounds:

- rounds - maximum 100
- points per round - maximum 200
- sets per point within each round - maximum 10

Even though the maximum limits set in the Trimble Digital Fieldbook software are generous, the limit on how many points you can observe depends on the memory available on the controller. For example, you could measure 100 rounds to 10 points, or 10 rounds to 200 points, but memory limits preclude measuring 100 rounds to 200 points.

For more details see:

- **Standard Deviations screen**
- **Point - Residuals screen**
- **Point details screen**
- **Face order**
- **Observation order**
- **Sets per point**
- **Number of rounds**
- **Skipping observations**

Standard deviations screen

At the end of each round, the *Standard deviations* screen appears. This screen shows the Standard deviations of each point in the rounds list.

Do one of the following:

- To observe another round, tap + *Round.*
- To store the current rounds session, tap *Close.*
- To view/edit the Details of a point, highlight the point and then tap *Details.*
- To view or edit the residuals of each individual observation to a point, tap the point in the list once.
- To exit from rounds and delete all rounds observations, tap *Esc.*

Notes

- Each individual round is stored to the job only when you tap *Close* or + *Round* to exit the *Standard deviations* screen.
- To change the rounds configuration settings, tap *Options.*

Tips

- To highlight an item in a list, tap and hold the item for at least half a second.
- To sort a column in ascending or descending order, tap the column header. Tap the *Point* column header to sort the point in ascending or descending observed order.
- To change the residual display view, select an option from the drop-down list in the *Residuals* screen.

Point - Residuals screen

The *Point residuals* screen shows the differences between the mean observed position and the individual observations to a particular point.

Do one of the following:

- To disable an observation, highlight it and then tap *Use*.
- To view the details of an observation, highlight it and then tap *Details*.
- To return to the *Standard deviations* screen, tap *Back*.

Notes

- If you have measured face 1 and face 2 observations to a point, when you disable the observation for one face, the corresponding observation on the opposite face is automatically disabled.
- Whenever you make a change in the *Point residuals* screen, the mean observations, residuals, and standard deviations are recalculated.
- If the current station setup has a single backsight only, the *Use* softkey is not available for observations to the backsight. Observations to the backsight are used to orientate observations and cannot be deleted.
- If you remove observations, the ⊘ icon appears. If you skipped observations in a round, no icon appears.

Tip - If the residuals for an observation are high, it may be better to disable the observation from the round.

Point details screen

The *Point details* screen shows the mean observation details for a particular point.

Station setup plus, Resection, and Rounds Options

There are up to four main settings that control the order in which the observations are taken, and how many observations are made during Station setup plus, Resection, and Rounds:

- Face order
- Observation order
- Sets per point
- Number of rounds

Face order options

- *F1 only* - observations are taken only on face 1
- *F1... F2...* - all face 1 observations are taken to all points and then all face 2 observations are taken to all points
- *F1/F2...* - face 1 and then face 2 observations are taken to the first point, face 1 and then face 2 observations are taken to the next point, and so on

Observation order options

- *123.. 123*
- *123.. 321*

When the *Face order* is set to *F1... F2...* :

- *123.. 123* - observations on face 2 are taken in the same order as the observations on face 1
- *123.. 321* - observations on face 2 are taken in the reverse order to the observations on face 1

When the *Face order* is set to *F1 only* or *F1/F2* :

- *123.. 123* - each round of observations is taken in the same order
- *123.. 321* - every alternate round of observations is taken in the opposite order

Sets per point option

This option can be used to measure multiple sets of face 1 observations, or face 1 and face 2 observations to a point per round of observations.

If *Face order* is set to collect F1 and F2 observations, the *Sets per point* was set to 3, and the *Number of rounds* was set to 1, then the total number of observations to each point would be; 2 x 3 x 1 = 6. Setting the *Sets per point* option to a number greater than 1 enables you to collect more than one set of observations to a point with only one visit to that location.

This option is currently available only in rounds.

Note - Before using this option please make sure this data collection technique matches your QA/QC requirements.

Number of rounds option

This option controls the number of complete rounds of observations that are are taken to each point.

Skipping Observations

When the Trimble Digital Fieldbook software reaches the end of a rounds list in which points have been skipped, the following message appears:

Observe skipped points?

Tap *Yes* to observe the points that were skipped during that round. The observations can be skipped again if required. Tap *No* to end the round.

If a point is skipped in one round, all subsequent rounds continue to prompt for observations to that point.

When one observation from a pair of face 1 and face 2 observations has been skipped, the unused observation is automatically deleted by the Trimble Digital Fieldbook software. Deleted observations are stored in the Trimble Digital Fieldbook database and can be undeleted. Undeleted observations can be processed in the office software, but are not automatically used to recompute Mean Turned Angle (MTA) records in the Trimble Digital Fieldbook software.

Backsight observations cannot be skipped using the *Skip obstructed foresights* option.

Angles and distance

In a conventional survey, use this measurement method to measure a point by angles and a distance.

Angles only and H.Angle only

In a conventional survey, use this measurement method to measure a point by both a horizontal and vertical angle or by a horizontal angle only.

Averaged Observations

In a conventional survey, use the Averaged observations method to:

- increase the measurement precision with a predefined number of observations
- view the associated measurement standard deviations

To measure a point using the Averaged observations method:

1. From the main menu, select *Survey* and then perform a station setup , station setup plus , resection , or refline.
2. From the *Survey* menu, select *Measure topo.*
3. In the *Point name* field, enter the name of the point.
4. In the *Code* field, enter a feature code (optional).
5. Select *Averaged observations* as the method.
6. Sight the target and tap *Measure.*
   While the instrument is carrying out the measurements, standard deviations are displayed for the horizontal (HA) and vertical (VA) angles, and the slope distance (SD).
7. View the resulting observation data, and the associated standard deviations, in the *Store* screen.
   If acceptable, tap *Store.*

Note - Use the options available in the *Measure topo* screen to change the number of observations taken by the instrument using averaged observations.

Angle Offset, H. Angle Offset, and V. Angle Offset

In a conventional survey, there are three angle offset methods that you can use to observe a point that is inaccessible; Angle offset, H. Angle offset, and V. Angle offset.

The *Angle offset* method holds the horizontal distance from the first observation, and combines this with the horizontal angle and vertical angle from the second observation to create an observation to the offset location.

The *V.Angle offset* method holds the horizontal distance and horizontal angle from the first observation, and combines this with the vertical angle from the second observation to create an observation to the offset location.

The *H.Angle offset* method holds the slope distance and vertical angle from the first observation, and combines this with the horizontal angle from the second observation to create an observation to the offset location.

All raw observables from the first and second observations are stored internally in the job file and are available in Custom ASCII Export.

To measure a point using one of the Offset methods:

1. From the main menu, select *Survey* and then perform a station setup , station setup plus , resection , or refline.
2. From the *Survey* menu, select *Measure topo.*
3. In the *Point name* field, enter the name of the point.
4. In the *Code* field, enter a feature code (optional).
5. In the *Method* field, select *Angle offset*, *H. Angle Offset*, or *V. Angle Offset.*

   When using the *H.Angle offset* measurement method, the target height from the first observation is applied to the horizontal angle offset observation.

   When using *Angle offset* or *V.Angle offset* measurement methods you do not need to enter the *Target height.* The offset measurements are to the offset location and the target height is not used in any computations. To ensure that a target height is not applied to the observation, a target height of 0 (zero) is automatically stored to the Trimble Digital Fieldbook software database.

6. Place the target beside the object to be measured, sight the target and then tap *Measure.*

   The first observation is displayed.

7. Turn to the offset location and then tap *Measure.* The two observations are combined into one:

- if you selected the *View before storage* check box in the survey style, the measurement values appear. Tap *Store* to store the point.
- if you did not select the *View before storage* check box, the point is stored automatically.

Note - The observation is stored in the database as raw HA, VA, and SD records.

Distance Offset

In a conventional survey, use this observation method when a point is inaccessible but a horizontal distance from the target point to the object can be measured.

Distance offset allows you to offset in one, two, or three distances in one step.

To measure a point using the *Distance offset* method:

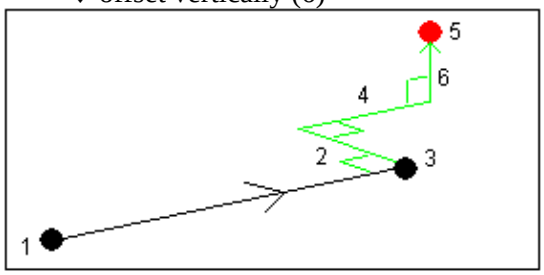
1. From the main menu, select *Survey* and then perform a station setup , station setup plus , resection , or

refline.

2. From the *Survey* menu, select *Measure topo.*
3. In the *Point name* field, enter the name of the point.
4. In the *Code* field, enter a feature code (optional).
5. In the *Method* field, select *Distance offset.*
6. In the *Target height* field, enter the height of the target.
7. Tap *Options* and then set the *Offset & Stakeout directions* perspective.
8. Enter the *L/R offset* (left or right offset) from the target to the object, if applicable.
9. Enter the *In/Out offset* from the target to the object, if applicable.
10. Enter the *V.Dist offset* from the target to the object, if applicable.

    The following figure shows an example where point 5 is measured with the *Offset & Stakeout directions* set to *Instrument perspective:*

    - offset to the left (2) of the target (3)
    - offset out (4) from the instrument station (1)
    - offset vertically (6)



11. Tap *Measure.*

    If you selected the *View before storage* check box in the survey style, the observation adjusted for the offset distance appears. Tap *Store* to store the point.

    If you did not select the *View before storage* check box, the point is stored automatically.

    The Trimble Digital Fieldbook software stores the adjusted horizontal angle, vertical angle, and slope distance in the point record, as well as an offset record with the offset measurement details.

Offset & Stakeout directions

The left and right directions used in *Distance offset* depend on the *Offset & Stakeout directions* setting. You can configure this setting in the survey style and also from *Options.*

When looking from the instrument to the object, an object that is offset to the left when the *Offset & Stakeout directions* are set to *Instrument perspective* is to the left.
When the *Offset & Stakeout directions* is set to *Target perspective,* the object is to the right.

The measurements are editable in *Review current job* and are always displayed in the perspective in which they were observed. The perspective cannot be changed in review. The measurement is always stored relative to the instrument position.

Dual-prism Offset

In a conventional survey, use this measurement method to coordinate a point that cannot be observed directly with a pole in a plumb position.

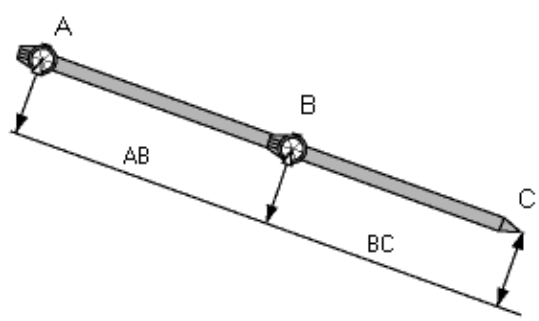
To measure a point using the dual-prism offset method:

1. As shown in the following diagram, space two prisms (A and B) apart on the range pole. The distance BC is known.
2. From the main menu, select *Survey* and then perform a station setup , station setup plus , resection , or refline.
3. From the *Survey* menu, select *Measure topo.*
4. In the *Point name* field, enter the name of the point.
5. In the *Code* field, enter a feature code (optional).
6. In the *Method* field, select *Dual-prism offset.*
7. Complete the fields as required.

   Tip - Enter a suitable *Tolerance AB* to generate a warning if there is a difference between the keyed-in distance AB between the two prisms and the measured distance AB between the two prisms. Exceeding the tolerance could indicate that the entered distance AB is incorrect, or it could indicate pole movement between the measurement to prism A and the measurement to prism B.

8. Take two measurements (tap *Measure).*

The Trimble Digital Fieldbook software calculates the obscured position (C) and then stores it as a raw HA VA SD observation.



All raw observations are stored internally in the job file and are available in Custom ASCII Export.

Circular object

In a conventional survey, use this measurement method to calculate the center point of a circular object, such as a water tank or silo. To do this:

1. From the main menu, select *Survey* and then perform a station setup , station setup plus , resection , or

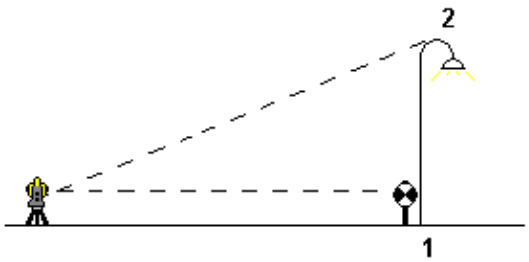
refline.
2. From the *Survey* menu, select *Measure topo.*
3. Use the *Circular object* method to measure an angle and distance to the front center face of the circular object.
4. Observe an angles only measurement to the side of the circular object.

From these two measurements Trimble Digital Fieldbook calculates the center point of the circular object and stores it as a raw HA VA SD observation. The radius is also calculated and stored as a note.

Remote Object

In a conventional survey, if the instrument does not support DR mode, or if you cannot measure a distance, use this method to calculate the height and/or width of a remote object. See the following diagram.

1. Start a conventional survey.
2. Select *Measure Topo / Remote object.*
3. Measure an angle and distance to the bottom of the remote object (1).
4. Set the method as required.
5. Sight to the Remote point (2).
6. Tap *Store* to store the observation.
7. To make multiple remote object observations, repeat steps 5 and 6.



Using the first measurement and continuous HA VA angles, Trimble Digital Fieldbook calculates the position of the remote object, showing the width and elevation difference from the base point. The observation to the base of the remote object is stored as an HA, VA, SD. The Remote point is stored as an HA, VA with a computed SD, including the Object height and Object width.

Conventional Instrument - Corrections

You can set the corrections associated with conventional observations.

Note - If you intend to perform a network adjustment in the Trimble Geomatics Office software using data from a conventional survey, make sure that you enter a pressure, temperature and, curvature and refraction

correction.

Use the *PPM* (Parts Per Million) field to specify a PPM correction to be applied to electronic distance measurements. Key in the PPM correction, or enter the pressure and temperature of the surrounding environment and let the Trimble Digital Fieldbook software compute the correction.

Typical pressure ranges are between 500 mbar - 1200 mbar, but when you work in an area with over-pressure (for example, a tunnel), larger pressures up to 3500 mbar are possible.

Use the *Curvature* and *Refraction* fields to control curvature and refraction corrections. The earth curvature and refraction corrections are applied to vertical angle observations and therefore have an impact on computed vertical distance values. They also affect the horizontal distance values to a very small extent.

The earth curvature and refraction corrections can be applied independently using the options provided. The earth curvature correction is the most significant correction with a magnitude of approximately 16" per km measured distance (subtracted from the zenith vertical angle).

The magnitude of the refraction correction is affected by the refraction coefficient, which is an estimate of the change in air density along the light path from the instrument to the target. Since this change in air density is affected by factors such as temperature, ground conditions, and the height of the light path over ground, it is very difficult to determine exactly which refraction coefficient to use. If you use typical refraction coefficients such as 0.13, 0.142, or 0.2, the refraction correction results in a correction in the opposite direction to the earth curvature correction with a magnitude of approximately one-seventh of the earth curvature correction.

Note - The DC file format only supports a curvature and refraction correction that are both off, or both on, and when on, either with a coefficient of 0.142 or 0.2. When settings other than these are used in the Trimble Digital Fieldbook software, the settings exported to the DC file will be a best match.

In the following table, the * symbol in a field indicates that the correction at the top of that column is applied.

Note - *' applies only to computed coordinates when a station setup has been defined.

Displayed / Stored data	Corrections applied								
	C / R	PPM	PC	SL	Orient	Inst ht	Tar ht	Proj Cor	Stn SF
Status line	-	-	-	-	-	-	-	-	-
HA VA SD (raw)	-	-	-	-	-	-	-	-	-
HA VA SD	*	*	*	-	-	-	-	-	-
Az VA SD	*	*	*	-	*	-	-	-	-
Az HD VD	*	*	*	-	*	*	*	*	*
HA HD VD	*	*	*	-	-	*	*	*	*
Grid	*	*	*	*	*	*	*	*	*
delta Grid	*	*	*	*	*	*	*	*	*
Station and offset	*	*	*	*	*	*	*	*	*
DC file (observations)	-	-	-	-	-	-	-	-	-

DC file (reduced coordinates)	*	*	*	*	*	*	*	*	*
JobXML (observations)	-	-	-	-	-	-	-	-	-
JobXML (reduced coordinates)	*	*	*	*	*	*	*	*	*
Survey Basic	*	*	*	*'	*	*	*	*'	*'

The following table explains the corrections used above.

C / R	Curvature and/or Refraction correction.
PPM	Atmospheric Parts Per Million correction - PPM is calculated from temperature and pressure.
PC	Prism constant correction.
SL	Sea level (ellipsoid) correction. - this correction is applied only if a fully defined coordinate system definition is being used; the correction is not applied in the *Scale factor only* definition.
Orient	Orientation correction.
Inst ht	Instrument height correction.
Tar ht	Target height correction.
Proj Cor	Projection correction. - this includes the application of a scale factor specified in the *Scale factor only* definition.
Stn SF	Station setup scale factor. - in any station setup, a scale factor for this setup can be specified or computed. This scale factor is applied in the reduction of all observations from this station setup.

Target Details

You can configure the details of the target during a conventional survey.

When connected to a conventional instrument the Target icon appears in the status bar. The number next to the target icon indicates the target currently in use. To alternate between targets or to edit the target height and the prism constant, tap the target icon. To select the target to use, tap the appropriate target in the pop-up list. You can create up to five non-DR targets.

Tip - To change to a target, select the target name. To edit entries in the *Target* form, select the target height or prism constant.

When using Trimble prisms, select the *Prism type* to automatically define the prism constant. When using non-Trimble prisms, select *Custom* to manually enter the prism constant.

When connected to a DR instrument, Target DR is used to define the DR target height and prism constant. To enable DR, select Target DR. To disable DR and return the instrument to its last state, select target 1 - 5.

To add a new target:

1. Tap the target icon in the status bar and then tap the height or prism constant for Target 1.

2. In the *Target 1* screen, tap *Add* to create Target 2.
3. Enter the details for *Target 2* and then tap *Accept.*
4. Target 2 now becomes the active target.

To delete a target from the list:

1. Tap the target icon in the status bar and then tap the height or prism constant.
2. In the *Target* screen, tap *Delete.* The Target is removed from the list.

Note - You can not delete Target 1 or Target DR.

To edit a target height:

1. Tap the target icon in the status bar.
2. Tap the target height for the target you want to edit.
3. Edit the target details and then tap *Accept.*

To edit target heights of observations already stored to the job, do one of the following:

- For a single observation or multiple observations using the same or different targets, use Point Manager.
- For a single target record, and subsequently a group of observations that use that target, use Review current job.

Prism Constant

The prism constant (distance offset) must be set for each prism that is used as a target in a conventional survey.

To edit a prism constant:

1. Tap the target icon in the status bar.
2. Tap the prism constant for the target you want to edit.
3. Edit the prism constant details and then tap *Accept.*
   Enter a negative value if the prism constant is to be subtracted from measured distances. Enter the Prism constant in millimeters (mm).

To review or edit the prism constant on previously stored observations, tap *Favorites / Review current job* or *tap Files / Point manager.* For more information, see Point Manager.

Measuring a Point in Two Faces

To start a conventional survey in the Trimble Digital Fieldbook software, you must first perform a *Station setup* using one of the following methods:

- Station setup
- Station setup plus
- Resection
- Refline

You can observe points using face 1 (direct) and face 2 (reverse) measurements during a station setup and during Measure rounds or Measure topo.

Consider the station setup and the new point measurement method together and choose which to use according to how you want to capture and store the data.

If you only want to use a single backsight (measured on one or both faces), and measure some topo points (on one or both faces), then use *Station setup* and *Measure topo.* When you measure on both faces, remember to also measure the backsight on face 2 in *Measure topo.* Otherwise, all foresights on face 2 will be oriented using the face 1 backsight observation.

If you want to measure multiple backsights, measure multiple rounds, or obtain better quality control of your observations, see below for more information on different station setup and new point measurement methods in Trimble Digital Fieldbook.

Use **Station setup plus** to:

- measure a single backsight point or multiple backsight points
- measure backsight and foresight points
- pair the face 1 and face 2 observations and create MTA records
- measure face 1 only observations and create MTA records
- measure one or more rounds of observations
- review the quality of the observations and remove bad observations

Use **Resection** to:

- coordinate the instrument point
- measure multiple backsight points
- measure backsight and foresight points
- pair the face 1 and face 2 observations and create MTA records
- measure face 1 only observations and create MTA records
- measure one or more rounds of observations
- review the quality of the observations and remove bad observations

Use **Station setup** to:

- perform a station setup with a single backsight measurement on one face only

Notes

- When measuring points on both faces, use *Measure topo* to observe the backsight on the other face. Alternatively, use *Measure rounds* and include the observation to the backsight point in the rounds.

- When you make topo observations after a *Station setup*, and you subsequently select *Measure rounds*, you must reobserve the backsight to include it in the rounds, generate an MTA to the backsight, and calculate turned angles from the backsight MTA for all foresight points.
- MTAs are not created during *Station setup*, but are created later if you make further observations to the backsight using *Measure topo* or *Measure rounds*.

Use **Measure rounds** (after performing a station setup) to:

- measure one or more foresight points
- pair the face 1 and face 2 observations and create MTA records
- measure face 1 only observations and create MTA records
- measure one or more sets of observations per point in one round
- measure one or more rounds of observations
- review the standard deviations of the observations and remove bad observations

Notes

- Standard deviations are only available after the second round of observations.
- If the station setup has a single backsight (from *Station setup* or *Station setup plus)*, you can choose whether or not to include the backsight point in the rounds list.
- If the station setup has multiple backsights (from *Station setup plus* or *Resection)*, the backsight points are not included in the rounds list.
- If you do not measure the backsight on face 2, then the horizontal angle face 2 measurements that were observed using *Measure rounds* will not be used when calculating the MTAs.
- When you use *Measure rounds* after a station setup with a single backsight, and you do not include the backsight point in the rounds list, all turned angles are calculated using the backsight observation(s) made during the station setup.

Use **Measure topo** (after performing a station setup) to:

- measure face 1 or face 2 observations and create MTA records

Note - You can measure multiple rounds using *Measure topo.* However, Trimble recommends *Measure rounds* as a more suitable method to use.

Additional notes about MTA records

- When you use *Station setup plus* or *Resection*, all observations are stored when the station setup is complete. When you use *Measure rounds*, the observations are stored at the end of each round. In all three options, the MTAs are stored at the end.
- When you use *Measure topo*, MTAs are calculated and stored on the fly.
- You can create MTAs during a station setup using *Station setup plus* and *Resection*, and also after a station setup using *Measure rounds* or *Measure topo.* When you measure the same point(s) using *Measure rounds* or *Measure topo* after *Station setup plus* and *Resection*, the Trimble Digital Fieldbook software may produce two MTAs for the one point. When more than one MTA exists for the same point in one station setup, the Trimble Digital Fieldbook software always uses the first MTA. To avoid having two MTAs for the same point, do not use both methods to measure a point.
- Once an MTA record is written to the job database, you cannot change it.

- You can delete a face 1 and face 2 observation but the MTA records are not updated.
- You cannot delete MTA records in review.
- In *Station setup plus*, *Resection*, or *Measure rounds*, when you use the F1... F2 or F1/F2... face order, MTAs that are created pair face 1 and face 2 observations.
- In *Station setup plus*, *Resection*, or *Measure rounds*, when you use the F1 only face order, MTAs that are created group face 1 observations.
- In *Measure topo*, MTAs that are created group together all observations for the same point.

Survey - Stakeout

Stakeout - Configuring the Display Mode

For a conventional survey the *Stakeout graphical display* screen displays directions using the conventional instrument as a reference point.

For a conventional survey, you can configure the *Stakeout directions* of the *Stakeout graphical display.*

Offset & Stakeout directions allows you to configure the stakeout directions to be from an instrument perspective, target perspective, or automatic.

To configure the display:

1. From the main menu, select *Configuration / Survey styles / <style name> / Instrument.*
2. Set the *Offset & Stakeout directions:*
   - Automatic - navigation directions are from *Instrument perspective.*
   - Instrument perspective (standing behind the instrument) - in/out and left/right navigation directions given from an instrument perspective, looking from the instrument towards the target.
   - Target perspective (standing at the target) - in/out and left/right navigation directions given from a target perspective, looking from the target towards the instrument.
3. Tap *Accept*, and then select *Stakeout.*
4. Choose a setting in the *Deltas (points)* and *Deltas (other)* fields. The two deltas fields allow you to configure one deltas default for point stakeout, and the other deltas default for arc, line, alignment and road stakeout.
   - Distances - navigate to a point using distances only
   - Delta grid - navigate to a point using delta grid values
   - Station and offset - navigate to a point using station and offset when staking a line or arc.

     When staking to the line or arc the station and offset view displays the Station, H.Offset, V.Dist and the Grade.

     When staking to the Station on the line / arc or the Station/offset from line / arc the view displays the Station, H.offset, V.dist, delta Station and delta H.offset.
5. Use the *Distance tolerance* field to specify the allowable error in distance. If the target is within this distance from the point, the graphical stakeout display indicates that the distance(s) is correct.
6. Use the *Angle tolerance* field to specify the allowable error in angle. If the conventional instrument is turned away from the point by less than this angle, the graphical stakeout display indicates that the angle is correct.

Alternatively, tap *Options* from the *Stakeout* screen to configure the settings for the current survey.

Stakeout - Using the Graphical Display

The graphical display in *Stakeout* helps you to navigate to a point.

To use the graphical display in a conventional survey:

1. The first display shows which way the instrument should be turned, the angle that the instrument should display and the distance from the last point staked to the point currently being staked.
2. Turn the instrument (two outline arrows will appear when it is on line), and direct the rod person on line.
3. If the instrument is not in *TRK* mode, tap *Measure* to take a distance measurement.
4. The display shows how far the person holding the rod should move towards or away from the instrument.
5. Direct the person holding the rod, and take another distance measurement.
6. Repeat steps 2 - 5 until the point has been located (when four outline arrows are displayed), then mark the point.
7. If a measurement to the target is within the angular and distance tolerances, tap Store at any time to accept the current measurement.
   If the instrument is in TRK mode and you require a higher precision distance measurement, tap *Measure* to take an STD measurement and then tap *Store* to accept that measurement.
   To discard the STD measurement and return the instrument to TRK mode, tap *Esc*.

Stakeout - Options

Configure the stakeout settings when you create or edit a Survey Style.

Select *Stakeout* and set the *As-staked point details* and *Stakeout display mode* options.

If you do not want the total station EDM set to *TRK* mode when you enter stakeout, clear the *Use TRK for stakeout* check box.

Alternatively, tap *Options* from the *Stakeout* screen to configure the settings for the current survey.

If you do not want the point removed from the stake out point list after it has been staked, clear the *Remove staked point from list* check box.

As-Staked Point Details

Configure the *As-staked point* details either in the *Stakeout* option, when you create or edit a survey style, or by tapping *Options* in the *Stakeout* screen.

You can configure the *View before storage* , *Horizontal tolerance* , *Staked deltas format* , *As-staked name* , *As-staked code* , and *Store grid deltas* .

View before storage and **Horizontal tolerance**

If you want to see the differences between the design point and the as-staked point before you store the point, select the *View before storage* check box and then choose one of these options:

- To see the differences every time, set the Horizontal tolerance to 0.000 m.
- To see the differences only if the tolerance is exceeded, set the Horizontal tolerance to 0.100 m.

Note - The *Stake delta* values are reported as differences ***from*** the measured/as-staked point ***to*** the design point.

User definable stakeout reports

The Trimble Digital Fieldbook software supports user definable stakeout reports, which enable you to configure the display of staked information on the *Confirm staked deltas* screen that appears when you enable *View before storage.*

User definable stakeout reports can offer the following benefits:

- important information can be displayed first
- the data can be ordered to suit the user's requirements
- information that is not required can be removed
- additional data can be computed for display, for example by applying construction offsets to reported values
- the point design elevation can be edited after the stake out measurement is completed
- up to 10 extra design elevations with individual vertical offset values can be defined and edited, with the cut/fill to each extra design elevation being reported

Formatting of the staked deltas screen also supports the following settings:

- the size of the font for prompts
- the size of the font for reported values
- the color of the font for prompts
- the color of the font for reported values
- widescreen on or off

The content and format of the stakeout reports is controlled by XSLT style sheets. Translated default XSLT Stakeout Style Sheet (*.sss) files are included with the language files, and accessed by the Trimble Digital Fieldbook software from the language folders. You can create new formats in the office and then use Microsoft ActiveSync technology to copy them to the *Trimble Data* folder on the controller.

From the *Staked deltas format* field, select an appropriate display format.

The following list shows the translated stakeout reports that are supplied with the language files, and the support offered by those reports:

- Point - Stake markup
    - Provides a simplified stakeout display that presents the vertical distance (cut/fill) to the design point.
- Point - Stake multiple elevs

    - Provides a stakeout display that allows you to edit the point design elevation (the cut/fill value will be updated) and entry of up to two extra design elevations with associated vertical offsets and updated cut/fill values.
- Line - Stake markup
    - Provides a simplified stakeout display that presents the vertical distance (cut/fill) to the design position. The appropriate station and offset values are reported, based on the selected line stakeout method.
- Arc - Stake markup
    - Provides a simplified stakeout display that presents the vertical distance (cut/fill) to the design position. The appropriate station and offset values are reported, based on the selected arc stakeout method.

Tip - When you use multiple Stakeout Style Sheet files, Trimble recommends that you set the Staked deltas format from the *Configuration / Survey Styles* menu, where you can configure unique formats for Points, Lines, Arcs, and Alignments. You can also select the format within *Options* during stakeout.

Note - The development of the XSLT style sheets is an advanced procedure recommended for users with programming experience. For more information, please refer to the *Trimble Digital Fieldbook software CD.*

As-staked name and **As-staked code**

You can set the **name** of the As-staked point to be one of the following:

- the next *Auto point name*
- the *Design point name* (not available for roads)

You can also set the **code** of the As-staked point to be one of the following:

- *Design name*
- *Design code*
- *Last code used*
- *Design station and offset*

The **Description** defaults as follows:

- When staking a point, line or arc with descriptions, the description of the as-staked point will default to the description of the design entity unless the *As-staked* code is set to *Last code used* in which case the the last used description is used.
- When staking a road the description will always be the last used independent of the the *As-staked code* setting.

Store grid deltas

Set the *Store grid deltas* check box. Do one of the following:

- Select the check box to display and store the delta northing, delta easting, and delta elevation during stakeout.

- Clear the check box to display and store the deltas as a horizontal distance, vertical distance, and azimuth.

Note - If you use a user definable stakeout report, the *Store grid deltas* option is not used, unless it is referenced in your report.

Stakeout - Points

There are many ways to stake a point. Select the method that suits you best:

- From the Map - single point
- From the Map - using a list
- From *Stakeout / Points* - single point
- From *Stakeout / Points* - using a list
- From *Stakeout / Points* - using a CSV/TXT file

For more information, see:

- Editing the design elevation

To stake a single point from the Map:

1. From the map, do one of the following:
   - Select the point to be staked out and then tap *Stakeout*.
   - Double-tap the point to be staked.
2. To change the target height, tap the target icon in the status bar, tap the target height field and then enter the new value in the screen that appears. Tap *Accept*.
3. Locate the point using the graphical display and then mark it.

   If required, edit the design elevation.

4. When the point has been marked, you can measure it as an as-staked point by tapping *Accept* or *Measure*.
5. When the point has been stored, you are returned to the map. The selection of the point that was just staked has been removed. Select another point to stake and then repeat the process.

To stake a group of points from the Map:

1. From the map, select the point(s) to be staked out. Tap *Stakeout*.

   If you have selected more than one point from the map for staking out, the *Stake out points* screen appears. Go to the next step. If you have selected one point from the map, go to step 4.
2. The *Stake out points* screen lists all points selected for stakeout. To add more points to the list, do one of the following:
   - Tap *Map* and then select the required points from the map. Tap *Stakeout* to return to the *Stake out points* screen.

- Tap *Add* and then add points using one of the methods listed to add more points to the list.

3. To select a point for stake out, do one of the following:
   - Tap the point name.
   - Use the controller arrow keys to highlight the point and then tap *Stakeout.*
4. To change the target height, tap the target icon in the status bar, tap the target height field and then enter the new value in the screen that appears. Tap *Accept.*
5. Locate the point using the graphical display, and then mark it.

   If required, edit the design elevation.

6. When the point has been marked, you can measure it as an as-staked point by tapping *Accept* or *Measure.*
7. When the point has been stored, the point is removed from the stake out list and you are returned to the stake out point list. Select the next point and then repeat the process.

To stake a single point from the Stakeout menu:

1. From the main menu, select *Survey / Stakeout / Points.*
2. Make sure that you are in the stake a single point mode:
   - If a *Point name* field is displayed, stake out point is in the stake a single point mode.
   - If a stake out point list is displayed, stake out point is in the stake from a list mode. Tap > *Point* to change to the stake a single point mode.
3. Enter the name of the point to stake, or tap the pop-up arrow and then select a point using one of the following methods:

Method	Description
List	Select from a list of all points in the current job and linked files.
Wildcard search	Select from a filtered list of all points in the current job and linked files.
Key in	Key in the coordinates of the point to stake.

   Tip - Tap *Closest* to automatically populate the *Point name* field with the name of the closest point. *Closest* searches the current job and all linked files to find the closest point that is **not** an as-staked point or a design point for the as-staked points.

4. Enter the *Point increment* and then tap *Stakeout.* Do one of the following:
   - To return to the stake out point screen after staking a point, enter an increment of 0 or ?.
   - To stay in the graphical stake out display and automatically increment to the next point, enter a valid increment value.
     If a point does not exist using the increment specified, you return to this form after staking a point.

   You can use a decimal point increment, for example 0.5. You can also increment the numeric component of a point name that ends in alpha characters, for example, you can increment 1000a by 1 to 1001a. To do this, tap the advanced pop-up arrow on the point increment field and then clear the *Apply to numeric only* setting.

5. To change the target height, tap the target icon in the status bar, tap the target height field and then enter the new value in the screen that appears. Tap *Accept.*
6. Locate the point using the graphical display, and then mark it.

If required, edit the design elevation.

7. When the point has been marked, you can measure it as an as-staked point by tapping *Accept* or *Measure.*
8. When the point has been stored, the increment value is used to determine the next point to stake:
    - If the next point using the increment value exists, you remain in the stake out graphics screen with the navigation details updated for the next point.
    - If the next point does not exist, you return to the stake out point screen where you can enter the name of the next point to stake.

Tip - When using stake a single point mode, you can still use a stake point list to ensure that you stake all required points. To do this, build the stake list, make sure that *Remove staked point from list* is enabled, and stake points using the stake a single point mode. As points are staked they will be removed from the stake list. Tap > *List* as required to check which points still need to be staked.

To stake a group of points from the stake out menu:

1. From the main menu, select *Survey / Stakeout / Points.*
2. Make sure that you are in the stake out list mode:
    - If a stake out point list is displayed, stake out point is in the stake from a list mode.
    - If a *Point name* field is displayed, stake out point is in the stake a single point mode. Tap > *List* to change to the stake from a list mode.
3. The *Stake out points* screen lists all points selected for stake out. The list may already contain points that were added to the list previously but not staked out.

    Tap *Add* and add points using one of the methods listed to add more points to the list.

4. To select a point for stake out, do one of the following:
    - Tap the point name.
    - Use the controller arrow keys to highlight the point and then tap *Stakeout.*
5. To change the target height, tap the target icon in the status bar, tap the target height field and then enter the new value in the screen that appears. Tap *Accept.*
6. Locate the point using the graphical display, and then mark it.

    If required, edit the design elevation.

7. When the point has been marked, you can measure it as an as-staked point by tapping *Accept* or *Measure.*
8. When the point has been stored, the point is removed from the stake out list and you are returned to the stake out point list. Select the next point and then repeat the process.

To stake out points from a CSV/TXT file or another Job

There are many ways to stake out points in a linked file; from linked points displayed in the map, or using various methods to build a stake out list.
This section describes how to build a stake out list from a CSV/TXT or Job file that does not need to be linked:

1. From the main menu, select *Survey / Stakeout / Points.*
2. Make sure that you are in the stake out list mode:
   - ♦ If a stake out point list is displayed, stake out point is in the stake from a list mode.
   - ♦ If a *Point name* field is displayed, stake out point is in the stake a single point mode. Tap > *List* to change to the stake from a list mode.
3. Tap add and choose *Select from file.*
4. Choose the file from which to select points to add to the stake out list. Do one of the following:
   - ♦ Tap the file.
   - ♦ Use the controller arrow keys to highlight the file and then tap *Accept.*
5. All the points in the selected file are listed. To check the points that are to be added to the list, do one of the following:
   - ♦ Tap *All.* A check mark appears beside every name.
   - ♦ Tap the point names. A check mark appears beside the name of each point that you selected.

   Note - Points in the CSV/TXT/JOB file that are already in the stake out list do not appear and cannot be added again to the list.

6. Tap *Add* to add the points to the stake out list.
7. To select a point for stake out, do one of the following:
   - ♦ Tap the point name.
   - ♦ Use the controller arrow keys to highlight the point and then tap *Stakeout.*
8. To change the target height, tap the target icon in the status bar, tap the target height field and then enter the new value in the screen that appears. Tap *Accept.*
9. Locate the point using the graphical display, and then mark it.

   If required, edit the design elevation.

10. When the point has been marked, you can measure it as an as-staked point by tapping *Accept* or *Measure.*
11. When the point has been stored, the point is removed from the stake out list and you are returned to the stake out point list. Select the next point and then repeat the process.

To add points to the Stake Out List:

1. Make sure that you are in stake out list mode:
   If a stakeout point list is displayed, stake out point is in the stake from a list mode
   If a *Point name* field is displayed, stake out point is in the stake a single point mode. Tap > *List* to change to the stake from a list mode.
2. Tap *Add* and then use one of the following methods to add points to the stake out list:

Method	Description
Enter single point name	Enter a single point name in the current job or linked files.
Select from list	Select from a list of all points in the current job and linked files.
Select using wildcard search	Select from a filtered list of all points in the current job and linked files.
Select from file	Add all points from a defined CSV or TXT file.
All grid points	Add all grid points from the current job.

All keyed in points	Add all keyed in points from the current job.
Points within radius	Add all points within a defined radius from the current job and linked files.
All points	Add all points from the current job and linked files.
Points with same code	Add all points with a defined code from the current job and linked files.
Points by name range	Add all points within a name range from the current job and linked files.
Section of job	Add points from a section of the current job.

Notes

- When you add points to the stakeout list using the *Select from file* option, you can now add them from the linked file even if the point in the linked file already exists in the current job. The *Select from file* option is the only way you can stake a point from a linked file when a point of the same name exists in the current job.
- If a linked job contains two points of the same name, the point with the higher class is displayed.

Editing the design elevation

- The design elevation appears in the bottom right corner of the navigation window. To edit the elevation, tap the arrow. To reload an edited elevation, select *Reload original elevation* from the pop-up menu in the *Design elevation* field.
  If the navigation window contains five rows of navigation information, the label for the *Design elevation* field is not shown.
- After staking, you can modify the design elevation in the as-staked deltas screen, depending on the stake out style sheet being used.

Stakeout - Lines

To stake out a line:

1. Do one of the following:
   - From the map, select two points to define a line, tap and hold and then select *Stake out line.*
   - From the map, select the line to be staked out. Tap *Stakeout*, or tap and hold on the map and then select *Stake out line* from the shortcut menu.
   - From the main menu, select *Survey / Stakeout / Lines.* Enter the name of the line to be staked out.

   Tip - In the *Line name* field (or the *Start point or the End point* field) use the advanced pop-up arrow to select staking either a keyed-in line or one defined from two points.

2. In the *Stake* field, select one of the following options:

- *To the line*
- *Station on the line*

- *Station/offset from line*
- *Slope from line*

3. Enter the *Target height*, the value of the station to be staked out (if any), and any further details, such as horizontal and vertical offsets. Tap *Start*.
4. Use the graphical display to navigate to the point.
5. Mark the point.
6. When the point has been marked, tap *Measure* to open the *Measure points* screen. Measure the point as an as-staked point.

To the line

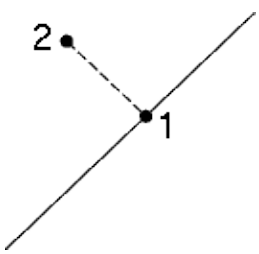
Use this option, as shown in the diagram below, to stake out points on a defined line starting with the closest point (1) from your current position (2).

To stake out a line using the *To the line* method:

1. Do one of the following:
   - From the map, select the line to be staked out. Tap *Stakeout*, or tap and hold on the map and select *Stake out line* from the shortcut menu.
   - From the main menu, select *Survey / Stakeout / Lines*. Enter the line name.

     Tip - To stake out a line, double tap it on the map.

2. In the *Stake* field, select *To the line*.
3. Enter the target height and tap *Start*.
4. Use the graphical display to navigate to the point.
5. Mark the point and tap *Measure* to measure it.



Station on the line

Use this option, as shown in the diagram below, to stake out stations (1) on a defined line at the stationing intervals (2) along the line.

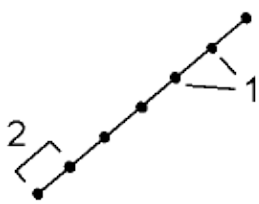
To stake out a line using the *Station on the line* method:

1. Do one of the following:
   - From the map, select the line to be staked out. Tap *Stakeout*, or tap and hold on the map and

select *Stake out line* from the shortcut menu.

- From the main menu, select *Survey / Stakeout / Lines.* Enter the line name.

2. In the *Stake* field, select *Station on the line.*
3. Enter the target height and the station to be staked out and tap *Start.*
4. Use the graphical display to navigate to the point.
5. Mark the point and tap *Measure* to measure it.

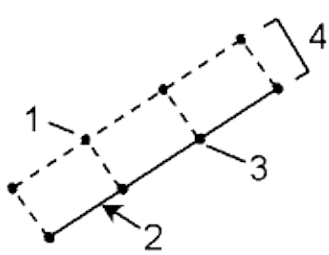


Station/offset from line

Use this option, as shown in the diagram below, to stake out points (1) perpendicular to stations (3) on a defined line (2) and offset to the left or right by a set distance (4).

To stake out a line using the *Station/offset from line* method:

1. Do one of the following:
   - From the map, select the line to be staked out. Tap *Stakeout*, or tap and hold on the map and select *Stake out line* from the shortcut menu.
   - From the main menu, select *Survey / Stakeout / Lines.* Enter the line name.
2. In the *Stake* field, select *Station/offset from line.*
3. Enter the target height and the station to be staked out.
4. Specify the *Horizontal offset* (a negative value is left of the line) and the *Vertical offset* and tap *Start.*
5. Use the graphical display to navigate to the point.
6. Mark the point and tap *Measure* to measure it.



Slope from line

Use this option, as shown in the diagram below, to stake out points on surfaces (2), at different defined grades (3), either side of the defined line (cross section =1). See the diagram below.

To stake out a line using the *Slope from line* method:

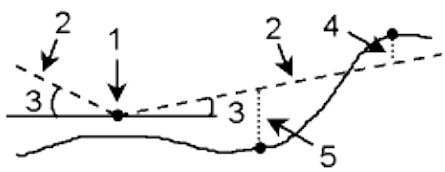
- From the map, select the line to be staked out. Tap *Stakeout*, or tap and hold on the map and select *Stake out line* from the shortcut menu.
- From the main menu, select *Survey / Stakeout / Lines.* Enter the line name.

1. In the *Stake* field, select *Slope from line.*

   Use the *Slope left* field and the *Slope right* field to define the type of grade in one of the following ways:

   - horizontal and vertical distance
   - grade and slope distance
   - grade and horizontal distance
2. Enter the target height, specify the grade of the left and right slopes and tap *Start.*
3. Use the graphical display to navigate to the point.
4. Mark the point and tap *Measure* to measure it.

   At any point on the surface, the display shows the closest station, the Horizontal offset, and the Vertical distance as a cut (4) or a fill (5).



Tip - When selecting a line or arc to stakeout, tap near the end of the line or arc that you want to designate as the start of the line or arc. Arrows are then drawn on the line or arc to indicate the direction.
If the direction of the line or arc is incorrect, tap the line or arc to deselect it and then tap it at the correct end to reselect the line or arc in the direction required.

Note - The offset directions are not swapped when the line direction is reversed.

Stakeout - Arcs

Follow these steps to stake out an arc:

1. Do one of the following:
   - From the map, select the arc to be staked out. Tap *Stakeout*, or tap and hold on the map and select *Stakeout* from the shortcut menu.
   - From the main menu, select *Survey / Stakeout / Arcs.* Enter the name of the arc to be staked out.

   Tip To stake out an arc, double tap it on the map.

2. In the *Stake* field, select one of the following options:
   - *To the arc*

- *Station on the arc*
- *Station/offset from arc*
- *Slope from arc*
- *Intersect point of arc*
- *Center point of arc*

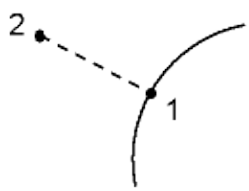
3. Enter the target height and the value of the station to be staked out (if any).
4. Enter any further details, such as horizontal and vertical offsets, and tap *Start*.
5. Use the graphical display to navigate to the point.
6. Mark the point.
7. When the point is marked, tap *Measure* to open the *Measure points* screen. Measure the point as an as-staked point.

To the arc

Use this option, as shown in the diagram below, to stake out points on a defined arc, starting with the closest point (1) from your current position (2).

To stake out an arc using the *To the arc* method:

1. Do one of the following:
   - From the map, select the arc to be staked out. Tap *Stakeout*, or tap and hold on the map and select *Stakeout* from the shortcut menu.
   - From the main menu, select *Survey / Stakeout / Arcs*. Enter the arc name.
2. In the *Stake* field, select *To the arc*.
3. Enter the target height and then tap *Start*.
4. Use the graphical display to navigate to the point.
5. Mark the point and tap *Enter* to measure it.



Station on the arc

Use this option, as shown in the diagram below, to stake out points (1) on a defined arc at the stationing intervals (2) along the arc.

To stake out an arc using the *Station on the arc* method:

1. Do one of the following:
   - From the map, select the arc to be staked out. Tap *Stakeout* or tap and hold on the map and select *Stakeout* from the shortcut menu.
   - From the main menu, select *Survey / Stakeout / Arcs*. Enter the arc name.

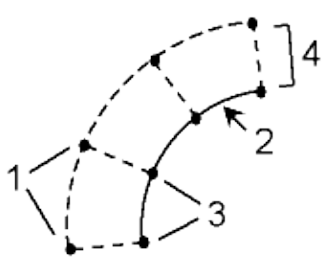
2. In the *Stake* field, select *Station on the arc.*
3. Enter the target height and the station to be staked out and tap *Enter.*
4. Use the graphical display to navigate to the point.
5. Mark the point and tap *Measure* to measure it.

Station/offset from arc

Use this option, as shown in the diagram below, to stake out points (1) perpendicular to stations (3) on a defined arc (2) and offset to the left or right by a specified distance (4).

To stakeout an arc using the *Station/offset from arc* method:

1. Do one of the following:
   - From the map, select the arc to be staked out. Tap *Stakeout*, or tap and hold on the map and select *Stakeout* from the shortcut menu.
   - From the main menu, select *Survey / Stakeout / Arcs.* Enter the arc name.
2. In the *Stake* field, select *Station/offset from arc.*
3. Enter the target height and the station to be staked out.
4. Specify the *Horizontal offset* (a negative value is left of the arc) and the *Vertical offset* and tap *Start.*
5. Use the graphical display to navigate to the point.
6. Mark the point and tap *Measure* to measure it.



Slope from arc

Use this option, as shown in the diagram below, to stake out points on surfaces (2), at different defined grades (3) either side of the defined arc (cross section=1).

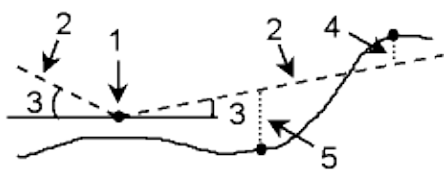
To stake out an arc using the *Slope from arc method:*

1. Do one of the following:

- ♦ From the map, select the arc to be staked out. Tap *Stakeout*, or tap and hold on the map and select *Stakeout* from the shortcut menu.
- ♦ From the main menu, select *Survey / Stakeout / Arcs.* Enter the arc name.

2. In the *Stake* field, select *Slope from arc.*
3. Enter the target height and tap *Start.*
4. Use the graphical display to navigate to the point.
5. Mark the point and tap *Measure* to measure it.

At any point on the surface the graphical display shows the closest station, the Horizontal offset and the Vertical distance as a cut (4) or a fill (5).

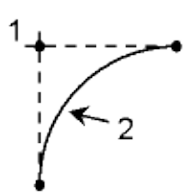


Intersect point of arc

Use this option as shown in the diagram below, to stake out the Intersection point (1) of an arc (2).

To stake out an arc using the *Intersect point of arc* method:

1. Do one of the following:
   - ♦ From the map, select the arc to be staked out. Tap *Stakeout*, or tap and hold on the map and select *Stakeout* from the shortcut menu.
   - ♦ From the main menu, select *Survey / Stakeout / Arcs.* Enter the arc name.
2. In the *Stake* field, select *Intersect point of arc.*
3. Enter the target height and tap *Start.*
4. Use the graphical display to navigate to the point.
5. Mark the point and tap *Measure* to measure it.



Center point of arc

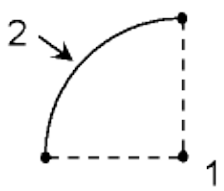
Use this option, as shown in the diagram below, to stake out the Center point (1) of a defined arc (2).

To stake out an arc using the *Center point of arc* method:

1. Do one of the following:
    - From the map, select the arc to be staked out. Tap *Stakeout*, or tap and hold on the map and select *Stakeout* from the shortcut menu.
    - From the main menu, select *Survey / Stakeout / Arcs.* Enter the arc name.
2. In the *Stake* field, select *Center point of arc.*

   Use the *Slope left* field and the *Slope right* field to define the type of grade in one of the following ways:

    - horizontal and vertical distance
    - grade and slope distance
    - grade and horizontal distance
3. Enter the target height and tap *Start.*
4. Use the graphical display to navigate to the point.
5. Mark the point and tap *Measure* to measure it.



Tip - When selecting a line or arc to stakeout, tap near the end of the line or arc that you want to designate as the start of the line or arc. Arrows are then drawn on the line or arc to indicate the direction.
If the direction of the line or arc is incorrect, tap the line or arc to deselect it and then tap it at the correct end to reselect the line or arc in the direction required.

Note - The offset directions are not swapped when the line direction is reversed.

Stakeout - Alignments

The Trimble Digital Fieldbook software supports offsetting and stakeout of alignments, which are sometimes known as polylines.

Alignments always have a horizontal component; the vertical component is optional. If an alignment is created using entities that have elevations, the alignment will have a vertical component.

You can select or create and stake alignments using one of the following methods:

- Key in point name ranges.
- Select a combination of points, lines, arcs, polylines, or alignments in the map.

To create and stake an alignment by keying in a point name range:

1. From the main menu, select *Survey / Stakeout / Alignments*.

   You can stake an existing alignment or key in a new alignment. If the *Point range* field is not visible, tap *New* to enter a new alignment.

2. Enter the point names that define the alignment.

   The following name range techniques are supported:

Enter	Result
1,3,5	Creates a line between points 1 to 3 to 5
1-10	Creates lines between all points from 1 through 10
1,3,5-10	Creates a line between points 1 to 3, to 5, and 5 through 10
1(2)3	Creates an arc between points 1 and 3, through point 2
1(2,L)3	2 (Radius point), L (left) or R (right) Creates a **Left** hand arc between points 1 and 3, with point 2 as the radius point
1(100,L,S)3	1 to 3, radius=100, L (left) or R (right), L (large) or S (small) Creates a **Left** hand **Small** arc between points 1 and 3 with a radius of 100

3. To store the alignment, enable the *Store alignment* check box, enter an *Alignment name*, enter a *Code*, if required, and then tap *Next*.

   This takes you to stakeout.

   Alignments are stored as RXL files. If you save the alignment, you can easily stake it again, view it in the map, and share it with other jobs and with other controllers.

   Tip - To offset the alignment, tap *Offset*. If the *Store alignment* check box is enabled, tap *Next* to store the alignment and go to stakeout. To store the alignment without going to stakeout, tap *Store*.

4. Select a *Station* to stake and then specify the *Station interval*.

   You can select a station using one of the following methods:

   - Select from the list in the *Stationing* field pop-up menu.
   - Key in a value.
   - Tap *Sta+* or *Sta-* to select the next/previous station.

5. To change target heights, tap the target icon in the status bar.
6. Select *Stakeout* and then use the graphical display to navigate to the point.
7. Mark the point and tap *Measure* to measure it.

Offsetting alignments

You can create an offset alignment from a keyed-in alignment or an alignment saved as an RXL file.

When creating an offset alignment, you can stake the alignment without saving it, or you can give the alignment a name and then save the offset alignment as an RXL file. You can also create and save node points

at the vertices of the horizontal alignment.

To offset and stake an alignment:

1. From the main menu, select *Survey / Stakeout / Alignments.*

   You can select an existing alignment or key in a new alignment.

   1. To select an existing alignment, tap the alignment name (if the *Select an alignment* screen is displayed). If the *Point range* field is displayed, tap *Select* to view the alignments already on the controller.
   2. To key in a new alignment, enter the point names that define the alignment (if the *Key in alignment* screen is displayed). If the *Select an alignment* screen is displayed, tap *New* to enter the point range.

      For more information, see the section above.

2. To offset an alignment, tap *Offset.*
3. Enter the offset distance.
   To offset to the left, enter a negative value.
4. To store the offset alignment, enable the *Store alignment* check box, enter an *Alignment name,* enter a *Code,* if required, and then tap *Next.* The alignment is stored as an RXL file.
5. To store node points at the vertices of the offset alignment, enable the *Store points at nodes* check box, enter a *Start point name,* enter a *Code,* if required, and then tap *Next.*

   Selecting *Next* stores the alignment, if the *Store alignment* check box is enabled, and takes you to stakeout. To store an alignment without going to stakeout, tap *Store.*

6. Select a *Station* to stake, and specify the *Station interval.*

   You can select a station by one of the following methods:

   - Select from the list in the *Stationing* field pop-up menu.
   - Key in a value.
   - Tap *Sta+* or *Sta-* to select the next/previous station.

7. To change target heights, tap the target icon in the status bar.
8. Select *Stakeout* and then use the graphical display to navigate to the point.
9. Mark the point and tap *Measure* to measure it.

An offset alignment will have a vertical component if the vertical geometry of the original alignment is coincident with the horizontal geometry and the vertical geometry consists only of points. The offset vertical geometry cannot include curves. If the vertical geometry of an alignment cannot be offset, only the horizontal component will exist in the offset alignment. You cannot offset an alignment that includes spirals.

Station abbreviations

The Trimble Digital Fieldbook software uses the following abbreviations in the *Stationing* field pop-up menu.

Abbreviation	Meaning	Abbreviation	Meaning
CS	Curve to spiral	SS	Spiral to spiral
PC	Point of curvature (Tangent to curve)	ST	Spiral to tangent
PI	Point of intersection	TS	Tangent to spiral
PT	Point of tangent (Curve to tangent)	VCE	Vertical curve end
AS	Alignment start	VCS	Vertical curve start
AE	Alignment end	VPI	Vertical point of intersection
SC	Spiral to curve	XS	Regular sections
Hi	Vertical curve high point	Lo	Vertical curve low point

Survey Configuration

Configuration Menu

Use this menu to:

- Change the language.
- Switch on or off sound events.
- Create and edit feature and attribute libraries.
- Create and edit survey styles.
- View the version number, serial number, authorization key and software warranty expiry.

For more information, see:

Feature and Attribute Library

Survey Styles

Survey Styles

Survey Styles define the parameters for configuring and communicating with your instruments, and for measuring and storing points. This whole set of information is stored as a template that can be called up and re-used when necessary.

If there is only one survey style, it is automatically selected. Otherwise, choose one from the list that appears when you select *Configuration / Survey styles.*

You can use the styles supplied with the system without configuring them, but you can change default settings as required.

To change the configuration of the Trimble Digital Fieldbook software for different types of survey, select *Configuration / Survey Styles* from the main menu.

For more information, see:

Conventional Survey

Conventional Instrument - Configuration

Measurement mode

The *Measurement mode* field shows the measurement modes that can be set on the instrument. Use this mode to specify how the EDM measures distances.

Tip - Tap Trimble functions to quickly change the measurement mode.

Averaged Observations

Use the Averaged observations method to:

- increase the measurement precision with a predefined number of observations
- view the associated measurement standard deviations

While the instrument is carrying out the measurements, standard deviations are displayed for the horizontal (HA) and vertical (VA) angles, and the slope distance (SD).

Measure distance on face 2

The *Measure distance on face 2* option is used in:

- Measure rounds, Station setup plus, and Resection, when a distance observation is not required on face 2

When the Measure distance on face 2 option is selected, if the face 1 measurement method included a distance measurement, then the measurement method for face 2 is automatically set to *Angles only* after the face 1 measurement. After the face 2 measurement, the instrument returns to the method used on face 1.

Set backsight

The *Set backsight* field appears if you can set the horizontal circle reading on the instrument when the backsight is observed. The options are *No* , *Zero,* and *Azimuth* . If you select the *Azimuth* option, when you observe the backsight the horizontal circle reading is set to the computed azimuth between the instrument point and the backsight point.

Centering error

The centering error is used to compute the observation weights as part of the Standard resection and Station Setup Plus computations. Set a value appropriate to the estimated accuracy of your instrument setup.

Instrument precision

Use the *Instrument precision* fields to record the precisions of the instrument. Do one of the following:

- Accept the default instrument values.
- Enter your own values based on your observing techniques.

Observation standard error statistics are stored with each observation. The standard errors can be used in the office software to weight the observations during a network adjustment.

Duplicate Point Tolerance

In a conventional survey, when you attempt to add a point name that already exists, no message appears to warn you that the point already exists. This is because you may want to regularly measure points on both faces.

You can set the tolerance for a duplicate point warning.

- Specify the maximum distance that a new point can be from an existing point.
- A duplicate point warning appears when you try to store a new point only if it is a duplicate point outside the tolerance set.
- If the new point has the same name as an existing point, and is closer to the existing point than the tolerance specified, the point is stored as a new point, and does not overwrite the existing point.
- When you select the *Auto average* option in the survey style, the point is stored as a new point and an average of all previous positions (of the same name) is also stored.
- An averaged position has a higher search class than a normal observation.

If the new point is further from the original point than the tolerance specified, you can choose what to do with the new point when you store it.
The options are:

- Discard
- Rename
- Overwrite - Overwrite and delete the original point, and all other points of the same name and the same (or lower) search class.
- Store as check - Store with a lower classification.
- Store another - Store the point, which can then be averaged in the office software. The original point is used in preference to this point.
- Average - Store the point and then compute and store the averaged position.

Note - When you select *Average*, the current observation is stored and the computed average position appears, along with the computed standard deviations for the north, east, and elevation ordinates. If there are more than two positions for the point, a *Details* softkey appears. Tap *Details* to view the residuals from the average position to each individual position. You can use the *Residuals* form to include or exclude specific positions from the average computation.

To configure the Duplicate point tolerance:

1. Select the *Survey Style*.
2. Select *Duplicate point tolerance.*
3. Specify the horizontal and vertical tolerances. If you set these distances to zero, a warning is always given.
4. To automatically compute and store the average position, select the *Auto average* within tolerance option.

Note - When the *Auto average* option is checked, and an observation to a duplicate point is within the specified duplicate point tolerances, the observation and the computed average position (using all the

available point positions) are automatically stored.

Note - The Trimble Digital Fieldbook software computes an averaged coordinate by averaging the grid coordinates computed from the underlying coordinates or observations. Observations that do not allow a grid coordinate to be resolved (for example, angles only observations) are not included in the average coordinate.

For more information, see:

- Cogo / Compute average

Face 1 and Face 2 observations

When you carry out two-face observations in a conventional survey during *Station setup*, *Station Setup Plus*, *Resection*, or when measuring *Rounds*, the Trimble Digital Fieldbook software checks that the Face 1 and the Face 2 observations to a point are within a preset tolerance.

If the observations are out of tolerance, the *Observation: Out of tolerance* screen appears.
The screen displays the following options:

- Discard - discard the observation without storing.
- Rename - rename to a different point name.
- Store as check - store with a classification of Check.
- Store another - store the observation.
- Store and reorient - (This option only appears if you are observing a backsight point.) Store another observation that will provide a new orientation for subsequent points measured in the current station setup. Previous observations are not changed.

Once you have completed the *Station Setup Plus*, *Resection*, or *Round* measurements, the Trimble Digital Fieldbook software saves the Mean Turned Angles to each of the observed points. The software does not check for duplicate points at this stage. Therefore, to use any of the observations to compute an average position for an observed point, you must select the Compute average option from the *Cogo* menu.

Feature and Attribute Library

You can create a feature and attribute library by using office software and then transferring the library to the controller, or you can create a feature code list directly in the controller.

Note - Feature codes created using the Trimble Digital Fieldbook software do not have attributes associated with them.

Use the following office software to create and transfer feature and attribute libraries:

To create the library, use ...	To transfer the library, use ..	File saved on controller as...
Feature and Attribute Editor	Trimble Geomatics Office	.fal
Feature Manager (Trimble Business Center)	Feature Manager	.fxl

Notes

- Feature and attribute libraries created on the controller as saved as .fxl files.
- Trimble Business Center version 1 Feature Definition Manager creates and reads version 1 files.
- Trimble Business Center version 2 Feature Definition Manager creates and reads version 1 and version 2 files.

There are up to five fields to configure when adding or editing feature codes.
The options available depend on the type of file:

- All feature and attribute libraries have a *Feature code* and *Description.*
- All feature and attribute libraries have a *Feature type.* You can edit the *Feature type* in a .fal file, and you can set the *Feature type* when you create a new .fxl file, but you cannot edit the *Feature type* in a .fxl file once it has been set.
- All feature and attribute libraries have a *Line style.* There are only two line styles supported by the Trimble Digital Fieldbook software, *Solid lines* and *Dashed lines.*
- Only .fxl feature and attribute libraries can have a *Line color*.

To create a new feature code list:

1. From the main menu, select *Configuration / Feature and attribute libraries.*
2. Tap *New*.
3. Enter the name of the list.
4. Tap the name of the new Feature and attribute file you just created and then tap *Edit* to add, delete, or edit codes.

   Note - An individual Feature code cannot contain more than 20 characters. But the maximum number of characters in a code field is 42.

   Tip - The *Code* and *Description* are both displayed when you use Feature and attribute libraries. Most recently used codes are displayed indented at the top of the list.

   Feature code names that contain spaces appear in the Trimble Digital Fieldbook software with a small dot between the words, for example, Fire·Hydrant. These dots do not appear in the office software.

   Some symbols are not supported in feature and attribute libraries, for example ! and [ ]. If you use unsupported symbols when creating a library in the office software, the Trimble Digital Fieldbook software converts them to the underscore symbol "_" when they are transferred.

Line codes

When it is operating with a feature code library, the Trimble Digital Fieldbook software can process the feature codes so that points with their *Feature type* set to *Line* will be joined by lines.

To configure a feature and attribute library for real time feature code processing:

1. From the main menu, select *Configuration / Feature and attribute libraries.*
2. Select a *Line color* for the line.

3. Tap *Accept* and then tap *Store* to save the changes.

   If the *Display coded features* option is selected in the map options, the Trimble Digital Fieldbook software draws lines between points, based on the specified display properties.

   Notes

- There are 15 basic colors available when configuring the line color in the Trimble Digital Fieldbook software.
- Colors can be defined in the office using the Feature Manager software and transferred via an .fxl file to the controller. The colors defined in the .fxl file by the Feature Manager software may not be identical to the colors used by the Trimble Digital Fieldbook software.
- Colors can be defined in the Feature Manager as 'By layer' or 'Custom'.
    - When 'By layer' has been defined the Trimble Digital Fieldbook software uses black.
    - When 'Custom' has been defined the Trimble Digital Fieldbook software uses the closest color match to the Trimble Digital Fieldbook palette.
    - You cannot define the color as 'By layer' or 'Custom' in the Trimble Digital Fieldbook software. If set in the office software, these options are displayed in the Trimble Digital Fieldbook software, and can be changed to a Trimble Digital Fieldbook software color, but if this is done you cannot change them back.

Control codes

With line codes set up in a feature and attribute library (as described above), points that have the same code can be joined by lines.

Example - In a topographical survey, set up the CL code as a *Line code* . Survey the center line of a road and assign the code CL to each point. If you have the *Display coded features* option selected, all points to which the code CL has been assigned are joined.

However, you will need extra line joining control to start new line sequences, close figures, and join specific points. To achieve this extra control, define *Control codes.* These are assigned to points in addition to the *Line code* of the point. A *Control code* follows the *Line code* it applies to and is separated from the *Line code* by a space character.

To create a *Control code,* set the *Feature type* for a code you are editing to *Control code.* When you have done this, a new *Control code action* is available.

The following control code actions are supported:

Control code	Action
Join to first (same code)	Joins the point to the first point that has the same code. Use this action in the definition of a control code that is used to close a figure.
Join to named point	Creates a line join from a point with this control code to the point named after this control code in the code field. The control code and name should be separated by a space. A line join created by this control code will be displayed in addition to the line join created by a line code that the control code may apply to.

Start join sequence	Starts a new join sequence. The current point is set as the first point in the sequence. As a result. the point that it will be joined to uses a control code with the action *Join to first (same code)*. This action also skips the join to the previous point with the same code that its associated line code would have created.
End join sequence	Instructs the system that the current point is the last point in the join sequence. This means that the next point that has the same line code will not join to it.
Skip join	Operates in a similar fashion to the *Start join sequence* action, but it only stops the join action of the line code it is associated with. It does not make the current point the first point in a new join sequence.
Start tangential arc	Use the Start tangential arc control code to start an arc tangentially (with points defining the entry tangent direction). The azimuth between the previous point with the same feature code, and the point that has the start arc control code, defines the entry tangent direction.
End tangential arc	Use the End tangential arc control code to end an arc tangentially (with points defining the exit tangent direction). The azimuth between the point with the end arc control code, and the next point with the same feature code, defines the exit tangent direction.
Start non-tangential arc	Use the Start non-tangential arc control code to start an arc non-tangentially. You do not need a previous point with the same feature code to start an arc this way.
End non-tangential arc	Use the End non-tangential arc control code to end an arc non-tangentially. No next point with the same feature code is required to end an arc this way.

Notes

When processing the arc feature codes and if an arc cannot be computed, the segment is drawn as a dashed red line to indicate that something is wrong with the coding. Situations where this will occur are:

- An arc is defined by two points and no tangency information is defined for at least one of the two points.
- A two point arc is defined as being tangential at both the start and end but these tangents do not work.
- A best fit arc from three or more points cannot be determined, for example when the points are all on a straight line.

Instruments

Instrument Menu

This menu provides information about the instrument, and is used to configure the settings.

Electronic Level

Direct Reflex

Tracklight

Instrument Settings

Adjust

Survey Basic

Trimble Functions

Laser Pointer

In a Direct Reflex survey, the laser pointer eliminates the need to look through the telescope when measuring DR points.

To turn on the laser:

1. To open the *Trimble Functions* screen, tap the Instrument icon in the status bar, or tap the Trimble key on the instrument.
2. Tap the *Laser* pointer button.

Note - If DR is not yet enabled, turning on the laser pointer enables it. If you turn off the laser pointer, the instrument remains in DR mode. However, if you turn off DR mode, the laser is automatically turned off.

Electronic Level

To level a Trimble M3 total station electronically from startup:

1. Plumb the instrument.
2. Use the tripod legs and the tribrach bubble to roughly level the instrument.
3. The Electronic level screen appears as part of the instrument start up process.
4. Turn the footscrews to center the bubbles for the sighting and trunnion axis.
5. To complete the leveling process, tap *Accept.*

The instrument initializes the compensator (unless the *Disable compensator* check box is selected).

To level an instrument electronically during a survey:

1. From the main menu, select *Instrument / Electronic level*.
2. Turn the footscrews to center the bubbles for the sighting and trunnion axis.

On the Trimble M3 total station, the laser plummet is also activated while the Electronic level screen is open.

Warning - If accuracy is important, do not disable the compensator. If you do disable the compensator, horizontal and vertical angles in the instrument are not corrected for mis-levelment errors.

Direct Reflex

Select *Instrument / Direct Reflex* to configure the DR settings.

Tip- For fast access to configure the DR settings, tap the instrument icon in the status bar or press the Trimble key, and tap and hold on the DR icon.

The following settings are available:

- To enable or disable direct reflex measurement, select *DR*.
- To enable or disable the laser pointer, select *Laser Pointer*.

The Target DR is dedicated for DR use. You must configure the prism constant and target height appropriately.

When you turn on DR, Trimble Digital Fieldbook automatically switches to Target DR.
When you turn off DR, the software returns to the last used non-DR target. If the last used target has been deleted, the software uses Target 1.

Alternatively, select *Target DR* to enable DR. Select *Target 1* to disable DR and return the instrument to its previous state.

Trimble Digital Fieldbook supports up to six preconfigured targets, but only one DR target. For more information see, Target details.

Tracklight

Operate the Tracklight as follows.

To set the speed of the guide-light:

1. From the main menu, select *Instrument / Tracklight*.
2. Select the *Enable tracklight* check box.

3. From the drop down list in the *Speed* field, select *Slow*, *Medium*, or *Fast.*

To switch on the tracklight or switch it off:

1. Tap the Trimble functions icon.
2. Tap *Tracklight* in the *Trimble Functions* screen.

Tip - For fast access to configure the Tracklight, tap the instrument icon in the status bar or press the Trimble key, and tap and hold on the Tracklight icon.

Instrument Settings

Select *Instruments / Instrument settings* from the main menu to access the *Instrument settings* dialog. Alternatively, tap and hold briefly on the instrument icon in the status bar and then release to enter *Instrument settings*.

Use this dialog to view and set specific controls on the instrument:

- instrument model
- instrument firmware version
- reticle illumination
- target test
- face 2 backlight
- EDM power save mode

Instrument Type and Firmware Version

The instrument type and firmware version details are also stored in the Trimble Digital Fieldbook job file and output to DC files and Custom ASCII files.

Target test

The target test is used primarily in Survey Basic when measuring a distance that is to be displayed as a dead record.
If the instrument is moved more than 30 cm from where the last measurement was observed, the HA and VA are updated but the SD reverts to "?" to avoid mistaking the next target's distance for the previously measured target's distance.

Face 2 Backlight

To enable the face 2 backlight when Trimble Digital Fieldbook is running, select *Face 2 backlight.*

EDM power save

The power save mode turns off the EDM when the instrument is not measuring a distance.
When the power save mode is off, the EDM is always turned on to receive a signal.

Instrument Adjustment

Select *Instrument / Adjust* from the main menu to complete the following tests:

HA VA Collimation

Trunnion axis tilt

To start the adjustment wizard, select *Instrument* / *Adjust.*

Note - *Instrument / Adjust* is not available during a survey. End the current survey to perform an instrument adjustment.

HA VA Collimation and Trunnion axis tilt adjustments

Set up the instrument on a stable surface and follow the prompts to complete the test.

Current adjustment values appear for each test (Horizontal collimation, Vertical collimation, and Trunnion axis tilt). Press the keys lightly to avoid bumping the instrument.

Position the instrument as follows:

1. Collimation - at least 100 m from the target.
2. Collimation - less than 3° (3.33 gon) from the horizontal plane.
3. Trunnion axis tilt - at least 30° (33.33 gon) from the horizontal plane.

Carry out the following steps to complete the Collimation and Trunnion axis tilt adjustments:

1. Observe the collimation target on face 1 - a target less than 3° (3.33 gon) from the horizontal plane.
2. Observe the collimation target on face 2.
3. The collimation results are displayed.
    - Tap *Store* to save the new horizontal and vertical collimation settings, or
    - Tap *Trun.* to continue on to the trunnion axis tilt adjustment. If carrying out the trunnion axis adjustment continue with the following steps.
4. Observe the trunnion axis target on face 2 - a target at least 30° (33.33 gon) from the horizontal plane.
5. Observe the trunnion axis target on face 1.
6. At least three sets of observations are required to complete the trunnion axis adjustment. Repeat the observations to the collimation and trunnion axis targets two more times. Note that the observations made must agree within a 10" (0.003 gon) range.
7. Tap *Store* to save the collimation and trunnion axis adjsutments and exit the adjustment process.

Final collimation values must be within tolerance of standard values. If not, the instrument needs to be adjusted mechanically.
For more information, contact your local Trimble dealer.

Survey Basic

You can use it as follows:

- If a Trimble Digital Fieldbook job was created with a station setup, then Survey Basic can display raw data, and coordinates based on the station setup in the job.
- If a current station setup does not exist, you can:
  - Make simple distance or angular checks.
  - Define the Northing and Easting coordinates for the instrument point in Survey Basic, set the horizontal circle and then display coordinates for points observed using Survey Basic.
  - Key in the elevation for the instrument point and then display the elevation for points observed using Survey Basic.
  - Observe to a point with a known reference elevation to compute the instrument elevation and then display the elevation for points observed using Survey Basic.

To compute the instrument point elevation from a known reference point using Survey Basic:

1. Ensure that a current station setup does not exist and then start Survey Basic.
2. Tap *Set* and then enter the *Target height*, *Reference elevation*, and *Instrument height.*
3. If required, enter the *Horizontal angle* and instrument point *Northing* and *Easting.*
4. To measure the reference point, tap *Measure.* The instrument point *Elevation* is computed.
5. To return to Survey Basic, tap *Accept.*

To change the view on the data displayed, tap the arrow button.

Notes

- If the target height **or** instrument height is null, the Trimble Digital Fieldbook software cannot calculate a VD.
- If target height and instrument height are **both** null, the Trimble Digital Fieldbook software assumes zero for both and can compute the VD, but cannot compute the Elevation.
- If a station setup is computed using Survey Basic, a scale only projection of 1.0 is used to calculate coordinates.

Tip - To quickly access Survey Basic, from the Trimble functions screen, press **0.**

Note - You cannot store measurements in Survey Basic.

The following table shows Survey Basic functions.

Tap the ...	to ...
Trimble functions icon	access the *Trimble Functions* screen
Instrument icon on the status bar	
Target icon	set or modify the target height
Zero softkey	set the instrument horizontal circle to 0
Set softkey	set the horizontal circle

	set the target height
	set the reference elevation, and compute the instrument elevation
	set the instrument point coordinates, and instrument elevation
	set the instrument height
Options softkey	modify the correction values used in Survey Basic
Inverse softkey (via up arrow)	compute the inverse between two measured positions
Clear softkey	reset the angles back to live and clear the slope distance after a measurement
Display view button	switch the display between HA, VA, SD and HA, HD, VD
Press the ...	**to ...**
Enter key	measure a distance and fix the horizontal and vertical angles

Note - When a survey is running you cannot change:

- the instrument's horizontal circle
- the instrument point coordinates
- correction values

Inverse

Inverse provides the ability to display inverse calculations between two measurements. You can configure inverse to compute Radial inverses from a single measurement to one or more other measurements, or Sequential inverses between successive measurements.

To use Survey Basic to compute the inverse distance between two measurements:

1. From the Survey Basic front screen tap the up arrow and then select *Inverse.*
2. Set the *Method* to either Radial or Sequential.
3. Enter a target height, if required.
4. Tap *Meas 1* to measure to the first point.
5. Enter a target height, if required.
6. Tap *Meas 2* to measure to the next point.
7. The inverse results are displayed.
    - ♦ Tap *Continue* to measure subsequent points. The process then continues from step 4.
    - ♦ Tap *Reset* to return to step 1.
8. Tap *Esc* to return to Survey Basic.

Notes

- If there is a survey running, the azimuth for each computed inverse will be displayed, and you will be able to select whether to display Grid, Ground or Ellipsoidal distances using the *Options* softkey, with the computations based on the settings in the current job.
- Without a survey running, and therefore no orientation, the azimuth is not available for computed inverses and all computations are based on simple cartesian computations with a scale factor of 1.0.
- Tap *Options* to configure the format of the grade display.

Trimble Functions

To access the *Trimble Functions* screen, do one of the following:

- tap the instrument icon on the controller screen
- tap the Trimble key on the instrument
- select *Instrument / Trimble Functions* from the Trimble Digital Fieldbook main menu

The *Trimble Functions* screen is available for conventional total stations. Use it to control commonly used instrument functions, and to change instrument settings:

- STD (EDM Standard mode)
- FSTD (EDM Fast Standard mode)
- TRK (EDM Tracking mode)
- Tracklight
- Laser (Laser pointer for DR instruments)
- DR (Direct Reflex) mode
- Electronic level
- Survey Basic

Trimble Functions shortcuts to the Instrument menu

Shortcuts to certain Instrument menu functions are available from *Trimble Functions.* In the *Trimble Functions* screen, tap and hold on the DR, Laser and Tracklight icons to quickly access their Instrument menu configuration screens.

Coordinate System

Coordinate System

A coordinate system consists of a projection and datum transformation and, sometimes, additional horizontal and vertical adjustments.

When you create a job, select a coordinate system by one of the following methods:

- Scale factor only
- Select from library
- Key in parameters

If you modify the coordinate system by manually changing the parameters, you must do so before you compute offsets or intersection points, or stake out points in the local coordinate system.

To set up a ground coordinate system for the job, choose the *Select from library* or *Key in* parameters option.

To customize the coordinate systems available on the Trimble Digital Fieldbook software, use the Coordinate System Manager software. For more information see Customizing the Coordinate System Database.

Customizing the Coordinate System Database

You can customize the coordinate system database used by the Trimble Digital Fieldbook software. This enables you to:

- Reduce the number of coordinate systems available in the Trimble Digital Fieldbook software so that it includes only the ones you need.
- Customize existing coordinate systems definitions or add new coordinate system definitions.

You must use the Coordinate System Manager software to modify the Coordinate System Database (CSD) and then transfer the modified database to the [Trimble data] folder on the Trimble controller. When a [custom.csd] file exists in the [Trimble data] folder, the Trimble Digital Fieldbook software uses the custom.csd database instead of the coordinate system database built into the Trimble Digital Fieldbook software.

Note - The Coordinate System Manager software is installed at the same time as your Trimble Office software, for example, Trimble Geomatics Office.

There are a number of ways you can use the Coordinate System Manager software to customize the coordinate systems. From the following options, choose the one that best suits your needs.

To reduce a coordinate system library to one or more coordinate systems, zones, and sites:

1. Run the Coordinate System Manager software on your office computer.
2. Do one or more of the following to hide the required element:
    - Coordinate system: In the left pane of the *Coordinate Systems* tab, select the coordinate system(s) that you do not want, right click and then select *Hide.*
    - Zone: In the left pane of the *Coordinate Systems* tab, select a coordinate system, from the right pane, select the Zone(s) you do not want, right click and then select *Hide.*
    - Site: From the *Sites* tab, right click the site(s) you do not want and then select *Hide.*
3. Select *File / Save As.*
4. Name the file [custom.csd] and then click **Save.**

By default, the file is saved in [Program Files\Common Files\Trimble\GeoData] with the extension *.csd.

To export only User defined coordinate systems:

1. Run the Coordinate System Manager software on your office computer.
2. Select *File / Export.*
3. Select *User-defined records only* and then click **OK.**
4. Name the file [custom] and then click **Save.**

By default, the file is saved in [Program Files\Common Files\Trimble\GeoData] with the extension *.csw.

Tips for using the Coordinate System Manager software

- To make multiple selections, press **CTRL** or **SHIFT.**
- To hide records, right click the selection and then select *Hide.*
- To display hidden records, select *View / Hidden Records.* Hidden records are displayed with a dark red icon.
- To unhide hidden records, right click hidden record(s) and then clear the *Hide* check box.

For more information, see the Coordinate System Manager Help.

Transferring Customized Coordinate Systems

You can transfer the file to the controller using the Trimble Data Transfer utility or Microsoft ActiveSync technology. The file must be called [custom.csd] for the Trimble Digital Fieldbook software to access it.

A file transferred by the Data Transfer utility is automatically renamed and saved to the [Trimble data] folder. If you transfer the file using ActiveSync technology, you must copy the file to the [Trimble data] folder and then rename the file to [custom.csd].

For more information on transferring a file from a Trimble controller to an office computer, see Connecting the controller to the office computer using Microsoft ActiveSync technology.

If using the Data Transfer utility, when the *Open* dialog appears, select *CSD Files (*.csd)* or *CSD Files (*.csw)* from the *Files of type* list.

Note - After you have copied a custom coordinate system database file [Custom.csd] to the [Trimble Data] folder you must shut down the Trimble Digital Fieldbook software and restart it to have the new coordinate

system database loaded.

To select a custom site in Trimble Digital Fieldbook software:

1. From the main menu, select *Files / New job.*
2. Enter the *Job name.*
3. In the *Properties* group, tap the *Coord sys* button.
4. Choose *Select from library* and then tap *Next,* if required.
5. In the *System* field, select *[User sites].*
6. In the *Site* field, select the required site.
7. If required, select a geoid model.
8. To return to the *New job* dialog, tap *Store.*
9. In the *New job* dialog, tap *Accept* to save the new job.

Scale Factor Only

Use this projection type when you are doing a conventional-instrument only survey with a local scale factor. This option is useful for areas that use a local scale factor to reduce distances to the local coordinate system.

To choose a Scale factor only projection:

1. Create a new job.
2. Select *Scale factor only* from the *Select coordinate system* menu.
3. Enter a value in the *Scale* field and then tap *Store.*

Projection

A projection is used to transform local geodetic coordinates into local grid coordinates.

Note - Enter an appropriate default height value for the Trimble Digital Fieldbook software to correctly calculate a sea level correction and then apply it to the grid coordinate.

You can specify a projection:

- when a job is created and you have to choose a coordinate system (select from a list, or key in)
- in the Trimble Geomatics Office software, when the data is transferred.

Do not change the coordinate system after you have staked out points, or computed offset or intersection points.

Ground Coordinate System

If you require coordinates to be at ground level instead of projection level, use a ground coordinate system. When you select a ground coordinate system, grid distances equal ground distances.

To set up a ground coordinate system, when you create a job:

1. Specify a coordinate system by choosing the *Select from library*, or *Key in parameters* option.
2. To use ground coordinates with the selected coordinate system, tap the Page down button, and then from the *Coordinates* field, do one of the following:
   - To key in a scale factor, select *Ground (Keyed in scale factor).*
   - To let the Trimble Digital Fieldbook software calculate the scale factor, select *Ground (Calculated scale factor).* Enter values in the *Project Location* group to compute the scale factor.

   The computed scale factor allows for the projection scale factor at the Project Location in order to ensure that the combined factor (grid scale factor plus elevation factor) at the Project Location equals 1.

   The Trimble Digital Fieldbook software applies the ground scale factor to the projection.

3. To add offsets to the coordinates, enter a value in the *False northing offset* and *False easting offset* fields as required.

Note - When working with a ground coordinate system the reported ground distance may not be the same as the reported grid distance. The reported ground distance is simply the ellipsoid distance corrected for the average height above the ellipsoid. However the grid distance is computed between the ground coordinates of the points, and is therefore based on a coordinate system that provides a combined scale factor of 1 at the Project Location.

Note - Use offsets to differentiate ground coordinates from unmodified grid coordinates.

Project Height

The project height can be defined as part of the coordinate system definition when creating a new job. To find it, select *Files / Properties of current job* for a coordinate system in either the *Library* or *Key in projection* dialogs.

If a point has no elevation, the Trimble Digital Fieldbook software uses the project height in Cogo calculations.

In 2D surveys where a projection has been defined, enter a value for the project height that approximates the height of the site. You need this value to reduce measured ground distances to ellipsoid distance, and to compute coordinates.

Horizontal Adjustment

A horizontal adjustment is a least-squares adjustment that is applied to minimize the differences between transformed grid coordinates and local control points.

Vertical Adjustment

You can specify the type of vertical adjustment when you create a job. Set this parameter when you choose the coordinate system. You can also key in the parameters when you create a job.

To change the parameters for the current job, from the main menu select *Files / Properties of current job*, tap *Coord sys* and then select *Key in parameters / Vertical adjustment.*

Note - When the Projection is set to *Scale factor only*, the *Datum transformation*, *Horizontal adjustment*, and *Vertical adjustment* options are not available. Select a non *Scale factor only* projection to access the other parameters.

Coordinate Systems

Choosing a Coordinate System for a Conventional Survey

When surveying using conventional equipment, it is important to choose a suitable coordinate system.

If a job is to contain conventional observations only, select one of the following when you create the job:

- A typical coordinate system and zone that provide mapping plane coordinates. For example, State Plane coordinates.
- Scale factor only.

  In a conventional survey, measurements are made at ground level. To compute coordinates for these measurements, observations are reduced to grid level. The specified scale factor is applied to measured distances to reduce them from ground to grid.

  The *Scale factor only* option is useful for areas that use a local scale factor to reduce distances to grid.

Tip - If you are not sure what coordinate system to use, select the *Scale factor only* projection and enter a scale factor of 1.000.

Local Coordinate Systems

A local coordinate system simply transforms measurements from a curved surface (the earth) onto a flat surface (a map or plan). Four important elements constitute a local coordinate system:

- local datum
- datum transformation
- map projection

Local Datum

Because an exact model of the earth's surface cannot be created mathematically, localized ellipsoids (mathematical surfaces) have been derived to best represent specific areas. These ellipsoids are sometimes referred to as local datums. NAD83, GRS80, and AGD66 are examples of local datums.

Datum Transformation

The datum transformations are as follows:

- three-parameter - This assumes that the rotational axis of the local datum is parallel with the rotational axis of WGS84. The three-parameter transformation involves three simple translations in X, Y, and Z. The three-parameter transformation that the Trimble Digital Fieldbook software uses is a Molodensky transformation, so there may also be a change in ellipsoid radius and flattening.

Note - Positions on a local datum are commonly called "local geodetic coordinates". The Trimble Digital Fieldbook software abbreviates this to "Local".

- Seven-parameter - This is the most complex transformation. It applies translations **and** rotations in X, Y, and Z, as well as a scale factor.
- Datum grid - This uses a gridded data set of standard datum shifts. By interpolation, it provides an estimated value for a datum transformation at any point on that grid. The accuracy of a datum grid depends on the accuracy of the gridded data set it uses. For more information, see Using a Datum Grid File.

Map Projection

Local geodetic coordinates are transformed into local grid coordinates using a map projection (a mathematical model). Transverse Mercator and Lambert are examples of common map projections.

Note - Positions on a map projection are commonly called "local grid coordinates". The Trimble Digital Fieldbook software abbreviates this to "Grid".

Using a Datum Grid File

A datum grid transformation uses interpolative methods to estimate the value of the datum transformation at any point in the area covered by the datum grid files. Two gridded datum files are required for this interpolation-a latitude datum grid file and a longitude datum grid file. When you export a datum grid using the Trimble Geomatics Office software, the two datum grid files associated with the current project are combined into a single file for use in the Trimble Digital Fieldbook software.

Selecting a Datum Grid File

To select a datum grid file when creating a job, do one of the following:

- Select a coordinate system from the library provided in the Trimble Digital Fieldbook software. Select the *Use datum grid* check box. In the *Datum grid* field, select the file that you want to use.
- Key in the coordinate system parameters. Select *Datum transformation* and set the *Type* field to Datum grid. In the *Datum grid* field, select the file that you want to use.

Note - The U.S. State Plane 1927 and the U.S. State Plane 1983 coordinate systems in the Trimble Digital Fieldbook software use three-parameter transformations.

To select a datum grid file for use in the current job:

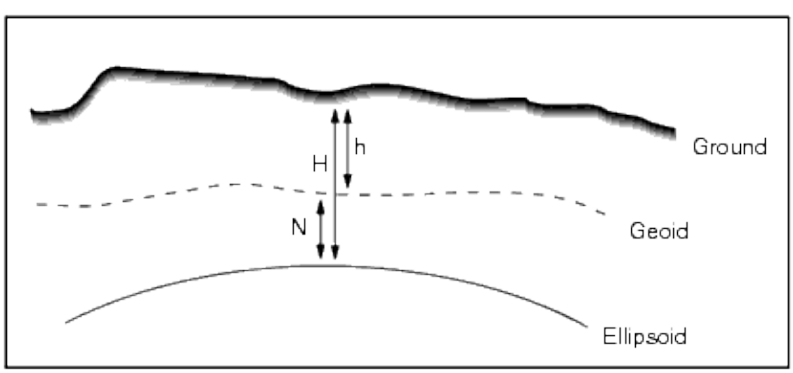
1. From the main menu, select *Files / Properties of current job - Coord. Sys.*
2. Do one of the following:
   - ♦ If *Key in parameters* is selected, select *Next.* Select *Datum transformation* and set the *Type* field to Datum grid. In the *Datum grid* field, select the file that you want to use.
   - ♦ If *Select coordinate system* is selected, select *Next.* Select the *Use datum grid* check box. In the *Datum grid* field, select the file that you want to use.

   The semi-major axis and flattening values for the selected datum grid file are displayed. These details overwrite any already provided by a specified projection.

Using a Geoid Model

The geoid is a surface of constant gravitational potential that approximates mean sea level. A geoid model or Geoid Grid file (*.ggf) is a table of geoid-ellipsoid separations that is used with the GNSS ellipsoid height observations to provide an estimate of elevation.

The geoid-ellipsoid separation value (N) is obtained from the geoid model and is subtracted from the ellipsoid height (H) for a particular point. The elevation (h) of the point above mean sea level (the geoid) is the result. This is illustrated in the following diagram.



Note - For correct results, the ellipsoid height (H) must be based on the WGS-84 ellipsoid.

When you select geoid model as the vertical adjustment type, the Trimble Digital Fieldbook software takes the geoid-ellipsoid separations from the geoid file chosen, and uses them to display elevations on the screen.

The benefit of this function is that you can display elevations without having to calibrate on elevation benchmarks. This is useful when local control or benchmarks are not available, as it makes it possible to work "on the ground" rather than on the ellipsoid.

Note - If you are using a geoid model in a Trimble Geomatics Office project, make sure you transfer that geoid file (or the relevant part of it) when transferring the job into a Trimble controller.

Selecting a Geoid File

To select a geoid file when creating a job, do one of the following:

- Select a coordinate system from the library provided in the Trimble Digital Fieldbook software. Select the *Use geoid model* check box. In the *Geoid model* field, select the file to be used.
- Key in the coordinate system parameters. Select *Vertical adjustment* and set the *Type* field to *Geoid model* or *Geoid/Inclined plane* as required. (Select *Geoid/Inclined plane* if you intend to key in the inclined plane adjustment parameters.)

To select a geoid file for the current job:

1. From the main menu select *Files / Properties of current job - Coord. Sys.*
2. Do one of the following:
    - ♦ If the *Key in parameters* screen is selected, select *Next.* Select *Vertical adjustment* and set the *Type* field to *Geoid model* or *Geoid/Inclined plane* as required. (If you intend to key in the inclined plane adjustment parameters, select *Geoid/Inclined plane.)*
    - ♦ If the *Select coordinate system* screen is selected, select *Next.* Select the *Use geoid model* check box. In the *Geoid model* field, select the file to be used.

Working with Ground Coordinates

If you need coordinates to be at ground level instead of projection level (for example, in areas of high elevation), use a ground coordinate system.

When you select a ground coordinate system, grid distances equal ground distances.

Setting up a Ground Coordinate System

When you set up a ground coordinate system in a Trimble Digital Fieldbook job, the software applies a ground scale factor to the coordinate system projection definition.

To set up a ground coordinate system when creating a job:

1. Define the coordinate system for the job. Do one of the following:
    - ♦ Choose the *Select from library* option to select a coordinate system from the library provided in the Trimble Digital Fieldbook software. Tap *Next.*
    - ♦ Choose the *Key in parameters* option to key in the coordinate system parameters. Tap *Next* and then select *Projection.*
2. In the *Coordinates* field, choose an option to define the ground scale factor.

Additional fields appear below the *Coordinates* field.

3. If you select the *Ground (keyed in scale factor)* option, enter a value in the *Ground scale factor* field.
4. In the *Project location* group, enter values in the fields as required.

   The project height is used with 2D points to reduce ground distances in Cogo calculations. For more information, see Project Height. If you select the *Ground (calculated scale factor)* option, the fields are used to calculate the ground scale factor. When the fields are completed, the computed ground scale factor is displayed in the *Ground scale factor* field.
5. To add offsets to the coordinates, enter a value in the *False northing offset* and *False easting offset* field, as required.

Note - Use offsets to differentiate ground coordinates from unmodified grid coordinates.

To configure a ground coordinate system for the current job:

1. From the main menu, select *Files* / *Properties of current job - Coord.Sys.*
2. Do one of the following:
   - If the *Key in parameters* screen is selected, tap *Next* and then select *Projection.* Select an option from the *Coordinates* field. Complete the fields below as required.
   - If the *Select coordinate system* screen is selected, tap *Next.* Select an option from the *Coordinates* field and then complete the fields below as required.

Options Softkey

This softkey appears in only some screens. It allows you to change the configuration for the task being performed.

If you make changes using the *Options* softkey, they only apply to the current survey or calculation. The changes do not affect the current Survey Style or the job configuration.

Distances setting options

The computed area varies according to the *Distance* display setting. The following table shows the effect of the distance setting on the area calculated.

Distances setting	Computed area
Ground	At the average ground elevation
Ellipsoid	On the ellipsoid surface
Grid	Directly off the grid coordinates

Traverse Options

Use these options to specify how a traverse calculation is adjusted.

Field	Option	What it does

Adjustment method	Compass	Adjusts the traverse by distributing the errors in proportion to the distance between traverse points
	Transit	Adjusts the traverse by distributing the errors in proportion to the northing and easting ordinates of the traverse points
Error distribution		
Angular	Proportional to distance	Distributes the angular error among the angles in the traverse based on the sum of the inverses of the distances between traverse points
	Equal proportions	Distributes the angular error evenly among the angles in the traverse
	None	Does not distribute the angular error
Elevation	Proportional to distance	Distributes the elevation error in proportion to the distance between traverse points
	Equal proportions	Distributes the elevation error evenly among the traverse points
	None	Does not distribute the elevation error

Note - The *Compass* option is the same as the Bowditch method of adjustment.

For information about calculating and adjusting a traverse, see Traverses.

Measure Display

Use the *Measure display* field to configure how the observations are displayed on the controller.
See the Conventional Instrument - Corrections table for a description of the measure display options and the corrections that are applied.

Subdivide Pts Code

When you subdivide a line or an arc, a number of points are created. Use the *Subdivide pts code* field to specify the code that the new points will be allocated. Choose from the name or the code of the line or arc that is to be subdivided.

Coordinate View Settings

To change the *Coordinate view* setting (when reviewing a job) for a point that you want to view:

1. When reviewing the database, highlight the point record and tap *Enter*.
2. Tap *Options* and set the *Coordinate view* field as required.

If the coordinate value for a point is *?*, one of the following situations may have occurred:

- The point may be stored as a polar vector from a point which has been deleted. To correct this, restore the point.
- In a 2D survey, a projection may have been defined with the project height at null. To correct this, set the *Project height* to approximate the site elevation.

Projection Grids

Use a projection grid to handle projection types that are not directly supported by the Trimble coordinate system routines. A projection grid file stores local latitude and longitude values that correspond to regular northing/easting positions. Depending on the direction of the conversion, either projection or local latitude/longitude positions are interpolated from the grid data for points within the grid extents.

Use the Coordinate System manager to generate the defined projection grid (*.pjg) file.

For more information, refer to the *Coordinate System Manager Help.*

Use the Data Transfer utility or Microsoft ActiveSync technology to transfer the *.pjg file to the controller. For more information, refer to the Trimble Digital Fieldbook File Transfer Help, Data Transfer Help or Microsoft ActiveSync Help.

To use the projection grid in Trimble Digital Fieldbook:

1. From the main menu, select *Files / New job.*
2. Enter the *Job name.*
3. In the *Properties* group, tap the *Coord sys* button.
4. Select *Key in parameters,* if required, tap *Next.*
5. In the *Key in parameters* dialog, select *Projection.*
6. In the *Type* field, select *Projection grid* from the drop-down list.
7. In the *Projection grid file* field, select the required grid file.
8. If required, select the *Use shift grid* check box.
9. Tap *Accept* twice, to return to the *New job* dialog.
10. In the *New job* dialog, tap *Accept* to save the new job.

Shift Grids

Initial projection coordinates are projections that are computed using specified projection routines. Some countries use shift grids to apply corrections to these coordinates. The corrections are generally used to fit the initial coordinates to local distortions in the survey framework, and so cannot be modelled by a simple transformation. You can apply a shift grid to any type of projection definition. Coordinate systems that use shift grids include the Netherlands RD zone, and the United Kingdom OS National Grid zones.

Note - The OS National Grid zones are now treated as a standard Transverse Mercator projection plus shift grid but they used to be handled as a special projection type with separate north and east grid files.

Use the Coordinate System manager to generate a shift grid (*.sgf) file. For more information, refer to the *Coordinate System Manager Help.*

Use the Trimble Data Transfer utility or Microsoft ActiveSync technology to transfer the shift grid (*.sgf) file to the controller. The file is stored in [\Trimble Data].
For more information, refer to the Trimble Data Transfer Help or Microsoft ActiveSync Help.

Geoid files and Shift grid files are available on the web from:
www.trimble.com/tsc_ts.asp?Nav=Collection-58928.

To apply a shift grid to a projection definition:

1. In the *Projection* dialog, select the *Use shift grid* check box.
2. In the *Shift grid file* field that appears, select the required file from the drop-down list.

File Transfer

Import / Export menu

This menu lets you export and import fixed format files and export and import custom format files.

For more information, see:

Export Fixed Format Files

Import Fixed Format Files

Export Custom Format Files

Import Custom Format Files

Transferring Files between the Controller and the Office Computer

This topic describes how to transfer data between a Trimble controller and an office computer. It lists the types of files that can be transferred, and shows how to connect the equipment for transfer.

For more information, see:

File transfer between a Trimble controller and the office computer

Connecting the controller to the office computer using Microsoft ActiveSync technology

Using the Trimble Data Transfer Utility

Using Microsoft Explorer with the Microsoft ActiveSync technology enabled

File conversion

Transferring a Geodimeter (GDM) job file

Transferring a Zeiss M5 file

File transfer between a Trimble controller and the office computer

You can transfer various types of files between a Trimble controller and the office computer, including data collector (.dc) files, feature code files, and language files. The file transfer process on the Trimble controller is controlled by the office computer software, once you have established a connection between the controller and office computer using the Microsoft ActiveSync technology.

You can transfer files using:

- The Trimble Data Transfer utility with Microsoft ActiveSync technology enabled
- Microsoft Explorer with the Microsoft ActiveSync technology enabled

To use the Microsoft ActiveSync technology, you must first install it from the Trimble Digital Fieldbook software CD.

You can also transfer data to and from a Trimble controller using other Trimble software packages. For more information, refer to the help provided with the Trimble office software.

Connecting the controller to the office computer using Microsoft ActiveSync technology

To transfer Trimble Digital Fieldbook files between the Trimble Digital Fieldbook software and the office computer, you must use Microsoft ActiveSync technology on either a Guest or Partnership connection.

To establish the connection:

1. Make sure that the Trimble controller and office computer are switched on.
   Disconnect any devices that are communicating with the controller, and close down any applications to ensure that the communications ports are available.
2. On the office computer, select *Start / Programs / Microsoft ActiveSync* to start the ActiveSync technology.

   You only need to do this the first time to configure the connection settings. Subsequent connections start Microsoft ActiveSync technology automatically.

3. In Microsoft ActiveSync, select *File / Connection Settings* to configure the connection method. Select the appropriate option for *Serial/Infrared* and specify the communications port, USB, or Network.
4. Connect the instrument to the office computer using a USB cable.
5. The Microsoft ActiveSync icon on your Windows taskbar will start spinning and the Trimble controller prompts you with the message, "Connect to desktop". Tap *Yes.*
6. If the message does not appear on the Trimble controller and the Microsoft ActiveSync icon does not spin, there is a connection problem. Check that the connection settings in the Microsoft ActiveSync technology are correct and that there are no applications using the COM port on the Trimble controller.

   If the controller fails to connect, a message may appear to advise that the connection is busy. Alternatively, an Error 678 message may appear to advise that the connection is not established. Remove the cable connected to the controller, perform a hard reset, and then reconnect the cable. When the cable is reconnected the [Connect to desktop] message appears, select [Yes] to connect.

   For more information on how to reset the instrument, see Perform a hard reset.

If you have not already created a partnership between this computer and the controller, the Microsoft ActiveSync connection wizard prompts you to do so during the connection process. Creating a partnership is not essential, but it does have some advantages, as shown in the following table.

Connection Type	Advantages	Disadvantages
Guest	Fewer questions to answer on initial connection Safer (because synchronization cannot adversely impact data either on your controller or your PC) For use on borrowed or shared computers	Slower subsequent connections (one more step per connection that requests for partnership) LAN connection is not possible
Partnership	Fast subsequent connections (one fewer step per connection) Once a partnership is established, you can connect to the office computer through a LAN (the fastest connection) The controller clock is set to match the office computer clock	More questions to answer on initial connection Synchronization is not supported on the controller If the clock on the office computer is wrong, it will make the clock on the controller wrong Partnership is deleted when you perform a hard reset on the controller

To create a Partnership:

1. On the [New Partnership] dialog select [Yes] then [Next].
2. To allow only one partnership with this controller, select [Yes] then [Next].
3. Select the synchronization settings, we recommend clearing all check boxes. Select [Next] to continue.
4. The setup is now complete, select [Finish] to exit the wizard. You have now completed the ActiveSync connection process and formed a partnership.

To transfer Trimble Digital Fieldbook files using Trimble Data Transfer, see Using the Trimble Data Transfer Utility.

For more information, refer to the Microsoft ActiveSync Help. On the office computer, click *Start / Programs / Microsoft ActiveSync*.

Using the Trimble Data Transfer Utility

Use the Trimble Data Transfer utility to transfer files between Trimble Digital Fieldbook and the office computer.

To transfer files using Trimble Data Transfer:

1. To transfer files to Trimble Digital Fieldbook, you must first connect the controller to the office computer using the Microsoft ActiveSync technology, for more information see Connecting the controller to the office computer using the Microsoft ActiveSync technology.

2. On the office computer, start the Data Transfer utility.
3. Ensure that the Device setting in Data Transfer is set correctly, for example, **Trimble Digital Fieldbook on ActiveSync** and select the **Connect** button to connect.
   When the default device is set correctly, this connection process is automatic.
4. Select the *Receive* or *Send* tab as appropriate.
5. Select *Add.*
6. In the *Open* dialog, set the appropriate options for the file type, and select the file to transfer.
7. Select *Transfer All* to start the file transfer.

For more information on using Data Transfer, refer to the Data Transfer Help.

Using Microsoft Explorer with the Microsoft ActiveSync Technology Enabled

You can use the Microsoft Explorer and ActiveSync technology to move or copy files to or from the Trimble controller. Use the software to transfer files that do not require conversion by Data Transfer (for example, comma delimited (.csv) files). See the table below.

To transfer files to Trimble Digital Fieldbook, you must first connect the controller to the office computer using the Microsoft ActiveSync technology. For more information, see Connecting the controller to the office computer using Microsoft ActiveSync.
When connected, from the Microsoft ActiveSync window:

1. Click **Explore** to move or copy files between the office computer and the Trimble controller for sharing information. Alternatively, use Windows Explorer to move or copy files.
2. Click **Tools** to backup and restore files.

For more information on using Microsoft ActiveSync technology to transfer files, refer to the Microsoft ActiveSync Help.

File Conversion

When data is transferred to and from the Trimble Digital Fieldbook software, some files are converted for use in the Trimble software.

The following table lists the files that are used in the Trimble Digital Fieldbook software and the file types they are converted to when transferred to and from Trimble office software.

PC	Controller	Description	Data Transfer	MS Explorer / ActiveSync
.dc	.job	Trimble Digital Fieldbook job files	Y	N
.csv	.csv	Comma Delimited (CSV) files	Y	Y
.txt	.txt	Comma Delimited (TXT) files	Y	Y
.fcl	.fal	Feature and Attribute Library files (TGO)	Y	N
.fxl	.fxl	Feature and Attribute Library files (TBC)	Y	Y
.ddf	.fal	Data Dictionary files	Y	N
.ggf	.ggf	Geoid Grid files	Y	Y

.cdg	.cdg	Combined Datum Grid files	Y	Y
.pjg	.pjg	Projection grid files	Y	N
.sgf	.sgf	Shift grid files	Y	N
.pgf	.pgf	UK National Grid files	Y	Y
.dxf	.dxf	Map files	Y	Y
.shp	.shp	ESRI map shape files	Y	Y
.lng	.lng	Language files	Y	Y
.wav	.wav	Sound files	Y	Y
.jxl	.jxl	JobXML files	Y	Y
.ixl	.ixl	Custom ASCII Import file definitions	N	Y
.xsl	.xsl	XSLT Custom ASCII Export Stylesheet files	Y	Y
.sss	.sss	XLST Custom Stakeout Stylesheet files	Y	Y
.rxl	.rxl	Alignment files	Y	Y
.csd .csw	.csd	Coordinate System Database files	Y	N

N = No. Use Data Transfer to convert the file.

Note - If a Trimble Geomatics Office project uses a geoid model, remember to also transfer the geoid file (or the subgridded part of it) when transferring the job into the Trimble Digital Fieldbook software.

Transferring a Geodimeter (GDM) job file

To create a GDM Job on the controller, or on a computer using ASCII File Generator, see Creating Custom ASCII Files. Custom ASCII File uses XSLT style sheets that you can modify as required to generate new formats.

Transferring a Zeiss M5 file

To create a Zeiss M5 file on the controller, or on a computer using ASCII File Generator, see Export custom format files. The M5 coordinates file that was created using Export custom format files lets you create files using the 3300 or the 3600 default markings. Export custom format files uses XSLT style sheets that you can modify as required to generate new formats.

Import and Export Fixed Format Files

Use these functions to:

- Import a fixed format file and convert it to a new Trimble job file
- Export a fixed format file from a Trimble job file and create a new file

The following formats are available:

- Comma delimited (*.csv, *.txt)
- Trimble DC v10.7
- SC Exchange
- Trimble JobXML

When you create files using *Export fixed format files* or *Export custom format files*, you can save the new format files to an existing folder on the controller, or create a new one. The default folder is the [Export] folder below the current project folder. If you change the project folder, the system creates an export folder under the new project folder, and gives it the same name as the previous export folder.
Tap ... to select an existing folder or create a new one.

When you create files using *Export fixed format files*, you can save the new format files to an existing folder on the controller, or create a new one. The default folder is the [Export] folder below the current project folder. If you change the project folder, the system creates an export folder under the new project folder, and gives it the same name as the previous export folder.
Tap ... to select an existing folder or create a new one.

If the Comma Delimited (*.CSV, *.TXT) option is selected, you can specify the format of the data that is received. Five fields appear: *Point name*, *Point code*, *Northing*, *Easting*, and *Elevation*.

Using the options provided, select a position for each field. Select *Unused* if a particular value is not present in the file being received. For example:

Point name Field 1

Point code Unused

Northing Field 2

Easting Field 3

Elevation Field 4

If description fields are enabled for the job, there are two additional fields to configure.

Null elevations

If the comma-delimited file you are importing contains 'null elevations' that are defined as something other than null, for example a 'dummy' elevation such as -99999, you can configure the format of the *Null elevation* and the Trimble Digital Fieldbook software converts these 'null elevations' to real null elevations inside the Trimble Digital Fieldbook job file.

The *Null elevation* value in *Import fixed format files* is also used when points are imported or copied from linked CSV files.

Tip - Dummy 'null elevations' can also be converted to true null elevations using the 'NullValue' string in Custom ASCII Import.

Notes

- Importing from a JobXML file to a Trimble job file is mainly used to transfer the coordinate system definition and design information. A JobXML file generated from a Trimble job contains all the raw data in the FieldBook section, and "the best" coordinate for each point from the job in the Reductions section. Only the data from the Reductions section is read into the new Trimble job file, raw observations are not imported.
- In an SC Exchange .dc file, all observations are reduced grid positions (coordinates). Use this file format to transfer .dc files to other products able to read .dc files.
- The Trimble Digital Fieldbook software outputs the latest version SC Exchange DC file that the software knows about.
  When importing SC Exchange files, the Trimble Digital Fieldbook software reads all records it knows about. If importing a new version SC Exchange file into an older version of the Trimble Digital Fieldbook software, the software does not read new records that it does not understand.
- The Trimble Digital Fieldbook software remembers where to export files only up to two folders below the project folder. If you send export files to subfolders deeper than that, you must set the folder each time you export a file.

To learn more about customizing your own ASCII format, see Export custom format files.

Export Custom Format Files

Use this menu to create custom ASCII files on the controller while in the field. Use the predefined formats or create your own custom formats. With custom formats, you can create files of almost any description. Use these files to check data in the field, or to produce reports, which you can e-mail from the field to your client or to the office for further processing with the office software.

The predefined ASCII export formats available on the controller include:

- Area computation report
- Check shot report
- Comma delimited with attributes
- GDM area
- GDM job
- ISO Rounds report
- M5 (3600) obs
- M5 coordinates
- Nikon raw format
- SDR33 coordinates
- SDR33 observations
- Stakeout report
- Survey report
- Traverse adjustment report

These Custom Export ASCII formats are defined by the XSLT style sheet (*.xsl) definition files. They can be located in both the language folder and in [Trimble data]. Translated Custom Export stylesheet files are

typically stored in the appropriate language folder.

You can modify a predefined format to meet your specific requirements, or use it as a template to create a completely new custom ASCII export format.

To create a custom ASCII file using a predefined XSLT style sheet:

1. Open the job that contains the data to export.
2. From the main menu, select *Files / Import/Export / Export custom format files.*
3. In the *File format* field, specify the type of file to create.
4. Tap ... to select an existing folder or create a new one.
5. Enter a filename.

   By default, the *File name* field shows the name of the current job. The filename extension is defined in the XSLT style sheet. Change the file name and extension as required.

6. If more fields are displayed, complete them.

   You can use the XSLT style sheets to generate files and reports based on parameters that you define. For example, when generating a Stakeout report, the *Stakeout horizontal tolerance* and the *Stakeout vertical tolerance* fields define acceptable stakeout tolerances. When generating the report you can stipulate the tolerances, then any stakeout delta greater than the defined tolerances appears in color in the generated report.

7. To automatically view the file after you create it, select the *View created file* check box.
8. To create the file, tap *Accept.*

Note - When the selected XSLT style sheet is applied to create the custom export file, the processing is all carried out in the program memory available on the device. If there is not enough memory to enable the creation of the export file, an error message will be displayed and no export file will be created.

The maximum program memory the controller operating system has available for this process is 32 MB.

Four factors will affect whether the export file can be created

1. The amount of program memory available to the device.
2. The size of the job being exported.
3. The complexity of the style sheet being used to create the export file.
4. The amount of data being written to the export file.

If it is not possible to create the export file on the controller, download the job as a JobXML file to a computer.

To create the export file from the downloaded JobXML file using the same XSLT style sheet, use the ASCII File Generator utility program (available on the Trimble Digital Fieldbook CD).

Creating XSLT Style Sheets to define Custom ASCII Formats

You can use any text editor, such as Microsoft Notepad, to make minor changes to the predefined formats. However, to create a completely new custom ASCII format, you need some basic programming knowledge.

You cannot easily modify or create a style sheet on the controller. To successfully develop new style sheet definitions, work on an office computer using a suitable XML file utility program.

The predefined formats on the controller are available on the CD. You can edit them and then transfer them to the controller using Microsoft ActiveSync technology. To retain the existing formats, save the modified formats with a new XSLT filename.

To develop your own XSLT style sheets, you need:

- An office computer.
- Basic programming skills.
- An XML file utility program with good debugging facilities.
- The JobXML file schema definition that provides the details of the JobXML format required to create a new XSLT style sheet.
- A Trimble Digital Fieldbook Job or JobXML file that contains the source data.

The predefined XSLT style sheets and JobXML file schema are available under the *[\Trimble Digital Fieldbook\Utilities]* folder on the Trimble Digital Fieldbook CD.

You can install the ASCII File Generator utility from the Trimble Digital Fieldbook CD. For information on using this utility, refer to the ASCII File Generator Help.

The basic steps are:

1. Source a Job file or JobXML file from your Trimble controller. Use one of the following methods:

- Transfer a Job file from the controller using Microsoft ActiveSync technology or Data Transfer and then use the job file directly with the ASCII File Generator.
- Transfer a Job file from the controller using Microsoft ActiveSync technology or Data Transfer and then use the ASCII File Generator to create a JobXML file.
- Create a JobXML file on the controller. From the *Import/Export / Create ASCII file* menu, set the *File format* field to *Trimble JobXML*. Transfer the JobXML file using Microsoft ActiveSync technology.
- Create and transfer a JobXML file using Data Transfer. Make sure that the *Files of type* field is set to *JobXML Files.*

2. Create the new format using a predefined XLST style sheet as a starting point and the JobXML schema as a guide.
3. To create the new custom ASCII file on the office computer, use the ASCII File Generator utility to apply the XSLT style sheet to the Trimble Job or JobXML file.
4. To create the custom ASCII files on the controller, copy the file to the [Trimble data] folder on the controller using Microsoft ActiveSync technology.

Notes

- XSLT style sheet definition files are XML format files.

- The predefined style sheet definitions are provided in English. Modify these files as required to your own language.
- During installation, new versions of the predefined ASCII import and export formats are installed to the controller. If you have created new custom import or export formats or modified and **renamed** the existing formats then these files are now reinstalled to the controller during the *Transfer Downloaded Trimble Files* step of the upgrade process.
  If you modified the predefined formats and saved them with the same name, they will be replaced when you upgrade the controller. The downloaded files still exist on your office computer. If you create new formats, or customize the predefined formats Trimble recommends you save the files with a new name. Use the Trimble Data Transfer utility or Microsoft ActiveSync technology to transfer these files back onto the controller once the upgrade is complete.
- Style sheets must be created according to the XSLT standards as defined by the World Wide Web Consortium (W3C). For details, go to http://www.w3.org.
- The Trimble JobXML file schema definition provides details of the JobXML file format.

Import Custom Format Files

Use this menu to import custom ASCII files into your current job. You can use the predefined formats or create your own custom format to import fixed-width or delimited ASCII files. You can import the following data using this option:

- Point name
- Code
- Description 1 and Description 2
- Notes attached to points
- Grid coordinates
- WGS84 geographic coordinates (degrees minutes and seconds, or decimal degrees)
  To be successfully imported, points must have a height.
- Local geographic coordinates (degrees minutes and seconds, or decimal degrees)
  To be successfully imported, points must have a height
- Line definitions
  Before you import, line start and end points must exist in the database.

  Line definitions include the following information: start point name, end point name, start station, station interval, azimuth, and length.

The predefined ASCII import formats available in the controller include:

- CSV Grid points E-N
  Point Name, Easting, Northing, Elevation, Code
- CSV Grid points N-E
  Point Name, Northing, Easting, Elevation, Code
- CSV Lines
  Start Point Name, End Point Name, Start Station, Station Interval

These Custom Import ASCII formats are defined by .ixl import definition files that are stored in the [Trimble

data] folder.

To import an ASCII file using a predefined file format:

1. Transfer the file to be imported into the Trimble Data folder on your controller.
2. Open or create the job that you want to import the data into.
3. From the main menu, select *Files/ Import/Export / Import custom format files.*
4. In the *File format* field, specify the type of file to import.
5. In the *File name* field, select the file to import. All files in Trimble Data with the file extension specified in the format file (by default CSV) appear in the list.
6. If you are importing points, select or clear, as required, the *Import points as control* check box to specify if the imported points should be control points.
7. To import the file, tap *Accept.*
   After import, a summary box shows how many items were imported and how many were discarded.

Creating custom ASCII import format files

Custom ASCII import format files are stored on the controller in the [Trimble data] folder, with the extension *.ixl. You can make simple edits to existing format files on the controller using Microsoft Pocket Word software. If you have majors edits or you want to create new format files, use a text editor on a desktop computer. Use ActiveSync technology to transfer the new or edited format files to the [Trimble data] folder on the controller.

For information on how to create your own import formats, refer to the Import Custom Format Files document available on the Trimble Digital Fieldbook CD in the *[\Trimble Digital Fieldbook\Utilities\Import Definitions]* folder.

Database Search Rules

Database Search Rules

This topic explains the database search rules relevant to the Trimble Digital Fieldbook database.

- Dynamic Database
- Search Rules
    - order in the database
    - search class
- Exceptions to the search rules
- Linked files and their Search Rules
- Finding the best point in the database
- The Overwriting rules
- Store another does not change the best point
- Assigning control class to a point

Note - If your job does not contain points of the same name, then the Search rules are not used.

Dynamic Database

The Trimble Digital Fieldbook software includes a dynamic database. This stores networks of connected observations during conventional surveys, making the positions of some points dependent on the positions of others. If you change the coordinates of a point that has dependent observations (for example, an instrument station or a backsight point), this affects the coordinates of all points that depend on it.

Note - Editing the name of a point that has dependent observations can also affect the coordinates of points that depend on it. If you change the point name, the following could occur:

- positions of other points could become null
- if another point with a matching name exists, that one could be used to coordinate the dependent observations

The Trimble Digital Fieldbook software uses database search rules to resolve the coordinates of dependent points, based on the new coordinates for a point they depend on. If the coordinates of a point with dependent points move by a certain amount, the dependent points are shifted by the same amount.

When two points of the same name exist, the Trimble Digital Fieldbook software uses search rules to determine the best point.

Search Rules

The Trimble Digital Fieldbook software lets multiple points with the same point name (point ID) exist in the same job.

To distinguish between points of the same name and to decide how these points are to be used, the Trimble Digital Fieldbook software applies a set of search rules. When you ask for the coordinates of a point in order to perform a function or calculation, these search rules examine the database according to:

- the order in which the point records were written to the database
- the classification (search class) given to each point

Order in the Database

A database search starts at the beginning of the job database and works down to the end of the job, looking for a point with the specified name.

The Trimble Digital Fieldbook software finds the first occurrence of a point of that name. It then searches the rest of the database for points of the same name.

The rules generally followed by the software are:

- If two or more points have the same class and the same name, it uses the first point.
- If two or more points have the same name but different classes, it uses the point of higher class, even if this is not the first occurrence of the point.
- If two or more points (one from the job database and one from an attached linked file) have the same name, the software uses the point in the job database, regardless of the classification of the point in the linked file. For more information see, Linked files and their Search Rules. There is one exception to this rule. You can now add points to a stakeout list from the linked file using the *Select from file* option, and the point from the linked file will be used even when the point already exists in the current job.

Search Class

The Trimble Digital Fieldbook software gives most **Coordinates** and **Observations** a classification. It uses this classification to determine the relative importance of points and observations stored in the job database.

Coordinates have priority over Observations. If a Coordinate and an Observation of the same name have the same class, the Coordinate will be used regardless of its order in the database.

The **Coordinate Classes** are arranged in a descending hierarchy, as follows:

- Control - (the highest class) can only be set when a point is keyed in or transferred.
- Averaged - is given to grid positions stored as a result of an average position computation.
- Adjusted - is given to points that are adjusted in a traverse computation.
- Normal - is given to keyed-in and copied points.
- Construction - is given to all points measured using Fastfix, which are typically used in the computation of another point.
- Deleted - is given to points that have been overwritten, where the original point had the same (or a lower) search class than the new point.
  Deleted points are not displayed in point lists and they are not used in calculations. However, they do remain in the database.

Control class

Control class is used in preference to other classes. It can only be set by you. Use control class for points that you want to use in preference to points of the same name in the same job database. For more information, see Assigning control class to a point.

Note - You cannot overwrite a control class point with a measured point, or use a control class point in an average position computation.

In general, if there are multiple observations with the same name, the best point is determined by the point that has the highest classification.
The **Observation Classes** are arranged in a descending hierarchy, as follows:

- Mean Turned Angle (MTA) *, Normal, Backsight, and Stakeout are now all the same classification.
- Normal and Stakeout have the same classification.
- Construction
- Check
- Deleted
  Deleted observations are not displayed in point lists and they are not used in calculations. However, they do remain in the database.

If there are multiple observations of the same name which also have an equivalent classification (that is, normal and backsight are equivalent), then the best is the one that is found first in the database.

* Within a single station setup, a Mean Turned Angle observation is better than all the other classes - it is treated as an equivalent classification to the other classifications that are listed only when the observations appear in different station setups.

Example

If a point named "1000" is entered as the start point when calculating a from-a-baseline offset, the Trimble Digital Fieldbook software searches for the first occurrence of point "1000". It then searches the rest of the database for any point named "1000", under the following rules:

- If no other point of this name is found, it uses the one it has to calculate the offset.
- If another point "1000" is found, the software compares the classes of the two points. It uses the point "1000" that has the highest classification. Remember that a Coordinate class point (for example, keyed-in) is higher than an Observation class point.
  For example, if both points were keyed in, one was given a normal classification and the other a control classification, Trimble Digital Fieldbook uses the control class point to calculate the offset, regardless of which record the search finds first. If one point was keyed in and one was observed, Trimble Digital Fieldbook uses the keyed-in point.
- If the points are of the same class, Trimble Digital Fieldbook uses the first one.
  For example, if both points named "1000" were keyed in, and both were given a normal classification, the first one is used.

Exceptions to the search rules

Normal search rules are not used in the following situations:

- **F1 or F2 from one station setup and an MTA from another station setup**

  If you observe a point on more than one face, an F1 observation and an F2 observation are combined to create an MTA record. In this situation, the MTA is used to coordinate the point.
  However, if there is an observation to a point on F1 or F2 only, from an earlier station setup, and later a station setup (that could be at the same station as the first) to that same point creates a new MTA, then the MTA is deemed to be of the same class as the earlier F1 or F2 observation. In this situation, the order in the database rule is invoked, and the first point in the database is deemed the best point.

- **Observations that coordinate a point are better than those that do not**

  An angles and distance observation that coordinates the point, is better than an angles-only observation that does not coordinate a point. This rule applies even when the angles-only observation is earlier in the database, and is of a higher class, for example, an MTA.

Linked files and their Search Rules

Comma Delimited (*.csv or *.txt) files or Trimble Digital Fieldbook (job) files can be linked to the current Trimble Digital Fieldbook job to access external data. For more information, see Linked files.

The Trimble Digital Fieldbook search rules do not operate across linked files. Points in the current job are **always** used in preference to a point of the same name in the linked file, regardless of the classification.
For example, if point 1000 in the current job has an As-staked classification, and point 1000 in a linked job file has a Normal coordinate classification, then the search rules will select the As-staked class point in preference to the Normal class point.
If both points were in the current job, then the search rules would select the Normal class point.

Note - You can add points to the stakeout list using the *Select from file* option even if the point in the linked file already exists in the current job. When a point of the same name exists in the current job, this is the only way that you can stake a point from a linked file.

When points of the same name exist in a single CSV file, the Trimble Digital Fieldbook software uses the first point.

When points of the same name exist in multiple CSV files, the Trimble Digital Fieldbook software uses the point in the first CSV file. The first CSV file is the first one in the file selection list. To change the order of the CSV files, tap the tabs at the top of the file selection screen. If you change the order of the CSV files, this may change the order in which files are selected.
When you accept a CSV file selection, and you then go back and select more CSV files, all subsequent files are appended to the initial selection, using the rules. This assumes that the original selection is not altered.

Trimble recommends that you do not use multiple CSV files that contain points of the same name.

Finding the best point in the database

To find the point with the highest classification, use the *Point manager.* In the *Point manager,* the highest class point always appears at the first level in the tree structure. If there is more than one point of the same name, the tree structure has a second level, which contains all points of the same name. The point with the highest classification appears at the top, followed by the other points of the same name, in the order in which they were observed.

Duplicate points and overwriting

Duplicate point tolerances compare the coordinates of a point to be stored with a point of the same name that already exists in the database. If the coordinates are outside the duplicate point tolerances defined in the survey style, the *Duplicate point out of tolerance* dialog appears. Select *Overwrite* to store the new point and delete all existing points of the same class or below.

Of the options displayed, *Overwrite* and *Average* are the only two options that might result in a point being 'promoted' - thus changing the coordinates for the best point.

Note - This warning only appears if the new point is out of tolerance with the original point. If you have changed the tolerance values, the message may not appear. For more information see, Duplicate point tolerance.

In a conventional survey, observations from one station setup to the same point are combined to create an MTA record. You do not see the "duplicate point out of tolerance" warning.

If you store a face 2 observation to a point that already has a face 1 observation, the face 2 observation is checked to see if it is within tolerance of the face 1 observation and then stored. For more information about face 1 and face 2 observations, see Measuring a point in two faces.

Warning - The duplicate point warning could indicate that you are about to overwrite a point that has dependent vectors. If you continue, the coordinates of the dependent vectors could change.

The Overwrite rules

Overwrite deletes points, and results in a change to the coordinates of the best point.

Note - Deleted points remain in the database and have a search class of Deleted. For more information, see Search Class.

If the *Overwrite* option does not appear in the Trimble Digital Fieldbook software, this means that an overwrite would not result in changes to the coordinates of the best point.

General Observation and Coordinate overwrite rules:

- Observations can overwrite and therefore delete Observations.
- Coordinates can overwrite and therefore delete Coordinates.
- Observations cannot overwrite Coordinates.
- Coordinates cannot overwrite Observations.

That does not mean that all Observations can overwrite all other Observations of the same name, and all Coordinates can overwrite all Coordinates of the same name. The Search Class rules still apply.

Some Examples

- If you measure a point with a name that already exists in the database, you can choose to overwrite it when you store the new one. All previous Observations of the same name, and with the same or a lower search class, are deleted.
  If a point stored as a Coordinate existed, then overwrite would not have been an option, because overwriting the observations would not have changed the best point.

- If you key in a point with a name that already exists in the database, you can choose to overwrite it when you store the new one. All previous points stored as Coordinates, of the same name, and with the same or a lower search class, are deleted.
  Points of the same name stored as Observations are not affected.

Store another does not change the best point

If you measure or key in a point with a name that already exists in the database, you can choose to store both points in the database, and both are transferred with the job. The Trimble Digital Fieldbook search rules ensure that the point with the highest class is used for calculations. If there are two points of the same class, the **first** is used.

Averaging overwrites another average

If you measure a point and use a name that already exists in the current job, you can choose to average all points of that name. To store the observation and an averaged grid coordinate, select *Average.* Where an averaged position of that name already exists, the new averaged position will overwrite the existing averaged position. Averaged points have a coordinate classification. Coordinates have a higher classification than observations, so the stored averaged position is used in preference to any observations. You can also choose to Auto-average when the point is within tolerance. For more information, see Averaging.

Assigning control class to a point

Control class is the highest classification that you can give to a point. Any high-accuracy point that you use as a fixed standard in a job can be a control point.

If you specify control search class when you key in the coordinates for a point, you can be sure that those coordinates will not change until you key in another point of the same name and the same search class (control) and choose to overwrite the first point.

The Trimble Digital Fieldbook software never elevates measured points to control class. This is because measured points have measurement errors and may change or be measured again during the course of the job. If the keyed-in point "CONTROL29" is control class, generally you would not want the coordinates of that point to change. A control class point is held fixed for the job.

The Trimble Digital Fieldbook software can measure **observed** control points, but it does not give them control classification. This is because, in calibration, the measured point often has the same name as the

keyed-in control point. This makes it easier to set up the calibration. It also makes it easier to manage your data, for example, if you know that all references to point "CONTROL29" on the ground are also references to point "CONTROL29" in the database.

Appendix A

Calculations performed by the Trimble Digital Fieldbook software

Introduction

This appendix outlines some of the calculations performed by the Trimble Digital Fieldbook software.

- Ellipsoid calculations
- Conventional instrument calculations
- Area calculations

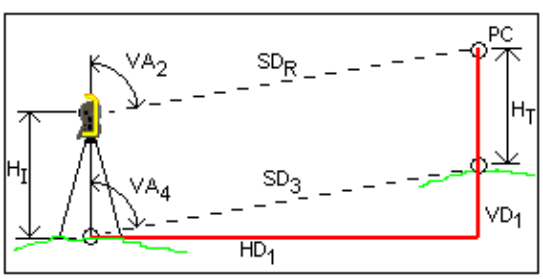
Ellipsoid Calculations

The ground and ellipsoid distances in the Trimble Digital Fieldbook software are calculated parallel to the ellipsoid. The equations used for these calculations are based on the Robbins ellipsoid geometry formulas. These formulas (by Dr A.R. Robbins) are in the *Empire Survey Review* No. 125, 1962. They are accurate to better than 20 mm over distances of 1,500 km. The errors can reach 16 meters at 4,500 km and more than 2,000 meters at 9,000 km.

Conventional Instrument Calculations

The following diagram labels the observations and corrections that are applied when you use the Trimble Digital Fieldbook software with a conventional instrument.

Note - Interim corrections are not shown in the diagram. They are enclosed in square brackets in the table that follows.



Correction variables used in conventional instrument calculations

Where:

VA_2	

	Vertical angle from conventional instrument. The Trimble Digital Fieldbook software assumes that the conventional instrument applies any corrections for collimation and tilt.
[VA_3]	Vertical angle corrected for curvature and refraction
VA_4	Vertical angle corrected for curvature and refraction, instrument and target heights
SD_R	Slope distance from EDM
[SD_1]	Slope distance corrected for prism constant (PC)
[SD_2]	Slope distance corrected for prism constant and PPM
SD_3	Slope distance corrected for prism constant, PPM, instrument and target heights
HD_1	Horizontal distance between instrument point and target point
VD_1	Vertical distance between instrument point and target point
H_I	Height of instrument
H_T	Height of target
PC	Prism constant

Prism Constant Correction

The prism constant is applied to all slope distances. It is usually negative, but can be positive.

$$SD_1 = SD_R + PC$$

where:

SD_R	measured (raw) slope distance
SD_1	resultant slope distance
PC	prism constant

PPM Correction

The parts per million (PPM) correction is applied to the slope distance after being corrected for the prism constant (see above). PPM depends on pressure and temperature.

$$D_2(P, T) = SD_1 \left[J - \frac{N \cdot P}{273.16 + T} \right] \cdot 10^{-6}$$

where:

P	air pressure in millibars
T	temperature in °C
J &N	constants *supplied by the EDM manufacturer*

Note - The J and N constants that are read from the instrument can be viewed in an exported JobXML file.

Curvature and Refraction Correction

The curvature and refraction correction is applied to vertical angles according to the coefficient of refraction that you set.

$$VA_3 = VA_2 - \left[\frac{(COnOff - k \times ROnOff) \times SD_1}{2R}\right] \times \frac{180}{\pi}$$

where:

COnOff	if the *Curvature correction* option is selected, this value is 1; otherwise it is 0
ROnOff	if the *Refraction correction* option is selected, this value is 1; otherwise it is 0
k	coefficient of terrestrial refraction, specified in the *Refraction const.* field on the *Corrections* screen
R	approximate spheroid radius = 6378137m. (WGS-84 semi-major axis)
SD_1	slope distance, from equation - Prism Constant Correction
VA_2	vertical angle, from instrument
VA_3	corrected vertical angle

Instrument and Target Height Reduction

The corrected vertical angle (VA_4) from the instrument to the target is:

$$VA_4 = \tan^{-1}\left[\frac{SD_2 \sin VA_3}{SD_2 \cos VA_3 + H_I - H_T}\right]$$

where:

H_I	instrument height
H_T	target height
SD_2	slope distance
VA_3	vertical angle, from equation - Curvature and refraction correction
VA_4	corrected vertical angle

The slope distance from source point to target point (SD_3) is given by the following:

$$SD_3 = \frac{SD_2 \sin VA_3}{\sin VA_4}$$ (Point to point slope distance)

Face 1/Face 2 Determination

This section describes how the Trimble Digital Fieldbook software reduces Face 2 readings to Face 1 readings in order to perform calculations. It does this automatically.

The observed raw vertical angle is used to determine whether an observation is Face 1 or Face 2:

- If the vertical angle is not present the observation is assumed to be Face 1.
- If the vertical angle is in the range 0° to 180°, the observation is Face 1.
- If the vertical angle is in the range 180°-360°, the observation is Face 2.

Orientation Correction

To orient circle readings so that they become azimuths, an orientation correction is applied. The orientation correction is the difference between the backsight circle reading and the backsight azimuth. This term is applied to all the other observations (circle readings) at a station.

The formula is:

$$Az_X = HA_X + (Az_B - HA_B)$$ (Orientation correction)

where:

Az_x	azimuth to any point X
HA_x	horizontal observation to any point X
Az_B	actual backsight azimuth (`reference azimuth')
HA_B	observed backsight circle reading

Slope Reduction

The horizontal and vertical components of an observation (HD_1 and VD_1) are found from the vertical angle and slope distances by:

$$HD_1 = SD_3 \sin VA_4$$

$$VD_1 = SD_3 \cos VA_4$$

where:

HD_1	horizontal distance
VD_1	vertical distance
VA_4	zenith angle
SD_3	slope distance

Coordinate Calculation

Coordinates of a target point are calculated from observations and the coordinates of the instrument point using:

$$N_2 = N_1 + HD_1 \cos Az_1$$

$$E_2 = E_1 + HD_1 \sin Az_1$$

$$Z_2 = Z_1 + VD_1$$

where:

N_1, E_1, Z_1	Northing, Easting, Elevation of instrument point
N_2, E_2, Z_2	Northing, Easting, Elevation of target point
HD_1	horizontal distance
VD_1	vertical distance
Az_1	from equation - Orientation correction.

Mean Turned Angle Calculations

When the software calculates the mean turned angle and the mean distance for a point, it also calculates standard errors as follows:

For the angles, the standard error of the mean of a set of measurements formula is used:

$$\sigma = \sqrt{\frac{\Sigma v^2}{n(n-1)}}$$

For distances, the standard error of the set of measurements formula is used:

$$\sigma = \sqrt{\frac{\Sigma v^2}{(n-1)}}$$

Resection Calculation

The resection calculation is a least-squares calculation that uses all available data.

Observations to the same point taken on different faces are treated as separate observations. However, the results are the same as those gained from using meaned (averaged) observations.

The residuals are given for each *point* , not each observation.

The formula used for the standard errors is as follows:

$$\sigma = \frac{(\sqrt{\Sigma v^2})}{(n-1)}$$

Traverse Calculation

This section shows the formulae that the software uses when it calculates a traverse.

Compass adjustment

The Compass adjustment distributes the error in proportion to the length of the traverse lines. The formulae are as follows:

Northing adjustment = $\frac{D}{\Sigma D}$ x Northing misclosure

where:

D	horizontal distance
ΣD	sum of the horizontal distances in the traverse

Easting adjustment = $\frac{D}{\Sigma D}$ x Easting misclosure

where:

D	horizontal distance
ΣD	sum of the horizontal distances in the traverse

Transit adjustment

The Transit adjustment distributes the error in proportion to the northing and easting of each traverse point.

Northing adjustment = $\frac{\Delta N}{\Sigma \Delta N}$ x Northing misclosure

where:

ΔN	change in northing for the traverse line
$\Sigma \Delta N$	sum of the changes in northings of all the traverse lines

Easting adjustment = $\frac{\Delta E}{\Sigma \Delta E}$ x Easting misclosure

where:

ΔE	change in easting for the traverse line
$\Sigma \Delta E$	sum of the changes in eastings of all the traverse lines

Angular adjustments

There are three options for distributing the angular error in a traverse:

- Proportional to distance-the error is distributed among the angles based on the sum of the inverses of the forward and back traverse distances for each point. The formula used is as follows:

$$A_a = \frac{\frac{1}{to\ dist} + \frac{1}{from\ dist}}{\sum\left(\frac{1}{to\ dist} + \frac{1}{from\ dist}\right)} \times A_m$$

where:

A_a	Angular adjustment
A_m	Angular misclose

- Equal proportions--the error is distributed evenly among the angles in the traverse.
- None--the error is not distributed.

Elevation adjustments

There are three options for distributing the elevation error in a traverse:

- Proportional to distance--the error is distributed in proportion to the length of the traverse line to the point.
- Equal proportions--the error is distributed evenly among the traverse lines.
- None--the error is not distributed.

Standard Errors Recorded With Conventional Observations

Each conventional observation that is recorded in the job file has standard errors associated with it. The standard errors that are recorded with the observations are determined as follow:

- For a single observation to a point (for example, Measure topo) the standard error values assigned to the observation are the instrument standard error values (a-priori values). This is because there is nothing else that the standard errors can be determined from.
    - If a distance fails to reach the instrument's rated accuracy (typically due to an unstable target), Trimble Digital Fieldbook saves the achieved standard deviation of the measurement. When this occurs, a message tells you that the instrument's distance standard deviation was not achieved for this observation.
- Computed 'observations' for example, Dual prism offsets, Distance offsets, Circular Object and Remote Object measurement methods, the standard errors are recorded as null.

Area Calculations

Grid areas

When the *Distances* field is set to Grid, the area computed is the area at sea level and is calculated using grid coordinates.
Elevations are not used in the computation.

Ellipsoid areas

When the *Distances* field is set to Ellipsoid, the ground area is computed by multiplying the grid area by the projection scale factor (at the centroid of the area) squared.

Ground areas

When the *Distances* field is set to Ground, the ground area is computed by multiplying the grid area by the combined scale factor (at the centroid of the area) squared.

The combined scale factor (at the centroid of the area) is the point scale factor multiplied by the sea level factor,

where, the point scale factor is computed for the centroid of the area based on the current projection definition, and the sea level factor is:

$$\left(\frac{\bar{h}+R}{R}\right)$$

So the ground area is:

$$GA \times \left(PSF \times \left(\frac{\bar{h}+R}{R}\right)\right)^2$$

where:

$$\bar{h} = \frac{\sum h_i}{N}$$

GA	Grid area
PSF	Point scale factor
N	number of elements with elevations
$\bar{h}$	average elevation
R	ellipsoidal radius

Glossary

Glossary

This topic explains some of the terms used in this Help.

Angles and distance	Measurement of horizontal and vertical angles and a slope distance.
Angles only	Measurement of horizontal and vertical angles.
azimuth	Horizontal direction relative to a defined coordinate system.
Backsight	Point with known coordinates or known azimuth from the instrument point that is used to orientate the instrument during station setup.
baud	A unit of data transfer speed (from one binary digital device to another) used in describing serial communications; generally one bit per second.
Construction point	A point that is measured using the "quick fix" option in COGO.
curvature and refraction	Correction to the measured vertical angle for the curvature of the earth and the refraction caused by the earth's atmosphere.
datum	See geodetic datum.
design code	The code name given to the design point.
design name	The name given to the design point.
Direct Reflex (DR)	Type of EDM that can measure to non reflective targets.
DTM	Digital Terrain Model. An electronic representation of terrain in three dimensions.
Dual-prism offset	Measurement of horizontal and vertical angles and a slope distance to two prisms located on one prism pole for the purpose of positioning an obstructed point.
Earth-Centered-Earth-Fixed (ECEF)	A cartesian coordinate system used by the WGS-84 reference frame. In this coordinate system, the center of the system is at the earth's center of mass. The z axis is coincident with the mean rotational axis of the earth and the x axis passes through 0° N and 0° E. The y axis is perpendicular to the plane of the x and z axes.
eccentric object	Measurement of horizontal and vertical angles and a slope distance to the face of a radial object (for example, power pole). An additional horizontal angle is observed to the side of the object to calculate the radius and thus position the center of the object.
elevation	Height above mean sea level. Vertical distance above the geoid.
ellipsoid	A mathematical model of the earth formed by rotating an ellipse around its minor axis.
Face 1 (F1)	Observing position of an instrument where the vertical circle is commonly on the left hand side of the telescope.
Face 2 (F2)	Observing position of an instrument where the vertical circle is commonly on the right hand side of the telescope.

feature codes	Simple descriptive words or abbreviations that describe the features of a point. For more information, refer to the Help
FSTD (fast standard)	The method of measuring one distance and one angle to coordinate a point.
geodetic datum	A mathematical model designed to fit part or all of the geoid (the physical earth's surface).
geoid	The surface of gravitational equipotential that closely approximates mean sea level.
H. Angle offset	Measurement of vertical angle and slope distance. Horizontal angle is then measured separately, usually to an obstructed point.
H. Angle only	Measurement of horizontal angle.
horizontal circle	Graduated or digital disc from which the horizontal angle is measured
instrument height	Height of the instrument above the instrument point.
instrument point	Point that the instrument is occupying.
measurement modes: Standard (STD), Fast Standard (FSTD), Tracking (TRK)	Angles are measured and averaged as one distances is measured. STD mode is indicated by an S next to the instrument icon on the status bar. One angle and one distance are measured. FSTD mode is indicated by an F next to the instrument icon on the status bar. Angles and distances are continually measured. TRK mode is indicated by a T next to the instrument icon on the status bar.
parity	A form of error checking used in binary digital data storage and transfer. Options for parity checking include Even, Odd, or None.
PPM	Parts per million correction that is applied to measured slope distances to correct for the affects of the earth's atmosphere. PPM is determined using observed pressure and temperature readings together with specific instrument constants.
Prism constant	Distance offset between the center of a prism and the point being measured.
projection	Used to create flat maps that represent the surface of the earth or parts of that surface.
refline	The process of establishing the position of an occupied point relative to a baseline by taking measurements to two known or unknown points.
resection	The process of establishing the position of an occupied point by taking measurements to two or more known points.
RMS	Root Mean Square. This is used to express the accuracy of point measurement. It is the radius of the error circle within which approximately 70% of position fixes are to be found.
RMT	Remote target
rounds	Conventional observation method of multiple observations to multiple points.
Single dist. Offset	Measurement of horizontal and vertical angles and a slope distance. Plus additional offset distances to position obstructed points.
Station setup	The process of defining the instrument occupation point and setting the

	orientation of the instrument to a backsight point or points.
stationing	The distance or interval along a line or arc.
String	A string is a series of 3D points joined together. Each string represents a single feature such as a curb line or the centerline of a road.
target height	Height of prism above the point being measured.
Tracklight	A visible light that guides the prism operator on the correct bearing.
TRK	Tracking mode. Used to measure towards moving targets.
vertical circle	Graduated or digital disc from which the vertical angle is measured.
WGS-84	World Geodetic System (1984), the mathematical ellipsoid used by GPS since January 1987. See also ellipsoid.