Trimble Penmap for Windows software

USER GUIDE

TRANSFORMING THE WAY THE WORLD WORKS

Trimble

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Contents

1 Introduction

About Trimble Penmap for Windows

Trimble Penmap is premium data collection software, designed specifically for surveyors, cadastral surveying, mapping, land registration tasks and GIS professionals.
As a tool for pen-based, graphical and feature data collection, Trimble Penmap allows users to check and finish their survey job in the field, eliminating mistakes and costly rework.
Trimble Penmap provides easy to use field client software specifically designed to run on your Windows device.

Using Trimble Penmap, data that was previously collected using text-only loggers and then plotted back at the office may now be viewed onscreen instantly. Viewing data “as collected” is only part of the advantages of Trimble Penmap:

- Take existing data set out to site in a digital format. Edit the existing data and add new data as needed, greatly reducing errors, time spent, and the need to revisit sites.
  This combination of data collection and handling produces a field editing system more powerful than any individual Surveying, CAD, or GIS System, and of unparalleled multiple functionality.
- Use the large map display to collect features as graphical objects and add GIS records to the feature.
  Trimble Penmap provides a range of survey methods to create nodes for features, including GNSS positioning, optical positioning, and COGO calculations such as bilateration and chain&
  offset. You can also create a range of construction nodes, from which to create other nodes.
  Alternatively, key in coordinates or add them by tapping the map. Use as many different methods as

required to add all of the nodes you need to any feature.

- Use the Trimble Connect cloud-based collaboration platform to download projects sent from the office and to upload data collected in the field.

Resources

You can find all software downloads and updates here:

https://landadmin.trimble.com/2017/02/14/penmap-downloads/

You will also find useful video tutorials about every function of Trimble Penmap. This is the fastest way to get familiar with your Trimble Penmap software in your own speed.

You can also contact your Trimble Penmap Support team for customized training sessions, online or in your office.

Penmap features

- Direct logging of Total Station and GNSS data
- Free station calculation
- Full parcel editor
- Setting out
- Area computation
- Capture photographs, signatures and even fingerprints
- Multiple and verification measurements
- Full 3D surveying
- Configurable point numbering
- Configurable code tables

Penmap benefits

- Quick and simple survey and GIS data collection.
- Customized workflows streamline data collection processes for improved productivity.
- Direct logging of total station and GNSS data save time.

- Revolutionary user interface design enables easy-to-use finger operation. l Trimble CenterPoint® RTX support offers centimeter accuracy worldwide. l WMS support provides access to high-resolution satellite imagery.
- Connect with the most popular GNSS receivers, total stations, and laser rangefinders.
- Use with your choice of controller, tablet PC, or mobile device running Windows® 10, 8, 7, Vista® or XP operating systems.

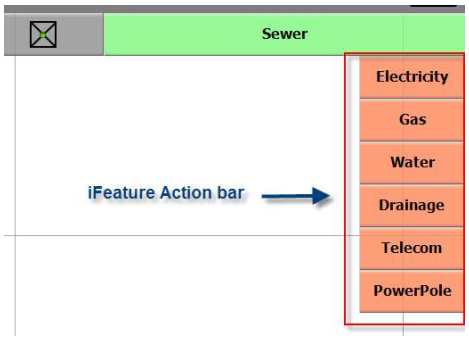
NOTE – *Penmap is also available for Android.*

2 Getting to know Trimble Penmap

Main screens and toolbars

Item	Definition
Home Screen	When you create a new project, the **Home** Screen displays. The **Home** Screen is the main screen in Penmap and gives you access to all functionality and applications.
Data Collection Screen	Click the **Data Collect** button on the **Home** Screen to access the **Data Collection** screen. The **Data Collection** screen gives you access to all supported **Collect methods.**
Collect Method bar	Trimble Penmap Editing System has a comprehensive set of more than 10 main collecting/surveying methods, including GNSS, Total Station, to generate nodes on a survey.

	The **Collect Method** bar provides all the methods:  Use any method or combination of methods for generating nodes can create any graphics item. You can create the same graphic item using a variety of methods and different graphic items can be created from the same combination of nodes. You also have a wide range of editing functions and expansive features that can be activated simultaneously while a node is being generated and graphic item created.
Functions & Application bar	The main bar in the **Home** Screen; provides access to functionalities such as data collection, import/export, edit options, stakeout & verification, and project settings. 
Navigation bar	Use the **Navigation** bar to zoom, activate/deactivate the visibility of nodes in the map and access to the **Point List Manager.** 
Status bar	Displays the GNSS antenna height, GNSS information (RMS, DOP, Connection Status), Total Station target height, Battery device status, Point Number + Cpde- Following information are displayed:
Penmap Icon	Tap this to go back to the **Home** screen. 
iFeature Action bar	The **iFeature action** bar is positioned above the map in the **Data Collection** screen. There you can select the feature which you want to generate in real-time.

	
iFeature Selector	Edit and/or add iFeatures to the **iFeature Action** bar. You can remove or disable current iFeatures.

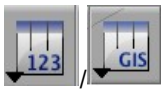
Using the touch screen

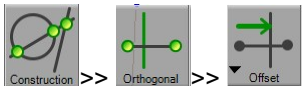
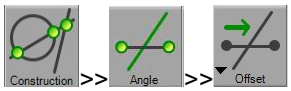
You can use different touch gestures on the screen. To:

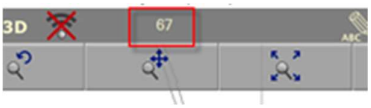
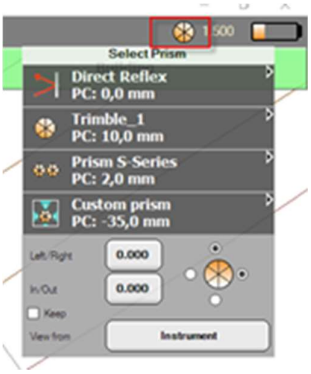
- Toogle between COGO Calculations and Add Offset, tap once on the map.
- Zoom in, tap twice on the map
- Zoom out, tap three times on the map.
- Define the zoom level in which nodes should be visible, tap four times on the map.

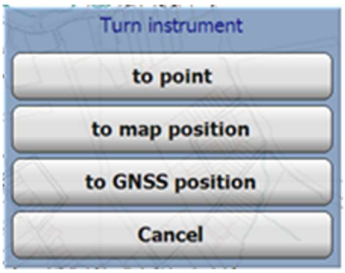
Additional functionalities are accessed by a **tap-hold.** If a **tap-hold** function exists, a small arrow on the lower left of a button indicates it has additional functions. **Tap-Hold** the button to view the button's pullout menu, or, to toggle between the two states of the button.

NOTE – *A short tap on the button performs the action show on the button.*

Tap-Hold...	To...
	Switch between **iFeature collecting method** and **Point number+Code collecting method.**
	Switch between **Point List Manager** and **GIS View Manager.**
	Open the selection of changing the map scale.

	Activate the configuration of the **OSNI Data Validation** Tap **Test** to open the corresponding dialog.
	Open the ***GNSS Method dialog.***
	Open the ***Total Station Method dialog.***
	Open the point list and pick the desired backsight node. ***NOTE –*** *If* ***Integrated Surveying*** *is activated, then the GNSS button is displayed for measuring.*
	Open the **Add Offset** functionality.
	Open the ***Polar Settings dialog.***
	Open the ***Bilateration dialog.***
	Switch between Extend Hz.  and Extend Slope 
	Use the middle point between node 1 and node 2.
	Use the middle point between node 1 and node 2.
	Add more iFeatures types to the **iFeature Action** bar**.**

	Open the ***project properties.*** 
	Disable the ***point numbering.*** 
	Add additional comments to the code 
	Toggle between ***End*** and ***Close*** a line feature 
	Open the ***target dialog.*** 

 On the map to open the **Turn to dialog**	Turn the instrument to the selected option ***Point, Map or GNSS.***

Navigating between screens

Penmap has two main screens:

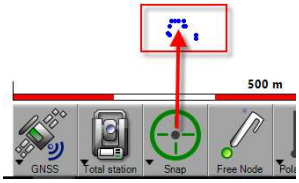
- **Home** screen. See Using the Home screen.
- Data Application Screen

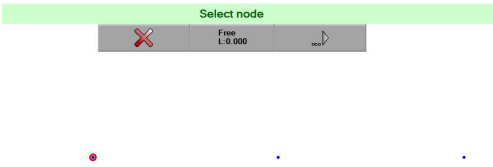
When working in the **Data Application Screen**, or any other Penmap screen, tap  to go back to the **Home** screen.

Selecting points from the map

If you cannot select a detailed point from the map (for example, picking from a point cloud, or a larger map scale is being use), but if you can directly select the point you want, Penmap automatically zooms in when you tap on the map:

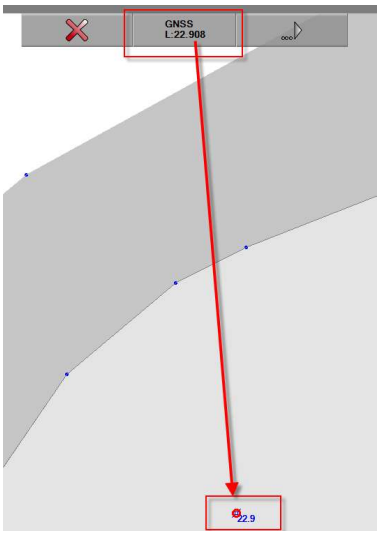
Snapping from the map -> Zoom in





If the zoom level is reached, an additional selection bar is displayed:

Tap  to move to the point you want to select. The current active point is always highlighted in red. The point information (point number if available, level of the point, and the collected method) is displayed on the selection bar:



Tap on the marked red point to select it.

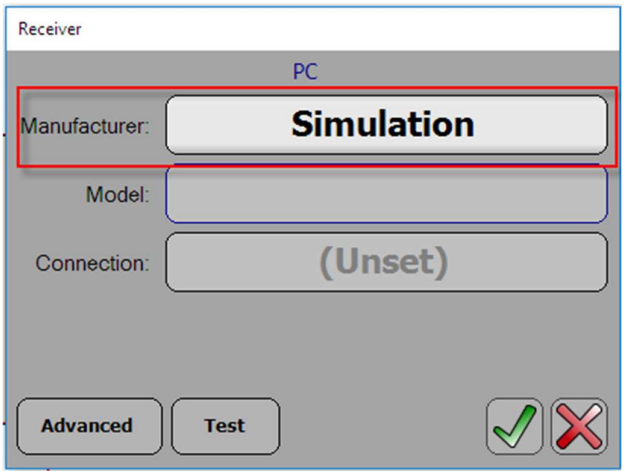
Or, tap  to leaving the selection without selecting a point from the node.

GNSS & Total Station Simulation

If required, you can run a **GNSS simulation** instead of using a supported GNSS receiver, and a Total Station simulation, using a Total Station simulation or a Total Station Keypad instead of using a Total Station.

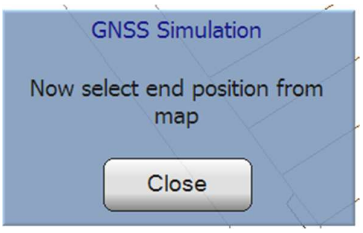
To run a GNSS simulation:

1. Select Simulation as the Receiver Manufacturer:



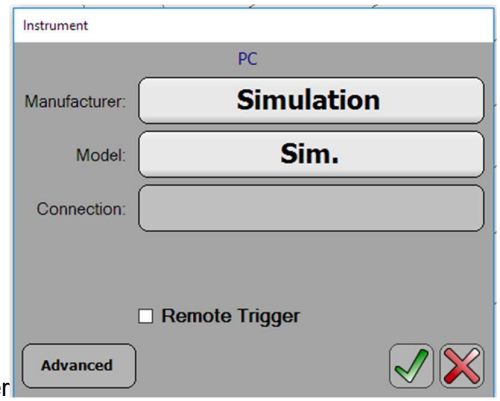
2. When you tap  to start the GNSS connection, the following displays:

3. Tap Close and select the start position from ma. The following dialog displays:

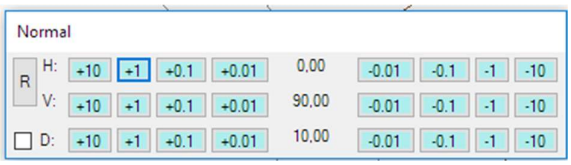


4. Tap **Close** and select the end position from map. The GNSS cursor/position “walks” between the start and end positions you selected.

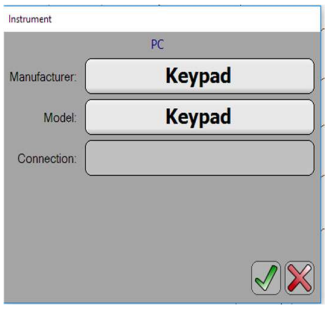
To run a Total Station simulation:

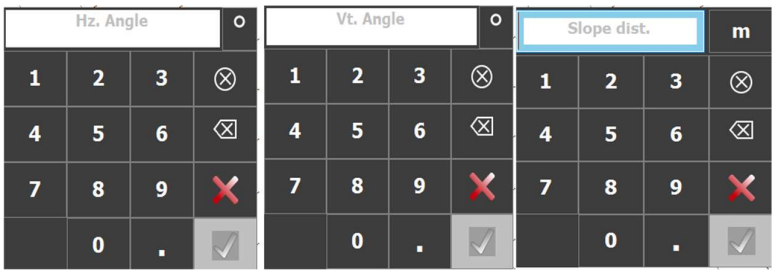


1. Select **Simulation** as the Manufacturer
2. When a connection is established, you can change the values for Hz, V, and Distance by tapping on the corresponding buttons.



If you select Keypad instead of Simulation as the Manufacturer, and you start a Total Station measurement, the Keypad for entering Hz, V, and Slope distance displays:





Special Tools

Penmap provides the following special tools:

- GIS Database Editor
- VisualMapper

GIS Database Editor

Penmap allows you to define and customize your own GIS data model (tables, GIS forms) or to import them directly from your ESRI or Smallworld GIS system. The GIS definition is done in the ***Database Editor tool*** which is part of the Penmap Installation. You can download these programs from Penmap's support website. No license is required to run the Database Editor.

GIS definition files (*.xsd) are stored in the folder ***: \ProgramData\Penmap encore\configfiles.***

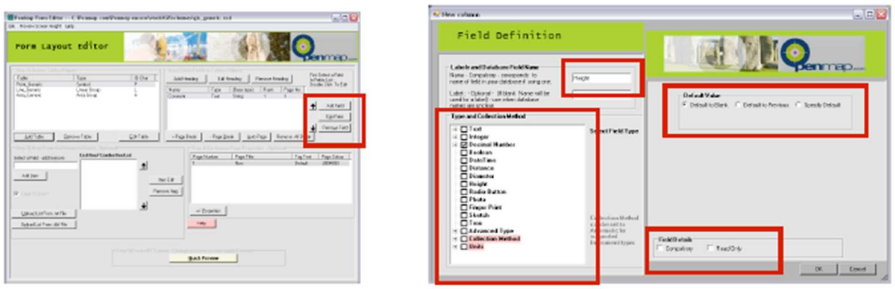
The Database Editor supports four ways to define or customize your GIS data model:

1. From New - (Create a new GIS data model)
2. From an existing Database (you can use the example *.xsd files which come with the Penmap installation, or other XML files)
3. From a ***.dbf File** (which are part of an ESRI shape files)
4. From ***.apl or *.apm Files** (from ESRI ArcPad or ArcGIS)

From New - Create a new GIS Data Model

1. Start the ***Database Editor (DBedit.exe) program.***
2. Click **Add Table** to define Tables / Object classes by clicking the ***Add Table button***. Enter a Table/ Object class name, select the GIS type (Symbol, Linear Group, Area group...) and assign a unique ID character to this table. This character will be used by Penmap in the little black GIS edit box in the map view of the Penmap **Home** screen.

3. Click **Add Field** to add attribute fields to the table by clicking on Add Field. Enter a database field name, select a Field type (Text, Integer, Date/Time, Photo, Sketch, a Measurement method or others) and define the default value and field details (compulsory, read only).



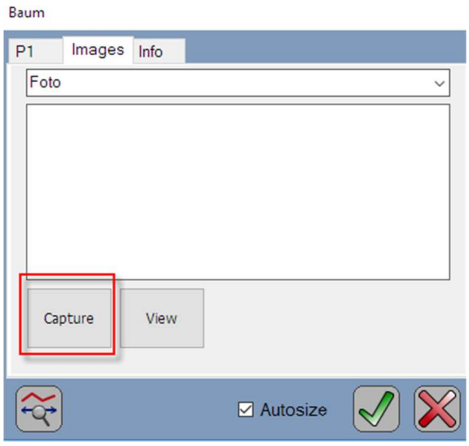
4. Enter Drop down list items if required and edit/adjust the page properties.

VisualMapper

Penmap allows you to use and take pictures for a feature element. This GIS schema must have the attribute Photo, and you must have the VisualMapper tool installed. You can download this from

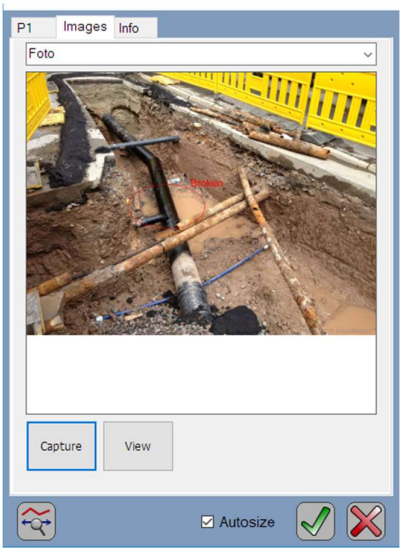
http://landadmin.trimble.com/2017/02/14/penmap-downloads/

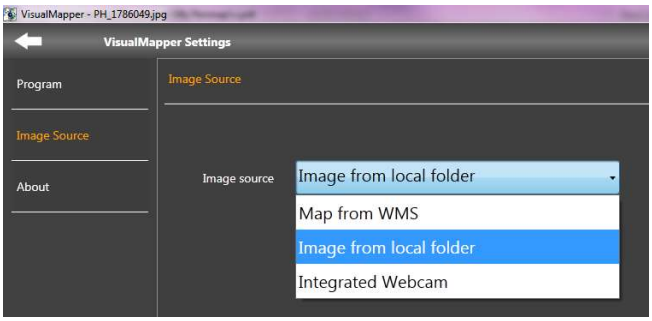
1. When creating a feature in Penmap and the corresponding GIS dialog is opened, tap ***Capture:***



The VisualMapper starts.

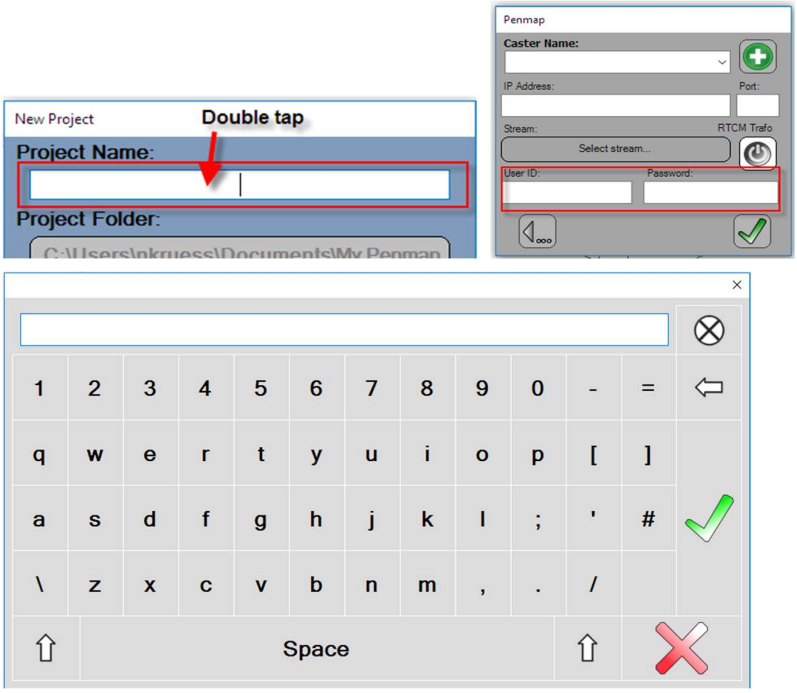
2. Take your photo, and mark up/sketch with comments if needed. Tap . The photo is added to the feature:





Penmap Keypad

You can use the keyboard provided by Windows or use the Trimble Penmap keyboard. For all numeric fields, Penmap provides its integrated large button keypad. To access the Penmap alphanumeric keypad, double-tap on any text entry box.



Penmap Project and program directories

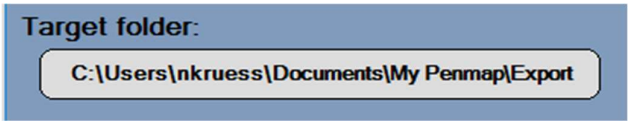
C:Program Files\Penmap\Penmap 10

- ***Library files *.dll***

  NOTE – *This is the default path when you install Penmap. If you changed this during the installation, it will be located where you specified.*

C:\Users\Documents\My Penmap

- **Project files *.pdt and *.rec file:** When you start a project, the *.pdt file is unpacked; when you close the project, it is re-packed. The *.rec file is stored paralled to the *.pdt file. Should there hardware or software crash, all files and actions since the last save are saved here.
- **BackgroundMaps:** Stores Base Maps (Vector).
- **Export:** Exported files (UNV, CSV) can be saved directly to this folder when doing an export. The target folder is set automatically to this path but can be changed if required:



NOTE – *Depending on the Windows operating system on your machine, the MyPenmap folder may be located under a different path.*

C:\ProgramData\Penmap encore

Important folders to note are:

- **Backup:** Stores configuration settings for GNSS, coordinate systems, targets, and general configuration. If you reinstall Penmap, the message Use backup displays. If you click Yes, you can re-use the configured settings.
- **Configfiles**: Contains the templates and the corresponding template files Layer, Symbol, Styles, GIS, Features, Rules (Validation rules), and Code (iFeature).
- **Key**: Contains the related license information like serial number and license code
- **Settings**: Contains the settings for the project: general configuration, GNSS, coordinate system, target.
- **Settings / Stock / Fixed:** Contains coordinate system files for Trimble and Penmap library.
- **Settings / Stock / NTRIP:** Contains the related NTRIP settings for GPRS provider, NTRIP Casters, and NTRIP Mountpoints.

NOTE – *You can add new NTRIP casters directly in Penmap (Real Time Corrections Settings) or make changes in the text files.*

C:\ProgramData\Penmap WMS

- If using a WMS source as background map, the corresponding caches are stored in the folder **Penmap WMS.**

Reinstalling Penmap

If you reinstall Penmap, when you restart it, you are prompted to use the backup configuration. Click Yes to confirm the message Use backup configuration

Restoring projects after a crash

In the unlikely case of a hardware or software crash, the data in the Penmap project is saved to the *.rec backup file.

To restore the project and data, wait at least one minute, then restart the project. If the project is restarted within less than one minute:

1. Copy the *.rec file from the My Penmap folder and paste it immediately to the My Penmap folder again. A *.rec file copy is created.
2. Delete the stock *.rec file and rename the *.rec file copy to the project name.
3. Start Penmap again. All files should be available.

⚠ **CAUTION –** Before deleting any files, make a copy and save them. If you re-open a project immediately after a crash and log new data measurements and save the project, the data you logged before the crash is overwritten.

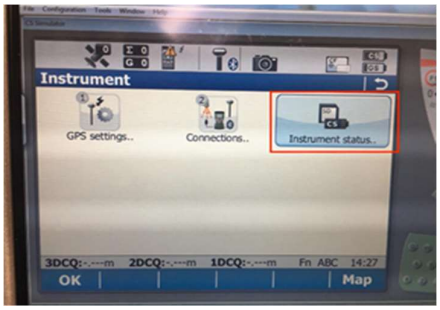
Working with Leica hardware

- Activation codes for Leica interface Geocom and OWI
- Leica Receiver settings
- Leica Total Station settings: Measuring the antenna height
- Using Leica Disto

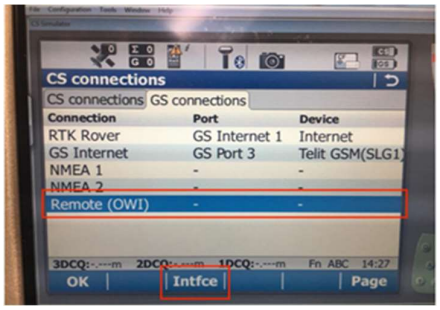
To work with Leica hardware and non-Leica software packages, you must have a valid interface Geocom for Total Station and OWI for GNSS.

Activation codes for Leica interface Geocom and OWI

The images below show the required settings in the Leica GS15 receiver (setting OWI for the correct port):

-> 

->



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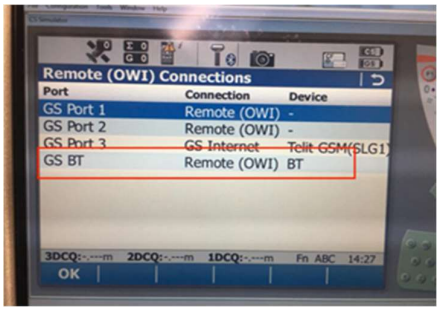


Leica Receiver settings: Measuring the antenna height

The antenna offset is predefined for each antenna type. To view the Antenna offset details, in the GNSS Method menu, tap ***GNSS Settings / GNSS Receiver*** and then tap **Test.**

Penmap uses the ***Bottom of antenna mount*** method to measure the antenna height; ensure that you measure the antenna height to the bottom of antenna mount as shown:

⚠ **CAUTION -** The internal antenna height of the Leica receiver must be **Zero (0.000 m).** If an internal

antenna height of **not** 0.000 m is set in the Leica receiver, this antenna height is used for the GNSS measurement too.
This means the internal antenna height is used in addition to the entered antenna height in Penmap, resulting in an incorrect height.
If the internal antenna height is not Zero (0.000 m), then change it immediately to **Zero** before working with Penmap.
To check if the internal antenna height of the Leica receiver is **Zero (0.000 m)**, do the following:

1. In Penmap, enter the antenna height which should be used for the measurement, e.g. 2.000 m. Perform controm measurements of a known coordinated point.
2. Compare the measured height regarding the tolerance. If the internal antenna height is **Zero**, the results in the height must be ok.

Do not work with the Penmap software and the internal Leica software together, while working with a Leica controller. This will result in incorrect GNSS measurements.

Leica Total Station settings

Before connecting Trimble Penmap to a Leica Total Station for the first time, set the prism constant to “0” (Zero) in the instrument.

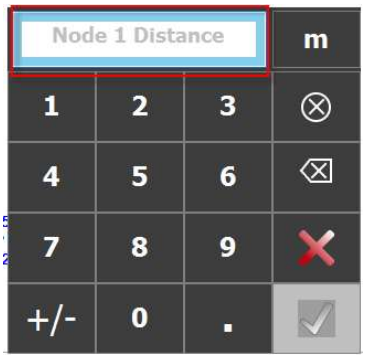
After connection to the Leica Total Station, Penmap transfers a user-defined prism with the prism constant of Penmap to the instrument. The Leica constant is calculated internally.

Do not change the prism type/prism constant directly in the instrument when working with Penmap; otherwise wrong distances are measured and wrong results are calculated.

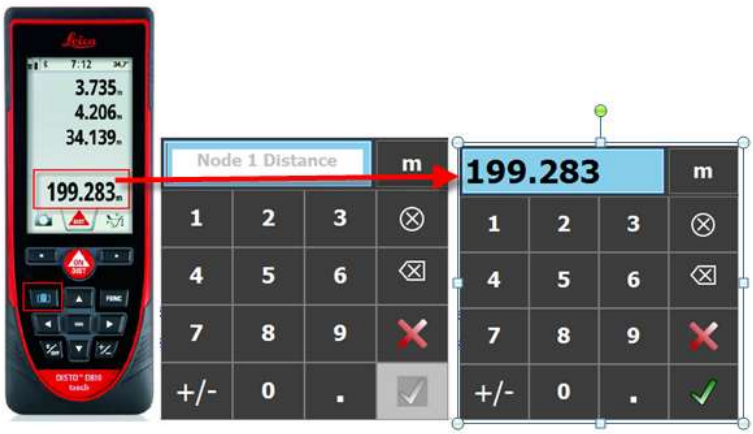
Using Leica Disto

You can use a Leica Disto to measure distances. These distances can be send directly via Bluetooth to any Trimble Penmap keypad.

Make sure the Leica Disto Connect Software is installed on your device. Pair and establish a Bluetooth connection between the Leica Disto and your device.



In Penmap, for all methods which require you to enter a distance, the distance measurement can be triggered from the Leica Disto. Tap the Bluetooth button on the Leica Disto; the distance is displayed in the keypad:



Tap  for apply the distance.

Getting started

There are two ways to start Trimble Penmap:

- Use the Trimble Penmap Launchpad to create and open projects. As well as managing projects, Penmap Launchpad includes all the functionality required for your daily work, such as importingGML data, Cloud services, and structured and detailed project overviews.
- If you just want to open and create projects without having additional features like Cloud services and an overview of the projects, tap the Trimble Penmap icon 

. A dialog with the following options appears:

Tap...	To...
New Project	Create a new project.
Open Recent	Access recent job files; the last five projects are listed.
Open...	Open a project directly from the Trimble Penmap project folder **“My Penmap”.**
Exit	Close this dialogue; cancel the project creation.

See Using the Home screen.

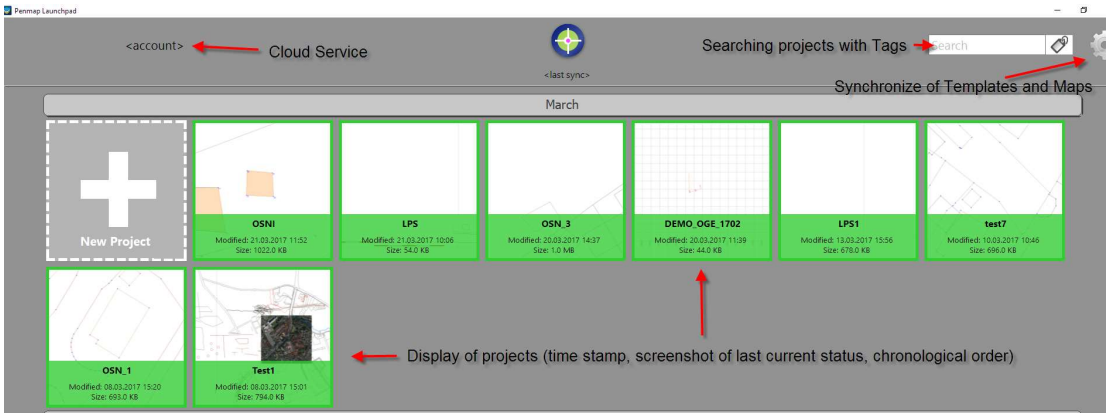
3 Using the Penmap Launchpad

To start the Trimble Penmap Launchpad, tap the Penmap icon 

on your desktop, or go to ***Start / All Progams / Penmap / Penmap Launchpad.***

From the Penmap Launchpad, you can:

- Create new projects
- Automatically import a GML file
- Use Cloud services to synchronize projects in real-time



Projects are displayed in chronological order; use the slider to scroll down / up the project list.

By default, the projects display as large tiles showing the last modified project status.

Create new project

1. Tap  to create a new project / job file. The **New Project** dialog displays.
2. Enter a project name.
3. The Project Folder field shows the path and location where the project is stored. You cannot change this here.
4. Specify a Template; tap the **Template** button and pick the template from the drop-down list.

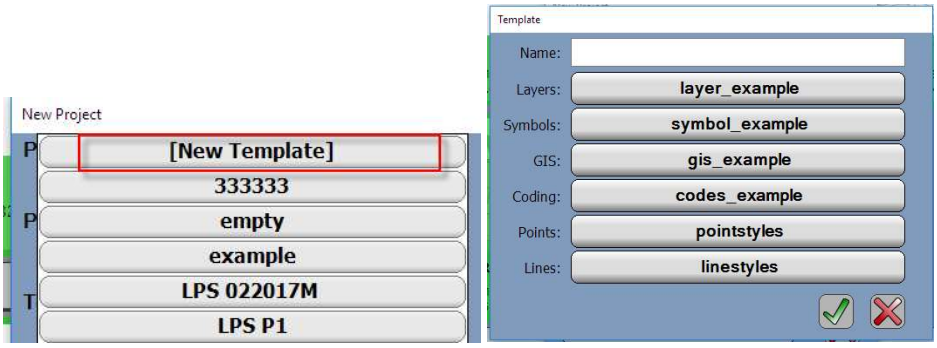
Templates in Penmap are usually created in the office and then sent to the field device with the project. Templates are stored as text files (e.g. LPS022017M.generic.txt) under c:\ProgramData\Trimble Penmap encore\configfiles.

Trimble Penmap uses iFeatures to select the feature you want to collect. A “Feature” is a real-world object (for example, a tree, a road curb) you want to survey and map.

There are different terms in the Surveying and GIS community for real-world objects: A surveyor will call it “Code” or “Feature Code” (therefore often use the term “code list” or “coding system”), a CAD professional uses “Layers” and “Symbols” to distinguish real-world objects, and a GIS administrator uses “Objects”, “Object classes”, or “Themes”. Trimble Penmap supports all these definitions under the single term “Feature”. The Trimble Penmap iFeature system allows you to select the real-world object (Feature) you want to collect and automatically sets:

- The correct graphic element (point, symbol, polyline, arc, text, circle…)
- The correct style and color (line-, point-, symbol-style, line color)
- The correct attribute table (GIS record) if you want to attach additional information to the surveyed feature. All of these settings are controlled by the Template you select or define when starting a new project.
- A Template is a defined set of:
    - Layer file
    - Symbol library file
    - GIS data model file
    - Features file (Coding)
    - Searches (GIS Search)

If you want to create a new template, tap **New Template** and select your preferred template files by tapping on the corresponding buttons:



5. Enter any required Tags. Working with tags, which you can use as filters, is helpful if you have a lot of projects. For example, create a tag called *Topography* and create the project. In the **Tags** field on the Launchpad, enter *Topography* to filter all projects with this tag. They are listed first
6. Tap **Create Project.** The **Home** screen appears.

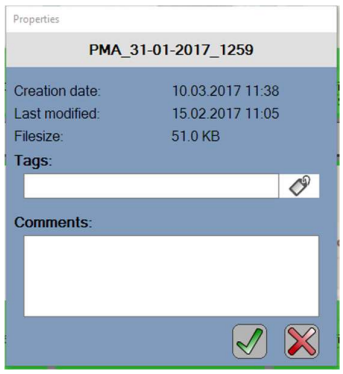
Opening an existing project

To open an existing project, tap the project tile on the Launchpad.

Project properties

Tap-Hold on a project to access the following:

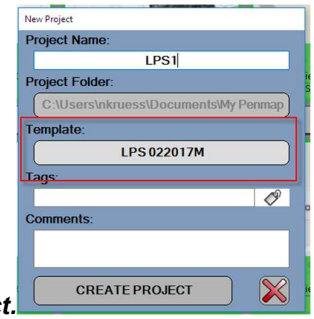
Tap...	To...
Open	Open the project.
Download from Cloud	Download a project from the cloud to the local machine. ***NOTE*** *- This functionality is just available when a cloud service is configured.*
Upload to Cloud	Upload a project from the local machine to the cloud. ***NOTE*** *- This functionality is just available when a cloud service is configured.*
Delete	Delete the marked project.
Properties	View the project information, including the creation date, last modified date, and file size. You can also add or edit tags and comments.

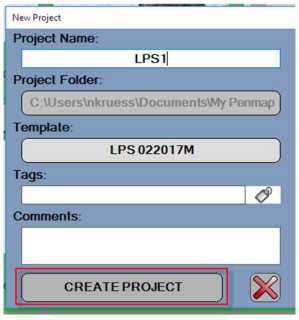
	
Cancel	Exit this dialog without doing anything.

Importing a GML file

The GML file import to a new project is an easy way to do it.

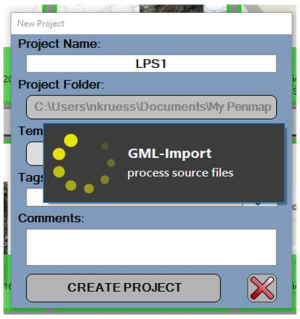
Important note – *To use the GML import, you need a special* ***config.generic.txt file.*** Ask you Trimble dealer about details.

1. First select the corresponding template and tap the button ***Create project.*** 

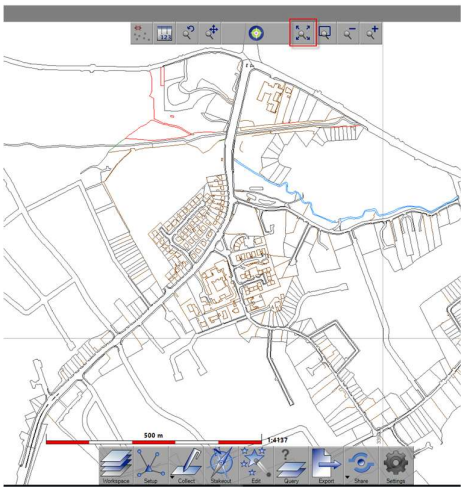
-
> 

2. The Windows explorer dialogue is opened. Navigate to the folder in which the GML file is located.

   NOTE – *If you don't want to import GML files, just close the Windows Explorer without selecting a GML file.*
3. After selecting the GML file, the import is started automatically.



If the GML file export was successful, the project is opened. If no data are visible for the first moment, just do a hard zoom to make it visible:



Cloud Service / Cloud Synchronization

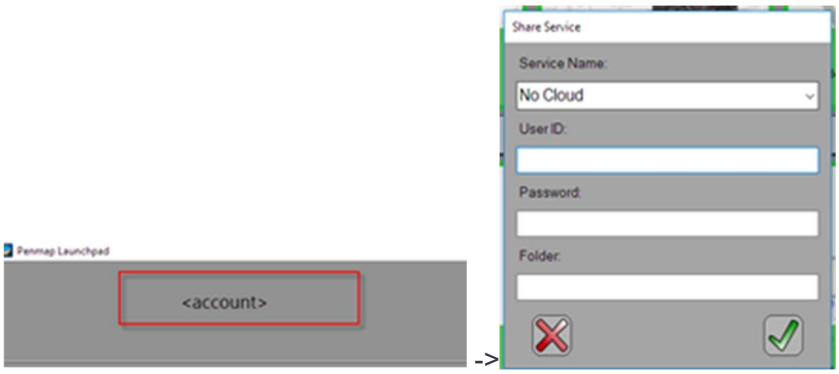
The following are synchronized:

- Projects (Jobs)
- Background maps
- WMS raster maps (offline)
- Settings
- Templates, Catalogues
- Workforce Management, Tasks
- Protocols
- WebDAV
- FTP

- Trimble Connect

Configuring the Cloud

1. Tap **<account>**, then choose the Cloud service you want to use.



2. Tap **Service Name** to choose the pre-defined Cloud services.

   NOTE - *You can enter new services if the one you want is not listed. You can add or change it in the txt-file "shareservices" under C:\ProgramData\Trimble Penmap encore\stock\fixed if you want to use the service Dropbox you also need the extension DropDAV which you must pay for. Without DropDAV the WebDAV protocol are not available for free.*

3. In the **User-ID** field, enter your user name.

4. In the **Password** field, enter your password.

   Penmap connects to the Cloud service and checks for new Penmap projects available to the device, and for changes to projects already on the device.

5. To check the status of projects on the device at any time, tap  to synchronize the projects in the project list. The Project status is indicated using the following icons:

   -  The project in the Cloud contains changes which should be downloaded to the device.
   -  The project on the device has been synchronized with the project in the Cloud.
   -  The device contains changes to the project, which should be uploaded to the Cloud.

- No symbol. The project is on the device only. There is no version of the project in the Cloud.

Downloading a project to the device

1. **Tap-Hold** the project and then tap **Download**.

A thumbnail view of the project map appears next to the project name and the project sync status changes.

To open the project, tap the project name in the Project list.

Uploading project changes to the file sharing service

When you close a project, you are prompted to save any changes. If a project has been changed on the device, the project sync icon changes to to indicate changes need uploading.

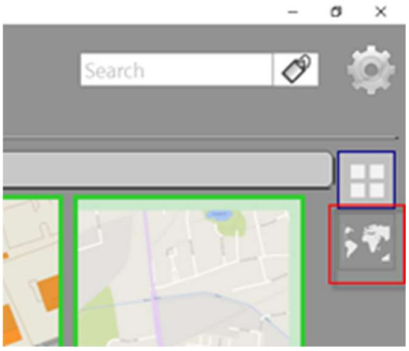
To upload the changes, **tap-hold** the project and then tap **Upload to Cloud**. 

The project sync status changes to  when the upload is complete.

Penmap Launchpad settings

Tap  to access the following options:

- **Account**: Configure and/or edit your Cloud service.
- **Synchronization**. Synchronize templates, background maps, and map packs.
- **Map settings**. Change the view of the displayed project overview. By default, the projects are displayed as large tiles with a screenshot of the last current status. Using **Map settings** , you can define the desired service, for example Google Maps, and an additional button is activated in the Launchpad, enabling you to switch the project view between tiles and map service:



If you use the map service, placemarks show the available projects:

You can **tap-hold** on the placemarks to download/upload, open, and delete the project.

4 Using the Home screen

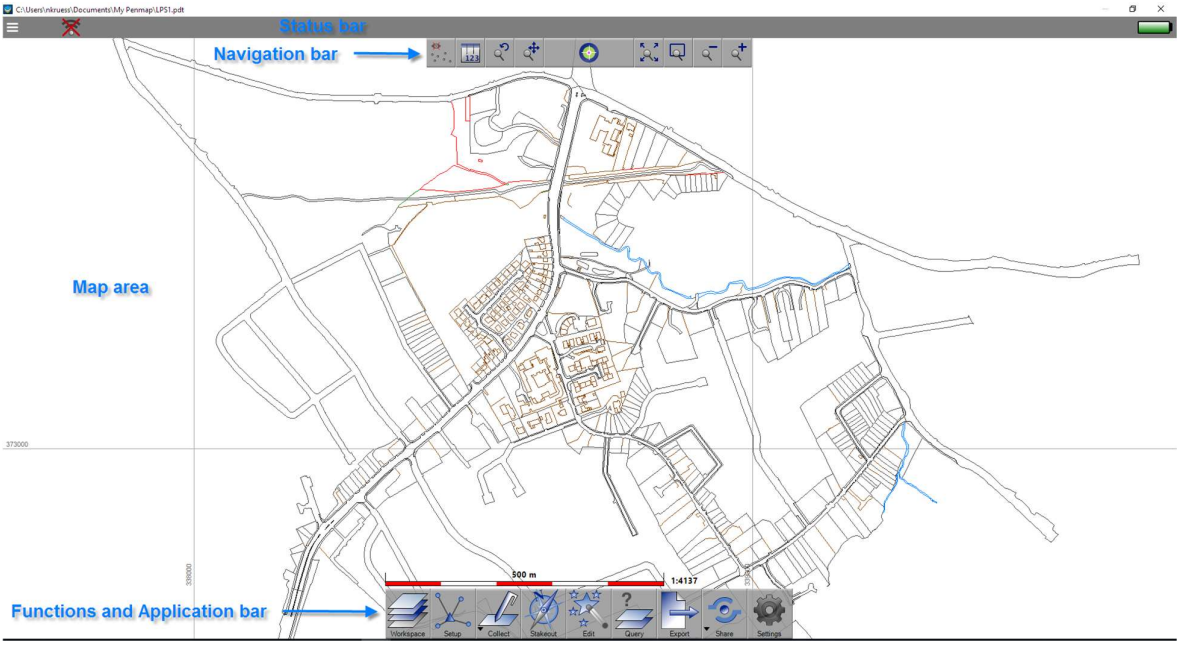
The main Penmap screen, the **Home** screen displays when you create or open a project, and provides access to all data collection activities, all functionality, and applications.

You can return to the **Home** screen from all applications at any time by tapping  on the **Status** bar.

You can tap  on the the **Home** screen to create or open projects, or switch to the Penmap Launchpad.

Home screen options

The **Home** screen includes following options:



Status bar icons	Function
	NTRIP Connection
	Estimated RMS 2D accuracy
	GNSS antenna height
	Target height
	Battery Status ***NOTE*** *- If more than one device is connected, the battery with the lowest level is displayed*

Navigation bar icons	Function

	Menu Exit
	Zoom to Last
	Map Pan
	Zoom to Extends
	Zoom to Window. Tap-hold to open and select the default map scales.
	Zoom out ***NOTE***- *You can also zoom out by tapping three times on the map.*
	Zoom in ***NOTE*** - *You can also zoom in by tapping twice on the map.*
	Display the nodes in the current zoom level. ***NOTE -*** *f you zoom in, the nodes remain displayed. If you zoom out, the nodes are no longer displayed. Tap*  *again to display them.*

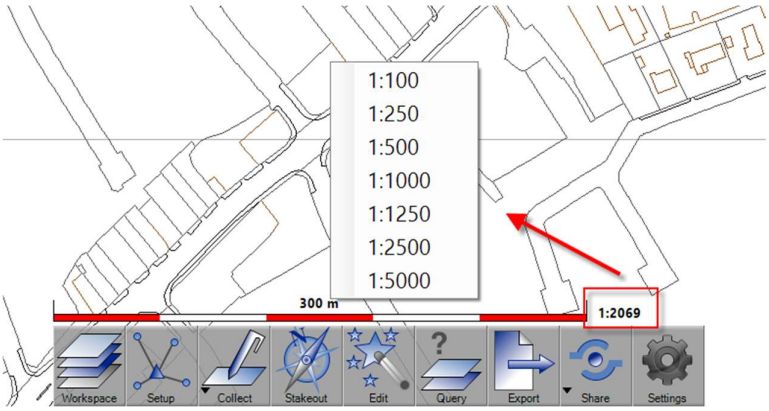
Functions & Application bar icons	Function
	Workspace Manager. Includes the following functions: • Import functions • Table of contents • L/S/G dialogue

	• MapPack
	Instrument (GNSS & Total Station) Setup
	Data collection
	Navigation, Stakeout
	Edit
	Query, Measure
	Export, Save
	Settings: • Related project properties • DTM • Symbols manager • Custom option • iFeature editor

Map area

The map area shows all imported, generated, and measured data. The map scale indicates the current dimension. You can zoom in or zoom out to change the map scale. You can also change the map scale

manually by pressing on the map scale:



Settings background Maps

Penmap supports the following map file formats:

- Raster map file formats: *.ecw, *.tif, *.jp2, *.sid, *.bmp, *.jpg, and *.tif
- Base map formats
- WMS

To work with background maps, in the **Home** screen, tap  on the **Application Status bar.**

Importing a raster/base background map

1. In the **Home** screen, tap  , then tap  to open the **Background Maps** dialogue.
2. Tap  , then select the type of background map you want to import; tap **Add Rastermap** or **Add Base map.**

You can import and add multiple rastermaps/base maps to the project.

Adding WMS as a background map

1. In the **Home** screen, tap  , then tap  to open the **Background Maps** dialogue.
2. Tap  , then select **Add WMS**.
3. In the **WMS Setup** dialog, click the **WMS Source** drop-down menu to define and select a WMS Source.
4. Configure the brightness of the WMS by moving the slider left or right:

NOTE – *To use WMS sources you need an active internet connection to download the caches. WMS background maps can also be used offline. The caches of the last displayed and used WMS are stored. When working offline you can work with it zoomed in.*

Managing layers and styles

To work with layers and styles (Point, Text, Line, Area):

1. In the **Home** screen, tap  on the **Application Status bar**.
2. Tap  to open the **Layers** dialogue.

   All layers which are integrated in the template you are using are visible.

   You can easily switch layers on or off by selecting the required layer.

   Furthermore you can change the linestyle and create new layers to the template.

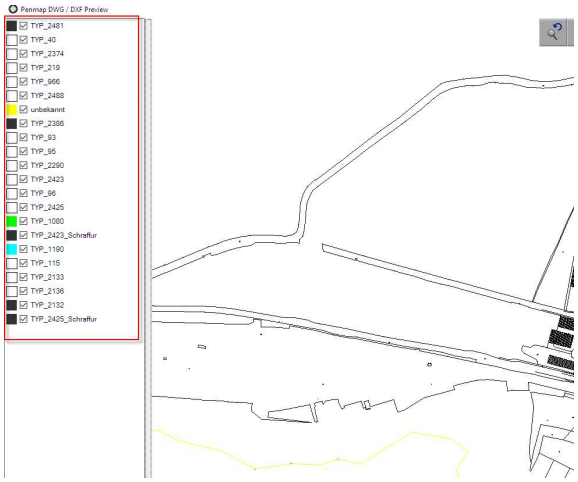
5 Workspace Manager

Importing a DWG/DXF file

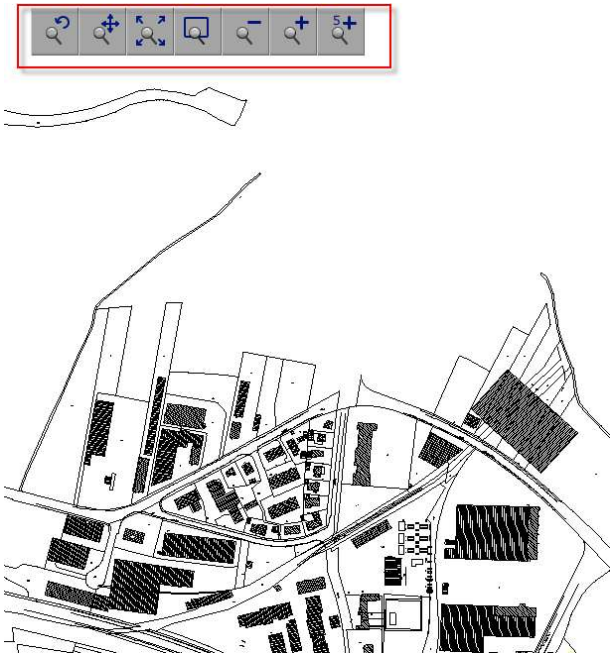
To import DWG/DXF files:

1. On the Penmap **Home** screen, tap **Workspace / Import DWG.**
2. Select the DWG/DXF file you want to import.

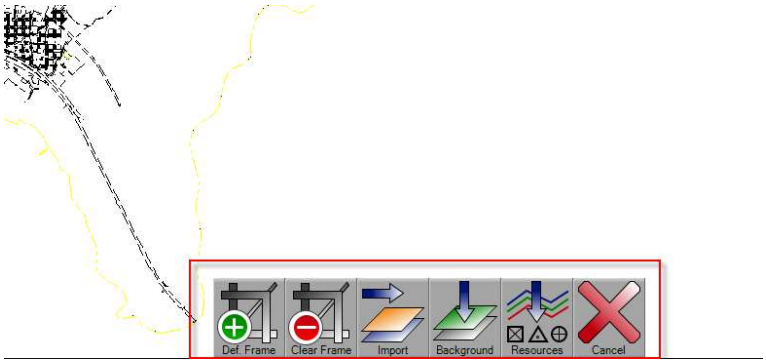
   The DWG/DXF preview displays, where you can define what kind of layers you want to import.



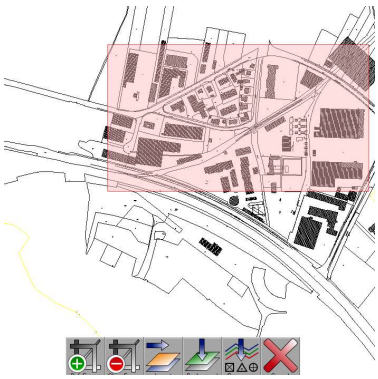
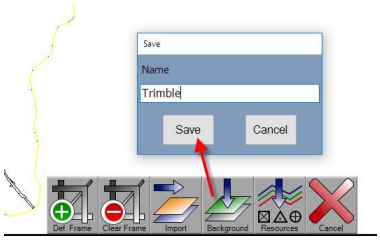
3. Use the **Navigation** bar to zoom in/out, drag the map, define a Zoom area, and for a Hardzoom



You can use the following options:



Tap...	To...
	Define a frame for the DWG/DXF file graphic area. The data inside the defined frame are imported to the project. Tap the button and define the frame with your pen/finger directly on the map. The selected frame is highlighted in Red:

	
	Clear the defined frame.
	Import the DWG/DXF file to the project.
	Create a background base map from the DWG/DXF file. Name and save it:  Once saved, the background map is used automatically for the current project. To use the generated background map for other projects, go to the **Home** screen and tap  on the **Status** bar to open the background maps settings  Tap  and select **Add Base map.** Select your preferred base map and tap 
	Create a new template directly from the DWG/DXF file. ***NOTE -*** *When you have created the template,*

	you can use it for new projects; select it when you create a new project. The imported layers and symbols from the DWG/DXF file are shown on the lower left side. Name the template and select the desired files **Layers, Symbols, GIS**, and **Coding.** If you want to use the layers and symbols directly from the DWG/DXF file, tap on the Layers and Symbols button and then tap **New**. Tap **Accept**. The new generated files are listed. Tap to apply the settings (or to discard).

NOTE - *Point numbers are not imported, only graphic elements and graphic text elements. If you want to import points with point numbers, use the* ***CSV import.***

Importing a UNV file

To import UNV files:

1. On the Penmap **Home** screen, tap **Workspace / Import UNV.**
2. Select the UNV file you want to import.

   You can use the following options:

   - Import as survey
   - Import as survey [Old]
   - Create resources
   - Cancel

Tap...	To...

Import as survey	Import the UNV file as graphic element. The integrated layers and symbols are added to the template used.
Create resources	Create a template from the UNV file. The elements from the UNV file (layers, symbols, GIS) are added to the template. Once created, you can use the template for new projects; select it when you create a new project.
Cancel	Discard the UNV import.

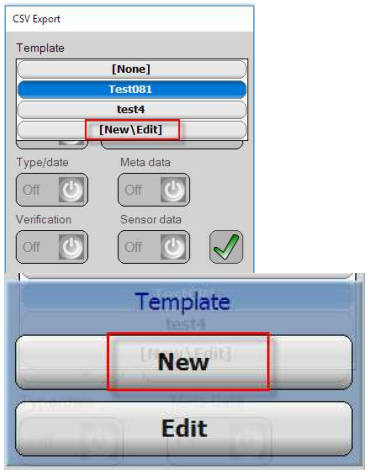
Importing a CSV file

To import CSV files:

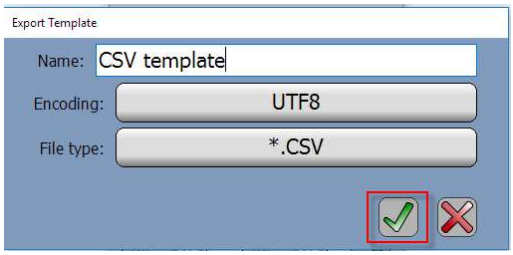
1. On the Penmap **Home** screen, tap **Workspace / Import CSV.**
2. Select the CSV file you want to import.

Once selected, you can use either a CSV template or manually define in which structure the file should be imported. :

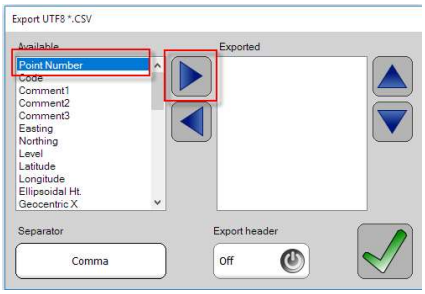
Tap...	To...
Use Template	To generate a CSV template, go to the **Home** screen, and tap **Export** / **Export CSV**:  Tap **New/Edit** and then **New:**

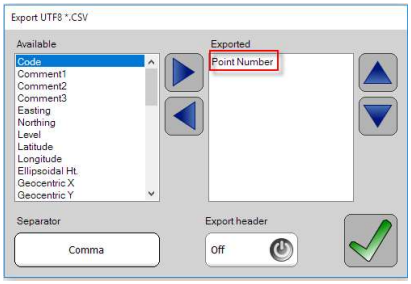


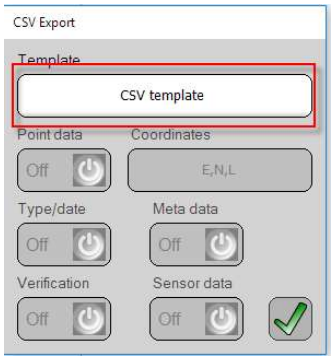
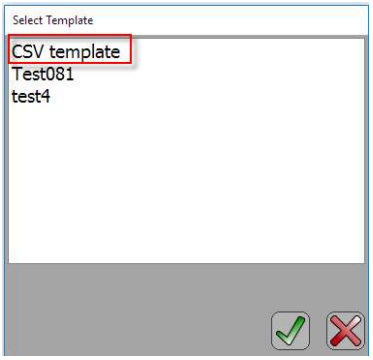
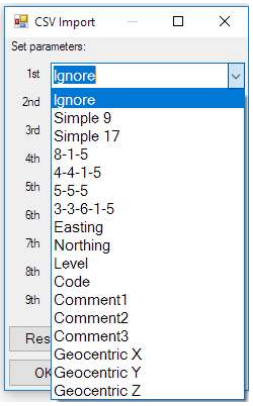
Name the template, select the required encoding and file type, and tap  :



Define the CSV template: select an element in the **Available** column and tap the Arrow button to move it to the **Exported** column. Do this for all required elements.





	Select the required Separator and  You can now use the configured CSV template for the import: 
Manual	Manually define the parameters for the CSV mport. Open the drop-down list to 

Importing Shapefiles

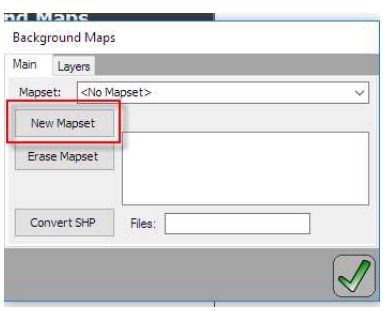
Importing Shapefiles is an easy way:

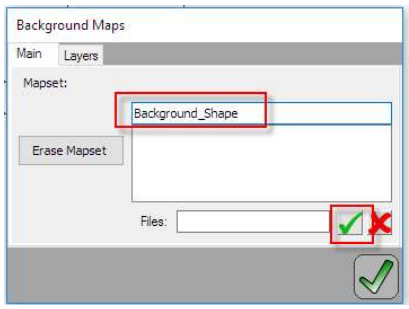
1. On the Penmap Home screen, tap **Workspace / Import SHP.**
2. The Windows dialog is opened. Select the preferred shapefiles and the import starts.

***NOTE** – Using the GIS schema from the shapefiles, you have to create a new GIS.xsd file from the *.dbf files with the help of the **Database Editor**. See therefore* *GIS Database Editor.*

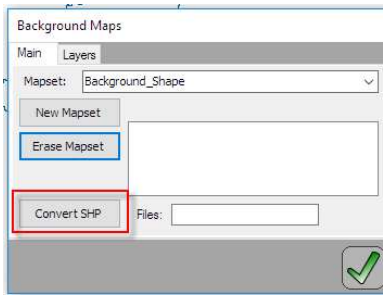
Base Maps

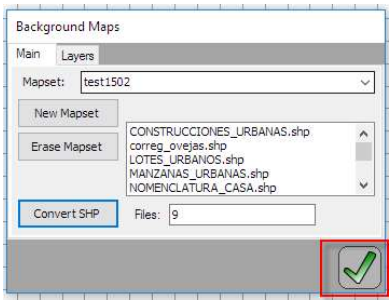
1. To create a background map from shapefiles, tap on the Penmap **Home** screen **Workspace / Base Maps.**
2. Select the option what kind of background map you want to create
3. Then an additional dialog opens. Tap **New Mapset**, giving a name and tap .





4. Tap **Convert SHP** and select your preferred shapefiles. After selecting the creation starts. When finished, tap .





5. You can now select and use the generated base map for each project. In the **Home** screen, tap , then tap to open the **Background Maps** tab.

6. Tap , then select the type Add Base Map and select your configured background map.

6 Measurement modes

Collecting numbered points with codes

As well as collecting iFeatures objects/graphic elements, you can also collect points that have only a point number + code.

3. In the **Home** screen, **tap-hold** 

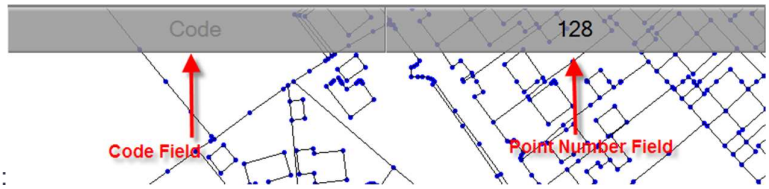
to activate the measurement mode **Collecting numbered point with codes**. The button now shows 

.

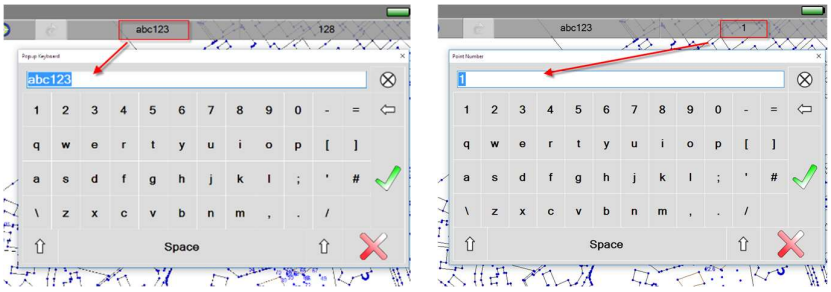
   *To switch back to the iFeature mode, **tap-hold** the button again.*

2. Tap 

to open the **Data Collection** screen. In the **Status** bar above the map, the **Code** field **Point number** field options are visible:

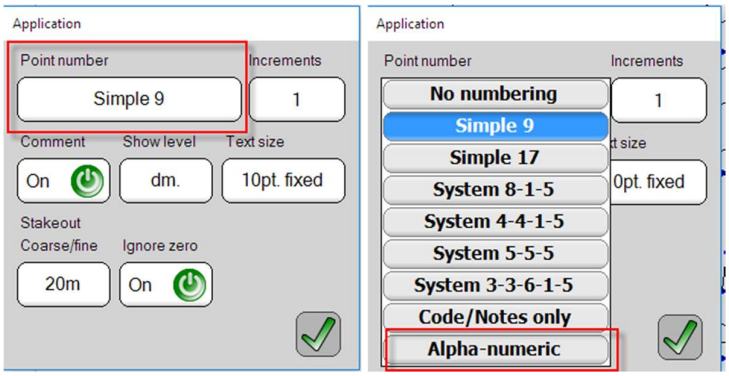


3. Tap in the **Code** field and enter the code to use for the numbered point. Tap in the **Point number** field and enter the point number to use for the generated node.

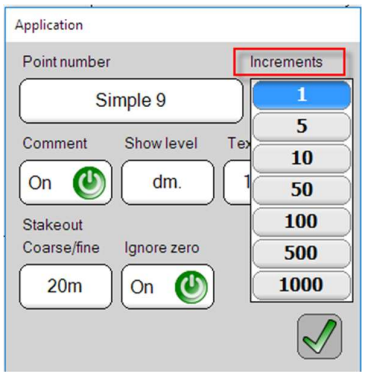


NOTE- *You can define and use a point numbering.*

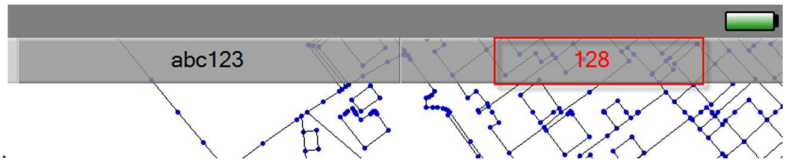
Go to the ***Home*** *screen /* ***Settings*** */* ***Application*** */* ***Point number*** *by tapping the corresponding button and select your desired point number format. For example,* ***Simple 9*** *means that a point number is used with 9 numeric digits. If you want to use an alpha-numeric format, select* ***Alpha-numeric****:*



Change the Increments under ***Home*** ***screen / Settings / Application / Increments***



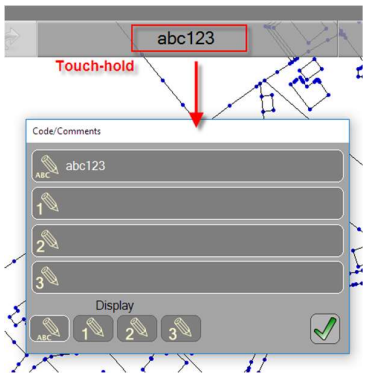
4. If you want to collect nodes with no point numbering during your field work, **tap-hold** on the point number field. The point number is shown in red, indicating that the point numbering is blocked



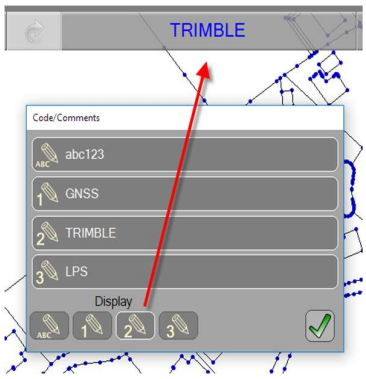
.

With point numbering blocked, nodes without point numbers are created as you collect data.

5. You can link comments to the code. **Tap-Hold** on the code field and enter additional comments (max. three items) to the code:



Use the **Display** buttons to define what kind of code/comment should be shown on the code field button:



NOTE – *The three comments are just using for the next node generation. Once the node is generated, the comments are set to <blank> and only the code is used for the next nodes.*

6. Select the collect method from the **Collect Method** bar and then perform the appropriate steps to add a node to the map for the point.

7. If required, edit the code for the next point or select a different collect method.

8. Continue adding numbered points as required.

Stakeout/Navigation/Verification application

You can stakeout from imported point lists or straight from CAD drawings without the need to extract single points first.

> ⚠ **CAUTION -** If using a GNSS site calibration, you must complete a calibration before you compute offset or intersection points, or stake out points. If you change the calibration after computing or staking out these points, they will not be consistent with the new coordinate system and any points computed or staked out after the change.

To use the Stakeout/Navigation application:

1. In the **Home** screen tap 

.

   If you are connected to a GNSS receiver or a Total Station, the visual Stakeout application is launched.

2. Select the device you want to use (GNSS receiver or Total Station):

3. Select the stakeout mode you want to use:

   - 

Stakeout Node: A stakeout to a Node/Point features, and take a control measurement without changing the coordinates of the staked-out node.

   - 

Verify Node: Once the node is verified, you can set a new coordinate method(Old/New/Average) to the node.

   - 

Stakeout Line: Stakeout to a Reference line. This enables you to align your position to a line. You can define parallel, angled, and station offsets through coarse and fine navigation to taking the final verification measurement.

   - 

Surface Navigation: Use a DTM for stakeout and height control.

- 

Navigate Line: Control of existing lines in the field.

To exit the Stakeout application and return to the **Home** screen, click the **Penmap icon** in the tip **Status** bar

NOTE – *You cannot change manually the view from* ***prism <-> instrument.*** *When using robotic mode (connection medium via Radio or Bluetooth), the view from prism is used, and for Serial view from instrument. This is only related to the display of the shown differences Current position -> Stakeout node. The map is always north-orientated regardless of the connection medium.*

Stakeout to Node

Penmap provides a workflow from feature selection through coarse and fine navigation to taking the final verification measurement. Using the **Stakeout to Node** function, you can take a control measurement of the known point. The coordinates of the stakeout point are not changed.

1. In the **Home** screen tap 

/ 

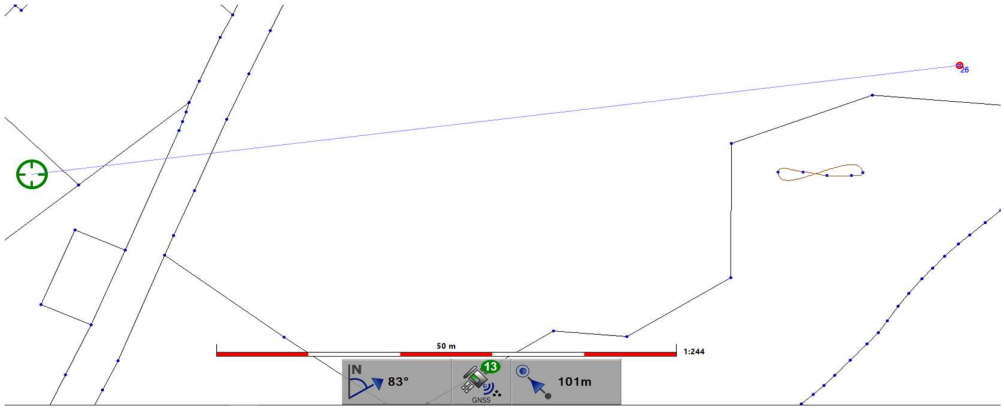
and then select the node from the map. You can access nodes from your current survey or from a vector background map. Use the map navigation buttons to navigate the map. The selected node is highlighted in red.

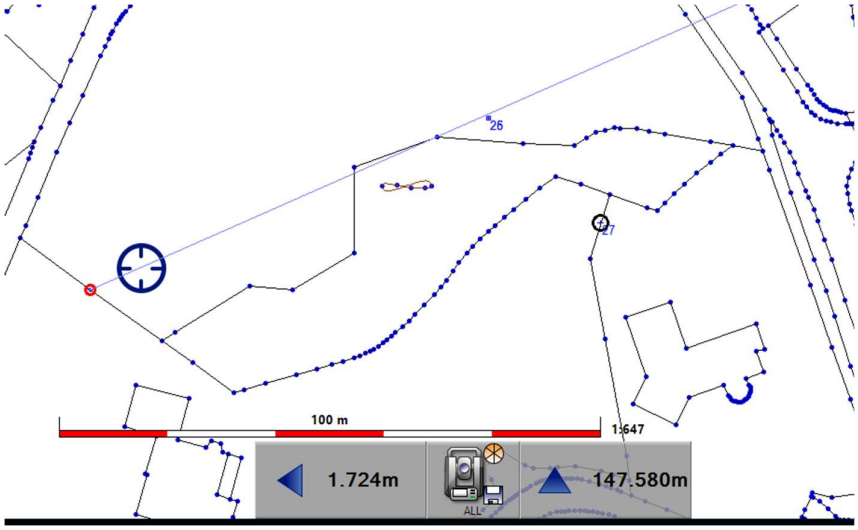
2. If you have not connected to GNSS already, tap 

.to do this now.

3. The middle GNSS button gives you the same functionality as the **GNSS Method** button in the **Collect method** bar. **Tap-hold** the button to access the GNSS controls, the badge indicating the number of used satellites, measurement methods etc. Likewise if you are using a Total Station, you have the same functionalities as those from the Total **Station Method** button in the **Collect method** bar. **Tap-hold** the button to access the Total Station options.

4. Once you select the feature, Penmap enters **Coarse Navigation** mode and adjusts the zoom to show the target node and your current position on the map, connected by a thin blue line to indicate the direction to walk. Start walking toward the node.

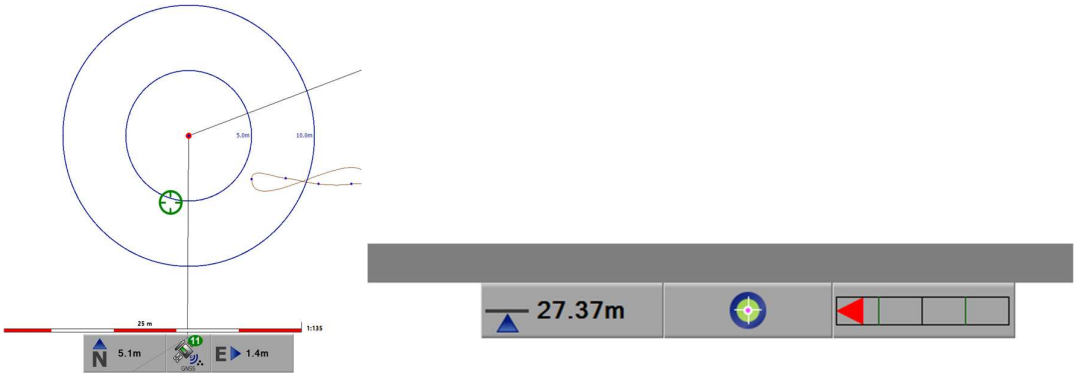




When you reach the coarse/fine navigation threshold, Penmap switches to **Fine Navigation** mode.

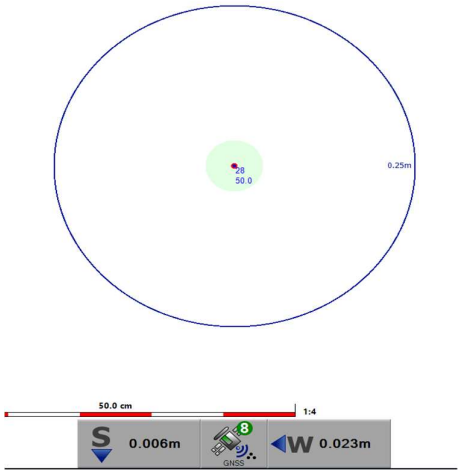
NOTE – *The default threshold value ist 20m; you can change this under* ***Settings / Properties / Application / Stakeout Coarse/Fine.***

The target node is now in the center of the map area and blue circles indicate the distance to the target. The bottom bar icons have changed and show now the remaining distance to the target. In the upper part of the map screen the vertical displacement bar is visible now to show you the cut/fill value and a visual indicator.



5. You can deactivate the vertical displacement bar if required; select ***Settings / Properties / Application / Stakeout Ignore Zero.***

6. As you appraoach the target, a green circle appears. This is the defined horizontal stakeout error limit. You can set an error limit for the maximum horizontal and vertical displacement under **Settings** / **Properties** / **Tolerances**/ **Stakeout**. The default value is 4 cm; a value of “0” means that this error limit will be ignored.
   When you are within the defined stakeout error limits, the inner green circle is filled in light green and the vertical displacement indicator is shown in light green.



7. Take the measurement by tapping on the **GNSS** or **Total Station** button on the icon bar.

8. A confirmation message informs you about the final displacements and the fulfillment of the error limits. Tap **Accept** to confirm the measurement, or **Discard** to go back to the stakeout. The main navigation screen displays. All staked out nodes are highlighted in green.

Verify Node

You can do a verification of a node by giving a new coordinate decision to the node Old/New/Average.

All related objects and graphic elements will be changed and calculated newly when you do a new coordinate decision for the verified node.

1. In the **Home** screen tap 

/ 

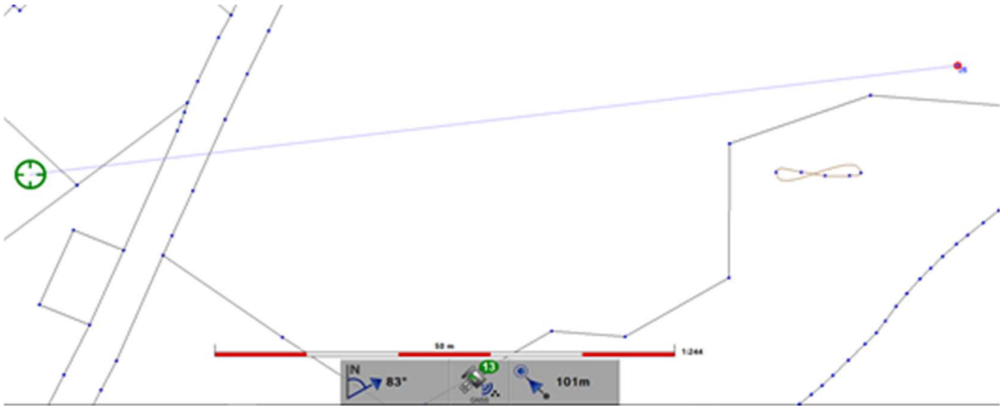
and then select the node from the map. You can access nodes from your current survey or from a vector background map. Use the map navigation buttons to navigate the map. The selected node is highlighted in red.

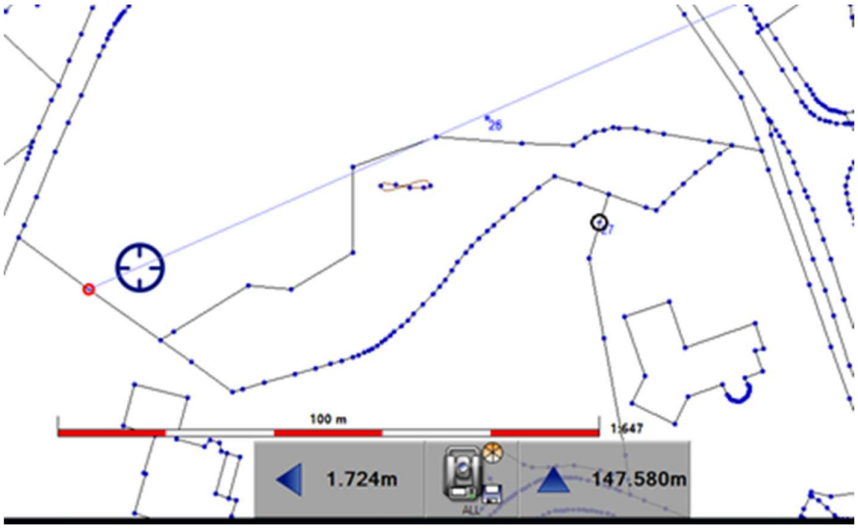
2. If you have not connected to GNSS already, tap 

.to do this now.

3. The middle GNSS button gives you the same functionality as the GNSS Method button in the Collect method bar. **Tap-hold** the button to access the GNSS controls, the badge indicating the number of used satellites, measurement methods etc. Likewise if you are using a Total Station, you have the same functionalities as those from the Total Station Method button in the Collect method bar. **Tap-hold** the button to access the Total Station options.

4. Once you select the feature, Penmap enters Coarse Navigation mode and adjusts the zoom to show the target node and your current position on the map, connected by a thin blue line to indicate the direction to walk. Start walking toward the node.



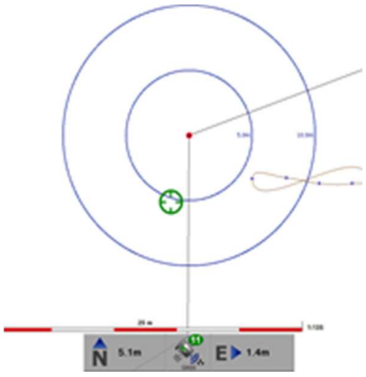


When you reach the coarse/fine navigation threshold, Penmap switches to Fine Navigation mode.

The default threshold value is 20m; you can change this under ***Settings / Properties / Application / Stakeout Coarse/Fine.***

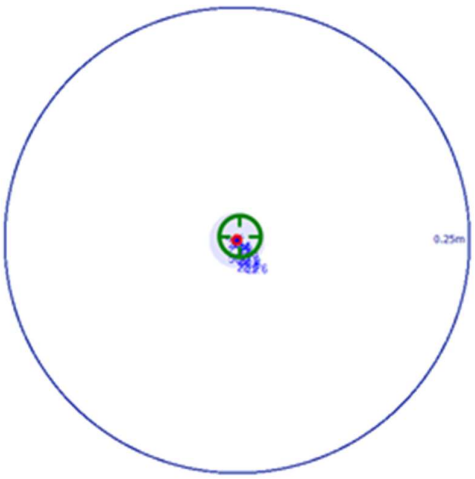
The target node is now in the center of the map area and blue circles indicate the distance to the target. The bottom bar icons have changed and show now the remaining distance to the target. In the upper part of the map screen the vertical displacement bar is visible now to show you the cut/fill value and a visual indicator.

5. You can deactivate the vertical displacement bar if required; select ***Settings / Properties / Application / Stakeout Ignore zero.***



6. As you appraoach the target, a green circle appears. This is the defined horizontal stakeout error limit. You can set an error limit for the maximum horizontal and vertical displacement under ***Settings / Properties / Tolerances / Stakeout.*** The default value is 4 cm; a value of “0” means that this error limit will be ignored.

When you are within the defined stakeout error limits, the inner green circle is filled in light blue and the vertical displacement indicator is shown in light blue.



6. Take the measurement by tapping on the **GNSS** or **Total Station** button on the icon bar.
7. A confirmation message informs you about the final displacements and the fulfillment of the error limits. Tap New and define what kind of coordinate decision you want to have.
    - Average: the new measured coordinate and the coordinate of the staked out node are used for calculation the mean value
    - Old: the new measured coordinate discard and the coordinate of the staked out node has been endured.
    - New: the new measured coordinate are used and the old one is deleted.
8. Tap **Accept** to confirm the measurement, or **Discard** to go back to the stakeout.

    The main navigation screen displays. All verified nodes are highlighted in blue.

Stakeout to Reference line

1. In the **Home** screen tap 

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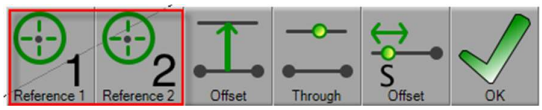
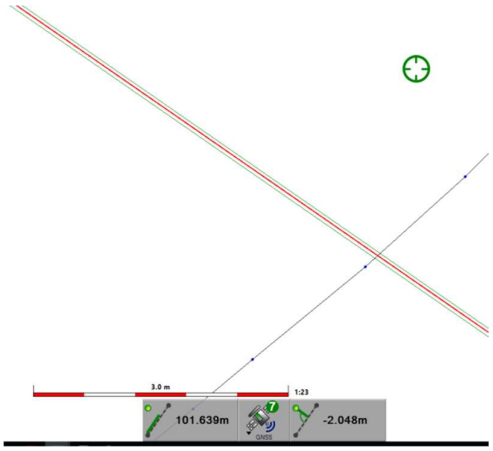
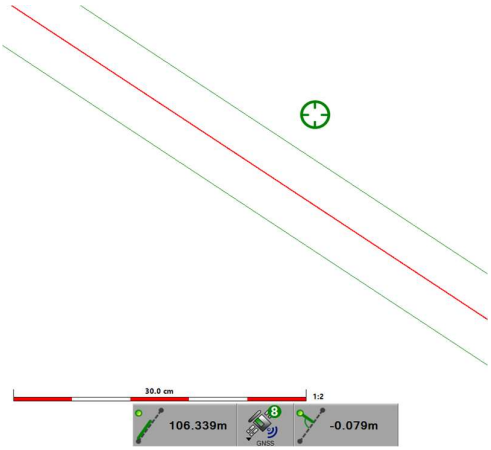
2. Use the two **Reference** buttons on the left and snap to two nodes in your map to define the reference line. Reference 1 is always the start node; reference 2 defines the orientation of the line



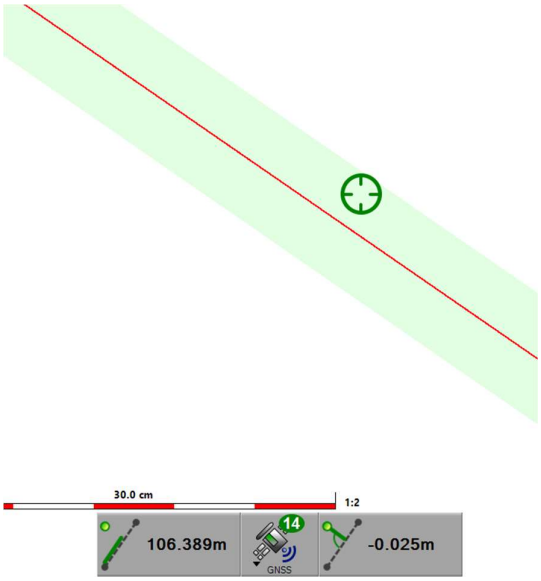
3. To enter the parallel offset distance, tap  . The construction line moves by the distance you entered. To move the construction line in the opposite direction, tap the map. Tap the map again to toggle between the alternative positions for the construction line.
4. Tap  and then tap the node that the construction line should pass through.
5. Tap  to enter a station offset for reference 1. A positive value will move reference 1 towards node 2, a negative value to the opposite direction.
6. **Tap-Hold** on any button of the lower bar to toggle between parallel offset or angled line definition.
   - Tap  to enter the angle of the construction line.
   - Tap  to enter an parallel offset of the angled line
7. To start the Navigation process, tap 
   The navigation process is the same as that for the Stakeout to Node workflow. Penmap displays the Chain and Offset values, and in **Fine Navigation** mode also the vertical displacement in reference to node 1. The chain value is related to reference node 1, the offset is the vertical distance from your current position to the line. The graphical display of the line depends how far away you are from the line.





Trimble Penmap will adjust the zoom automatically and displays the error limits.

8. If you are within the tolerance limits, a green bar is displayed. You can edit the tolerances in the **Home** screen under ***Settings / Properties / Tolerances / Stakeout***



9. Take the measurement by tapping on the **GNSS** or **Total Station** button on the icon bar. A confirmation message informs you about the final displacements and the fulfillment of the error limits.

10. Tap **Accept** to save the node.

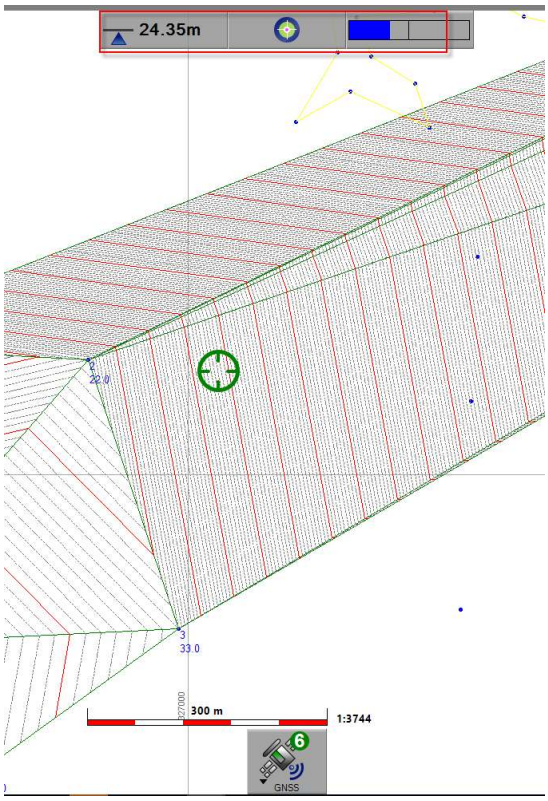
Surface Navigation

If you have defined a DTM model in the **Home** screen under ***Settings / DTM***, you can use the Stakeout functionality **Surface Navigation.**

1. In the **Home** screen, tap ***Stakeout / Surface Nav.***

2. If you have not connected to GNSS already, tap 

.to do this now. Once connected, the current results displays; blue scale means FILL, red scale means CUT.



3. Tap the ***GNSS Method button*** to take the measurement. In the Results dialog that displays, tap **Accept.**

Navigate Line

Use the **Navigate Line** function to control existing lines in the field. Work along the line (line object or area object) and check if you are within the tolerance.

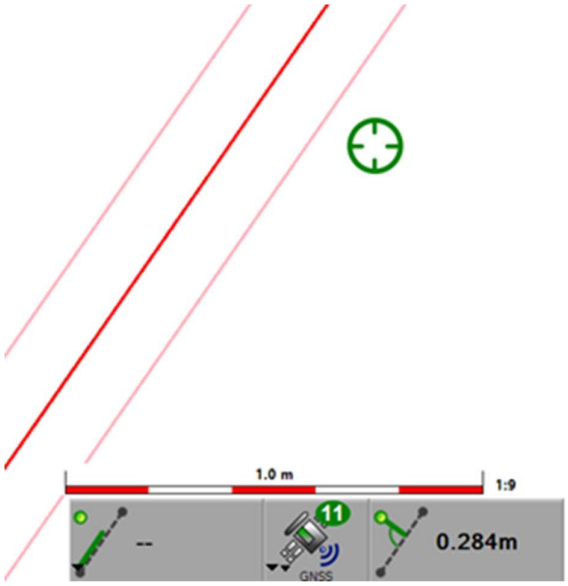
1. In the **Home** screen, tap **Stakeout** / **Navigate Line**.

2. If you have not connected to GNSS already, tap  to do this now.

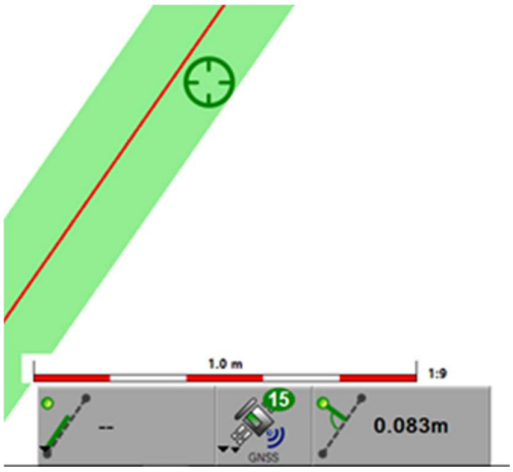
3. The middle GNSS button gives you the same functionality as the **GNSS** Method button in the Collect method bar. Tap-hold the button to access the GNSS controls. See GNSS method for more information. Likewise if you are using a Total Station, you have the same functionalities as those from the Total Station Method button in the Collect method bar. Tap-hold the button to access the Total Station options. See Total Station method for more information.

4. Select the GIS object you want to use to navigate the line. The following actions happen automatically:

- Penmap zooms in to the whole line object.
- The allowed corridor (tolerance limit) for the **Navigate Line** function displays in pale red for the whole line object:



If the GNSS Cursor is within the tolerance limit, the corridor is shown in green:



- If you are going along the line, a map revision is done automatically. You can zoom in manually at any time.

NOTE - *The tolerance limits are configurable. The default value is +/-50 cm.*

7 Collecting iFeatures

The iFeature system provides a fast way to organize and access your data collection features. In surveying, this is often called feature coding or using a code list.

iFeatures are point, line and polygon features that have GIS attributes.

iFeatures overview

The iFeature system is a fast way to organize and access your data collection features. In surveying terms this is often called **feature coding** or **using a code list**.
iFeatures are point, line and polygon features that have GIS attributes.

A feature in Penmap's iFeature file controls following information:

- **Feature name -** The name you find this feature in your list.
- **Topic/Page name -** You can organize all features in separate pages, e.g. Topography, Utilities, Street furniture...for quick access.
- **Layer -** Places the feature on the defined layer and controls style and color. This is configurable in the ***Sidebar menu / Layers / LSG Manager.***
- **Style –** Defines the point, line or area style+fill style. This is configurable in the ***Sidebar menu / Layers / LSG Manager.***
- **Default Graphic element -** Uses the defined Graphic element as a default, e.g. Symbol, Polyline, Circle, Text…
- **Feature type: Point, Line, Area -** Controls the feature end/close button.
- **GIS record -** will link the defined GIS record/form to this feature.
- **Symbol name and size -** Defines Symbol name from the library, size and orientation.

The iFeature configuration file is a simple text file, located in the **Trimble Penmap Encore\configfiles** folder.

The iFeature file that you want to use for data collection is defined in the Penmap Template.

To edit iFeatures, from the **Home** screen, tap **Settings** / **iFeature**.

To collect iFeatures, in the **Home** screen tap 

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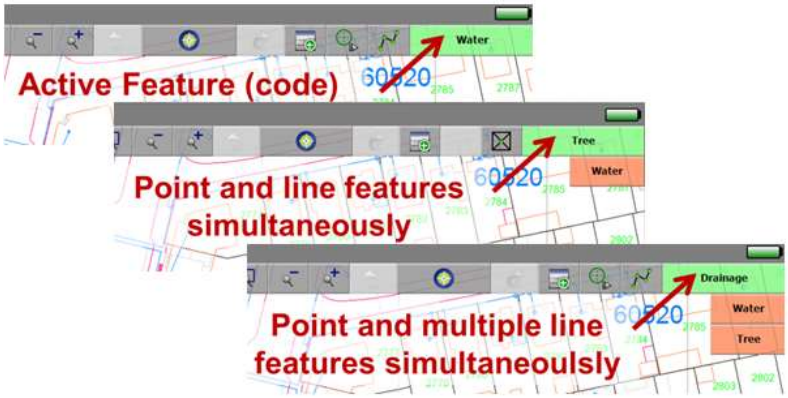
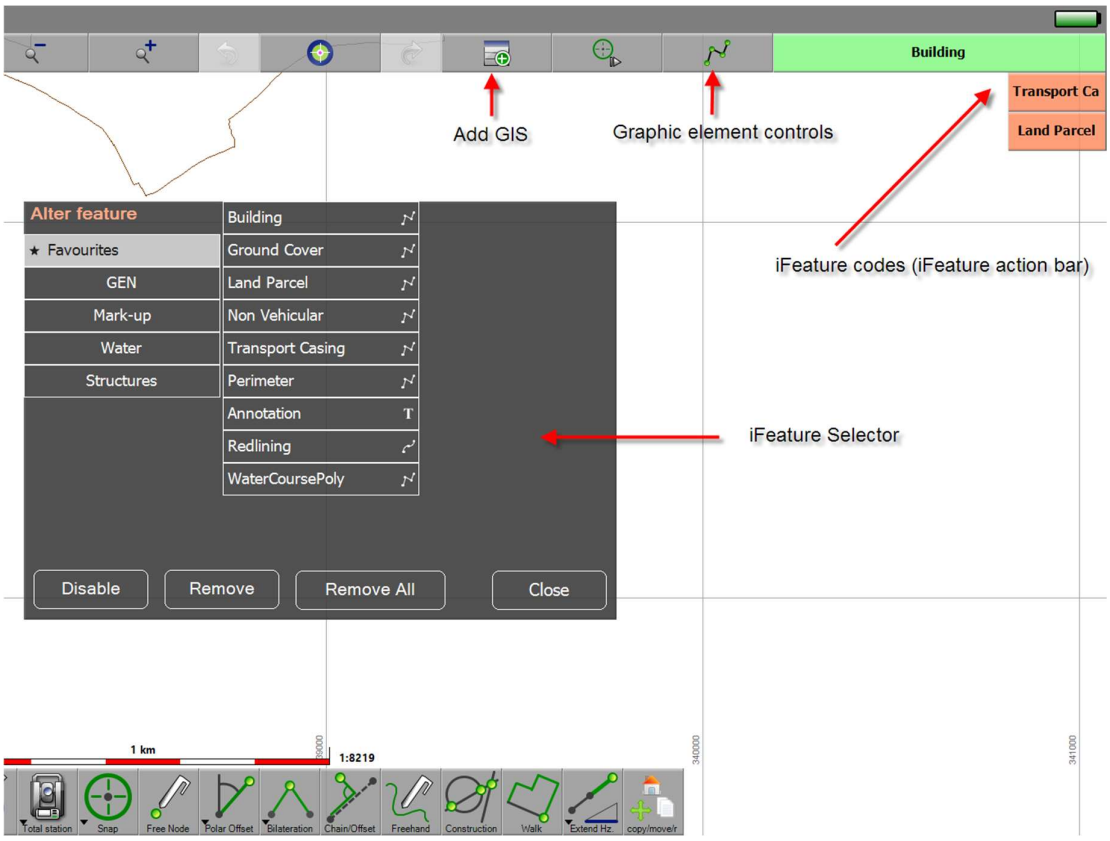
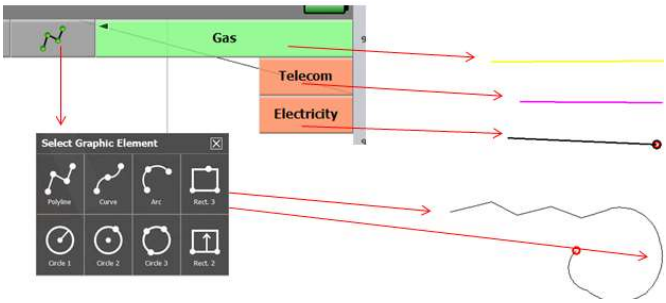
With the integrated iFeature system, you can easily create multiple iFeatures at the same time.





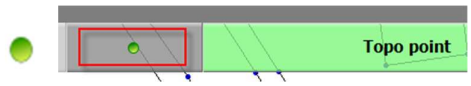
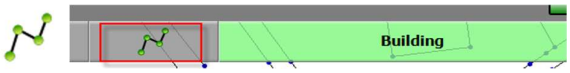
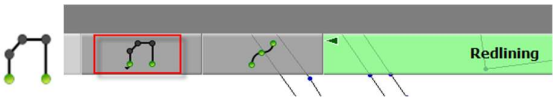
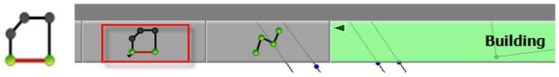
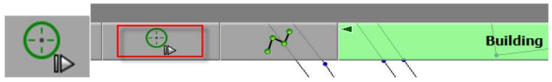
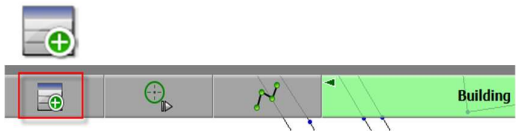


- Load the iFeatures you want to generate in the field

- Select a feature code from the **iFeature** selector and
- Select a collecting method from the Collecting Method bar
- Start with the first measuring of the first node for feature

Using the iFeature action bar

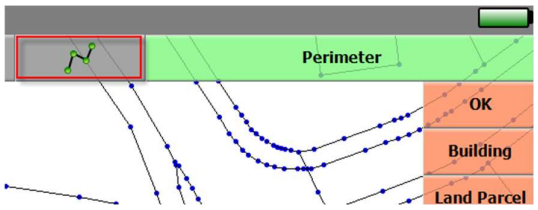
The **iFeature Action** bar is positioned above the map.

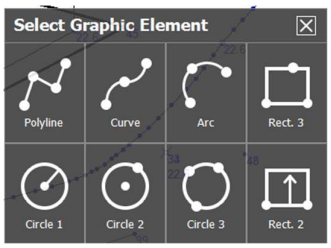
Tap...	To...
Select iFeature 	Open the **iFeature** selector and select the class of iFeature you want to collect. Once selected, the button is displayed in green with the current active feature. 
	Add a point feature.
	Select the line or polygon type to use for the active iFeature. ***NOTE** - The icon shown on the button depends on the selected line or polygon type.*
	End the active line iFeature.
	Close the active polygon iFeature.
	Extend the active line or polygon iFeature.
	There are two ways to add a GIS record to a feature: • After the measurement/data generation the GIS record dialogue opens

	automatically. Add a GIS record to the active iFeature and finish the feature. • Before the measurement/data generation is started, you can define the GIS attributes for the upcoming measured feature by tapping the button  . When you have finished the measurements, the GIS record dialog closes. You can only do this for one feature measurement.
	Tap on the number to edit the point number.
	**Undo/Redo** the active iFeature. The Redo option becomes active only after an “Undo”. You can only perform an “Undo” on the current active iFeature.

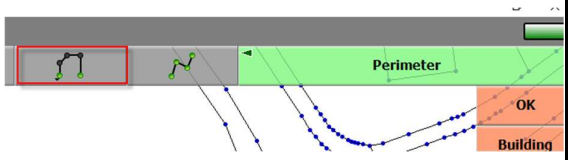
Button controls

Button	Function
Select iFeature 	• **Tap** to select/change a feature or disable the feature coding. • **Tap-Hold** to add more iFeature types tn the **iFeature Action** bar**.** The active iFeature is displayed in green, the inactive iFeatures in red. To change an inactive iFeature to active, tap the inactive iFeature.
Change the graphic element	**Tap** to change the default graphic element





Finish feature



Tap-Hold to toggle between **End** and **Close** a line feature


END: Line feature

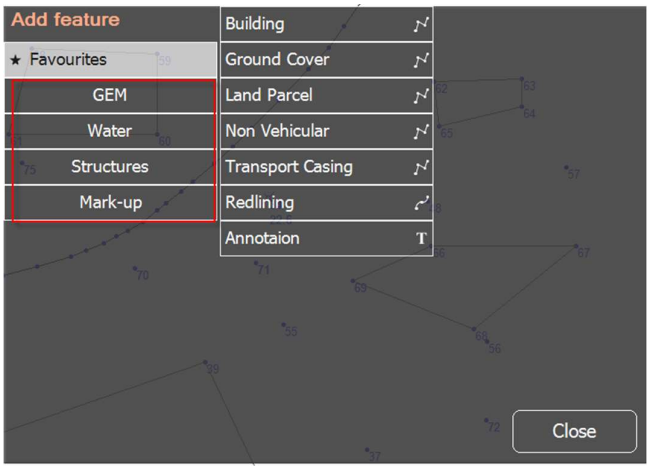

CLOSE: Line feature

Adding iFeatures using the iFeature Selector

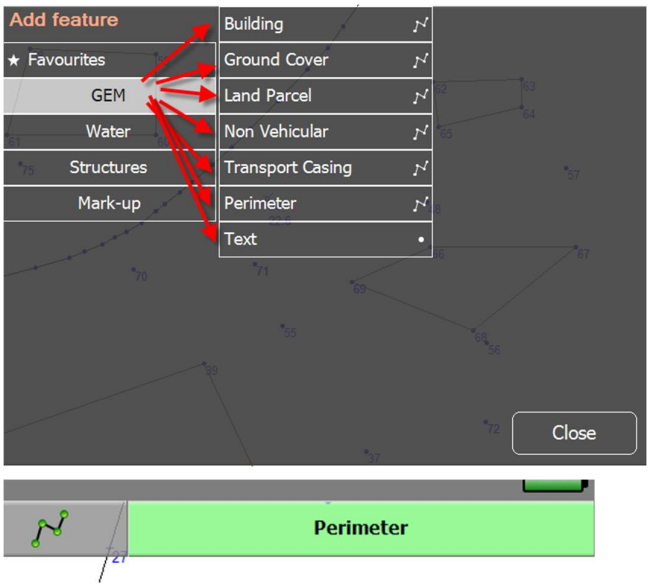
1. In the **Home** screen, tap **Collect** to switch to the **Data application** screen.
2. Tap Select iFeature to open the **iFeature** selector and add features to the iFeature action bar.
3. The categories and listed iFeatures are saved in the template; you can configure them in the **Home** screen under ***Settings / iFeature.***

To add features to the **iFeature Action** bar**:**

1. Select the iFeature category.



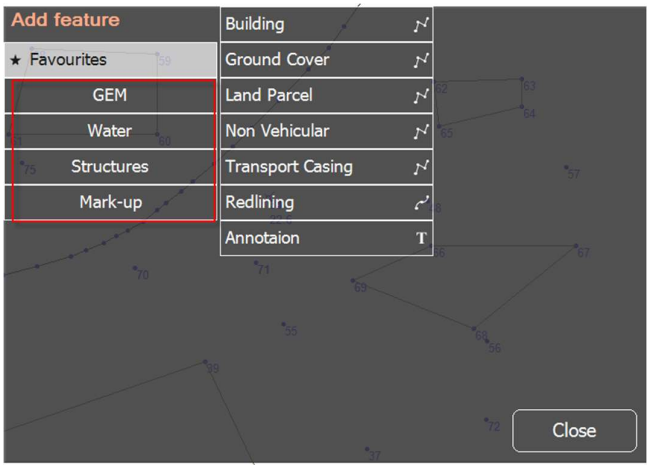
2. Select the corresponding iFeature type which relates to the iFeature category.
   The selected iFeature is added to the **iFeature Action** bar, is active by showing in green, and can be used for data generation.



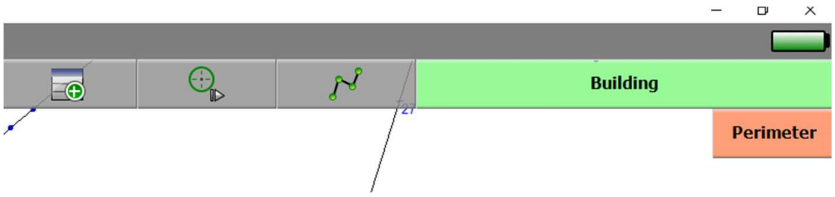
3. Select the collect method from the Collect Method bar and then perform the feature generation.

To add multiple point and line features to the **iFeature Action** bar**:**

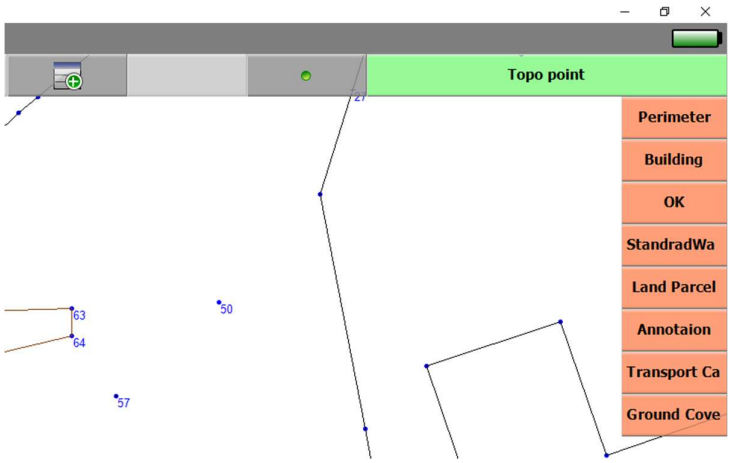
1. If one iFeature is active, **tap-hold** on the iFeature button.
2. Select the iFeature category, then select the corresponding iFeature type which relates to the iFeature category.



The selected iFeature is added additionally to the **iFeature Action** bar, is active by showing in green, and can be used for data generation. The last active iFeature is inactive but still listed.



3. Repeat until you have added all required iFeatures types.
   You can have up to 8 iFeature types selected at one time. Additional iFeature type buttons are stacked at the right of the **iFeature Action** bar. The active iFeature is highlighted in green.



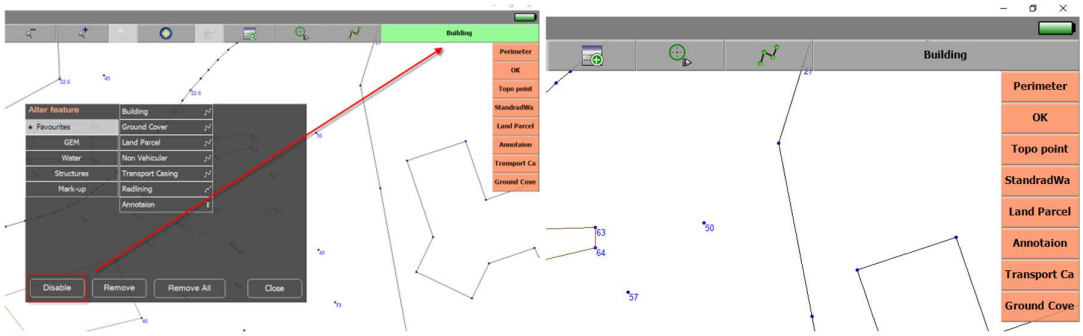
4. To change the active iFeature, tap a different inactive iFeature type button in the **iFeature Action** bar.
5. Add nodes for the active iFeature, selecting the required line type / point style and collection method.

Disabling/re-enabling an iFeature

If you want to disable an active iFeature but don't want to delete it, tap on the active iFeature in the **iFeature Action** bar, then tap **Disable**.

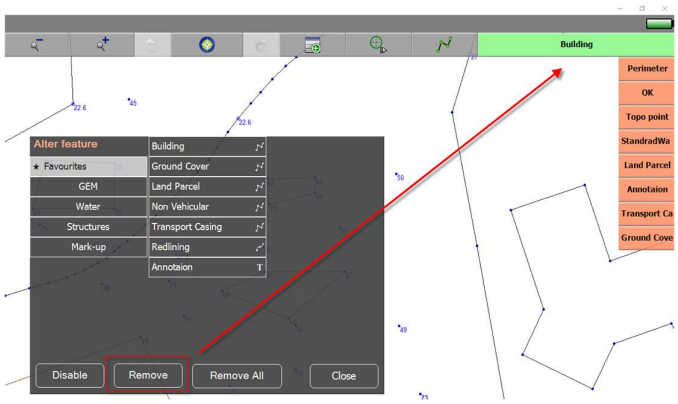
The active iFeature is shown in grey. If you now take measurements, only nodes are generated instead of line or point feature codes.

To make the iFeature enable again, tap the disabled (greyed-out) iFeature in the **iFeature Action** bar.

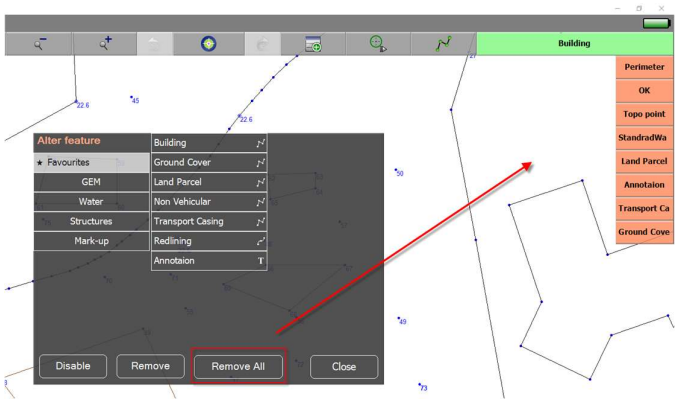


Removing an iFeature from the iFeature action bar

If you want to remove one iFeature from the **iFeature Action** bar, tap the active iFeature in the **iFeature Action** bar, then tap **Remove**.



To remove all iFeatures (active and inactive), tap **Remove All**.

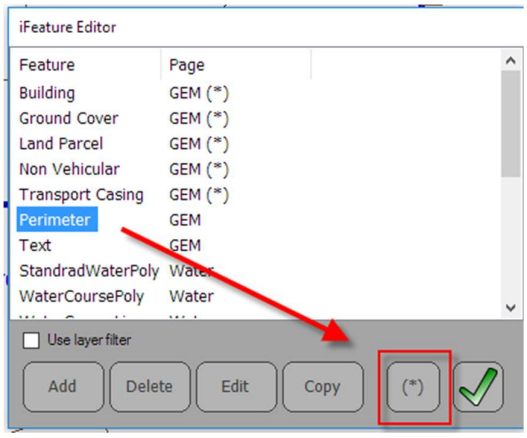


Adding iFeature classes to the Favorites list

To list you most-used features on the first page in the **iFeature** selector page, add the iFeatures to your favorites list:

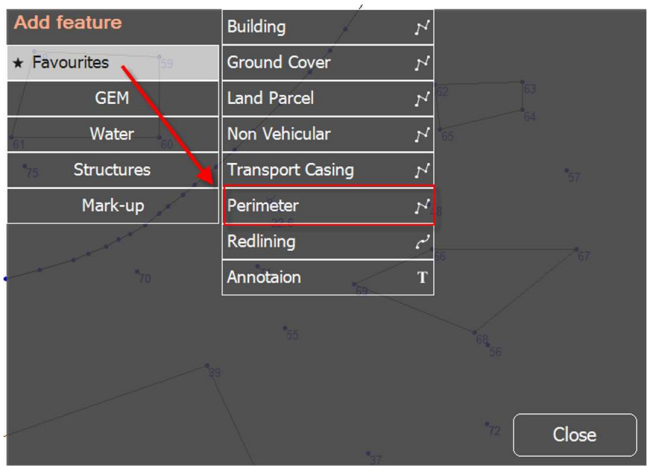
1. In **Home** screen, tap **Settings** / **iFeature**.

2. Select the iFeature you want to add to your Favorites list and tap (*).



3. Tap then tap **Update system now**.

4. In the **Data Collection** screen, tap the **Select iFeature** button to open the **iFeature** selector; you will see your Favorites listed.

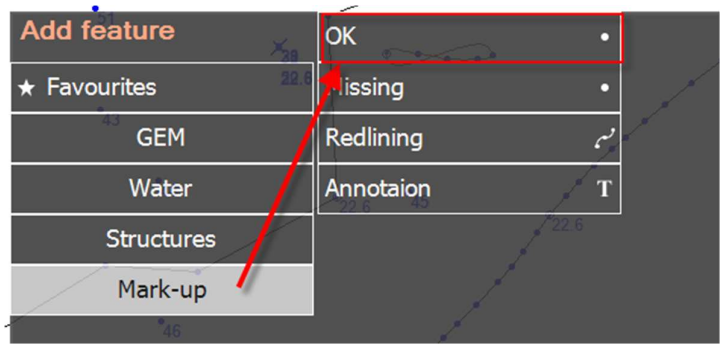


Collecting a point iFeature

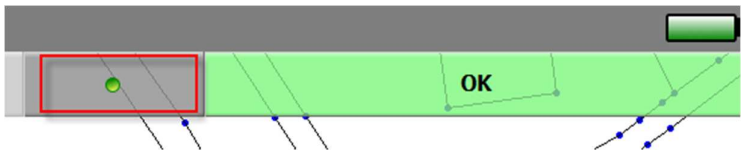
1. In the **Home** screen tap 

.
2. Tap iFeature 

to open the **iFeature** selector.
3. Select the iFeature category and then the iFeature type **"Point"** to add to the **iFeature Action** bar.



The name of the selected iFeature type and the point button appears on the **iFeature Action** bar.



4. Select the collect method from the Collect method bar and then perform the appropriate steps to add a node to the map for the point.
   You can use every collect method Trimble Penmap supports for generating the point feature:
   - GNSS
   - Total Station
   - COGO functions
   - Snap to node
   - Free node
5. If more information is required, such as a radius or height value, a dialog appears on-screen.
   Enter the required value and tap ***OK.***
6. If the selected and active feature has an integrated GIS schema, the GIS form opens. Fill out the GIS record form for the iFeature and then tap  (or tap  to discard).
7. To add a photo to a feature, the GIS schema must have the **Photo** attribute defined, and you must have the VisualMapper tool installed. See VisualMapper for more information. Then:
   a. When you are creating the feature, on the GIS dialog, tap **Capture.** VisualMapper starts automatically.

b. Take a photo or select an image from a local folder, mark it up and sketch with comments if needed. Then tap . The photo is added to the feature.

Using the buttons at the bottom of the dialog you can:

- *- Zoom in to the feature*
- *- Change the focus to the start or end point of the feature*
- *- Zoom to the marked start or end point*

The **Info** tab includes the information about the perimeter and area square meter.

If you want to enter the GIS attributes before the measurement/data generation is started for the selected feature, tap to define the GIS attributes for the upcoming measured feature. Once you finish the measurement, the GIS record dialog is no longer open.

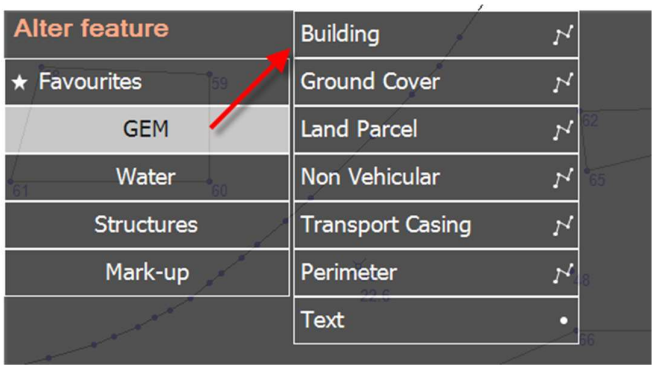
NOTE – *You can only use this for line features.*

To collect another point iFeature of the same type, repeat steps 3 to 5.

To stop collecting iFeatures of the selected type, tap the iFeature type name in the **iFeature Action** bar and then tap **Remove**.

Collecting a line or polygon iFeature

1. In the **Home** screen tap .
2. Tap iFeature to open the **iFeature** selector.
3. Select the iFeature category and then the iFeature type **"Line/Polygon"** to add to the **iFeature Action** bar.



The name of the selected iFeature type and the Line type button appears on the **iFeature Action** bar.

4. To change the line type/graphic element, tap the Line type button and then select one of the following:

Icon	Name	Requires you to collect...
Polyline	Polyline	At least two nodes.
Curve	Curve	At least three nodes.
Arc	Arc	At least three nodes.
Circle 1	Circle 1 point	One node in the center of the circle and a radius value.
Circle 2	Circle 2 point	Two nodes: one node in the center of the circle and one node on the edge.
Circle 3	Circle 3 point	Three nodes on the edge of the circle.

	Rectangle 3 point	Three nodes: two nodes along one side of the rectangle and one node on the opposite side.
	Rectangle 2 point	Two nodes along one side of the rectangle and a height value.

***NOTE** - If using the graphic element **Polyline** and start a feature generation, you can switch between polyline and arc during the generation.*

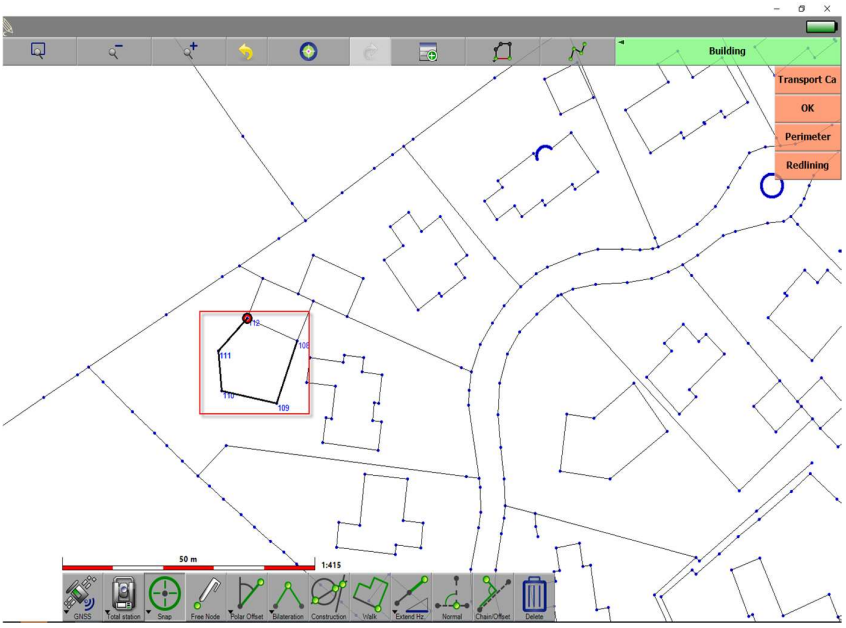
5. Select the collect method from the **Collect method bar** and then perform the appropriate steps to add the required number of nodes to the map for the iFeature.

   You can combine and switch between different collect methods for generation of a line or polygon:

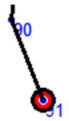
   - GNSS
   - Total Station
   - COGO functions
   - Snap to node
   - Free node

For example start with measuring the first nodes with GNSS, then do a calculation of a node, then snap to a known node on the map, then go back to the GNSS measurement.

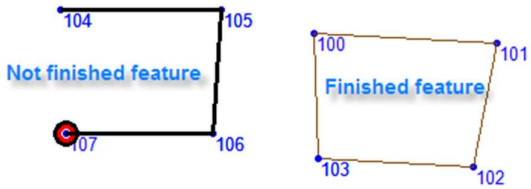
In real time the new generated/measured object is visible on the map:



The last generated node is displayed with a little red circle:



6. If more information is required, such as a radius or height value, a dialog appears on-screen. Enter the required value and tap ***OK.***
7. If the selected and active feature has an integrated GIS schema, the GIS form opens. Fill out the GIS record form for the iFeature and then tap (or tap to discard).
8. To add a photo to a feature, the GIS schema must have the **Photo** attribute defined, and you must have the VisualMapper tool installed. See VisualMapper for more information. Then:
    a. When you are creating the feature, on the GIS dialog, tap **Capture.** VisualMapper starts automatically.
    b. Take a photo or select an image from a local folder, mark it up and sketch with comments if needed. Then tap . The photo is added to the feature.
9. To end the iFeature, tap the End line or Close polygon button. A line or polygon feature which is not 'finished' displays in bold.



Using the buttons at the bottom of the dialog you can:

- - *Zoom in to the feature*
- - *Change the focus to the start or end point of the feature*
- - *Zoom to the marked start or end point*

The **Info** tab includes the information about the perimeter and area square meter.

If you want to enter the GIS attributes before the measurement/data generation is started for the selected feature, tap to define the GIS attributes for the upcoming measured feature. Once you finish the

measurement, the GIS record dialog is no longer open.

NOTE – *You can only use this for line features.*

To collect another point iFeature of the same type, repeat steps 3 to 6.

To stop collecting iFeatures of the selected type, tap the iFeature type name in the **iFeature Action** bar and then tap **Remove**.

If you remove a feature which is not finished, a message displays prompting you to confirm the feature will be lost.
If you try to close the project when a feature is still open, you can finish all incomplete features automatically.
Tap **Yes** and the features are finished. If the feature has a GIS schema integrated, the GIS attribute dialog opens first for entering attributes.

A message displays informing you that you have an incomplete feature and cannot close the project.

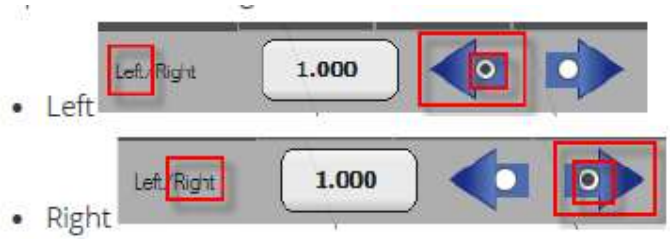
GNSS Measurement Distance Offset

If you have an active line/area feature, and some nodes are not accessible for you to log GNSS positions, you can use a distance offset “Left/Right” from your current GNSS position.

1. Tap the **Antenna Height** field. An additional option bar is available on the bottom of the dialog.

2. Tap the button 

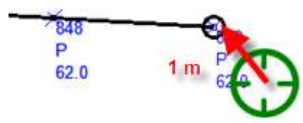
then enter the distance offset using the keypad that displays.
3. Tap the left or right button to select the direction from your current GNSS position.



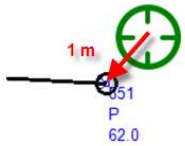
4. Tap to apply the settings. *An arrow on the antenna height icon displays the active direction with the distance offset.* When you log a GNSS measurement, the measured node is placed according to the distance offset.

To turn off the distance offset, reset the offset to 0.00 and tap .

Direction *Left*, distance offset 1.00 m



Direction *Right*, distance offset 1.00 m

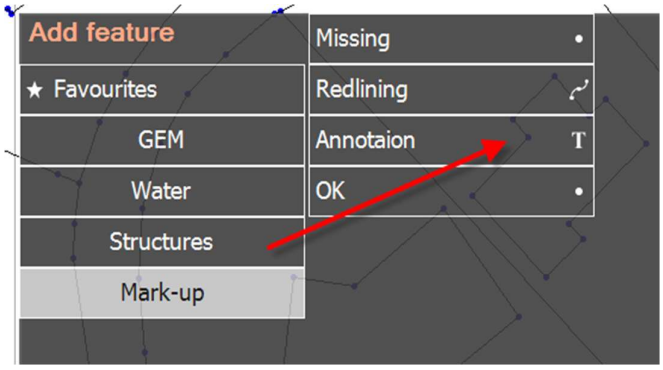


Collecting a Text iFeature

1. In the **Home** screen tap .

2. Tap iFeature to open the **iFeature** selector.

   The name of the selected iFeature type and the Text button appear on the **iFeature Action** bar.



3. Select the collect method from the Collect method bar and then perform the appropriate steps to add a node to the map for the point.

   You can use every collect method Trimble Penmap supports for generating the point feature:

   - GNSS
   - Total Station
   - COGO functions
   - Snap to node
   - Free node

4. Once the node is generated, the Penmap keypad opens. Enter the required text and tap  .

Switching between iFeatures in progress

To make your data collection more efficient, you can switch between iFeatures in progress and can do feature generation in parallel. This is useful, for example, if you are:

- Collecting a line iFeature and you want to collect some point iFeatures as you travel alongside the line iFeature
- Collecting a parallel line iFeatures such as the elements of a road by zigzagging your way across the road.

To switch between iFeatures in progess:

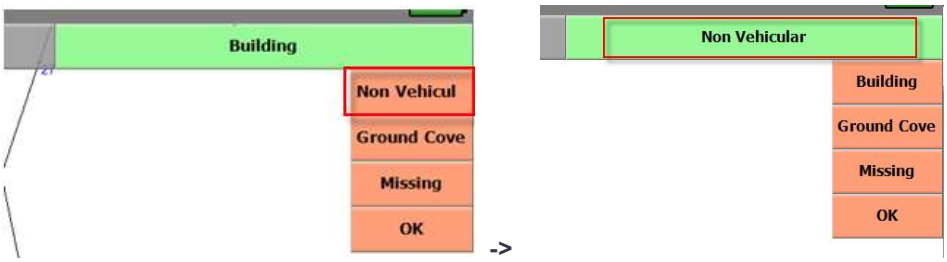
1. In the **Home** screen tap 

.
2. Tap iFeature 

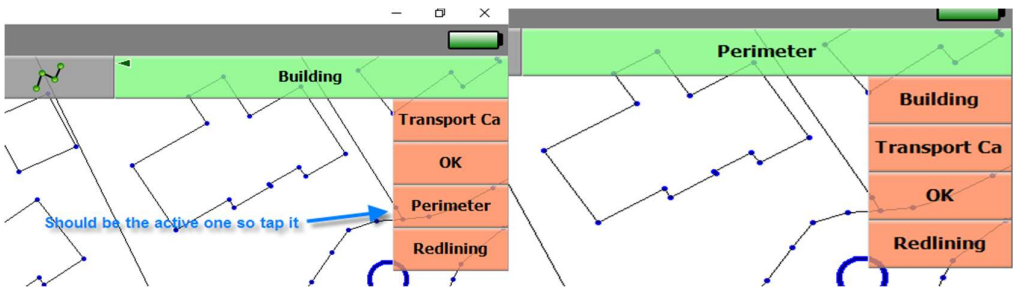
to open the **iFeature** selector**.**
3. Select the iFeature category and then the iFeature type. The button for the selected iFeature type is added to the **iFeature Action** bar.
4. To add more iFeature types, **tap-Hold** the iFeature type button 

in the action bar and add another iFeature type. Repeat until you are have added all the iFeature types you require. You can have up to 8 iFeature types selected at one time.

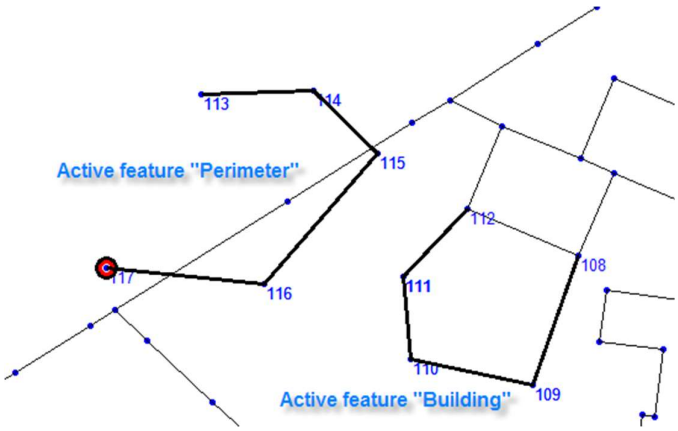
   The iFeature type buttons are stacked at the right of the **iFeature Action** bar. The active iFeature is highlighted in green, the inactive iFeatures in red. To become an inactive one to an active one just tap the inactive iFeature.



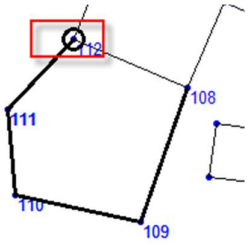
5. Add nodes for the active iFeature as usual, selecting the required line type and collect method as needed.
6. To switch to a different iFeature, e.g. from Building to Perimeter, that is to make an inactive iFeature the active iFeature, tap it. Then add the nodes for the new active iFeature.



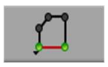
The two (or more) active features are displayed on the map in bold:



If you now switch from a not finished **feature A** to another unfinished **feature B**, a small circle appears around the last generated node of the feature. You can easily continue the feature generation.

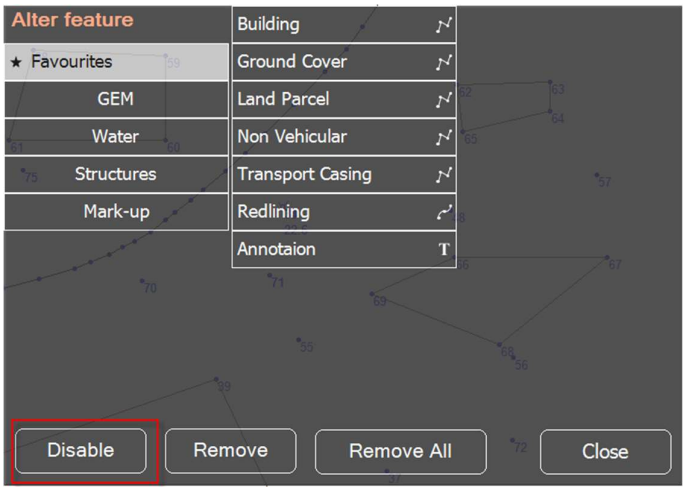


If the active iFeature is a point iFeature, tap the iFeature code button for the new iFeature and then add a node.

If the active iFeature is a line or polygon, tap the End line  or Close polygon  button.

7. To return to the previous iFeature, tap the ***iFeature type button*** for the previous iFeature. If the iFeature is a line or polygon, tap  and then tap the node from which to extend the iFeature.

NOTE *- To disable the current iFeature and measure or compute a point without any associated feature, tap* ***Select iFeature****. In the* ***Alter dialog*** *tap* ***Disable****. You can now collect points that are not part of iFeatures. To return to collecting iFeatures, tap* ***Select iFeature*** *again and the current feature is re-enabled.*



8 Data collection application

- Normal method

Penmap offers a comprehensive set of more than 10 main collecting methods, including GNSS, Total Station, to generate nodes on a survey. Nodes generated by each **Penmap Collect Method** are identified in the Penmap map space by a specific blue symbol.

Any method of combination of methods for generating nodes can create any graphics item. A variety of method routes can create the same graphics item.
Different graphics items can be created from the same combination of nodes.
Penmap also provides a wide range of editing functions and expansive features that can be activated simultaneously while a node is being generated and graphics item created. This is a fully integrated system.

To open the **Data Collection application**, on the **Home** screen, tap 

.

To return to the **Home** screen at any time, tap the Penmap icon

on the top **Status** bar.

Types of nodes generated by Method

Nodes generated in Penmap fail into two categories:

- Nodes generated independently of other nodes. The Free Node method and Enter Data Method enable you to create new nodes arbitrarily on the survey (although usually by referring to the base map or grid, or entering a coordinate).
- Nodes generated with reference to other nodes

  All the other methods require that node positions are calculated by either using the coordinates of base nodes already laid down by the Free Node method and Enter Data Method, or from the nodes that make up the base map of a survey, or in the case of Total Station nodes, by referring to a station setup.

NOTE - *To see the nodes which have been generated, make sure the* ***'Show Nodes'*** *check box in* ***Settings / Properties / Display*** *is selected.*

Accessing the coordinates of nodes

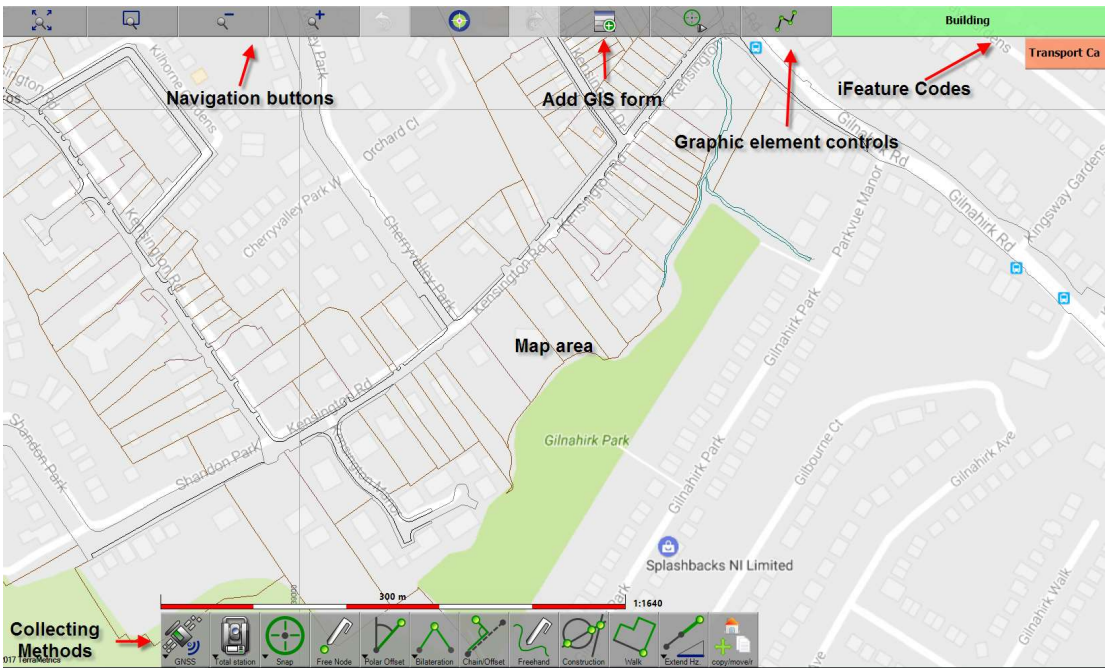
The coordinates and the used method to create a node can be reviewed by selecting ***Query - ID Node*** and then tap on the node.

To open the **data collection application**, tap the button 

on the **Home** screen.

To return to the **Home** screen, tap the ***Trimble Penmap icon*** on the top **Status** bar.

Using Data Collection Method screen



To begin data collection:

- Select a feature code from the **iFeature** selector. See Adding iFeatures using the iFeature Selector.
- Select a collecting method from the **Collecting methods** bar. See Using the Collection Method bar.

The current, active feature is shown on a green button.

Button controls

Function	To
iFeature	• **Tap t**o select/change a feature or disable the feature coding • **Tap-Hold** to add a feature and use point and line features simultaneously.
Graphic element controls	• **Tap t**o change the default Graphic element • **Tap-Hold** to toggle between End and Close a line feature
Navigation buttons	• **Tap** to zoom in/out or pan and zoom to extends • **Tap-Hold** to toggle between zoom in/out and pan/extents controls.
Methods bar	• **Tap t**o select a method, trigger for GNSS/Total Station measurement. • **Tap-Hold** to access to GNSS or Total Station controls.

Onscreen keyboards

Penmap has its own keypad. To access the Penmap alphanumeric keypad, double-tap in any text entry field.

Using the Collection Method bar

The **Collection Method** bar provides all the data collection methods that Penmap supports.
See Collection method options for all the available options.

You can configure the **Collection Method** bar in the **Home** screen under **Settings** / **Custom**.

You can use more than one collection method to collect data. For example, you might want to collect a rectangle iFeature by measuring three nodes using the GNSS method, but a large tree blocking signals from GNSS satellites means you cannot use the GNSS method for one of the nodes on the rectangle. Use the **Collection Method** bar to switch to a different method, for example select the Bilateration method to measure the third node using two existing nodes as reference points.

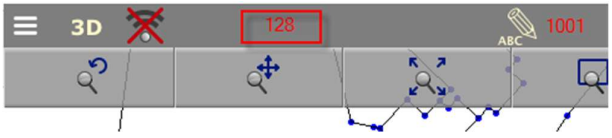
See also **Collection Method** bar Graphic Elements and Zoom and navigation controls.

Using point numbering

For all collection methods you can define and use point numbering. Go to the **Home** screen / **Settings** / **Application** / **Point number** and tap the **Point number** button.

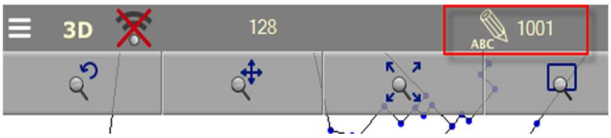
During data collection, tap on the point number field and enter the required point number.

During your data collection, if you want some nodes to **not** use point numbering, **tap-hold** on the point number field. The point number is shown in red, meaning point numbering is blocked; as you collect data, only nodes without a point number are created.



You can also link a code to the point number:

- Tap on the code field in the **Status** bar and enter the code.



- **Tap-hold** on the code field to create a code and three additional comments. The three comments are only used for the next node generation; once the node is generated, the comments are set to <blank>.

NOTE – *Codes and comments can only be used when you do not have an active iFeature.*

Collection method options

You can configure the **Collect Method** bar in the **Home** screen under ***Settings / Custom.***

Icon	Description
	GNSS Method button with SV count. Use to add nodes to the survey using coordinates data from a GNSS receiver.
	Total Station method
	Snap Node method
	Free Node method
	Bearing & Distance Polar Offset method
	Visual Bilateration method
	Key-in Coordinates Enter data method
	Visual Chain & Offset method
	Sketch - Freehand method
	Construction method
	Construction Object - Walk method

	Extend Distance – Extend horizontal/Extend Slope method
	Perpendicular calculation - Normal method
	Delete Item method

Graphic elements

Element	Function
	Graphic Point
	Graphic Text
	Symbol 1 anchor node
	Symbol 2 anchor nodes
	Polyline
	Bezier Curve
	3 Nodes Arc
	Circle: Center and Radius
	Circle: 2 Nodes
	Circle: 3 Nodes

	Three nodes: two nodes along one side of the rectangle and one node on the opposite side.
	Two nodes along one side of the rectangle and a height value.
	END: Line feature
	CLOSE: Line feature
	Add GIS record

Zoom and Navigation controls

Tap...	To...
	Menu Exit
	Zoom to Last
	Map Pan
	Zoom to Extends
	Zoom to Window. Tap-hold to open and select the default map scales.
	Zoom out ***NOTE –*** *You can also zoom out by tapping three times on the map.*
	Zoom in ***NOTE –*** *You can also zoom in by tapping twice*

	on the map.
	Make the nodes visible in the current zoom level. This means that as long as you are at the zoom level in which the visibility was activated, the nodes are displayed on the map.

GNSS method

Use the ***GNSS method*** to add nodes to the survey using coordinates data from a GNSS receiver.

CAUTION - If using a GNSS site calibration, you must complete a calibration before you compute offset or intersection points, or stake out points. If you change the calibration after computing or staking out these points, they will not be consistent with the new coordinate system and any points computed or staked out after the change.

- When measuring control points or point features, a node is created after a single GNSS observation (epoch), by averaging multiple epochs, from the mean of the number of observations and at prescribed time interval.
- When measuring line or polygon features, add multiple nodes to the feature using single or averaged GNSS epochs.

When you created the project, you will have configured some GNSS settings. Once you connect to the GNSS receiver, you can configure additional GNSS settings for the current measurement method. This enables you to select different settings depending on your requirements for that measurement mode.

Before collection data, you must set up the GNSS device and other parameters associated with collecting GNSS measurements, such as a coordinate system.

Connecting to a GNSS receiver

In the **Home** screen, tap 

then tap 

on the **Collection Method** bar to start the GNSS method and connect to the GNSS receiver.

Penmap attempts to connect to the GNSS receiver you have configured for the current measurement mode. If you have not yet configured GNSS settings for the current measurement mode, the software uses the GNSS settings you configured when you created the project.

NOTE - *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*

Logging GNSS positions

Once the receiver is connected, tap 

to start logging GNSS positions.

Depending on the selected collection mode, a node is created by any of the following:

- a single epoch
- averaging over multiple epochs
- using defined distance/time intervals
- if using a Trimble R10 receiver, a Tilt and Compensated measurement.

To set or change the antenna height, tap the antenna height icon in the **Status** bar.

> ⚠ **CAUTION -** The antenna offset is predefined for each antenna type. To view the Antenna offset details, in the GNSS Method menu tap **GNSS Settings** / **GNSS Receiver** and then tap **Test**.
>
> Penmap uses the method **Bottom of antenna mount** for the antenna height measurement; make sure you measure to the bottom of the antenna mount.

⚠ **CAUTION** - FOR LEICA RECEIVERS – The internal antenna height of the Leica receiver must be Zero (0.000 m). If an internal antenna height of **not** 0.000 m is set in the Leica receiver, this antenna height is used for the GNSS measurement too. This means the internal antenna height is used in addition to the entered antenna height in Penmap, resulting in an incorrect height. If the internal antenna height is not Zero (0.000 m), then change it immediately to Zero before working with Penmap.

To check if the internal antenna height of the Leica receiver is Zero (0.000 m), do the following:

1. In Penmap, enter the antenna height which should be used for the measurement, for example 2.000 m. Perform control measurements of a known coordinated point.
2. Compare the measured height regarding the tolerance. If the internal antenna height is Zero, the results in the height must be ok.

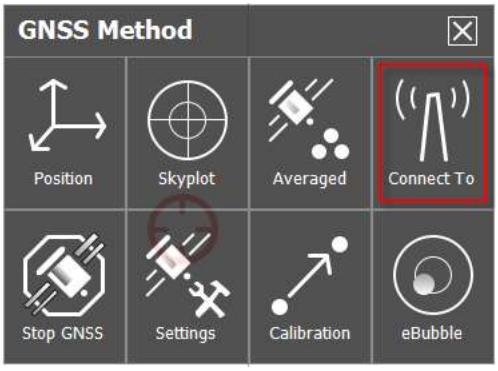
Do not work with the Penmap software and the internal Leica software together, while working with a Leica controller. This will result in incorrect GNSS measurements.

Starting the GNSS correction data stream

In the **Home** screen, tap 

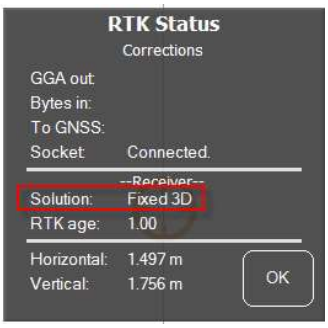
then **tap-hold** 

and tap **Connect To.** The correction stream is started.



To indicate that the receiver is logging NTRIP correction data, the network symbol on the **Status** bar no longer shows with a red cross:

To view the RTK status, tap on the network symbol and tap RTK.



NOTE – *If you have selected the* ***Auto start*** *option (****Home*** *screen /* ***Setup*** */* ***GNSS Setting*** */* ***GNSS receiver*** */* ***Advanced****, then the NTRIP correction data stream is started automatically when the receiver is connected.*

If you use the RTX or SBAS real-time correction service, the data correction logging also starts automatically.

To disconnect from an active data correction source, tap  then **tap-hold**  and tap **Disconnect**.

GNSS Status Information

When Penmap is successfully connected to the GNSS receiver, the following GNSS status information is displayed:

- 

The GNSS icon shows the number of satellites being used. If the number is in red, then not enough satellites are being tracked to log a valid GNSS position.

  NOTE – *If Penmap cannot detect the connected GNSS receiver,* ***tap-hold*** 

and then in the ***Home*** *screen tap Settings/GNSS receiver and select the receiver type and connection method. To dismiss the GNSS settings dialog, tap anywhere outside the dialog.*

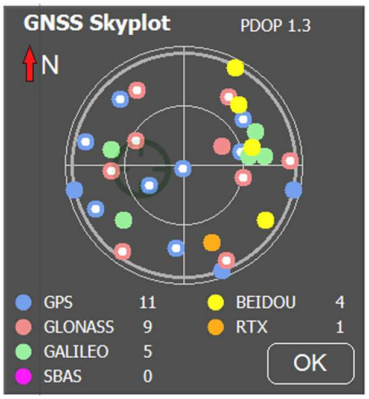
- 

Estimated accuracy. Tap this value to toggle to other information.

- 

When receiving NTRIP correction data, the GNSS symbol is displayed without a red cross. Tap the symbol to open the VRS dialog. The following options are available:
  - 

    View detailed coordinate and precision information for the current GNSS position.
  - 

    View the GNSS skyplot showing the type and position of the GNSS satellites being tracked by the GNSS receiver.
    All satellites which are used for calculation the ambiguities have a little white node in the middle of the circle.
    

- 

  Manually connect to/disconnect from the configured real-time correction source.

- 

  Manually disconnect from the GNSS receiver.

- 

  Display of RTK Status information. This includes the receiver solution, RTK age, RMS accuracy, and correction status.

- **Antenna height.** Tap on it in the **Status** bar to enter or change it.

⚠ **CAUTION -** The antenna offset is predefined for each antenna type. To view the Antenna offset details, in the GNSS Method menu tap **GNSS Settings** / **GNSS Receiver** and then tap **Test**.

Penmap uses the method **Bottom of antenna mount** for the antenna height measurement; make sure you measure to the bottom of the antenna mount.

⚠ **CAUTION -** FOR LEICA RECEIVERS – The internal antenna height of the Leica receiver must be Zero (0.000 m). If an internal antenna height of **not** 0.000 m is set in the Leica receiver, this antenna height is used for the GNSS measurement too. This means the internal antenna height is used in

addition to the entered antenna height in Penmap, resulting in an incorrect height. If the internal antenna height is not Zero (0.000 m), then change it immediately to Zero before working with Penmap.

To check if the internal antenna height of the Leica receiver is Zero (0.000 m), do the following:

3. In Penmap, enter the antenna height which should be used for the measurement, for example 2.000 m. Perform control measurements of a known coordinated point.
4. Compare the measured height regarding the tolerance. If the internal antenna height is Zero, the results in the height must be ok.

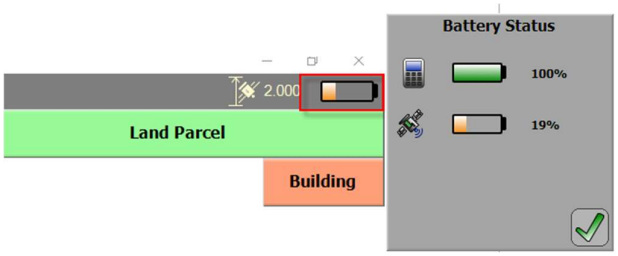
Do not work with the Penmap software and the internal Leica software together, while working with a Leica controller. This will result in incorrect GNSS measurements.

- **Color-codes GNSS position cursor.** When the GNSS receiver is connected, the GNSS position cursor is color-coded on the map to indicate the quality of the current GNSS position. You can define the quality limits under **Home** screen / **Setup** / **GNSS Settings** / **Quality**.

Cursor	Indicates the current GNSS position is...
	Outside the quality limits. Measurement is not possible
	Within the warning limit. A warning message appears if you attempt to log the position. To log the position, tap ***OK***.
	Within the defined quality limits. When you tap GNSS, logging starts immediately.

For more detailed GNSS status information, **Tap-Hold** the GNSS Method button 

and then tap 

- 

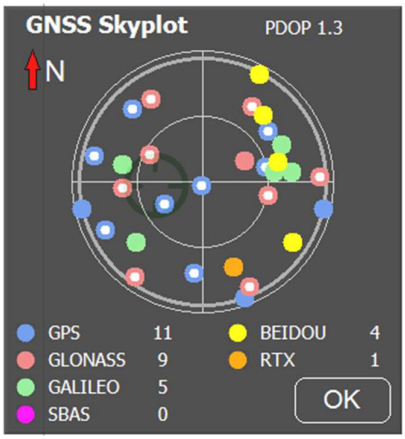
Display the current battery status. The battery icon on the **Status** bar shows the charge of the device with the lowest battery power. Tap the icon to show charges for all devices' batteries.

GNSS Method menu

To access more detailed GNSS status information and controls, **Tap-Hold** 

. The GNSS Method menu has the following options:

Tap...	To...
	View detailed coordinate and precision information for the current GNSS position.
	View the GNSS skyplot showing the type and position of the GNSS satellites being tracked by the GNSS receiver. All satellites which are used for calculation the ambiguities have a little white node in the middle of the circle.

	
  If using Trimble R10, you will also see:  	Tap to toggle between using a **Single GNSS position, Epoch averaging GNSS positions, Distance,** or **Time.** If you are using a Trimble R10 receiver you can also use **Tilt** and **Compensated**. • When using **Averaged, Distance, Time, Tilt,** or **Compensated,** go to **GNSS Settings/Collection** mode to configure the number of positions to use. ***NOTE –*** *On the button, the next discontinued measurement method is shown, not the active one. On the GNSS button the current measurement method is displayed as well.* • When using the mode **Averaged**, an additional progress bar displays. Tap **OK** to stop and save the average measurement, or tap **Cancel** to discard the measurement.  • When using **Distance** or **Time**, tap  to start logging positions. The button highlights; logging will continue according to the distance or time interval you have set. To stop logging, tap  .

	• When using Tilt with a Trimble R10 receiver, tap  to start logging positions. The button highlights; logging will continue automatically as long as the rover pole is levelled. To stop logging, tap  .
	Manually connect to /disconnect from the configured real-time correction source.
	Manually disconnect from the GNSS receiver.
	Configure GNSS settings. The options are simialr to those on the **Home** screen, such as **Setup / GNSS settings.**
	Load or start a site calibration. See Performing a GNSS Site Calibration.

GNSS Measurement Distance Offset

If you have an active line/area feature, and some nodes are not accessible for you to log GNSS positions, you can use a distance offset “Left/Right” from your current GNSS position.

1. Tap the **Antenna Height** field. An additional option bar is available on the bottom of the dialog.

2. Tap the button 

then enter the distance offset using the keypad that displays.
3. Tap the left or right button to select the direction from your current GNSS position.

- Left 

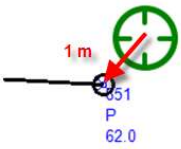
- Right 

4. Tap to apply the settings. *An arrow on the antenna height icon displays the active direction with the distance offset.* When you log a GNSS measurement, the measured node is placed according to the distance offset.

To turn off the distance offset, reset the offset to 0.00 and tap .

Direction *Left*, distance offset 1.00 m

Direction *Right*, distance offset 1.00 m



Performing a GNSS Site Calibration

Perform a GNSS site calibration to transform WGS-84 coordinates from the connected GNSS receiver into grid coordinates (NEE).

CAUTION - If using a GNSS site calibration, you must complete a calibration before you compute offset or intersection points, or stake out points. If you change the calibration after computing or staking out these points, they will not be consistent with the new coordinate system and any points computed or staked out after the change.

Before you begin a GNSS site calibration:

- Make sure the receiver is connected. See Connecting to a GNSS receiver.
- Configure the calibration tolerance settings; on the **Home** screen, tap **Settings** / **Properties** / **Tolerances** and then enter Horizontal and Vertical Resection / Calibration tolerance values.

To perform a GNSS site calibration:

1. On the **Home** screen, tap 

to switch to the **Data Application Screen.**
2. **Tap-hold** 

in the **Collect Method** bar the button ***GNSS*** and select the option ***Calibration.***
3. Depending on your project, you may be prompted to select one of the following options:
   - Tap ***New*** to start a new calibration.
   - Tap ***Edit*** to edit the currently loaded calibration.
   - Tap ***Load*** and then select a saved calibration file from the list.
   - Tap ***Disable*** to discard the currently loaded calibration.
4. To add a calibration point:
   a. Tap 

and select the first calibration point from the map. The calibration point coordinates appear.
   b. Select whether to use a 3D/2D/1D coordinate.
   c. When the GNSS antenna is positioned directly over the point on the ground and you have made sure the antenna is vertical and not moving, tap the 

button to start your measurement.
5. Repeat steps 5 a to 5 c for the next calibration points.
6. Once the observation is stored, the icon on the **Results button** updates to show if the calibration results are within the configured calibration tolerance values 

or outside the configured calibration tolerance values 

Tap the Results button 

to view the **Calibration results**. Then:

- Tap **Report** to view the results as a report, or
- Tap **Save as preset** to save the calibration for use in future surveys or for other projects.

7. If required, tap ***Settings*** 

to change the scale factor or to use a fixed scale. To view how your changes affected the solution, tap the ***Results button*** to return to the **Calibration results dialog.**
8. If required, you can remove observations that are outside the tolerance settings. To do this:
   a. Tap the GNSS node on the map (you can only do this when the calibration bar is open). The **Observation details** dialog appears.
   b. Exclude different elements of the observation by reducing the number of dimensions used for the measurement i.e. reduce from **3D/2D/1D** to **Off**. Tap 
   c. To view how your changes affected the solution, tap the Results buton to return to the **Calibration results** dialog.
9. To apply the calibration, tap 

. To discard the calibration, tap 

Total Station Method

The Total Station Method allows the coordinates of target nodes on the site to be calculated using an optical Total Station or any other device which can compute a bearing and distances.

For the purpose of this user guide, the term Total Station includes specified binocular and monocular instruments with laser range finding.

To use this method, you must:

1. Select the correct instrument and communication parameter; on the **Home** screen, select **Setup** / **TS Settings**.

2. Set up the instrument using one of the stationing procedures; on the **Home** screen, select **Setup** / **Known Stationing** / **Resection**.

Connecting to the Total Station

If a stationing is active, you will already be connected to the Total Station. If not, in the **Home** screen, tap 

then tap 

on the **Collection Method** bar.

NOTE - *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings/Custom*** *in the* ***Home*** *screen to add it.*

If the instrument is connected, a prism displays on the Total Station button 

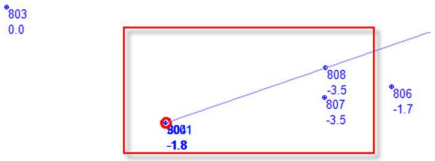
along with the current measurement method. If **Direct Reflex** is used, a red circle shows on the button 

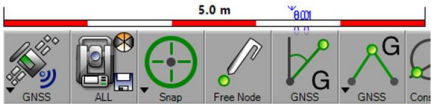
.

Total Station Status Information

When Penmap is successfully connected to the instrument, the following Total Station status information displays:

- The current line of sight (light blue line) on the survey





- 

Target **"Prism"** is in use and the **"Autolock option"** is inactive.

- 

Target **"Prism"** is in use and locked. Autolock option is acdtive. The prism has two fixed black triangles; if the locking is lost the triangle rotates.

  NOTE - *To activate* ***Autolock,*** ***Tap-Hold*** 

and tap 

.

- 

Measurement method **"All"** is active. This means distance + angle are measured at the same time.

  NOTE - *To change the measurement method,* ***Tap-Hold*** 

and tap 

- 

Measurement method **"Distance/Record"** is active; when you tap the Total Station button to start a measurement, the distance is measured first. The icon then changes to 

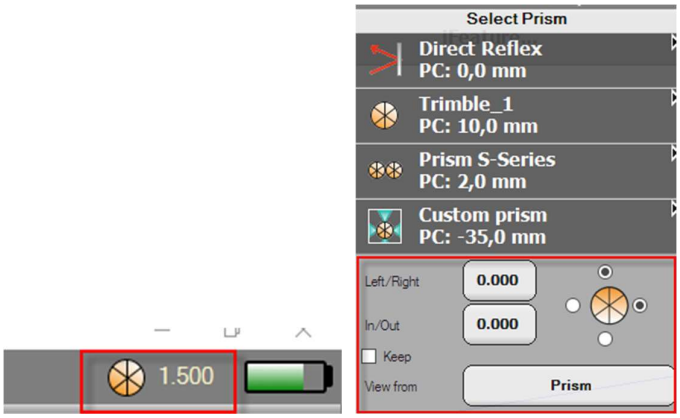
. You can then turn in the angle and record distance + angle by tapping the Total Station button again.

  NOTE - *To change the measurement method,* ***Tap-Hold*** 

and tap 

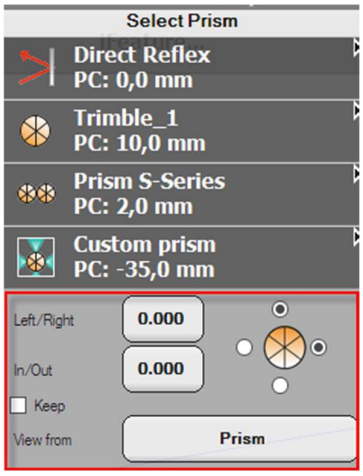
- 

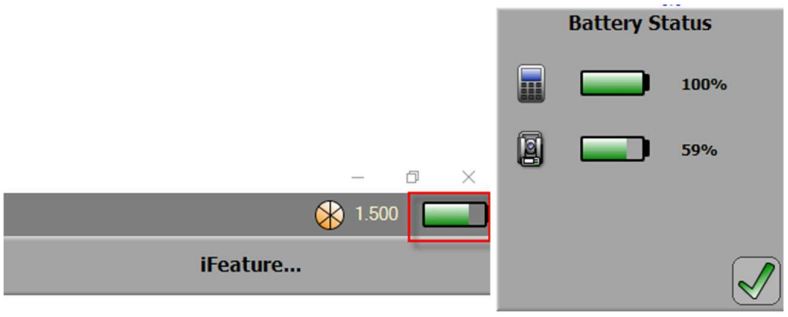
Target **"Direct Reflex"** is in use.

- 

Target selection bar is displayed. You can switch between three defined **Prism** and one **Direct Reflex** target by tapping on the target type. Then the selected target mode is shown 

You can also use the Distance Offset measurement of nodes:



- 

Current battery status.

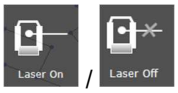
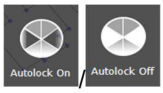
Display of the current battery status. The device with the lowest battery charge is displayed in the **Status** bar. Tap it to display the charge for other devices.

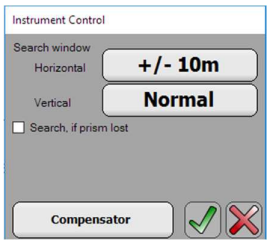
Total Station Method menu

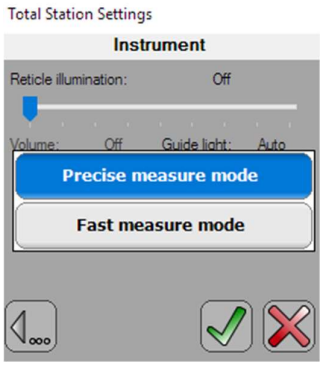
To access more detailed Total Station status information and controls, **tap-hold** 

. The Total Station Method menu has the following options:

Tap...	To...
	Switch between measurement methods **"All"** and **"Distance&Record".** • **All**: distance + angle are both measured at the same time. • **DIST/REC**: when you tap the Total Station button to start a measurement, the distance is measured first. You can then turn in the angle and record distance + angle by tapping the Total Station button again. Depending on the active method, the icon on the Total Station method button will show: •  Tap to start the measurement. •  Tap to measure the distance first. The icon then changes to  . You can then turn in the angle and record distance + angle by tapping the Total Station button again.
	Only available if you are using a Trimble instrument. Move your pen or finger in the upcoming screen.

	 The instrument turns to the direction your pen/finger is moving in. **Tap-hold** to aim horizontally.
	Tap to activate the laser. The button shows the state to switch to, not the state the laser is in: •  means that the laser is **Off.** Tap to turn the laser on. •  means that the laser is **On**. Tap to turn the laser off.
	Tap to activate the Autolock function (if your instrument supports it). The button shows the state to switch to, not the state the Autolock option is in: •  means that the option is **Off.** Tap to turn the option on. •  means that the option is **On**. Tap to turn the option off. NOTE - *If the instrument is locked, the prism on the Total Station button has two fixed black triangles*  *; if the locking is lost the triangle rotates.*

	Manually disconnect from the instrument.
	Define the search window for searching the prism. Tap **Compensator** to open the **Level bubble dialog.** You can disable and enable the compensator there.  
	Tap to configure the Total Station settings. Select: • **Corrections:** (Weather, Temperature, Pressure, MSL Height, Curvature) • **Instrument:** change between **Precise measure** mode and **Fast measure** mode. With **Precise measure** mode a measurement will take 5 to 6 seconds; with **Fast measure** mode a measurement will take just one second because the tracking modus of the instrument is used. ***NOTE -*** *If you are doing a stakeout with the Total Station, the Fast measure mode is automatically used to have the current differences in real time between the stakeout node and your position.*

	
	Start the prism search depending of the defined search window.

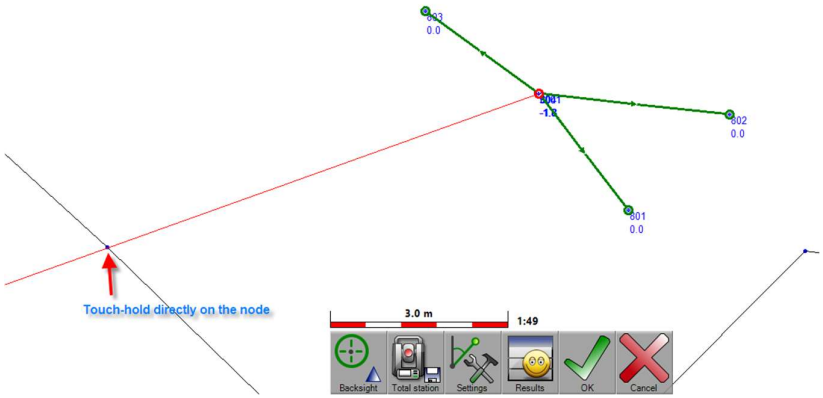
Starting the Total Station measurement

Once the Total Station is connected, tap  to start a measurement.

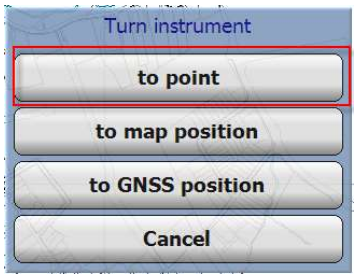
Turn to function

Penmap offers three different **Turn to functions:**

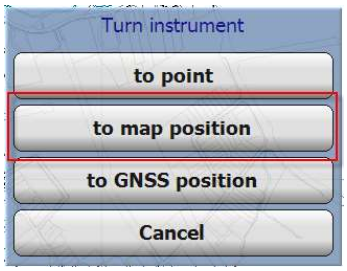
- To point
  a. On the map, **tap-hold** the node you want to turn to.



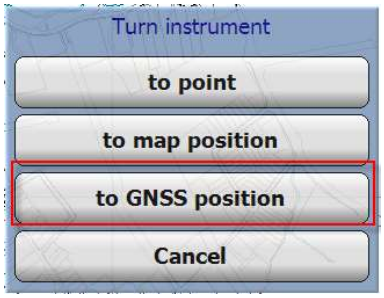
  b. On the **Turn instrument** dialog, tap **to point**. The instrument turns to the selected point, also visible by the current line of sight (light red line) on the survey.



- To map position
  a. On the map, **tap-hold** the node you want to turn to.
  b. On the **Turn instrument** dialog, tap **to map position**. The instrument turns to the selected map position, also visible by the current line of sight (light red line) on the survey



- To GNSS position:
  a. Make sure you are connected to a GNSS receiver (see Connecting to a GNSS receiver) and logging positions (see Logging GNSS positions).
  b. On the **Turn instrument** dialog, tap **To GNSS position**. The instrument turns to the current GNSS position.



Target selection

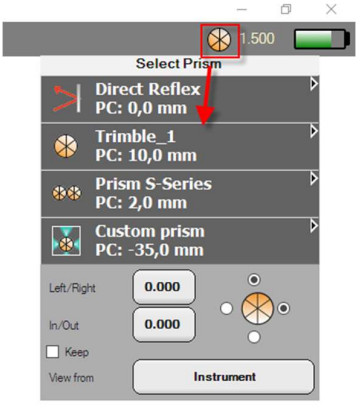
⚠ **CAUTION FOR LEICA TOTAL STATION -** Before connecting Penmap for the first time with a Leica Total Station, set the prism constant to **"0" (Zero)** in the instrument. Once connected, Penmap transfers a user-defined prism with the Penmap prism constant to the instrument. The Leica constant is calculated internally. **DO NOT** therefore ever change the prism type / prism constant directly in the instrument when

working with Penmap' doing so results in incorrect distance measurments and calculated results.

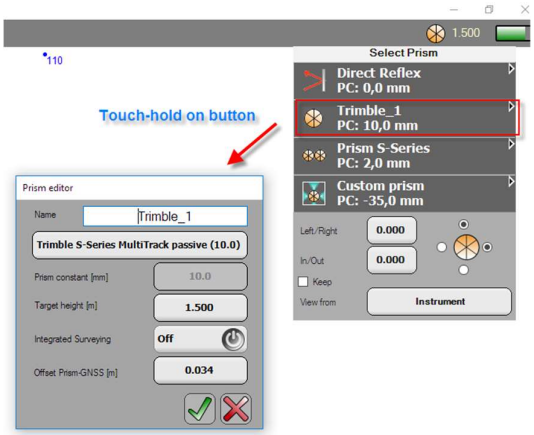
With Penmap, you can define three **Prism** methods and one **Direct Reflex** method.

1. Once connected to the instrument, either in the **Stationing method** or the **Total Station Method**, the target icon 

displays.
2. Tap the prism (or direct reflex) icon to open the selection and configuration list of the target.

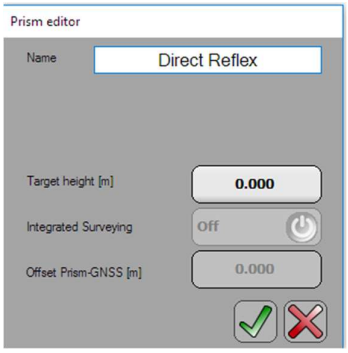


3. You can define and configure three **Prism** targets, and one **Direct Reflex** target. **Tap-hold** the required option in the list. The target editor dialog opens.



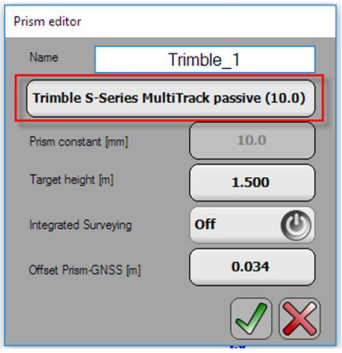
4. If you selected:

   - the Direct Reflex target, enter a name and a target height, then tap  .



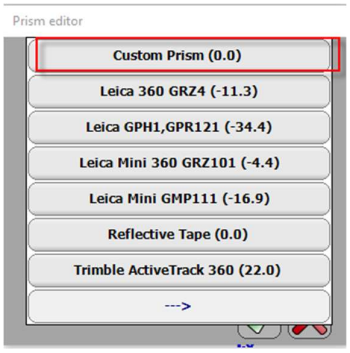
NOTE – *If you want to use an additional constant for Direct Reflex, you must configure an In/Out value. See [Total Station Measurement Distance Offset](#).*

- A prism:
  a. Enter a name.
  b. Tap the prism button to open the prism list, then select the prism you want to use.



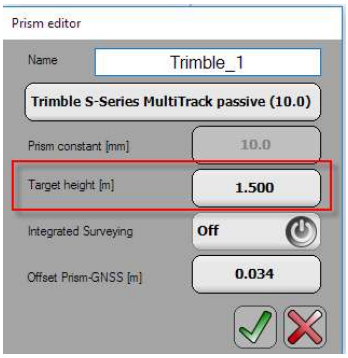
NOTE - *Use the Arrow at the bottom of the dialog to move down the list; use the Arrow at the top of the dialog to move back up the list.*

  c. If the prism you want to use is not in the list, you can define a custom prism. Tap **Custom Prism** and define the prism constant for it by tapping on the button

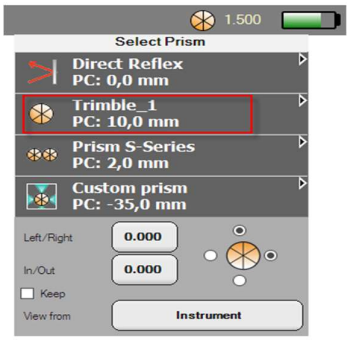


NOTE - *If you choose a pre-defined prism, you cannot to change the prism constant.*

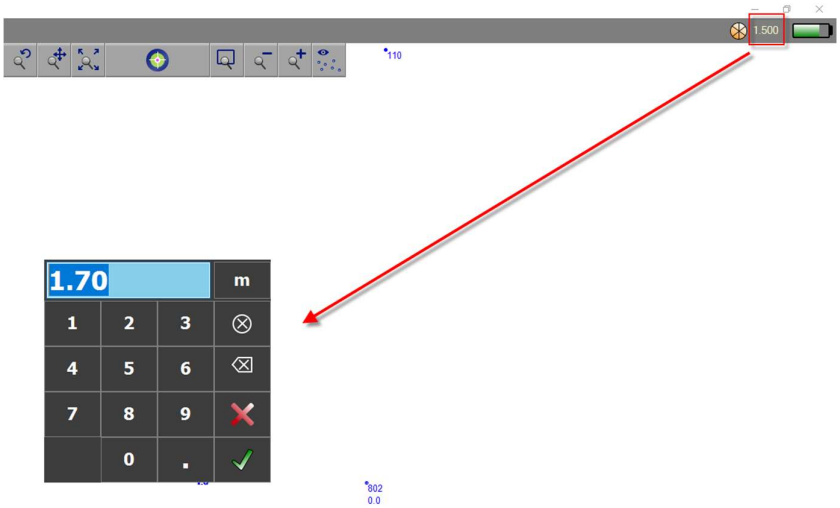
  d. Tap the **Target Height button** and enter the target height.



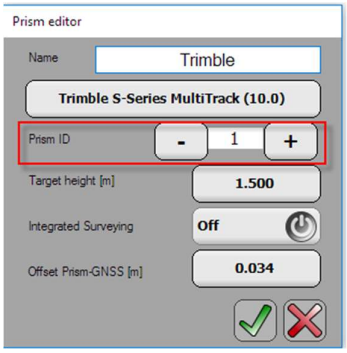
e. When you have configured the prism, tap the target you want to use for the measurement.



NOTE - *The configured target height of the selected prism is displayed and used for the measurement. To change it, tap on the target height value on the* ***Status*** *bar.*



NOTE - *If you want to use an active prism with prism ID, select the appropriate prism in the list, for example Trimble S-Series MultTrack, and enter the corresponding prism ID.*

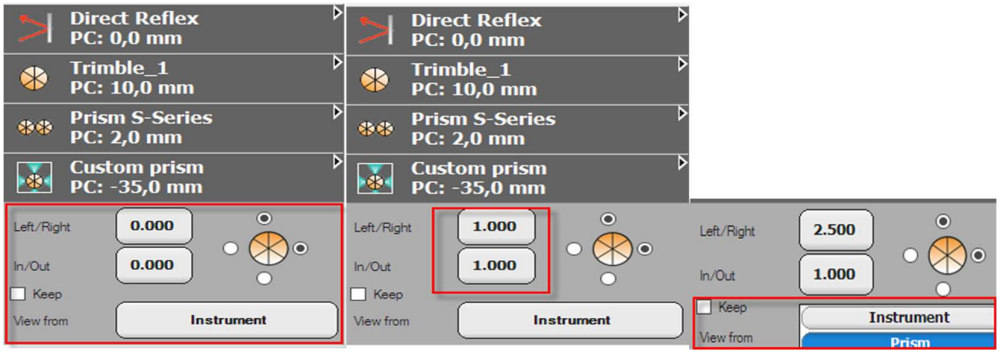


Total Station Measurement Distance Offset

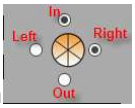
To measure nodes that cannot access directly, you can use the ***Left/Right*** and ***In/Out*** offset options.

1. When you are successfully connected to a Total Station, tap on the target icon 

on the **Status** bar.
2. At the bottom of the dialog that displays, define the values for the non-accessible nodes and the view from the instrument or prism. Tap **Left/Right** and **In/Out** to enter the values for the non-accessible node, then tap **View from** to define the view from **Instrument** or **Prism**.



NOTE - *When connected using a Radio or Bluetooth, use* ***view from prism****. When connected using a serial cable, use* ***view from instrument****.*

3. Use the visual graphic to set the direction of the nodes from your current position 

For example:
   - View from instrument. Node is 1m on your left side and 2m behind you; enter 1m for Left/Right, and 2m for In/Out, then set the visual option to the following:

- View from prism. Node is 2.5m on your right side and 1m in front of you; enter 2.50m for Left/Right, and 1m for In/Out, then set the visual option to the following:

4. Select the option **Keep** to keep the values for each measurement. If you deselect this option, the values you enter for Left/Right and In/Out are used only for the next measurement, and are then reset to zero.

Snap Node method

The **Snap Node** method snaps graphical elements onto existing nodes. It collects nodes together to form graphics items selected from the Graphic menu. It does not generate nodes.

You can also use this method as a type of edit utility to snap together nodes to form new graphics items after others have been undone or deleted.

The **Snap Node** method is also a convenient way to add text adjacent to a number of nodes or graphical items. If the position of a node is recalculated, the text moves with the node.

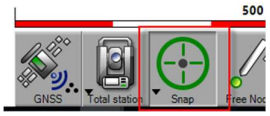
You must have at least one node on the survey before you use this method.

To use the method:

1. In the **Home** screen, tap 

then tap 

on the **Collect Method** bar to start the **Snap Node** method.
   NOTE – *if the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*

   This method stays active until another method is selected; the button remains highlighted while the method is active. 

2. Tap a node on the map. Usually the node will be snapped to another node to form a graphic item, but when the feature is a graphic point or symbol the **Snap Node** method creates graphic points. It does not join them to anything. This is useful when recording the position of items such as traffic signs, telegraph poles, or manhole covers.

3. If you don't want to snap each node of a line object manually, you can create quickly a line segment from which you continue or create a line feature. Tap-hold 

and select the start position from map by picking a node.

   NOTE – *You have to define a line feature first.*

   - If you select a node which is not related to more than one line object, the end of the line object is found automatically.
   - If the selected node relates to more than one line object, for example, an area object or two different line objects, you can toggle between two choices by tapping on the map.
   - Tap 

to select and end the whole line/area object automatically.
   - Tap 

and pick the required node from the map. This node becomes the end node of the line object.
   - Tap 

and generate a line feature from the defined end node.

To exit the **Snap Node method**, tap 

again or select a different method.

Free Node method

Use the **Free Node** method to add new nodes to the map as required. It is useful to have selected a background map provider before you do this. You do not need any existing nodes in the survey to use the **Free Node** method.

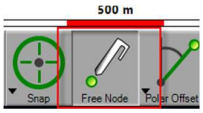
To add a new node to the map:

1. In the **Home** screen, tap 

then tap on the **Collect Method** bar to start the **Free Node** method.

***NOTE -** If the option is not available in the **Data Collection** screen, go to **Settings** / **Custom** in the **Home** screen to add it.*

This method stays active until another method is selected; the button remains highlighted while the method is active.



2. Tap the map at the required position. Penmap calculates the coordinates of the node from the location on the map; a small circle denoting a free node appears on the map

To exit the **Free Node** method, tap 

again or select a different method.

Chain/Offset

To use this method you must have two reference nodes positioned in the survey and know the chain distance and the offset distance, measured using a tape measure or a laser rangefinder.

This method is useful if, for example, you cannot measure a GNSS position for the target node but you have two nodes nearby you can use as reference nodes. You would draw a construction line between them and then measure the chain distance along the construction line until you are in the line with the target, then measure the offset distance to the target node.

Collecting a point using the chain & offset method:

1. In the **Home** screen, tap 

then tap 

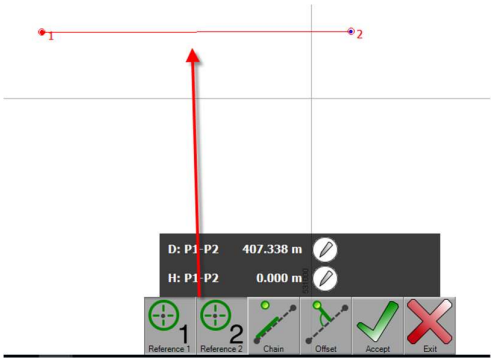
on the **Collection Method** bar to start the **Chain / Offset** method.

   ***NOTE -** If the option is not available in the **Data Collection** screen, go to **Settings** / **Custom** in the **Home** screen to add it.*

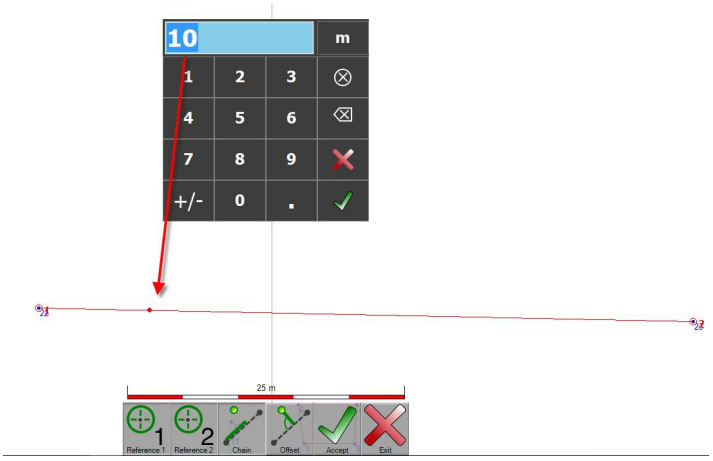
2. Select the two reference nodes that define the construction line. Tap 

and enter the horizontal chain distance from node 1. Then tap 

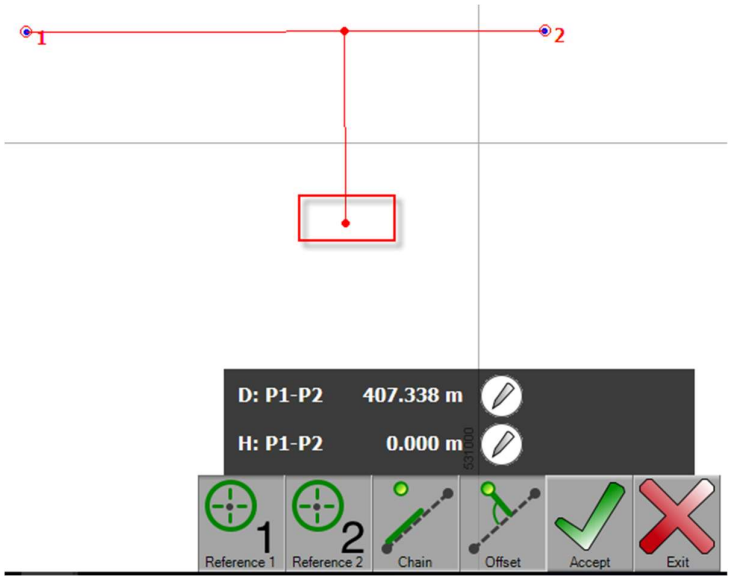
and tap the second node. The construction line appears on the map.



3. Measure and enter the horizontal chain distance from node 1. The chain value measurement is the distance from the first base node, along a line that joins the two base nodes and possibly beyond it, to a point where the normal to that line from the target node meets it. Tap  and enter the distance using the keypad.



4. Measure the horizontal offset distance. The offset value measurement is the distance along the normal from the target node to the end of the chain. Tap  and enter the distance using the keypad. The target node appears on the map. Positive values are right of the chain line, negative values left of it.

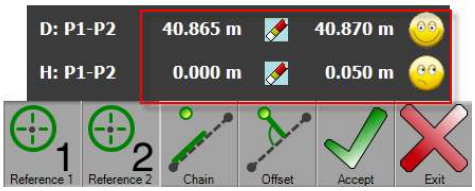


NOTE - *You can easily change the direction of the offset by clicking on the map. Tap the map to toggle between the two possible calculated positions for the target node.*

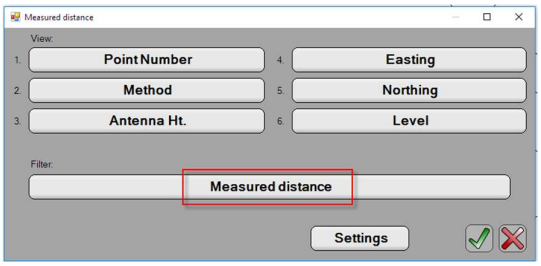
If you enter a negative distance value, you can use this method as the **Extend** method.

5. The Chain/Offset method is shown the baseline length and to allow to enter the measured ground measurements.

6. The calculated distance between the two reference points is displayed. If required, you can enter the measured ground distance and/or the height difference between the two points. Tap  and enter the distance. The values entered are checked against the defined tolerance:



NOTE - *The distance entered is listed in the Point Manager dialog when you use the* ***Measured distance*** *filter.*



You can preview, view, edit and delete the available distances.

7. Tap 

to create the node in the position shown.

   NOTE - *When the position of the node has been calculated, the construction line is still active; you do not have to select the reference points again, you can enter the new required values.*

Construction method

Use the **Construction** method to create construction objects from existing nodes and graphic elements.

This method enables you to create construction objects from which nodes are generated at the intersections of these objects.

Each option on this dialog creates a different type of construction object. Depending on the option you use when creating construction lines, you can choose a position for the object.

Tap on the map to change the sense of construction and to view the alternatives before selecting one.

If two or more construction lines intersect, a new construction node is created.

When you have created all required nodes on the map, close this method. You can then use a different method, for example, Snap Node method, to assign features to these nodes.

1. In the **Home** screen, tap 

then tap 

on the **Collect Method** bar *to start the Construction method.*
2. Use the options on the Construction toolbar to create an object:

Tap...	To create...
	a construction line parallel to another line.

	a construction line perpendicular to another line.
	a construction line intercepting another line at an oblique angle.
	a construction line defined by bearing.
	construction circle

When you create the first construction object, it appears in green on the map.

3. Create the next required construction object.
4. When you create the second construction object, it appears in green on the map and Penmap creates construction nodes at any/all intersection points.
5. Continue creating construction objects as required. When you have created all the required nodes, tap  to exit the **Construction** method. The construction lines disappear from the map, leaving only the new construction nodes.
6. Use the Snap Node method to assign the new construction nodes to features.

NOTE - *When creating construction lines, sometimes there is a choice of position for the object. Tap the map to toggle between the alternative positions. The construction line is created in the position shown when you tap*  *. To exit the selected construction type at any time, tap* 

Creating a construction line parallel to another line

Use this method to create a construction line parallel to an existing line defined by two nodes.

1. In the **Home** screen, tap  then tap  on the **Collection Method** bar.

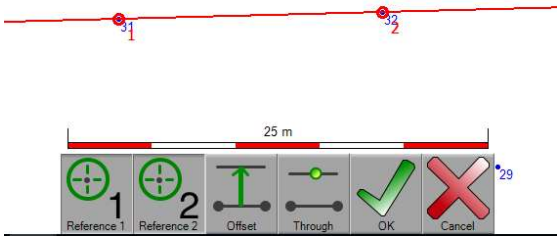
   NOTE – *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*

2. Tap  in the **Construction** bar.

3. Select the two reference nodes that define the construction line: tap 

and then tap the first node, then tap 

and tap the second node. The construction line appears on the map.



4. Do one of the following:

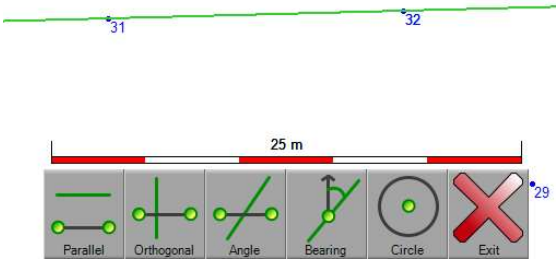
   - To enter the offset distance, tap 

. The construction line moves by the distance you entered. To move the construction line in the opposite direction, tap the map. Tap the map again to toggle between the alternative positions for the construction line.
   - Tap 

and then tap the node that the construction line should pass through.

5. Tap 

to create the construction line. The construction line is shown in green, showing it is active and in use.



Creating a construction line perpendicular to another line

Use this method to create a construction line perpendicular to an existing line defined by two nodes.

1. In the **Home** screen, tap 

then tap 

on the **Collection Method** bar.

***NOTE –** If the option is not available in the **Data Collection** screen, go to **Settings** / **Custom** in the **Home** screen to add it.*

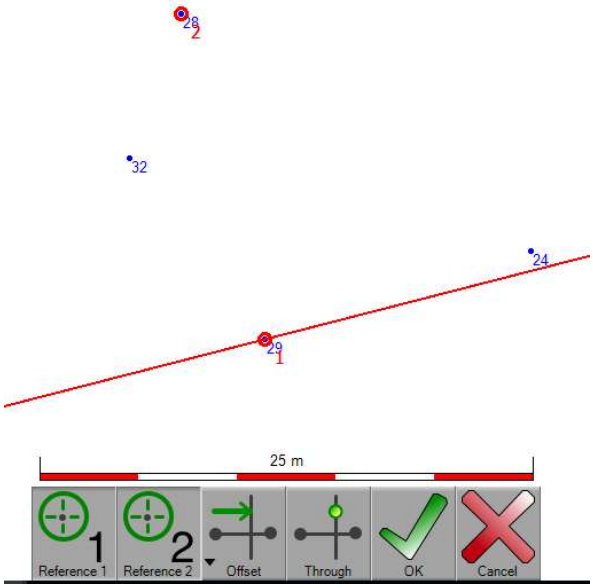
2. Tap 

in the **Construction** bar.

3. Select the two reference nodes that define the construction line: tap 

and then tap the first node, then tap 

and tap the second node. The construction line appears on the map.



4. Do one of the following:

   - To enter the offset distance, tap 

. The construction line moves by the distance you entered. To move the construction line in the opposite direction, tap the map. Tap the map again to toggle between the alternative positions for the construction line.

   - To use the middle point between node 1 and node 2, **Tap-Hold** 

. The button changes to 

. Tap 

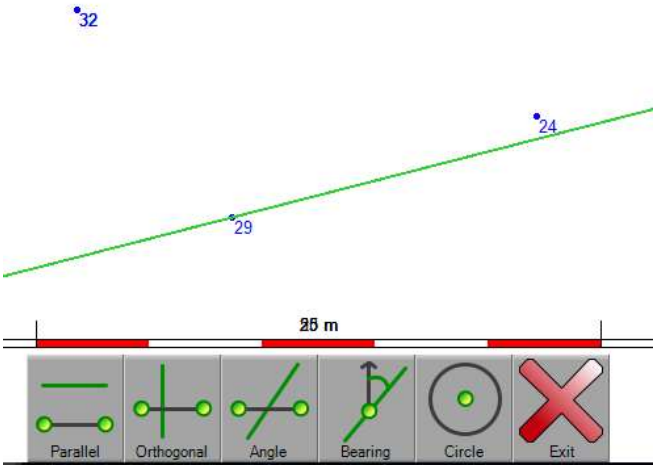
. The construction line moves to the middle point between the two nodes.

   - Tap 

and then tap the node that the construction line should pass through.

5. Tap 

to create the construction line. The construction line is shown in green, showing it is active and in use.



Creating a construction line intercepting another line at an oblique angle

Use this method to create a construction line in a specific angle to an existing line defined by two nodes.

1. In the **Home** screen, tap 

then tap 

on the **Collection Method** bar.

   NOTE – *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*

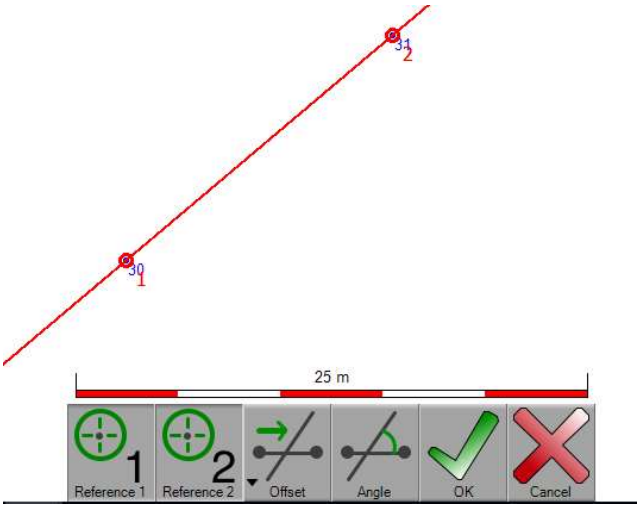
2. Tap 

in the **Construction** bar.

3. Select the two reference nodes that define the construction line: tap 

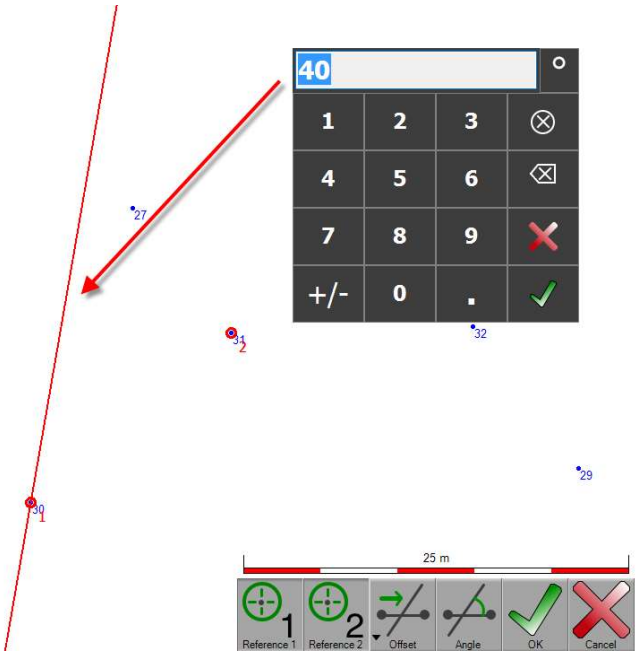
and then tap the first node, then tap 

and tap the second node. The construction line appears on the map.

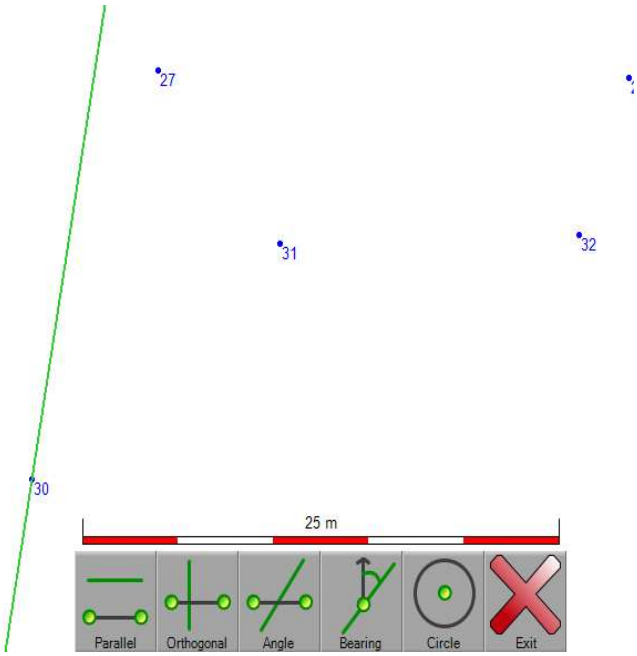


4. Do one of the following:

- To enter the offset distance, tap  . The construction line moves by the distance you entered. To move the construction line in the opposite direction, tap the map. Tap the map again to toggle between the alternative positions for the construction line.
- To use the middle point between node 1 and node 2, **Tap-Hold**  to change the button to  . Tap  - the construction line moves to the middle point between the two nodes.
- Tap  and then tap the node that the construction line should pass through.



5. Tap  to creae the construction line. The construction line is shown in green, showing it is active and in use.



Creating a construction line defined by bearing

Use this method to define a construction line by its azimuth angle from a reference node. This method is useful if you want to determine a feature position by two compass readings to two reference node (resection).

1. In the **Home** screen, tap 

then tap 

on the **Collection Method** bar.
   NOTE – *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*
2. Tap 

in the **Construction** bar.
3. Tap 

and then tap the node on the map to use as the reference node.
4. Tap 

and enter the azimuth value to the reference node.
5. Tap 

to create the construction line. The construction line is shown in green, showing it is active and in use.

Creating a construction circle

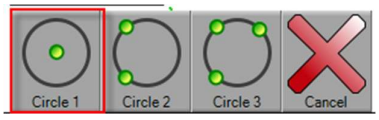
With this method you can create a construction line as a circle.

1. In the **Home** screen, tap 

then tap 

on the **Collection Method** bar.
   NOTE – *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*
2. Tap 

in the **Construction** bar.
3. To define the circle by:
   - Center point plus radius
     a. Tap 

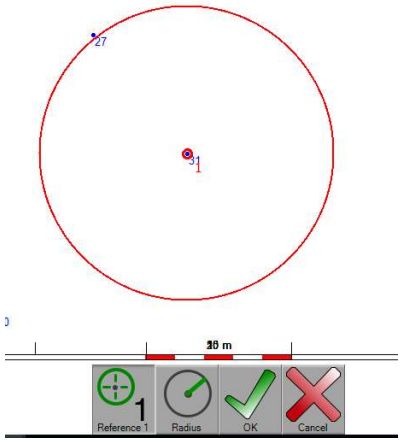
on the bar 

b. Tap 

and then tap the node to use as the reference node.

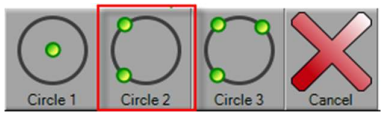
c. Tap 

to enter the radius.



- Two nodes on the circle plus radius

a. Tap 

on the bar 

b. Tap 

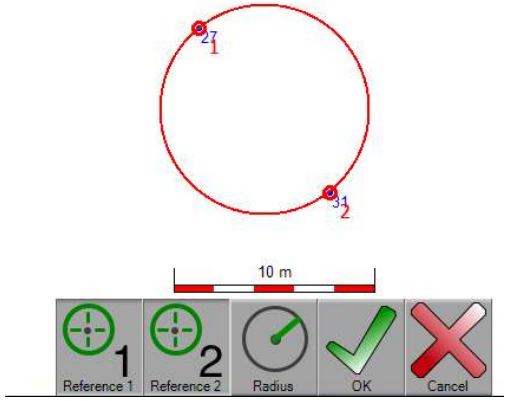
and then tap the first node to use as the reference node.

c. Tap 

and select the second one.

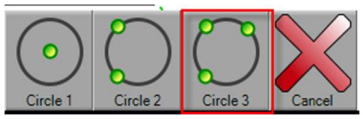
d. Tap 

and enter the radius.



- Three nodes on the circle

  a. Tap 

  on the bar 

  b. Tap 

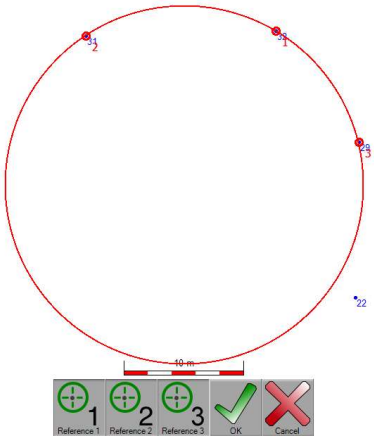
  and then tap the first node to use as the reference node.

  c. Tap 

  and select the second one.

  d. Tap 

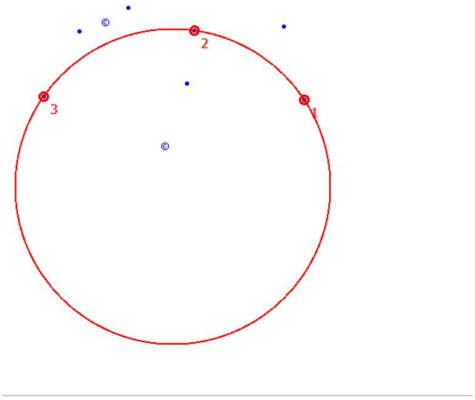
  and select the third node.



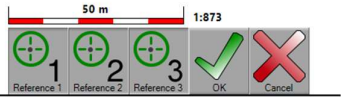
4. Tap 

to create the construction line. The construction line is shown in green, showing it is active and in use.

Create the final construction node(s)

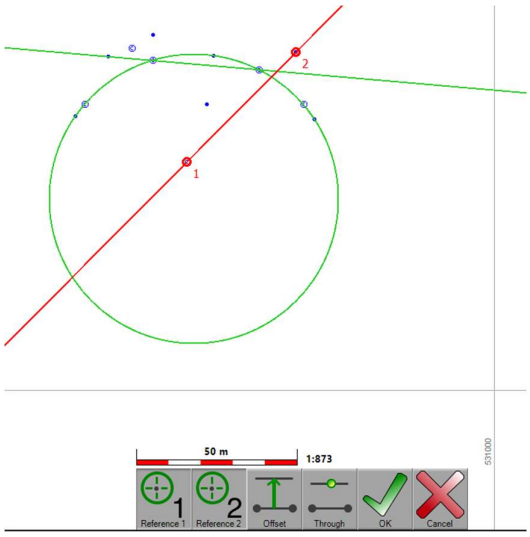


1. Define the first construction object, then tap 

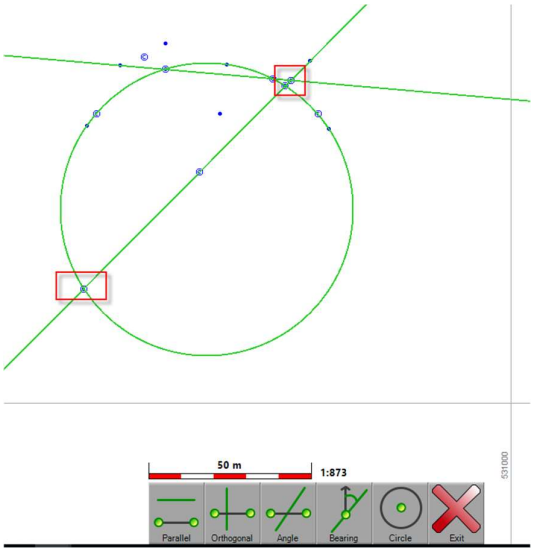
. 

2. Define the second construction object, shown in red here. Tap 

.



3. Penmap creates the construction nodes at all intersection points. You can add further construction objects if required



4. When you close the Construction method, the construction lines are removed, leaving only the new construction nodes. Use the Snap Node method (see Snap Node method) to attach graphic elements to them.

Walk method

Use the **Walk method** to quickly create a new object, for example a building.

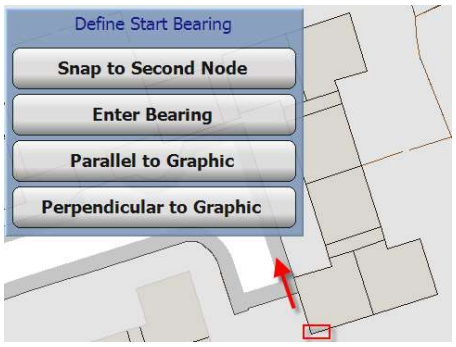
You must have a line / area feature, for example, feature **Building**, defined.

1. In the **Home** screen, tap  then tap  on the **Collection Method** bar.

   NOTE - *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*

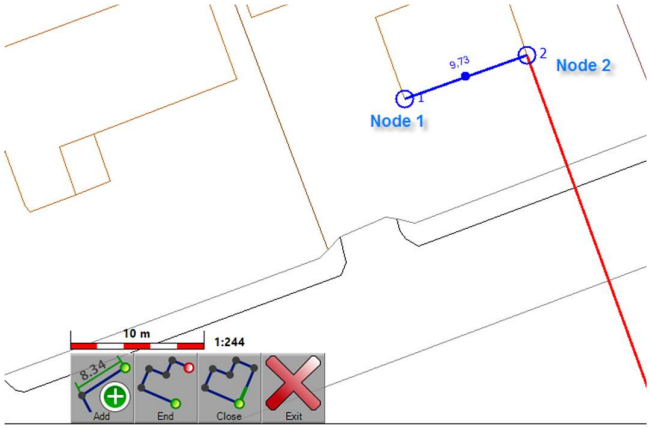
2. On the map, snap to the start node.

3. You can then define the bearing from the snapped node.

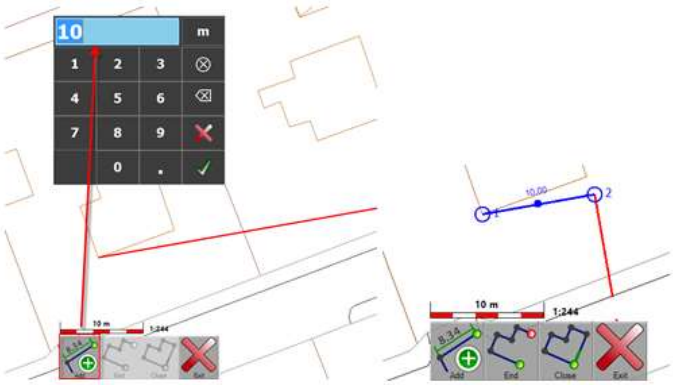


4. Do one of the following:

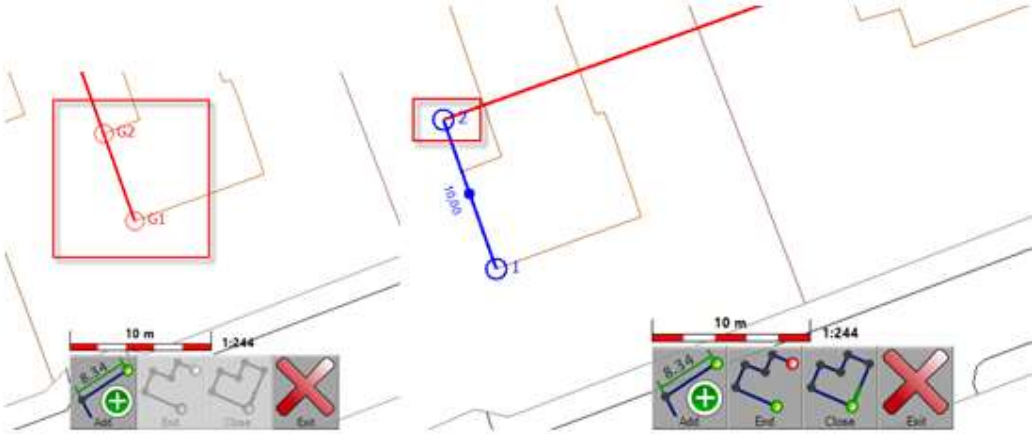
- **Snap to the second node**. Select the node from the map and use the distance from node 1 to node 2, or enter a distance manually. The first construction line between node 1 and node 2 is created.



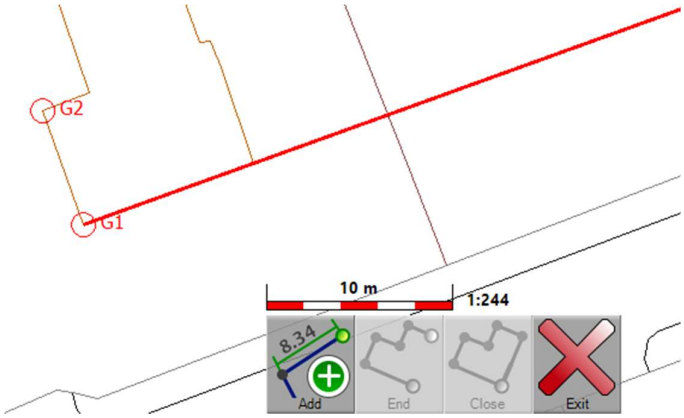
- **Enter a bearing**. Define the bearing from start node 1. Tap on the map to toggle between the two possible solutions. Then tap **Add** and enter the distance you want to use. The second node is created.



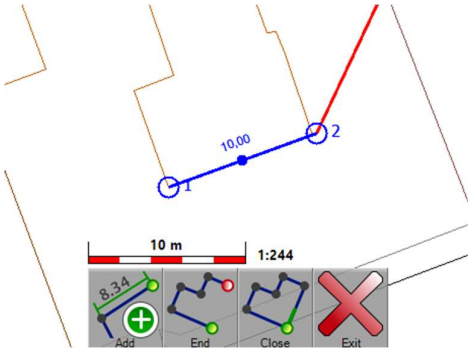
- **Parallel to graphic**. Select the start and end of the line. Tap on the map to toggle between the two solutions. Then tap **Add** and enter the distance you want to use. The second node is created.



- **Perpendicular to graphic**: Select the start and end of the line. Tap on the map to toggle between the two solutions. Then tap **Add** and enter the distance you want to use. The second node is created.



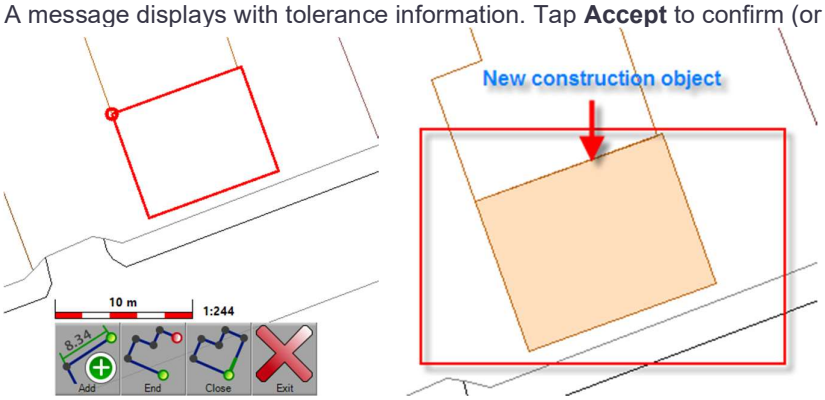
4. When the first and second nodes are created, tap on the map to change the direction (45° steps).



5. Tap  to enter the distance from node 2 to the next node that you want to construct. Repeat for all required nodes for the object.

6. Tap  to create a line feature, or tap  to create (and close) a polygon feature to finish the object.

7. A message displays with tolerance information. Tap **Accept** to confirm (or tap **Discard**).



Enter data method

Use the Enter data method to add a new node to the map by entering the coordinates of the node. The generated node is a free node.

To use this method you must know the plane or WGS84 coordinates of the target position.
To enter WGS84 coordinates as Latitude, Longitude and Altitude values you must define the transformation and projection parameters in the GNSS settings.

To add a new node to the map:

1. In the Home Scree, tap  then tap  on the **Construction Method** bar.
   NOTE - *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*

2. To enter coordinates, do one of the following:
   - Tap  Northing, Easting, Elevation

- Tap  for WGS84 coordinates (Latitude, Longitude, Height) in Degrees, Minutes, Seconds
- Tap  for WGS84 coordinates (Latitude, Longitude, Height) in decimal degrees

3. To toggle between N/S, tap ***N or S.***
4. Tap  for confirming.

Bilateration method

To use the **Bilateration** method you must have two reference nodes positioned in the survey and know their distance from the target node. Use a tape measure or laser rangefinder to measure the distance to the target node.

If you are using a Trimble Geo 7 series handheld, you can measure the reference node in real time and take the distance measurement with the integrated laser rangefinder.

Penmap constructs two arcs from the reference nodes and calculates where they intersect; it can then calculate the coordinates of the bilateration node.

You can survey a point using:

- The manual bilateration method. See Surveying a point using the manual bilateration method
- The GNSS bilateration method. See Surveying a point using the GNSS bilateration method

Surveying a point using the manual bilateration method

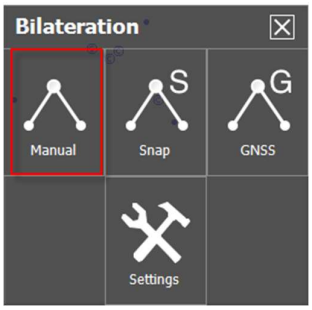
You can use this method in two scenarios:

- You start from one reference node and measure the distance to the target, then move to the second reference node and measure this distance to the target. This is ideal for a single feature.
- You can stay at the target (for example, a manhole, a tree) and take measurements to the two reference nodes (for example, the corner of a building). Then move to the next target and take new distance measurements to the same reference nodes. This is a very fast process when you want to collect multiple features or a line feature with a laser rangefinder to two known positions on the map (for example, positions already collected with the GNSS method).

1. In the **Home** screen, tap 

then **tap-hold** 

on the **Construction Method** bar, then select **Manual.**



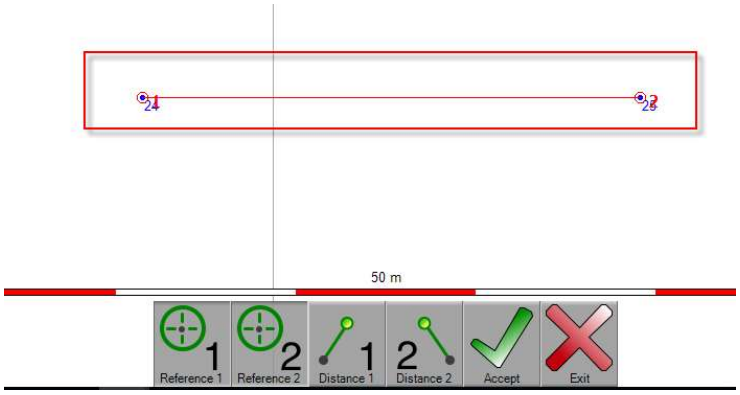
NOTE - *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*

2. Tap 

3. Select the two reference nodes that define the construction line; tap 

and then tap the first node, then tap 

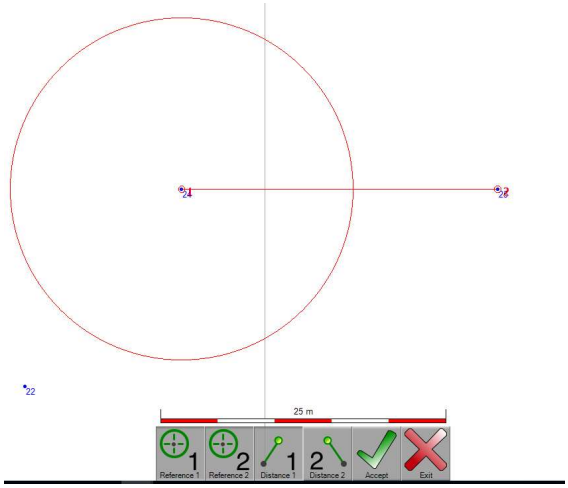
and tap the second node. The construction line appears on the map.



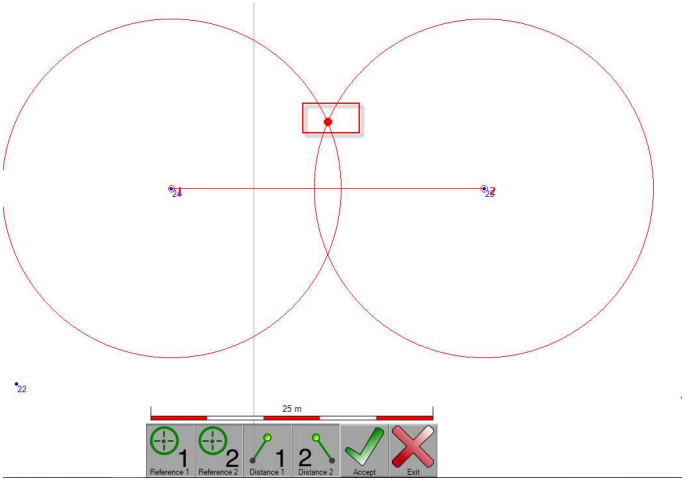
4. Measure the horizontal distance from node 1 to the target. Tap 

and enter the distance. The first

circle is displayed:



5. Measure the horizontal distance from node 2 to the target. Tap  and enter the distance. The second circle is displayed and the target node appears on the map.



6. Tap the map to toggle between the two possible calculated positions for the target node.
7. Tap  to create the node in the position shown.

Surveying a point using the GNSS bilateration method

If you are using a GNSS controller with integrated laser rangefinder, for example a Trimble Geo 7 series handheld, you can measure the reference points in real time and take the distance measurement with the laser rangefinder. You do not need known reference nodes.

Before you start, make sure you are connected to the controller's internal GNSS receiver.

1. In the **Home** screen, tap 

then **tap-hold** 

on the **Construction Method** bar, then select **GNSS.**

   NOTE - *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** / ***Custom*** *in the* ***Home*** *screen to add it.*

   The icon changes to 

.

2. **Tap-hold** 

then tap **Settings**, and define the rangefinder device settings. Tap  .

3. Tap 

to start the measurement. The current GNSS position is logged and stored as the first reference node.
4. Use the laser rangefinder of the controller to take your distance measurement. Save it.
5. Repeat for the second reference node.
6. Tap 

.

NOTE – *You can find a video tutorial for the Geo7x here* https://www.youtube.com/watch?v=xZ9s6inTifo&t=79s

Polar Offset method

To use this method you must have one node in position on the survey, to know its distance (measured by tape measure or laser rangefinder on the site) from the target node, and to determine North from a compass reading. From this data, Penmap can calculate the coordinates of the bearing and distance node.

If you are using a Trimble Geo 7 series handheld, you can measure the reference node in real time and take the distance measurement with the integrated laser rangefinder.

You can survey a point using:

- The manual polar offset method. See Surveying a point using the manual polar offset method

- The GNSS polar offset method. See [Surveying a point using the GNSS polar offset method]

Surveying a point using the manual polar offset method

1. In the **Home** screen, tap 

then **tap-hold** 

on the **Collection Method** bar, then select **Manual.**

   NOTE - *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*

2. Tap 

.

3. Tap 

to snap to the reference node.

4. Enter the Azimuth (compass reading) 

and the vertical angle 

.

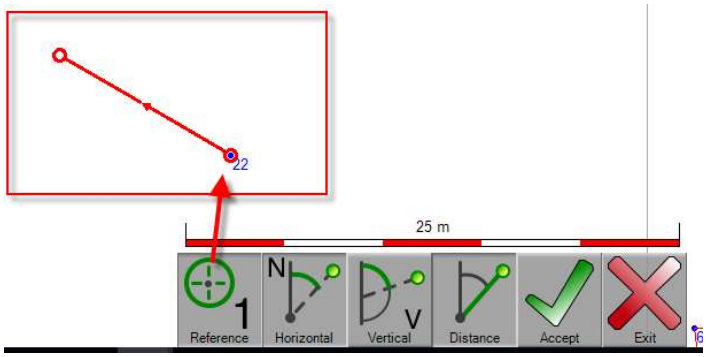
   NOTE – The default vertical angle is 90 degrees (horizontal); you do not need to enter it.

5. Tap 

to enter the horizontal distance to the target.

   The result displays on the map.

   Trimble Penmap will show the result on the map.



6. Tap 

to create the node or modify the data you entered.

NOTE - *You can create multiple bearing and distance nodes from a single reference node, by changing the azimuth or/and distance. Data entered already stays in memory for faster node creation.*

Surveying a point using the GNSS polar offset method

If you are using a GNSS controller with integrated laser rangefinder, for example a Trimble Geo 7 series handheld, you can measure the reference points in real time and take the distance measurement with the laser rangefinder. You do not need known reference nodes.

Before you start, make sure you are connected to the controller's internal GNSS receiver.

1. In the **Home** screen, tap 

then **tap-hold** 

on the **Collection Method** bar, then select **GNSS.**
   NOTE - *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*
   The icon changes to 

2. **Tap-hold** 

then tap **Settings**, and define the rangefinder device settings. Tap  .
3. Tap 

to start the measurement. The current GNSS position is logged and stored as the first reference node.
4. Use the laser rangefinder of the controller to take your distance measurement. Save it.
5. Repeat for the second reference node.
6. Tap 

.

Extend horizontal method

Use this method to do an extension (horizontal or slope) from a known node.

1. In the **Home** screen, tap 

then tap 

on the Construction Method bar. To use Extend Slope,

tap-hold the button; it changes to 

NOTE - *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*

2. Select the two reference nodes that define the construction line by tapping the node on the map. The keypad opens.
3. Enter the measured distance which should be extended from the second node of the construction line. The node is calculated.

Freehand method

Use the Freehand method to sketch with the pen on the screen. The method contains algorithms for automated shape recognition and can only be used in conjunction with line features.

Penmap automatically sets the Graphic element to Bezier curve. All Sketch nodes are treated as free nodes.

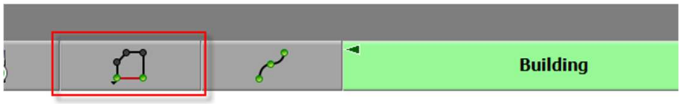
Penmap calculates its coordinate value from the position of the pen. A small circle denoting a Free node is displayed at that position on the survey.

This method is ideal for all highly-detailed features which are impossible or impractical to survey with traditional surveying methods. Use this method in conjunction with the GNSS or Total Station method which provide a very accurate framework for your freehand sketching.

1. In the **Home** screen, tap 

then tap 

on the **Construction Method** bar. ***NOTE -*** *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*
2. Use the pen to draw a sketch on the screen on the survey. To draw with the mouse, hold down the left mouse button while sketching.
3. To end the sketch, lift the pen off the screen or lift the finger off the mouse button. A series of free nodes with connecting line elements is displayed on the survey.
4. To finish drawing a freehand element, tap the **End**



feature button

5. **Tap-hold** the **End feature** button to toggle to **Close feature**. Then close the graphic element. Penmap draws a smooth curve. You can now also add a GIS record to this element.

Normal method

Use the Normal method to calculate the dropped perpendicular foot.

1. In the **Home** screen, tap 

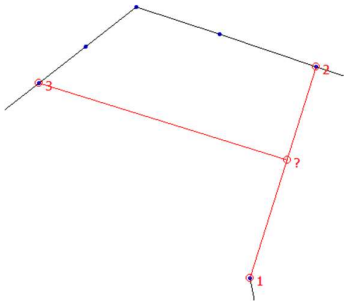
then tap 

on the **Construction Method** bar.
   NOTE - *If the option is not available in the* ***Data Collection*** *screen, go to* ***Settings*** */* ***Custom*** *in the* ***Home*** *screen to add it.*
2. Tap 

and 

to define the construction line
3. Tap 

to snap the node that should be calculated perpendicular to the construction line.



4. Tap 

to finish the calculation.

9 Settings

Display

In the **Home** screen, tap **Settings / Properties / Display** to open the **Display Settings** dialog.

Tap...	To...
Nodes	Switch on/off the display of all nodes on the map, in the foreground and the background. Tap  to change the status.

Graphics	Switch on/off the display of the current graphic. • Graphic foreground – imported data (for example, after GML or DXF import) • Graphick Background – raster data, base maps, or WMS. Tap  to change the status.
Grid size	Control the appearance of the map grid.
Sensitivity	Toogle the sensitive between Touch and Stylus. You can use either your finger or a stylus in either mode, but selecting a specific mode improves the screen sensitivity, for example, if **Touch** is selected, it facilitates the picking of nodes from a point cloud. If you only work using your finger, use **Touch** mode; if you only use a stylus, use **Stylus** mode.

Application

In the **Home** screen tap **Settings / Properties / Applications** to open the **Application Settings** dialog.

Tap...	To...
Point number	Select the point number format you want to use. • for numeric point format, select, for example Simple 9 (9 digits) or Simple 17 (17 digits). • For point numbers with numbers and/or characters, select **Alpha-numeric.**
Increments	Select the increments format you want to use

	when generating nodes. For example 1 (1->2) or 5 (1->6)
Comment	Switch on/off the display of comments on the map. Tap On to change the status.
Show level	Show level/height of nodes on the map. Select meter, decimeter, centimeter or millimeter. Or, to not have any levels on the map, select **Off.**
Text size	Select the text size for the comments on the map.
Stakeout coarse/fine	Define the limit that the stakeout graphic changes from coarse (thin blue line to indicate the direction to walk) to fine (target node is in the center of the map area and blue circles indicate the distance to the target).
Ignore zero	Switch on/off the vertical height stakeout for the target node Tap On to change the status.

General

In the **Home** screen tap **Settings / Properties / General** to open the **General Settings** dialog.

Tap...	To...
Language	Select your preferred language.
Library	Select your preferred coordinate system library. Penmap supports two libraries at the moment: • Trimble

	• Penmap See Coordinate system settings.
Units	Select your preferred units for distances and angles.
Project Reduction	Use a reduction for your project. The requirement is that you have the corresponding coordinate system (UTM or the German used Gauss-Krueger and Soldner).

License

In the **Home** screen tap **Settings /Properties / License** to open the **License Settings** dialog.
This dialog displays your serial number.

Tap...	To...
Enter License	Register a new license for the hardware that Penmap is installed on.
Reset Trial	Extend your current demo license. ***NOTE –*** *To extend a demo license, contact your support dealer.*

Tolerances

In the **Home** screen tap **Settings / Properties/ Tolerances** to open the **Tolerances Settings** dialog.

Tap...	To...
Resection/Calibration	Tap the buttons to enter the horizontal and vertical tolerance for your Total Station stationing (Resection and Known Station) and your GNSS calibration.

Stakeout	Tap the buttons to enter the horizontal and vertical tolerance for the **Stakeout Node** function.
Verify	Tap the buttons to enter the horizontal and vertical tolerance for the **Verify Node** function.
GNSS	Change the sigma values (95% or 67%)
Traverse	Change the tolerance values dA, dL and dQ.

Defaults

In the **Home** screen, tap **Settings / Properties / Defaults** to open the **Default configuration** dialog.

You can save a new **config file** which contains all related project settings and configuration:

- Receiver and instrument settings
- Real-time correction settings
- Coordinate System settings
- Properties settings

The files are stored at **C:\ProgramData\Trimble Penmap encore\settings\presets.** You can copy these files to other devices.

Tap...	To...
	Create and save a new configuration.
	Delete a configuration file.

 Factory defaults	Reset all Penmap settings to factory default. All sensor related configurations are deleted.

Coordinate system settings

Penmap offers two different coordinate system libraries:

- Trimble
- Penmap

⚠ **CAUTION** – DO NOT change the coordinate system unless the survey is empty. If the coordinate system is changed. Penmap does not change it for data that has already been collected.

1. In the **Home** screen, tap **Settings / Properties / General / Library.**
2. Tap the Library button to select the Trimble coordinate system library or the Penmap coordinate system library.

The main difference between the Trimble library and the Penmap library is the amount of supported coordinate systems. The Trimble library also only allows you to download Geoid files directly. The main transversal mercator coordinate systems are the same.

You can also define a new coordinate system. See Define a new coordinate system, page 170.

Trimble coordinate system library

1. In the **Home** screen, tap **Settings / Properties / General / Library.**
2. Tap the Library button and select the Trimble coordinate system. The Trimble coordinate system library dialog opens.

NOTE – *You can also access this from the* ***Home*** *screen /* ***Setup / GNSS Settings / Coordinate System.***

Tap...	To...
System	Scroll up or down, then tap to select the coordinate system you want to use. The systems are listed in alphabetical order.
Zone	Select the zone you want to use. The zones available will depend on the coordinate system you selected. ***NOTE –*** *The Datum is set automatically and cannot change.*
Geoid	Scroll up or down, then tap the geoid file you want to use. The geoid files are listed in alphabetic order.
Show at Startup	Turn on/off the display of the coordinate system after creating a new project. If this option is On the dialog pops up every time you create a new project. If this option is Off , it won't display.
	View information about the coordinate system.
	Confirm the settings. If coordinate system related files GGF and/or DGF files are still needed, tap Download in the upcoming dialog. The downloaded files are saved on ***C:\ProgramData\Trimble\GeoData.*** ***NOTE –*** *If you want to work with geoid files + ShiftGrid files, be aware the files are located on your Tablet PC. If you don't have an internet*

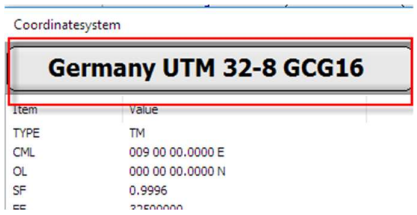
	connection for downloading these files in real time, copy the corresponding files manually to your device.

Penmap coordinate system library

1. In the **Home** screen, tap **Settings / Properties / General / Library.**
2. Tap the **Library** button and select the Penmap coordinate system. The Penmap coordinate system library dialog opens.

   NOTE – *You can also access this frim the* ***Home*** *screen /* ***Setup / GNSS Settings / Coordinate System.***

   The following options are available:

Tap...	To...
	Scroll up or down, then tap to selet the coordinate system you want to use.
	View information about the coordinate system.
	Turn on/off the display of the coordinate system after creating a new project. If this option is On  the dialog pops up every time you create a new project. If this option is Off  , it won't display.
	Confirm the settings.

Define a new coordinate system

Use the **Coordinate System Manager** tool to define a new coordinate system:
NOTE – *if you want to define a new geoid definition, the geoid name must be the same as the name of the geoid file (*.ggf).*
NOTE – *If you want to define a new grid definition, the grid name (name.sgf) must be the same as the geoid file name (name.ggf).*

1. Navigate to the coordinate you want, then right-click it and select **Export**.
2. In the **Export** dialog, select **Selected records only** and click **OK**.
3. Save the file to the folder C:\ProgramData\Trimble\GeoData, with a file type of ***.JXL.**
4. Open a Penmap project and go to the Coordinate System Settings.
5. Under **System**, select **My Systems**.
   NOTE – *This is only available if there is a .jxl file in the GeoData folder; it must not be in a sub-folder (this can happen at Export).*
6. Under **Zone**, select the coordinate system you defined.

iFeature Editor

- Defining a new iFeature class in the template
- Editing an iFeature in the template
- Adding an iFeature class to the Favorites list

Defining a new iFeature class in the template

To add a new ***iFeature definition*** to the template:

1. In the **Home** screen, tap ***Settings / iFeature*** .
2. Tap **Add**. The **Add Feature** dialog displays.
3. In the **Feature name field**, enter the name to use for this iFeature class.
4. In the **Code field**, enter the code to assign to iFeatures of this class.
5. Tap **Page** and then select the template page in which this iFeature class will appear. You can find the template page in the iFeature selector. You can also create a new page by tapping **New.**
6. Tap **Feature type** and then select the feature type (point, text, polyline, or area).
   NOTE – *If you select point or text type, an additional option **Adjust after place** displays. If you select this option, when a point object with a symbol and text object is generated, the adjustment dialog opens automatically.*
7. Tap **GIS** to select the GIS form that can be added to iFeatures of this class.
8. Tap Layer and then select the layer in which the iFeatures of this class will appear.
   NOTE – *You can configure using the **LSG** dialog (**Home** screen / **Sidebar / Tab Layers / Button Layer Settings).***
9. Tap **Graphic element** and select the graphic element used to represent iFeatures of this class. Options available depend on the Feature type you selected

- For Point feature types:

Select ...	Then...
Point	In the **Point style** field, select the symbol to use for features of this class.
Symbol 1 pt.	In the **Symbol name** field, select the symbol to use for the feature. In the fields below the **Graphic element** field, enter the width, height, and degrees of rotation for the symbol.
Symbol 2 pt.	In the Symbol name field, select the symbol to use for the feature. You must create two nodes to draw the symbol on the map.
Text	In the **Graphic element** field, enter the height and degrees of rotation to use for the text in the fields below the **Graphic element** field.

- For Polyline or Area feature types:

Select from...	When collecting the feature you will need to add...
Arc	At least three nodes.
Circle 1 point	One node in the center of the circle and a radius value.
Circle 2 point	Two nodes: one node in the center of the circle and one node on the edge.
Circle 3 point	Three nodes on the edge of the circle.
Curve	At least three nodes.
Polyline	At least two nodes.
Rectangle 2 point	Two nodes along one side of the rectangle and a height value.
Rectangle 3 point	Three nodes: two nodes along one side of the rectangle and one node on the opposite side.

10. Tap ***Save*** to return to the **iFeature template** screen.

11. Tap  to accept the changes

12. Tap **Update system now** to save the settings directly in the current template. Or tap **Save into new template** to save it into a new template.

Editing a iFeature in the template

To edit, delete or copy an existing iFeature

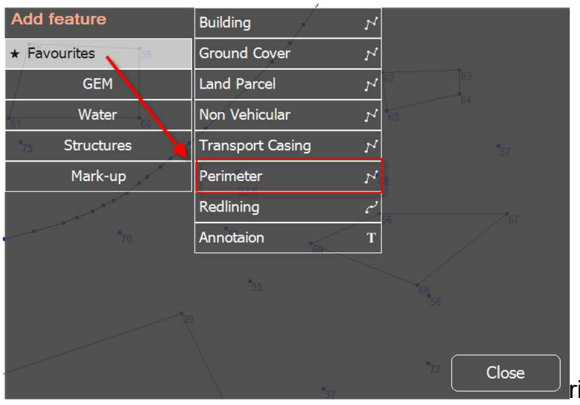
1. In the **Home** screen, tap **Settings / iFeature.**
2. Select an iFeature, then tap **Edit, Delete**, or **Copy.**

Adding an iFeature class to the Favorites list

To add an iFeature class to the Favorites list in the **iFeature** selector dialog screen:

1. In **Home** screen tap **Settings / iFeature.**
2. Select an iFeature, then tap 
3. Tap  then tap **Update system now.**

On the Data Collection screen, tap the Select iFeature button to open the iFeature selector. The iFeature you added the Favorites list appears:



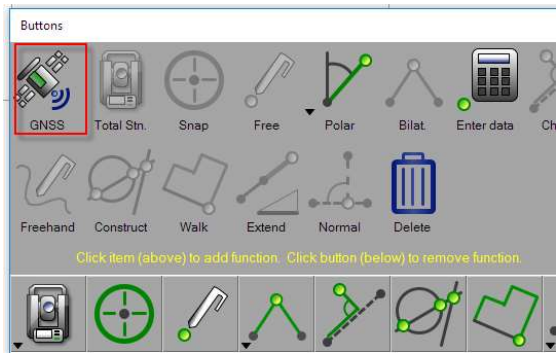
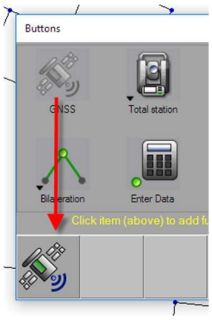
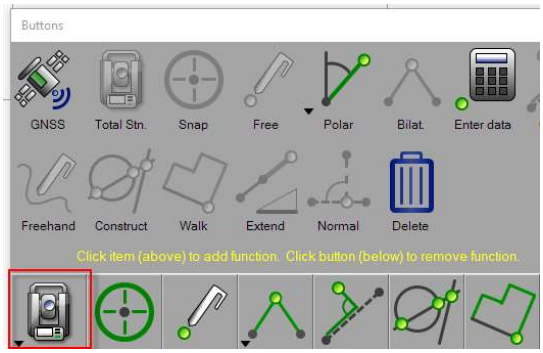
rite.

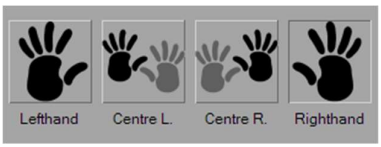
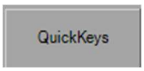
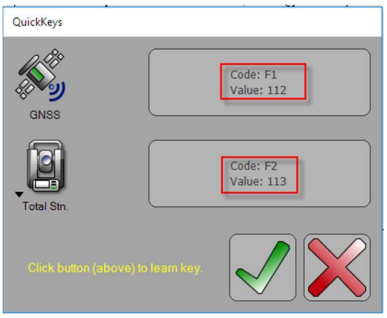
Using the Trimble Penmap Customizer

The Trimble Penmap Customizer provides an easy way to configure the available methods in the Data Collection application and for the Edit functions. You can add, remove, and change the order of the available methods in the lower Collection Methods bar and Edit bar (maximum 12 methods).

1. In the **Home** screen, tap ***Settings / Custom*** to open the customizer dialog:

You can configure the **Collect Method** bar (Data application screen).

Tap...	To...
On item in the section above.  	Add the selected item to the collect bar bar. ***NOTE –*** *After adding the item is displayed in grey.*  Repeat the steps for different items which you want to use for collecting data.
On item in the section below  	Remove this function from the **Collect Method Bar**.
	Remove all functions/items from the **Collect Method** bar quickly.

	Change the position of your items in the **Collect Method** bar. By switching between left hand and right hand the order of the items are changed in the opposite direction.
	Linked a key from your PC to use it for quick access to GNSS or Total Station method and to start a measurement directly with a button of your Tablet PC. Tap  and then tap any key on your machine, e.g. F1 button on the keypad to link them to the GNSS or Total Station method:  ->  Tap  to accept the configuration. The linked buttons for quick keys are displayed on the button:  If you do a tap on e.g. the ***F1 button*** on your key pad, a measurement will be started.
	Accept the settings and close the dialog.

	Discard the settings and close the dialog

Symbols settings

The Symbol toolbox controls the library of graphical symbols (e.g. AutoCAD blocks).
If you import a file including block information, these symbols will be automatically added to the current symbol library. You can define or modify the anchor nodes, change the default symbol size and save the symbols into a new library.

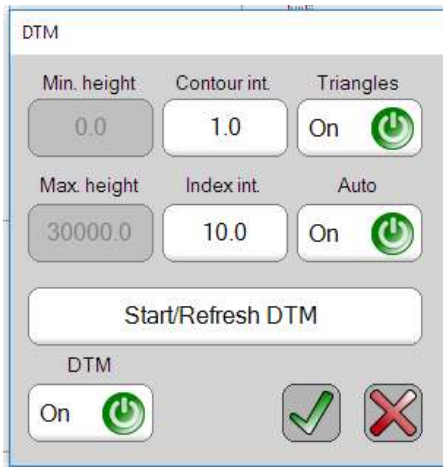
In the **Home** screen, tap **Settings / Symbols** to open the **Symbol** dialog.

Tab	Content
Main	Review symbols and define if you want to use one or two anchor nodes
Layer	Define the corresponding layer.
Anchors	Define the position of the symbol's anchor nodes.
Library	Save symbols into a library file.
Content	• Remove symbol from library • Restore removed symbol to library

DTM

You can generate a DTM from your survey nodes.

On the **Home** screen, tap **Settings / DTM** to open the **DTM dialog.** Define your preferred settings:


DTM
Min. height
Contour int.
Triangles
0.0
1.0
On
Max. height
Index int.
Auto
30000.0
10.0
On
Start/Refresh DTM
DTM
On

10 GNSS Setup

Instrument settings Trimble Receiver

To configure a Trimble receiver, in the **Home** screen tap **Setup** and then select **GNSS Settings.** The **GNSS Settings** dialog has the following options:

- **Turn Autoscroll ON/OFF.** If active, the GNSS position is scrolled automatically to the middle of the map when you close the current map view.

  NOTE – *If the option shows **Turn Autoscroll OFF**, it means it is active; tap to turn it off. If the option shows **Turn Autoscroll ON**, it means it is inactive; tap to turn it on.*
- **GNSS receiver.** Set up the sensor settings for connection to the receiver. See Sensor settings below.
- **Coordinate System.** Change or select the coordinate system.

  Change or select the coordinate system.
- **Real-time Corrections.** Add and edit the NTRIP correction data.

- **Collection Mode.** Define how the points should be measured (single, epoch, distance, time and additionally for R10 tilt or auto).
- **Quality.** Define the RMS accuracy and the elevation mask.

Sensor settings

To configure the sensor settings, in the **Home** screen tap **Setup** and then select **GNSS Settings / GNSS Receiver.** The following options are available:

- **Manufacturer.** Select the manufacturer of the receiver. In this case, Trimble.
- **Model.** Select the model type. For example, R10.
- **Connection.** Select the medium to use for the GNSS connection:
  - ***Serial*** (serial cable or virtual Bluetooth COM Port which was configured via the Windows Bluetooth stack).
  - ***Bluetooth.*** If you choose Bluetooth, Penmap searches for Bluetooth devices within range; tap **BT** to start the search and pairing of the Bluetooth devices.
  - If you are using a Trimble R10 receiver, you can also use **Wi-Fi.**

Tap **Advanced** to configure the GPRS provider settings:

- If you are using the modem in the receiver and the NTRIP correction data will be received via an internal SIM card in the receiver, enter the provider settings for your SIM card. Penmap offers many default providers; tap Presets to select one. If the provider you want is not listed, manually enter its credentials.
- If you want the NTRIP correction data connection to start automatically when the GNSS sensor connected, select the Auto start option.

Tap **Test** to check if the GNSS connection can be established correctly. When successfully connected, a dialog displays the receiver details (firmware, device name, services).

Instrument settings Leica receiver

If you have not yet configured GNSS settings for the project, you are prompted to do so when you select the GNSS survey method. To configure a Leica receiver, in the **Home** screen tap **Setup** and then select **GNSS Settings**. The **GNSS Settings** dialog has the following options:

- Turn **Autoscroll ON/OFF**. If active, the GNSS position is scrolled automatically to the middle of the map when you close the current map view.

NOTE – *If the option shows **Turn Autoscroll OFF**, it means it is active; tap to turn it off. If the option shows **Turn Autoscroll ON**, it means it is Inactive; tap to turn it on.*

- GNSS receiver. Set up the sensor settings for connection to the receiver. See Sensor settings below.
- **Coordinate System.** Change or select the coordinate system.
  Change or select the coordinate system.
- **Real-time Corrections.** Add and edit the NTRIP correction data.
- **Collection Mode.** Define how the points should be measured (single, epoch, distance, time).
- **Quality.** Define the RMS accuracy and the elevation mask.

Sensor settings

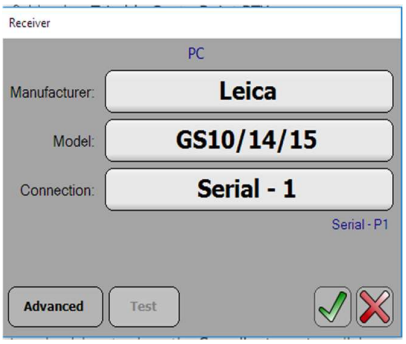
To configure the sensor settings, in the **Home** screen tap **Setup** and then select **GNSS Settings / GNSS Receiver.** The following options are available:

- **Manufacturer.** Select the manufacturer of the receiver. In this case, Leica.
- **Model.** Select the model type. Penmap supports the model types GS10, GS14, GS15, and GS16.
- **Connection.** Select the medium to use for the GNSS connection:
  - ***Serial*** (serial cable or virtual Bluetooth COM Port which was configured via the Windows Bluetooth stack).
  - ***Bluetooth.*** If you choose Bluetooth, Penmap searches for Bluetooth devices within range; tap **BT** to start the search and pairing of the Bluetooth devices.

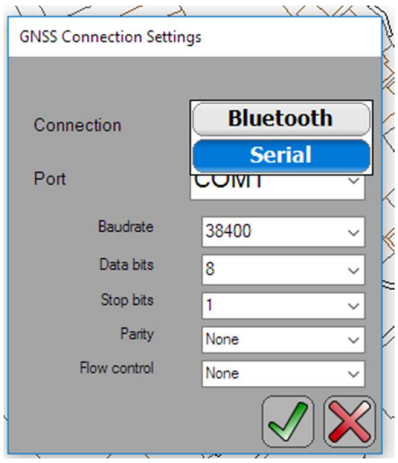
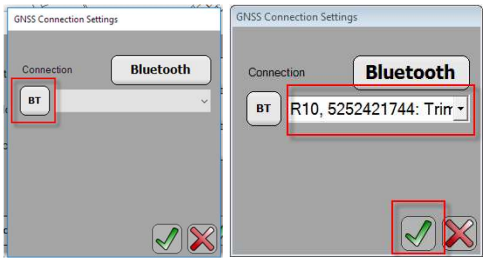
Tap **Advanced** to configure additional settings:

- **GPRS Bearer.** If you are using the modem in the receiver and the NTRIP correction data will be received via an internal SIM card in the receiver, enter the provider settings for your SIM card. Penmap offers many default providers; tap Presets to select one. If the provider you want is not listed, manually enter its credentials.
  If you want the NTRIP correction data connection to start automatically when the GNSS sensor connected, select the Auto start option.
- **RTK Stream.** Select your correction stream and your network by clicking on the button below the list.
- **Modem Rover.** Select the modem which is connected to the GNSS receiver. When you have confirmed the message *Receiver must be switched on and configured for correct port*, a list of modems displays. Select the correct modem type (for Leica GS15 it should be modem type **Telit GSM SLG1**). If you are unsure what type of modem type is connected to your Leica receiver, check with Leica support.
  After choosing the modem type, select **Port 3 (slot_in)**

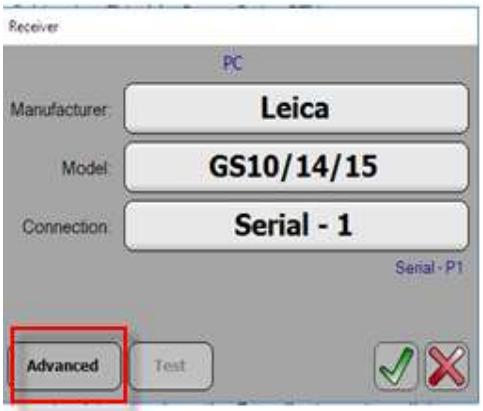
In the **Home** screen, tap ***Setup / GNSS Settings / GNSS Receiver*** to do the sensor settings.

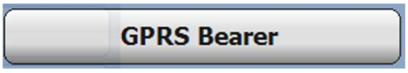


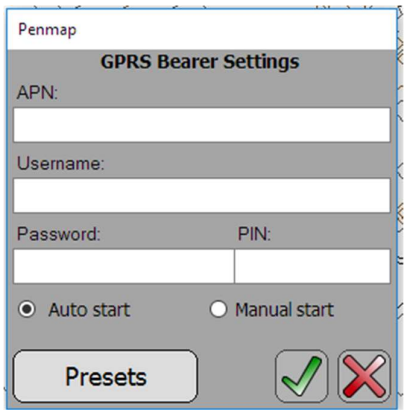
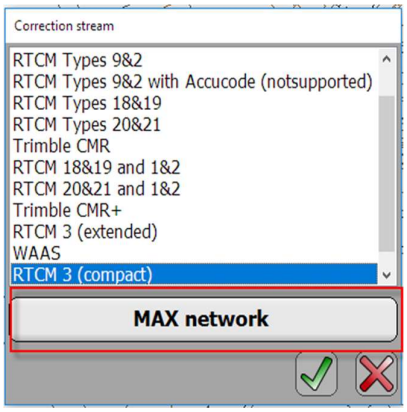
Item	Option...
Manufacturer	Select the manufacturer of the receiver. In this case **"Leica"**
Model	Trimble Penmap supports the model types **GS10, GS14, GS15 and GS16.**
Connection	Select your medium which should be used for the GNSS connection. You have the possibility to establish the connection via ***Serial*** (serial cable or virtual Bluetooth COM Port which was configured via the Windows Bluetooth stack) or with ***Bluetooth***. If you choose ***Bluetooth***, Trimble Penmap looking after a Bluetooth devices.

	 Tap the button ***BT*** do start the searching and pairing of the Bluetooth devices. 

Tap the button  to configure further needed settings:



Tap...	To...
	• If using ***Modem in receiver***, enter the needed provider settings of your SIM card if

	the NTRIP correction data should be received via an internal SIM card in the receiver. Trimble Penmap offers many default providers which you can select via the button Presets. If your desired provider is not available in the list just entering manually the credentials. • Deciding if the NTRIP correction data connection should be started automatically after successful GNSS sensor connection. If so check the option **“Auto start”.**
 	Select your correction stream and your network by clicking on the button below the list
	Select the plugged modem in the GNSS receiver. After confirming the message “Receiver must be switched on and configured for correct port” you are getting a modem list. Choose from the list the right modem type. If you are doubtful what kind of modem type is plugged in your Leica receiver, ask your Leica support.

Coordinate System Settings

Penmap offers two different coordinate system libraries:

- Trimble
- Penmap

⚠ **CAUTION –** DO NOT change the coordinate system unless the survey is empty. If the coordinate system is changed. Penmap does not change it for data that has already been collected.

1. In the **Home** screen, tap **Settings / Properties / General / Library.**
2. Tap the Library button to select the Trimble coordinate system library or the Penmap coordinate system library.

The main difference between the Trimble library and the Penmap library is the amount of supported coordinate systems. The Trimble library also only allows you to download Geoid files directly. The main transversal mercator coordinate systems are the same.

NOTE – *You cannot add new coordinate systems; you can only select from what Penmap offers. If you need a coordinate system which is not available in Penmap, contact your support dealer.*

Trimble coordinate system library

1. In the **Home** screen, tap **Settings / Properties / General / Library.**

2. Tap the Library button and select the Trimble coordinate system. The Trimble coordinate system library dialog opens.

   NOTE – *You can also access this from the* ***Home*** *screen /* ***Setup*** */* ***GNSS Settings*** */* ***Coordinate System.***

Tap...	To...
System	Scroll up or down, then tap to select the coordinate system you want to use. The systems are listed in alphabetical order.
Zone	Select the zone you want to use. The zones available will depend on the coordinate system you selected. ***NOTE –*** *The Datum is set automatically and cannot change.*
Geoid	Scroll up or down, then tap the geoid file you want to use. The geoid files are listed in alphabetic order.
Show at Startup	Turn on/off the display of the coordinate system after creating a new project. If this option is On , the dialog pops up every time you create a new project. If this option is Off , it won't display.
	View information about the coordinate system.
	Confirm the settings. If coordinate system related files GGF and/or DGF files are still needed, tap Download in the upcoming dialog. The downloaded files are saved on ***C:\ProgramData\Trimble\GeoData.*** ***NOTE –*** *If you want to work with geoid files +*

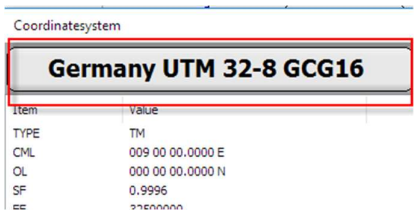
	ShiftGrid files, be aware the files are located on your Tablet PC. If you don't have an internet connection for downloading these files in real time, copy the corresponding files manually to your device.

Penmap coordinate system library

1. In the **Home** screen, tap **Settings / Properties / General / Library.**
2. Tap the **Library** button and select the Penmap coordinate system. The Penmap coordinate system library dialog opens.

   NOTE – *You can also access this frim the* ***Home*** *screen /* ***Setup / GNSS Settings / Coordinate System.***

   The following options are available:

Tap...	To...
	Scroll up or down, then tap to selet the coordinate system you want to use.
	View information about the coordinate system.
	Turn on/off the display of the coordinate system after creating a new project. If this option is On  , the dialog pops up every time you create a new project. If this option is Off  , it won't display.
	Confirm the settings.

Real-time corrections

For improved accuracy, connect to a real-time correction service to apply corrections to GNSS data in real time.

Depending on the model of the GNSS receiver you are using, you may be able to connect to any of the following types of real-time correction service:

- NTRIP broadcast server
- Radio Link
- Trimble CenterPoint RTX service (if you are using a Trimble receiver)
- SBAS Radio (if you have a base station)

***NOTE** - The services RTX and SBAS are only available if you are using a Trimble receiver.*

You can define various real-time correction settings and assign names to them. This makes it very easy to switch between different correction data streams (e.g. when using NTRIP).

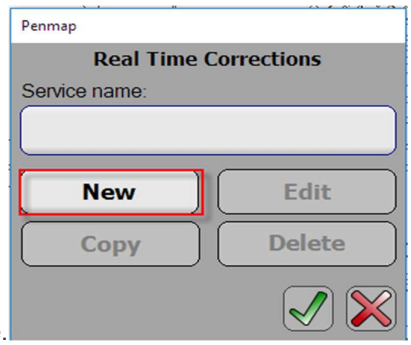
Setting up your NTRIP correction service

NTRIP is a convenient way to receiver real time correction data in the field using an internet connection. You will need a mobile phone respectively an integrated 3G module in the PC, or an integrated modem in the GNSS receiver.

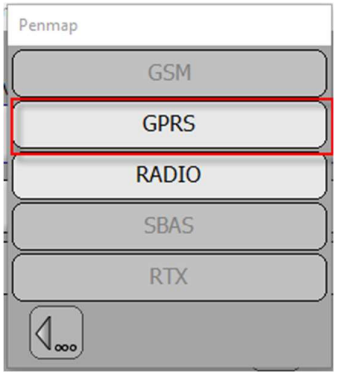
Make sure the SIM card is integrated in your receiver and working correctly.

To setup an NTRIP service:

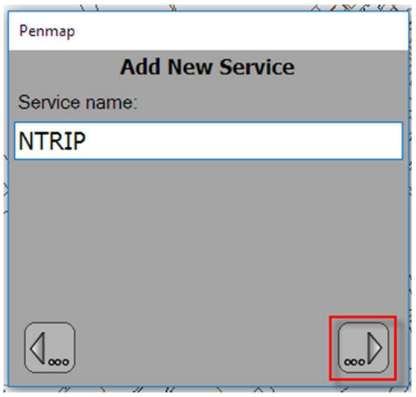
1. In the **Home** screen, tap **Setup / GNSS Settings / Real-time Corrections.** The Real-time corrections dialog opens.



2. Click **New** to create a new real-time correction service.
3. Select the correction data source **GPRS.**

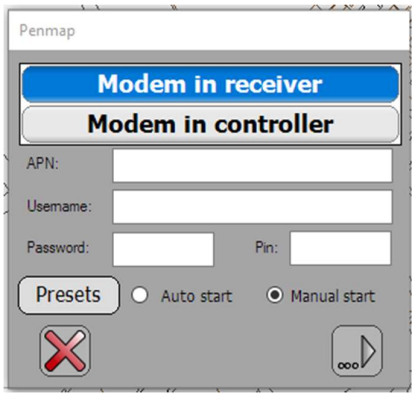


4. Enter a name for this service and click .



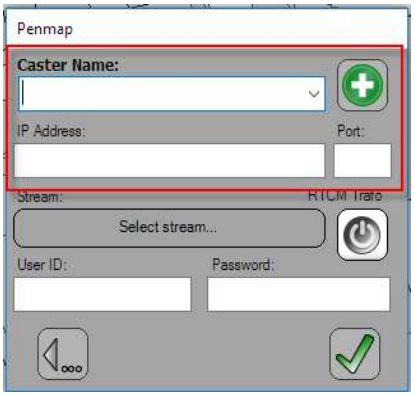
5. If you want to use an integrated SIM card in the receiver to connect to the Internet, select **Modem in receiver**. If you are using a SIM card in the PC or want to use an external Internet connection (WLAN, Network), select **Modem in controller.**

   If you select **Modem in receiver**, you can enter the GPRS Bearer settings, and select **Auto start** or **Manual start** to start the NTRIP connection automatically or by hand after a successful GNSS connection.

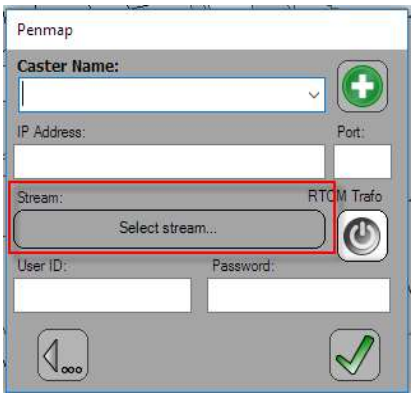


   Tap

6. Select the Caster name from the drop-down list. The Penmap NTRIP client contains a database of the most common NTRIP casters worldwide; select your country and Penmap suggests available casters.
   The IP Address and Ports fields are automatically completed. If the service you want to connect is not listed, enter the known IP Address and Port number, or tap and then enter the Caster name and the IP Address and Port number to connect to.



7. Tap Select stream and select the Mountpoint.



   - If you have an active Internet connection, tap Use Internal. The corresponding sourcetables are displayed.
   - If you don't have an active Internet connection, tap No internet and enter the Mountpoint details manually. Enter the Mountpoint name, choose format RTCM 3.x and select Requires NMEA. Then tap .

   NOTE – *If you have a GNSS connection established before, you can use the internal mobile connection of the receiver to download the sourcetables as well.*

8. Enter your NTRIP username and password and tap to save the settings as a new real-time correction service.

NOTE – *Tap to go back to previous settings screens.*

When you have saved a real-time correction service, you can edit, copy or delete it.

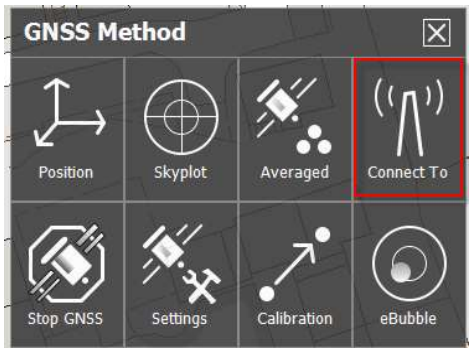
Connect to a NTRIP correction service

To connect to NTRIP once you have set it up:

1. In the **Home** screen, tap 

and then **tap-hold** 

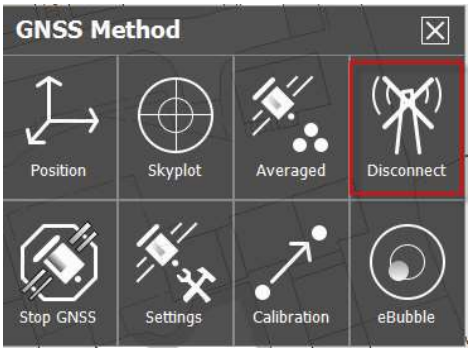
to access the **GNSS Method** Controls.
2. Tap **Connect To** to connect to the NTRIP caster. The connection icon in the top **Status** bar changes to **Connected.**



The network symbol on the **Status** bar is shown without the red cross, indicating that NTRIP correction data is being received.

3. To display the RTK status, **tap-hold** the network symbol and tap **RTK**; the RTK Status dialog displays.

To disconnect from NTRIP, tap **Disconnect.**



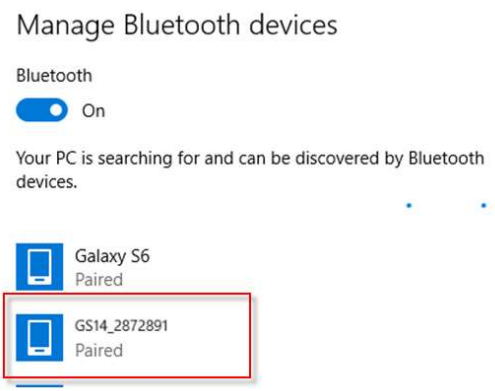
NOTE – *If the Auto start option is set, the NTRIP connection starts automatically when you have a successful GNSS connection.*

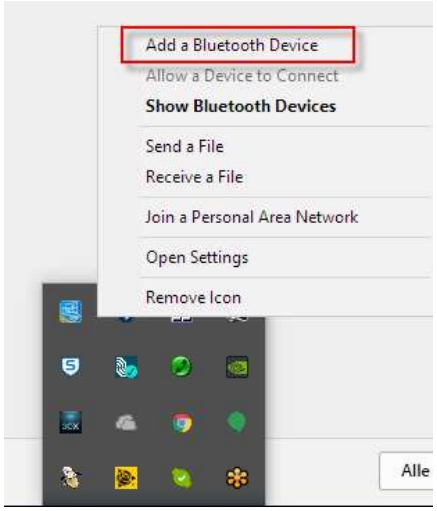
Leica NTRIP via Controller

Instead of using an internal SIM card in the Leica receiver to receive NTRIP correction data, you can use an external NTRIP source, for example a SIM card integrated in the Tablet PC, or an external Internet connection (WLAN).

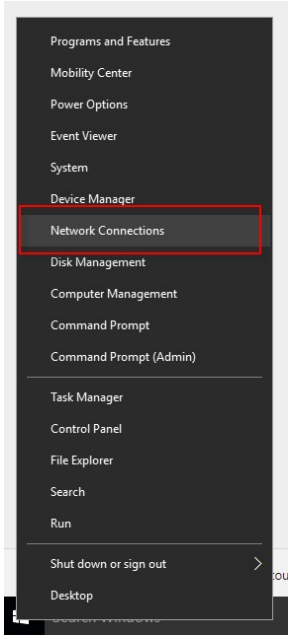
In the real-time correction service, you must select the **Modem in controller** option to connect to the Internet. You must also configure your Tablet PC.

1. Pair the Leica receiver with the Tablet PC; tap the **Bluetooth icon** on the tablet, then select **Add a Bluetooth Device** to add the Leica receiver.

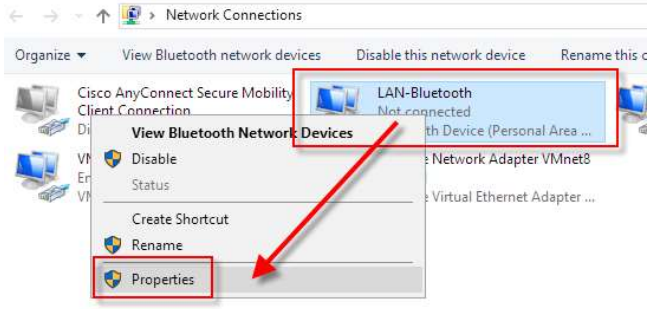




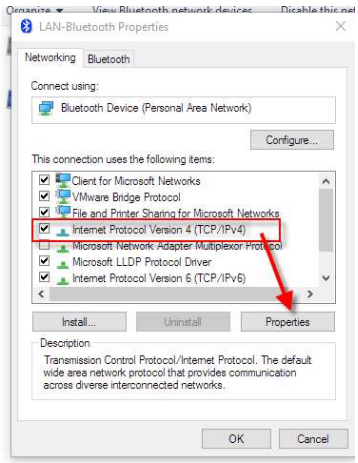
2. When successfully paired, tap **Windows / Start / Network Connections.**



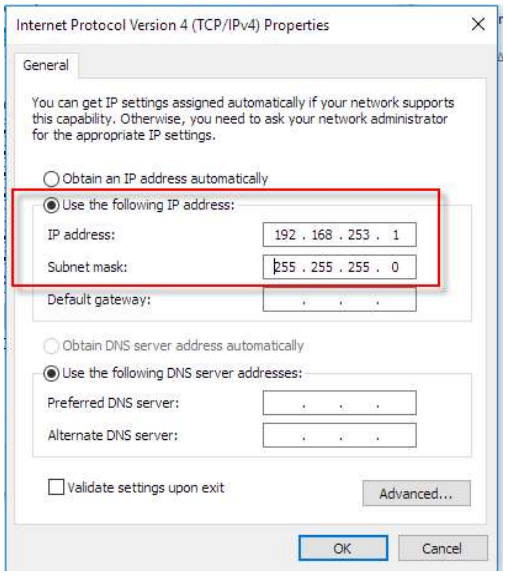
3. Right-click **LAN-Bluetooth** to open the **LAN-Bluetooth properties dialog**, then select **Properties.**



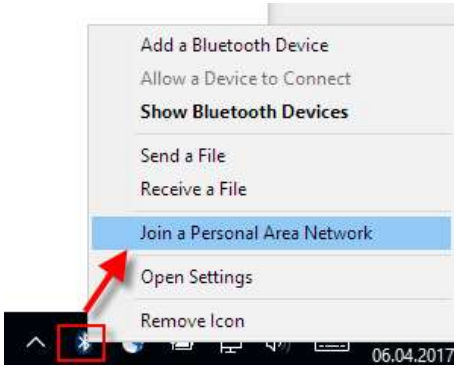
4. Select **Internet Protocol Version 4 (TCP/IPv4)** and tap **Properties.**



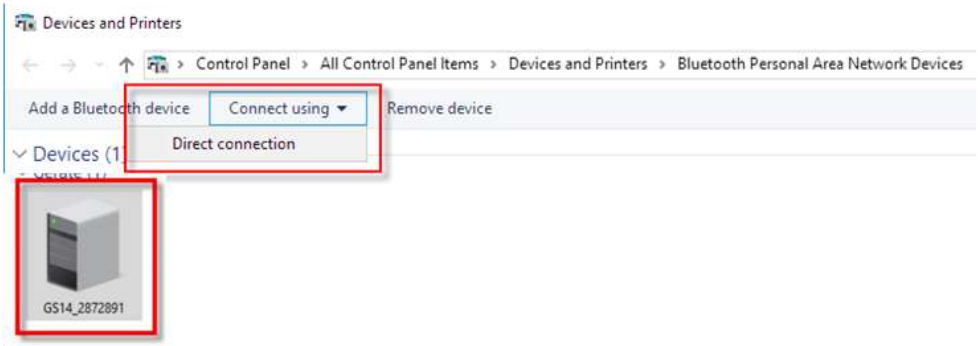
5. Select **Use the following IP address**, then enter IP address 192.168.253.1, and Subnet mask 255.255.255.0. Tap **OK** then close the dialog.



6. Right-click the Bluetooth Icon in the task, and select **Join a Personal Area Network.**



7. Select the Leica receiver you want to connect to, then tap **Connect using / Direct connection.**



8. When successfully connected, open a Penmap project.

9. In the Penmap **Home** screen, tap **Setup / GNSS settings**, then tap **Real-time Corrections** to set up the NTRIP service.
10. In the real-time corrections dialog, click **New,** then select the correction data source **GPRS.**
11. Enter a name for the new service and click 
12. Select **Modem in controller.**
13. Define and configure the NTRIP Caster settings and tap  .
14. Tap  to start the GNSS connection to the Leica receiver.
15. When successfully connected, **tap-hold**  and then tap **Connect to** to start the NTRIP correction stream.
16. The NTRIP data stream is established and you can start logging GNSS measurements.

Setting up your RTX correction service

If you have a Trimble receiver that supports **RTX** and **RTX subscription** you can use the ***Trimble RTX correction service.***

Trimble RTX is a high-accuracy, precise point positioning (PPP) system that provides real-time centimeter positioning without the need for an RTK base station or VRS network.

Where terrestrial-based corrections are not available, you can use satellite or Internet-RTX corrections in open areas.

In typical conditions, the RTX convergence time is 30 minutes or less when static. The convergence time varies based on GNSS constellation health, level of multipath, and proximity to obstructions, such as large trees and buildings.

To set up the RTX service:

1. In the **Home** screen, tap Setup / GNSS settings, then tap Real-time Corrections.
2. In the real-time correction dialog, click New, then select the correction data source RTX.
3. Enter a name for the new service and click  .
4. Select the RTX mode Satellite or Internet then tap  .

NOTE – *Tap*  *to go back to previous settings screens.*

When you have saved a RTX correction service, you can edit, copy or delete it.

Connect to a RTX correction service

To connect to the RTX service once you have set it up:

1. In the **Home** screen, tap 

and then tap 

to establish the GNSS connection.
2. Coordinates measured in surveys using the Trimble CenterPoint® RTX service are stored in the ITRF-2008 epoch 2005.0 reference frame. When you start an RTX survey, you must select a tectonic plate if you have not already done so for that job. The receiver uses the tectonic plate that you select to compute the ITRF 2008 epoch 2005.0 coordinates from ITRF 2008 current epoch coordinates used by the RTX network.
   When you are connected to the receiver, a dialog prompts you to select the required tectonic plate. When you have selected it, the RTX correction data stream starts automatically.
   The convergence time for getting centimeter-accuracy can take up to 30 minutes in typical conditions. Once convergence is attained, you can begin surveying.
   NOTE – *Convergence times given are a guide only. Convergence may take longer in adverse environments.*

   When RTX correction data is being received, the network symbol on the **Status** bar displays without a red cross:

   To view the RTX status, **tap-hold** the network symbol and then tap **RTK;** the RTK Status dialog displays with the solution type.

3. Proceed with the GNSS measurement as normal.
   NOTE – *Coordinates measured using the Trimble CenterPoint RTX service are stored in the ITRF-2008 epoch 2005.0 reference frame. This means two different coordinate systems are in use: for RTX, the ITRF system; and for the configured RTK coordinate system in Penmap, ETRS or another transversal system. Penmap calculates internally the offset RTX-RTK to transform the coordinates automatically into the RTK reference frame. So you have all the time-precise coordinates related to your configured and used coordinate system in your current project.*

RTX Quickstart on a known point

If the initialization is lost (for example, due to multipath), use the RTX-Init method for a RTX re-initialization on a known point.

NOTE – *The known point used must be a measured RTX point.*

1. **Tap-hold** 

and then tap **RTX Init.**
2. All related measured RTX points in a circumference of around 5 meters are highlighted in green. If only one point is in a circumference of 5 meters, this point is used automatically for the re-initialization. Otherwise select the point you want to use from the map. The convergence time to centimeter-accuracy is approximately 5 minutes.

Setting up a radio correction service

To use and receive correction data via a radio link, you must configure your receiver with the current channel and frequency which the base station is transmitting.

You cannot add a new frequency on the rover side with Penmap; you must do this with the WebUI of the receiver.

1. To set up the Radio service, in the **GNSS Settings** dialog, tap **Real-time Corrections** (**Home** screen / **Setup** / **GNSS Settings** / **Real-time Corrections**. The **Real-time Corrections** dialog displays.
2. Click **New** to create a new real-time correction service.
3. Select the correction data source **Radio**.
4. Enter a name for the service and tap  .
5. On the **Radio settings** dialog, tap **Channel** and select the required channel, then tap **Stream** and enter the required stream.

NOTE - *To see the frequency that is linked to the channel, you must be connected to the receiver. Then open the r**Real-time Corrections** dialog again.*

6. Tap  to save the settings.

Connecting to a radio correction service

When you have set up a Radio real-time correction service, to connect to the service:

1. In the **Home** screen, tap 

and then tap 

to start the GNSS connection.

   The Radio correction service starts; the network symbol on the status bar no longer shows a red cross, indicating that Radio correction data is being received:

To display the Fixed 3D solution, tap-hold the network icon and tap **RTK**.

Collection mode settings

For the GNSS measurement in Penmap, you can select different measurement methods using the Collection Mode method.

In the **Home** screen, tap **Setup / GNSS settings**, then tap **Collection mode.**

Penmap supports different collection modes for GNSS positions, independent from the selected feature. Depending on the manufacturer and model you are using, the following methods are available:

- **Single:** Tapping 

logs the current position.

- **Average:** To increase accuracy and reliability of your logged GNSS position you can select a number of epochs. Penmap will store the averaged (mean) position.
- **Continuous distance:** For specific features it can be convenient to log positions automatically in a user-defined distance interval. This means after *x* meters a point is measured and stored automatically.
- **Continuous time:** For specific features it can be convenient to log positions automatically in a user-defined time interval. This means after *x* seconds a point is measured and stored automatically.

Quality settings

With Penmap, it is easy to maintain quality control of your data. Status information shows you the current GNSS status instantly:

- **Number of used satellites –** Displayed as a badge on the GNSS Method icon.
- **Estimates 2D accuracy –** Displayed in meters at the top **Status** bar.
- **Quality status (solution, accuracy) –** Color codes GNSS position cursor.

To customize the Quality status settings (color codes), in the **Home** screen, tap **Setup / GNSS settings**, then tap **Quality.**

When collecting data, the color of the GNSS position cursor on the map indicates the quality level of the current position:

Color	Meaning	Trimble Penmap behavior
Green	Within the defined quality limit	Measurements start immediately after you tap the ***GNSS method button.***
Orange	Warning limit	You are prompted to confirm you want to log the position.
Red	Outside the quality limit	Measurement is not possible.

You can select two parameters to control the color code settings:

- Required solution status: Uncorrected, DGPS, Float, Fixed
- Required 2D Accuracy in Meters

Use the slider bar to choose between 5 pre-defined settings to control the solution status options. You can also manually change the suggested 2D accuracy thresholds by clicking on the values Your updated parameters are stored as your new Penmap configuration and are used every time you start Penmap.
To enter the elevation (degrees above the horizon) below which a satellite will not be used. Satellites that are too close to the horizon are subject to interference from objects on the ground.

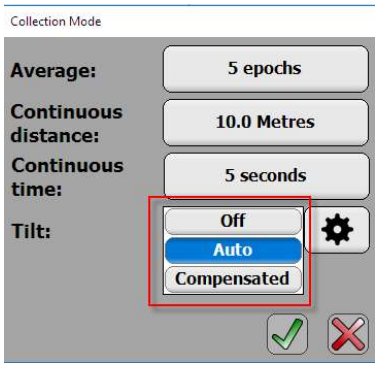
Additional features for Trimble receiver R10

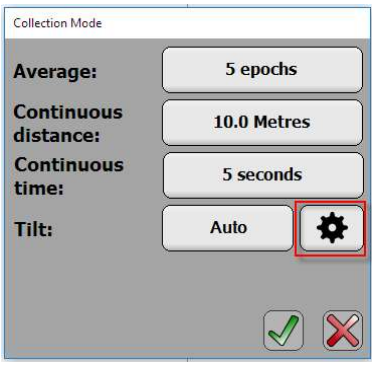
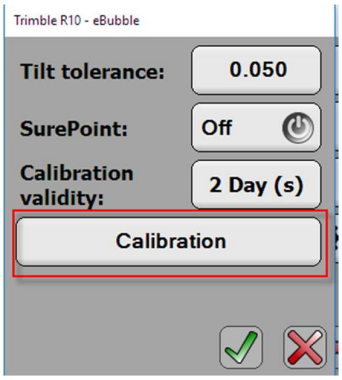
Collection Mode

The integrated tilt sensor in the Trimble R10 receiver allows you to use additional collection modes in

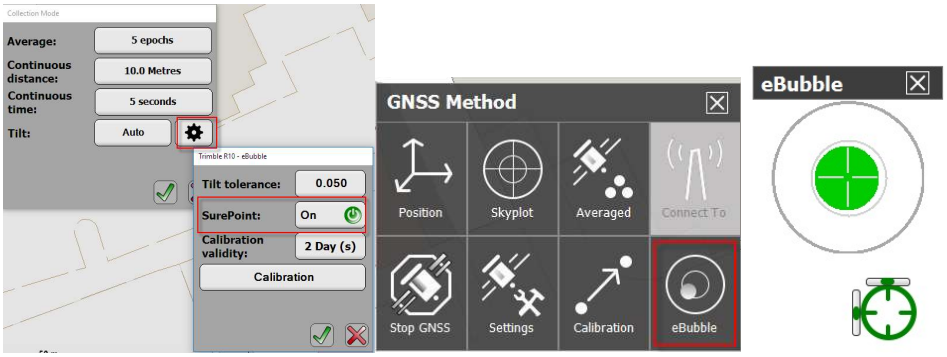
- **Auto Tilt method.** Measurement starts if the rover pole is levelled.
- **Compensated method.** Use this method if you want measuring points with an unlevelled pole and have the antenna's offset location corrected to produce a ground position at the tip of the pole (up to a slope of 15%). In the **Home** screen, tap **Setup / GNSS settings**, then tap **Collection Mode.**

If you configured a Trimble R10 receiver, the additional collection mode **Tilt** is displayed.

Tap...	To...
	Select the tilt measurement modes **"Off, Auto, Compensated".**

	Tap  to define the tilt tolerance for the leveling of the R10 bubble. Tap **Calibration** to calibrate the receiver. 

If you activate the option **SurePoints** and you have a GNSS connection to the R10 receiver, an additional button eBubble is available in the **GNSS Method** dialog. Tap **eBubble;** the current leveling is displayed as a circular bubble in the dialog and also as a 'bubble tube' directly at the GNSS cursor:



A green bubble means *within the tilt tolerance*, a red bubble means *outside the tilt tolerance.*

Calibrating a Trimble R10 receiver

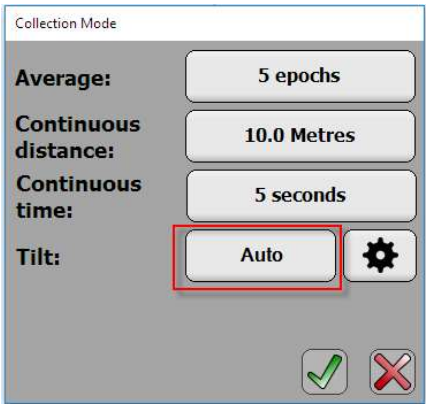
Before you can use the collection modes **Auto**, **Tilt** or **Compensated** described below, you must calibrate the Trimble R10 receiver for Tilt Sensor, Magnetometer calibration, and Magnetometer alignment.

1. Go to the **Data Collection** screen and establish a GNSS connection to the receiver.
2. **Tap-hold**  and tap **Settings / Collection Mode**. Tap  and then tap **Calibration.**

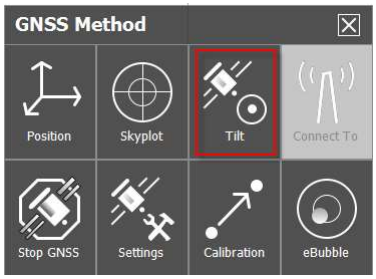
3. The Calibration dialog opens. Tap **Tilt sensor calibration**, or **Magnetometer calibration**, or **Magnetometer alignment** for the calibration you want to perform. Follow the onscreen instructions.

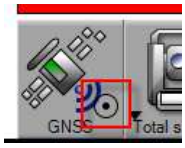
GNSS Measurement using Collection Mode "Auto Tilt"

1. In the **Home** screen, tap Setup / GNSS settings, then tap **Collection Mode**. Select **Auto.**



2. In the **Data Collection** screen, **tap-hold**  and click **Tilt.**





3. Tap  to start the measurement. The GNSS button is highlighted and active.

The GNSS measurement is done automatically when the receiver is levelled. You don't have to start the measurement manually for each point.

NOTE – *The receiver must be calibrated to start the tilt measurement.*

NOTE – *To stop the measurement, tap*  *again.*

GNSS Measurement using Collection Mode “Compensated”

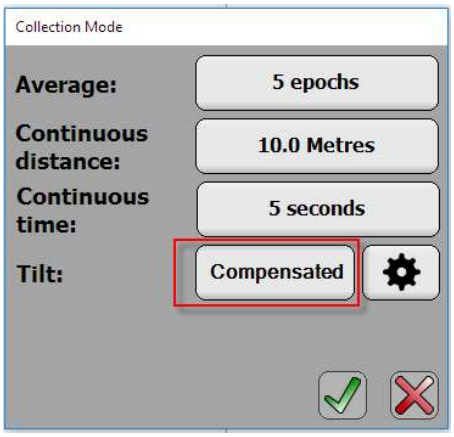
The Compensated point measurement method allows you to measure points with an unlevelled pole with a Trimble R10 receiver, and have the antenna’s offset location corrected to produce a ground position at the tip of the pole.

Compensated points are useful when:

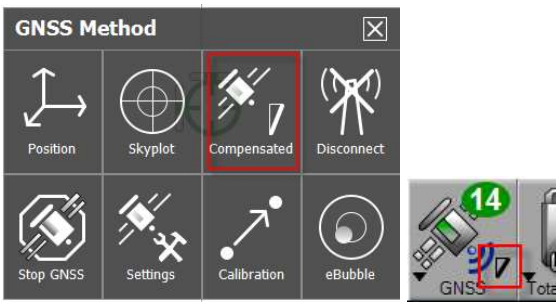
- You want to speed up your workflow without spending time making sure the pole is level.
- An obstruction means that you are unable to position the antenna directly above the point. Traditionally you would need to use an offsetting technique to measure such points.

The maximum tolerance limit for tilt is 15 degrees:

1. In the **Home** screen, tap **Setup / GNSS settings**, then tap **Collection Mode.** Select **Compensated.**

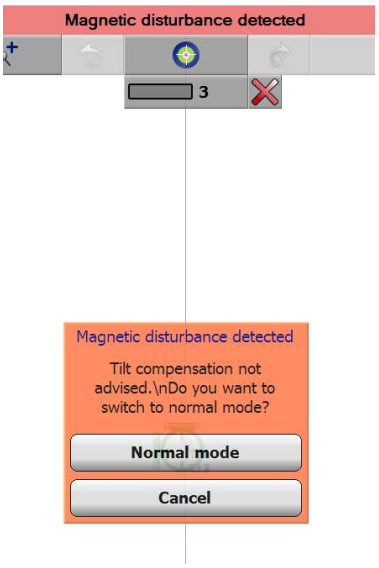


2. In the **Data Collection** screen, **tap-hold**  and click **Compensated.**



3. Tap  to start the measurement. A progress bar displays; 3 epochs count down, and the point is stored.

NOTE – *If magnetic disturbance is detected, an information message displays. Tap* ***Normal mode*** *to switch the collection mode to* ***Auto Tilt***



Setting up a Base Station with internal radio

1. In the **Home** screen, go to **Setup** / **Start Base**.

2. Enter the base pole height and tap  .

3. Make sure the base receiver is on and configured correctly. To check the configuration, tap-hold the **GNSS** button, then select **Settings** / **GNSS Receiver**.

4. Tap the **GNSS** button to start the connection to the base receiver.

5. When the receiver is connected, tap-hold the **GNSS** button, then select **Settings** / **Real-Time Corrections**. The Real-Time Corrections dialog opens.

6. Tap **New** to set up a real-time correction service.

7. Select the correction data source **Radio**.

8. Enter a name for the service and tap  .

9. On the **Radio settings** dialog, tap **Channel** and select the required channel, then tap **Stream** and enter the required stream.

10. Tap  to save the settings.

11. Snap the base coordinate directly from the map or enter the coordinates manually:

12. Tap **Stream** to define the data stream format. The stream currently displayed becomes the active stream.

The data stream must be the same as the data stream configured in the real-time correction service.

13. Tap  to save the settings.

14. To use an internal radio, on the **Select Radio** dialog, tap **Internal** as the radio source.

15. Tap  .

Setting up a Base Station with external radio

1. In the **Home** screen, go to **Setup** / **Start Base**.

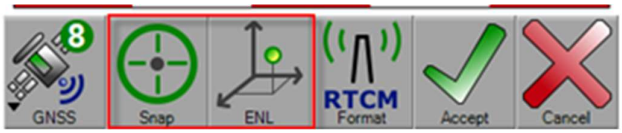
2. Enter the base pole height and tap  .

3. Make sure the base receiver is on and configured correctly. To check the configuration, tap-hold the GNSS button, then select **Settings** / **GNSS Receiver**.

4. Tap the GNSS button to start the connection to the base receiver.

   NOTE – *You do not need to configure a real-time correction service with channel and data stream. This will be done by the external radio device.*

5. Snap the base coordinate directly from the map or enter the coordinates manually:



6. Tap **Stream** to define the data stream format. The stream currently displayed becomes the active stream.

   NOTE - *The data stream must be the same as the data stream configured in the real-time correction service..*

7. Tap  to save the settings.

8. To use an external radio, on the **Select Radio** dialog, tap the radio you want to use from the drop-down list, then select the port number which is used by the external radio device.

9. Tap  .

⚠ **CAUTION -** Be aware that the base and rover radio have the same channel spacing. Cross-check in the **WebUI** / **Radio** / **Radio Configuration** if the rover and base radios are using the same channel spacing.

11 Total Station Setup

Penmap supports all major methods of setting up a Total Station on a known point with backsight observations or a sophisticated resection algorithm to use multiple backsights to calculate your Total Station's current position, orientation, and network scale factor.

NOTE - *You must configure the instrument correctly before Penmap will accept data collection or stakeout with the Total Station method.*

Instrument Settings: Trimble Total Station

If you have not yet configured Total Station settings for the project, you are prompted to do so when you select the Total Station survey method.

To configure a Total Station, in the **Home** screen tap **Setup / TS Settings.** The instrument dialog opens with the following options:

Item	Option
Manufacturer	Select the manufacturer of the instrument.
Model	Tap **Model** to open a list containing all supported model types. Select the required model.
Connection	Select the medium you want to use for the Total Station connection: • USB • Serial • Bluetooth • Radio • RadioBridge If you use **Radio,** you must define the Channel and Network ID which correspond to the instrument settings, and select the correct COM Port. When you have selected the medium, click **Test** to check the connection.

Instrument Settings: Leica Total Station

If you have not yet configured Total Station settings for the project, you are prompted to do so when you select the Total Station survey method.
To configure a Total Station, in the **Home** screen tap **Setup / TS Settings.** The instrument dialog opens with the following options:

Item	Option
Manufacturer	Select the manufacturer of the instrument.
Model	Tap **Model** to open a list containing all supported

	model types. Select the required model.
Connection	Select the medium you want to use for the Total Station connection: serial or Bluetooth. Select the correct COM Port to use for the connection. To use a Bluetooth connection, you must first pair the Total Station with your PC. Use your PC's Bluetooth tool to do this. Once paired, a virtual Bluetooth COM Port is configured. Use this one for the connection. ***NOTE –*** *To use the Leica Longrange Bluetooth, you also need a special tool TCPS ConfigTool to configure the settings. Contact your dealer if you have any queries.*
Remote Trigger	Penmap enables you to take a measurement directly from the instrument, or/and from the Penmap Total Station button. To active this option, enable the **Remote Trigger** option box in the Total Station settings. ***NOTE –*** *When this option is used, Penmap does not use the current line of sight (light blue line) on the survey.* To use this option, select the Q-Survey application (1) from the instrument's main menu. To take a measurement you can press **F1 (ALL)** for Distance and Angle measurements, or press **F4** to switch to the second page, then press **F1 (DIST)** and **F2 (REC)** for independent distance and angle measurements.

	NOTE – *After the first measurement, press Yes (F4) to confirm the message Recording to Interface.* While in Remote Trigger mode you can also fire the instrument using the Total Station button  on the Data **Collection Method** bar.

Settings for Leica Total Station Flexline TS02/06/09

If you are using a Leica Total Station Flexline TS02/06/09, configure the following instrument settings:

Instrument Main Menu

Settings (5) -> General (1) -> Page 2/6

• *Set Hz Increment to: Right*

• *V Setting to: Zenith*

Page 3/6

• *Angle unit: °´˝ or gon, dec.deg, mil (Trimble Penmap will automatically detect the format and convert the values)*

Page 4/6

• *Set Data output to: Interface*

• *Set GSI-Format to: GSI 16*

• *Set GSI-Mask to: Mask 1*

Confirm with OK (F4)

Comm. (3)

• *Set Port to: Bluetooth*

• *Set Bluetooth to: Active*

• *Check BT PIN (F1): 0000*

Confirm with OK (F4)

⚠ **CAUTION -** Before connecting Penmap to a Leica Total Station for the first time, set the prism constant to “0” (Zero) in the instrument.
After connection to the Leica Total Station, Penmap transfers a user-defined prism with the prism constant of Penmap to the instrument. The Leica constant is calculated internally.
DO NOT change the prism type/prism constant directly in the instrument when working with Penmap;

otherwise wrong distances are measured and wrong results are calculated.

Instrument Setup: resection

The resection function is used to perform a station setup and determine coordinates for an unknown point by making observations to known backsight points.

Creating new resection

1. In the **Home** screen, click **Setup / Resection.**
2. Enter the instrument's height, then tap  ..
3. Enter the point name for the stationing coordinate.
4. The connection to the instrument starts automatically. Once you are successfully connected to the instrument, the Stationing menu displays.
5. **Tap-hold** 

to open the **Total Station method** dialog. Then:
   - Tap 

to activate the Autolock function (if your instrument supports it).
     NOTE – The button shows the state to switch to, not the state the Autolock option is in:
     - 

*means that the option is **Off.** Tap to turn the option on.*
     - 

*means that the option is **On.** Tap to turn the option off.*

     NOTE – If the instrument is locked, the prism on the Total Station button has two fixed black triangles 

; if the locking is lost the triangle rotates.

   - Tap 

to activate the laser. The button shows the state to switch to, not the state the laser is in:
     - 

means that the laser is **Off.** Tap to turn the laser on.

- 

means that the laser is **On.** Tap to turn the laser off.

- On Trimble instruments, you can use Trackpad 

to turn the instrument to the direction of your pen/finger movement on the screen. **Tap-hold** to aim horizontally.
- Tap 

to define the search window for searching the prism.
Tap **Compensator** to open the **Level bubble dialog.** You can disable and enable the compensator there.
- Tap 

to configure the **Total Station** settings.
  - **Corrections:** (Weather, Temperature, Pressure, MSL Height, Curvature)
  - **Instrument:** change between Precise measure mode and Fast measure mode. With Precise measure mode a measurement will take 5 to 6 seconds; with Fast measure mode a measurement will take just one second because the tracking modus of the instrument is used.
    NOTE – *If you are doing a stakeout with the Total Station, the Fast measure mode is automatically used to have the current differences in real time between the stakeout node and your position.*
- Tap 

to start the prism search depending of the defined search window.

6. Tap 

to open **the Resection Settings** dialog.
   - Tap the Observations button to select Angle+Distance or Angle.
   - Tap the Calculation type button to select either Helmert or Least squares.
   - Select the Scale factor option for a Fixed scale factor. Deselect the option for free scale.
7. Tap the icon on the **Status** bar to select the correct prism (or direct reflex) type:

You can change the target height quickly by tapping on the target height value on the **Status** bar. To change the instrument height afterwards, tap the instrument height edit field on the left side of the **Status** bar.

8. Tap 

to select the backsight nodes that should be used for the Resection.
   - Tap once to select a node directly from the map.
   - **Tap-hold** to select a node from the point list.

   When you have selected the backsight node, a dialog shows the details of the node:
   - Coordinate
   - Point number (if available)

   Tap 

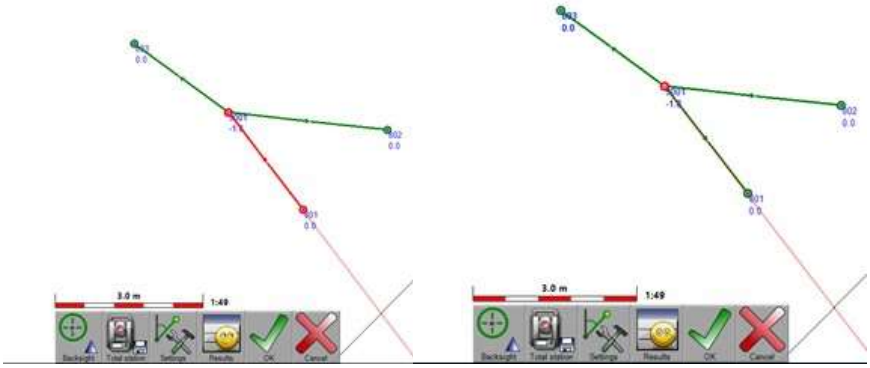
to determine in which dimension the backsight node should be used for stationing (1D, 2D or 3D):

9. You are prompted to measure the node. Tap 

to start the measurement to the backsight node.

10. If the stationing can be calculated (you must have at least two backsight nodes) and you select the third backsight node, you can turn the instrument directly to the selected node by tapping 
11. Repeat the steps for all backsight nodes.

    NOTE – *If you want to take more than one measurement to the same backsight node, select the node again and do the measurement.*
12. When you have measured all required backsight nodes, two indicators show if the stationing is within your tolerance, depending on what kind of tolerance settings you use.
    - Graphical display on the map. If the tolerances are exceeded, the line between the coordinate of the stationing and the backsight node is shown in red. If the stationing is within the tolerances, the line is green.
    - Smiley face on the Results button. A happy smiley means the tolerances are within the limit, a sad smiley means the tolerances are exceeded.



    NOTE – *You can define the tolerance under the* ***Home*** *screen /* ***Settings / Properties / Tolerances / Resection / Calibration.***
13. To view, edit or delete backsight measurements (for example, if you want to discard a backsight node because the tolerances are exceeded), tap on the backsight node in the map.

    The Observation details dialog opens. The observation details are displayed (Residuals, raw measurement data). If residuals are exceeded, the values are highlighted in Red.

    NOTE – *You can define the tolerance under the* ***Home*** *screen /* ***Settings / Properties / Tolerances / Resection / Calibration.***
    - Tap 

to toggle between 3D, 2D, 1D, or Disabled. If you select Disabled, the measurement is not used for the resection calculation.

- Tap Turn to to turn the instrument directly to the chosen backsight node. If you have more than one measurement taken to the same backsight node, you can switch to the observation details for each measurement by tapping or .

14. Tap Results to view detailed information about the stationing results. The results will depend on the tolerance settings you use.
    NOTE – *You can define the tolerance under the* ***Home*** *screen /* ***Settings / Properties / Tolerances / Stationing / Resection.***
15. Tap Report to get a report in HTML format.
16. To save and close the stationing tap OK. To discard, tap Cancel.

If you disconnect from the instrument and you then want to continue the last setup or create a new stationing, go to the **Home** screen / **Setup / Resection.**

Instrument setup: resection with Integrated Surveying method

With the Integrated Surveying method you can create a Total Station stationing Resection without having known coordinate backsight nodes.

You must have a GNSS connection and a Total Station connection to use this method. Make sure you have a GNSS connection to a receiver and that it is receiving correction data (such as NTRIP).

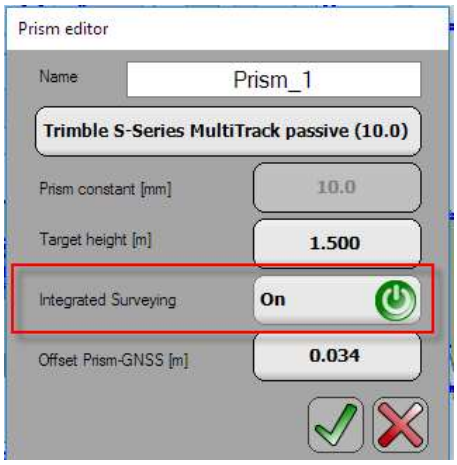
Creating a new resection

1. Attach the preferred prism and the GNSS receiver to the pole. For example:

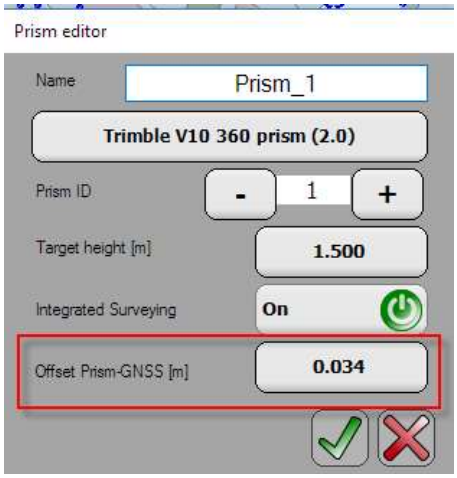
Make sure the receiver is connected to GNSS and that it is receiving correction data (such as NTRIP).

2. In the **Home** screen, click **Setup / Resection.**
3. Enter the instrument's height, then tap  .
4. Enter the point name for the stationing coordinate.
5. The connection to the instrument starts automatically. Once you are successfully connected to the instrument, the **Stationing menu** displays.
6. Tap the prism icon to go to the target selection dialog. **Tap-hold** the prism button to open the **Prism editor.** Define your preferred prism and target height.

7. To activate the Integrated Surveying method, set the Integrated Surveying option to **ON.**

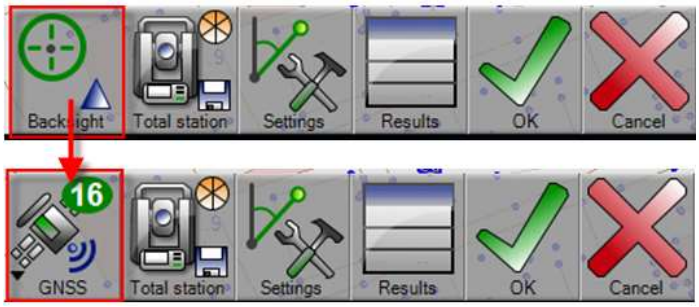


8. Tap the **Offset Prism-GNSS (m) button** to enter the offset between prism and GNSS Bottom of antenna mount.



9. Tap  to apply the settings. An additional symbol displays:

10. To start the Integrated Surveying method, **tap-hold** the Backsight button. The button changes to the GNSS button.



NOTE – *If you haven't yet established/configured the GNSS connection,* ***tap-hold*** *the GNSS button.*

11. To measure the first backsight node, tap the GNSS or Total Station button. It doesn't matter which button you tap; the GNSS measurement is started first, then the Total Station measurement to the GNSS measured node happens immediately.

12. Repeat this for all required backsight nodes.

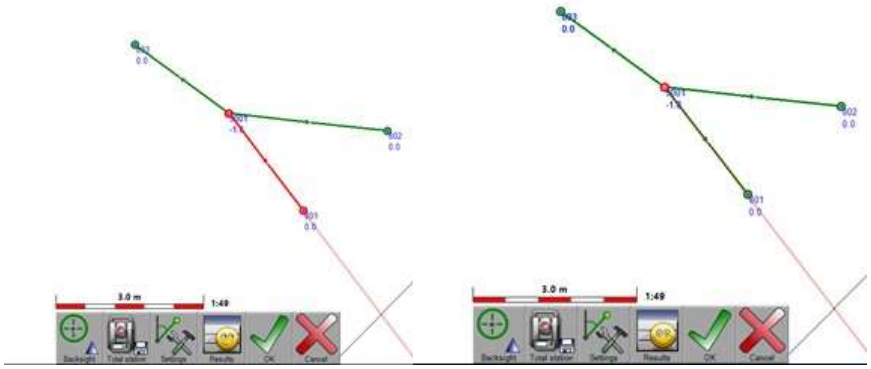
NOTE – *To quickly change the target height, tap the target height value on the* ***Status*** *bar.*

13. To use a known node for the stationing, **tap-hold** the GNSS button and then select Backsight. The stationing bar shows the Backsight button again. Tap it to select a node from the map, or **tap-hold** to select directly from the point list.

NOTE – *To switch back to the Integrated Surveying method,* ***tap-hold*** *the Backsight button again.*

14. When you have measured all the required backsight nodes, two indicators show if the stationing is within your tolerance. Depending on what kind of tolerances settings you use:

- Graphical display on the map. If the tolerances are exceeded, the line between the coordinate of the stationing and the backsight node is shown in red. If the stationing is within the tolerances, the line is green.
- Smiley face on the Results button. A happy smiley means the tolerances are within the limit, a sad smiley means the tolerances are exceeded.



NOTE – *You can define the tolerance under the* ***Home*** *screen /* ***Settings / Properties / Tolerances / Resection / Calibration***

15. To view edit or delete backsight measurements (for example, if you want to discard a backsight node because the tolerances are exceeded), tap on the backsight node in the map. The Observation details dialog opens. The observation details are displayed (Residuals, raw measurement data). If residuals are exceeded, the values are highlighted in Red.

NOTE – *You can define the tolerance under the* ***Home*** *screen /* ***Settings / Properties / Tolerances / Resection / Calibration.***

- Tap [3D] to toggle between 3D, 2D, 1D or Disable. If you selected Disabled, the measurement is not used for the resection calculation.
- Tap [Turn to] to turn the instrument directly to the chosen backsight node. If you have more than one measurement taken to the same backsight node, you can switch to the observation details for each measurement by tapping [◁] or [▷].

16. Tap [Results] to view detailed information about the stationing results. The results will depend on the tolerance settings you use.

NOTE – *You can define the tolerance under the* ***Home*** *screen /* ***Settings / Properties / Tolerances / Stationing / Resection.***

17. Tap [Report] to get a report in HTML format.

18. To save and close the stationing tap  . To discard, tap  .

If you disconnect from the instrument and you then want to continue the last setup or create a new stationing, go to the **Home** screen / **Setup** / **Resection.**

Using the Total Station method dialog

1. Tap-hold 

to open the Total Station method dialog. Then:

- Tap 

to activate the Autolock function (if your instrument supports it).

  NOTE – *The button shows the state to switch to, not the state the Autolock option is in:*

  - 

*means that the option is **Off.** Tap to turn the option on.*
  - 

*means that the option is **On.** Tap to turn the option off.*

  NOTE – *If the instrument is locked, the prism on the Total Station button has two fixed black triangles* 

; if the locking is lost the triangle rotates.

- Tap 

to activate the laser. The button shows the state to switch to, not the state the laser is in:
  - 

means that the laser is **Off.** Tap to turn the laser on.
  - 

means that the laser is **On.** Tap to turn the laser off.

- On Trimble instruments, you can use Trackpad 

to turn the instrument to the direction of your pen/finger movement on the screen. **Tap-hold** to aim horizontally.

- Tap 

to define the search window for searching the prism.
  Tap **Compensator** to open the **Level bubble dialog.** You can disable and enable the compensator there.
- Tap 

to configure the **Total Station** settings.
  - **Corrections:** (Weather, Temperature, Pressure, MSL Height, Curvature)
  - **Instrument:** change between Precise measure mode and Fast measure mode. With Precise measure mode a measurement will take 5 to 6 seconds; with Fast measure mode a measurement will take just one second because the tracking modus of the instrument is used.
    NOTE – *If you are doing a stakeout with the Total Station, the Fast measure mode is automatically used to have the current differences in real time between the stakeout node and your position.*
- Tap 

to start the prism search depending of the defined search window.

2. Tap 

to open the **Resection Settings** dialog.
   - Tap the Observations button to select Angle+Distance or Angle.
   - Tap the Calculation type button to select either Helmert or Least squares.
   - Select the Scale factor option for a Fixed scale factor. Deselect the option for free scale.

The resection function is used to perform a station setup and determine coordinates for an unknown point by making observations to known backsight points.

Instrument setup: known stationing

Penmap supports all major methods of setting up a Total Station on a known point with backsight observations or sophisticated Resection algorithm to use multiple backsights to calculate your Total Station's current position, orientation and network scale factor.

NOTE - *You have to perform an instrument setup first before Trimble Penmap accepts data collection or stakeout with the Total Station method.*

Creating new stationing

To set up a known stationing:

1. In the **Home** screen, click **Setup / Known Stationing.**
2. Select the station position by:
   - Picking a node directly from the map, or
   - Picking the node from point list, or
   - Entering the coordinates manually.
3. When the station position is defined, a dialog displays its details (Coordinate, and Point number (if available)).
4. Enter the instrument's height, then tap . The connection to the instrument starts automatically. Once you are successfully connected to the instrument, the Stationing menu displays.
5. **Tap-hold** to open the **Total Station method** dialog. Then:
   - Tap to activate the Autolock function (if your instrument supports it).

     NOTE – *The button shows the state to switch to, not the state the Autolock option is in:*

     - *means that the option is **Off.** Tap to turn the option on.*
     - *means that the option is **On.** Tap to turn the option off.*

     NOTE – *If the instrument is locked, the prism on the Total Station button has two fixed black triangles ; if the locking is lost the triangle rotates.*

   - Tap to activate the laser. The button shows the state to switch to, not the state the laser is in:
     - means that the laser is **Off.** Tap to turn the laser on.
     - means that the laser is **On.** Tap to turn the laser off.

- On Trimble instruments, you can use Trackpad 

to turn the instrument to the direction of your pen/finger movement on the screen. **Tap-hold** to aim horizontally.
- Tap 

to define the search window for searching the prism.
Tap **Compensator** to open the **Level bubble dialog.** You can disable and enable the compensator there.
- Tap 

to configure the **Total Station** settings.
  - **Corrections:** (Weather, Temperature, Pressure, MSL Height, Curvature)
  - **Instrument:** change between Precise measure mode and Fast measure mode. With Precise measure mode a measurement will take 5 to 6 seconds; with Fast measure mode a measurement will take just one second because the tracking modus of the instrument is used.
    NOTE – *If you are doing a stakeout with the Total Station, the Fast measure mode is automatically used to have the current differences in real time between the stakeout node and your position.*
- Tap 

to start the prism search depending of the defined search window.

6. Tap 

to open **the Total Station Settings** dialog.
   - Tap the Observations button to select Angle+Distance or Angle.
   - Select the Scale factor option for a Fixed scale factor. Deselect the option for free scale.
7. Tap the icon on the **Status** bar to select the correct prism (or direct reflex) type:

You can change the target height quickly by tapping on the target height value on the **Status** bar. To change the instrument height afterwards, tap the instrument height edit field on the left side of the **Status** bar.

8. Tap 

to select the backsight nodes that should be used for the known station.
   - Tap once to select a node directly from the map.
   - **Tap-hold** to select a node from the point list.

   When you have selected the backsight node, a dialog shows the details of the node:
   - Coordinate
   - Point number (if available)

   Tap 

to determine in which dimension the backsight node should be used for stationing (1D, 2D or 3D):

9. You are prompted to measure the node. Tap 

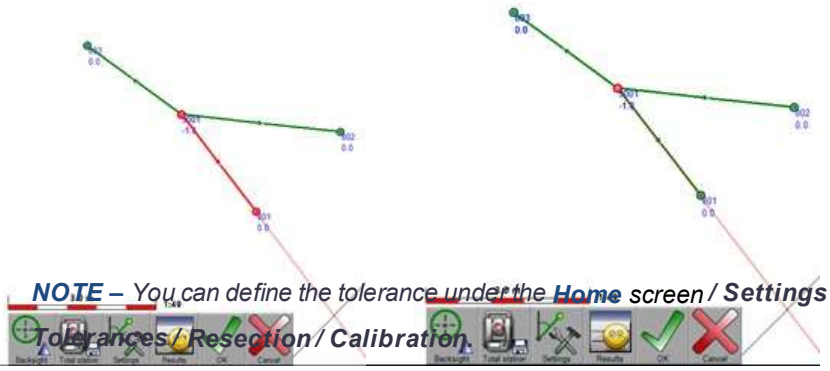
to start the measurement to the backsight node.

10. You can turn the instrument directly to the selected node by tapping  .

11. Repeat the steps for all backsight nodes.

    NOTE – *If you want to take more than one measurement to the same backsight node, select the node again and do the measurement.*

12. When you have measured all required backsight nodes, two indicators show if the stationing is within your tolerance, depending on what kind of tolerance settings you use.
    - Graphical display on the map. If the tolerances are exceeded, the line between the coordinate of the stationing and the backsight node is shown in red. If the stationing is within the tolerances, the line is green.
    - Smiley face on the Results button. A happy smiley means the tolerances are within the limit, a sad smiley means the tolerances are exceeded.



NOTE – *You can define the tolerance under the* ***Home*** *screen /* ***Settings*** */* ***Properties*** */* ***Tolerances*** */* ***Resection*** */* ***Calibration***.

13. To view, edit or delete backsight measurements (for example, if you want to discard a backsight node because the tolerances are exceeded), tap on the backsight node in the map.

    The Observation details dialog opens. The observation details are displayed (Residuals, raw measurement data). If residuals are exceeded, the values are highlighted in Red.

NOTE – *You can define the tolerance under the* ***Home*** *screen /* ***Settings / Properties / Tolerances / Resection / Calibration.***

- Tap 3D to toggle between 3D, 2D, 1D, or Disabled. If you select Disabled, the measurement is not used for the resection calculation.

14. Tap Results to view detailed information about the stationing results. The results will depend on the tolerance settings you use.

NOTE – *You can define the tolerance under the* ***Home*** *screen /* ***Settings / Properties / Tolerances / Stationing / Resection.***

15. Tap Report to get a report in HTML format.

16. To save and close the stationing tap OK. To discard, tap Cancel.

If you disconnect from the instrument and you then want to continue the last setup or create a new stationing, go to the **Home** screen / **Setup / Resection.**

Editing a stationing

When you have created a stationing, you can open and/or edit it in two ways:

- If you are still in the project, in the **Home** screen, tap **Setup / Resection respectively Setup / Known Station.** Then tap Edit current setup to edit the active stationing.
- You can edit a stationing without opening it, for example if you have more than one stationing in the project or you want to use a stationing at another time, via the Point Manager.

  a. In **Home** screen, tap 123, then tap and set the filtert o Stationing/Resection. Tap .

  b. All stationings created for the project are listed. Select the stationing you want to open and/or edit and tap .

  NOTE - *To view the stationing information (method type, coordinate, time stamp…) double-tap it.*

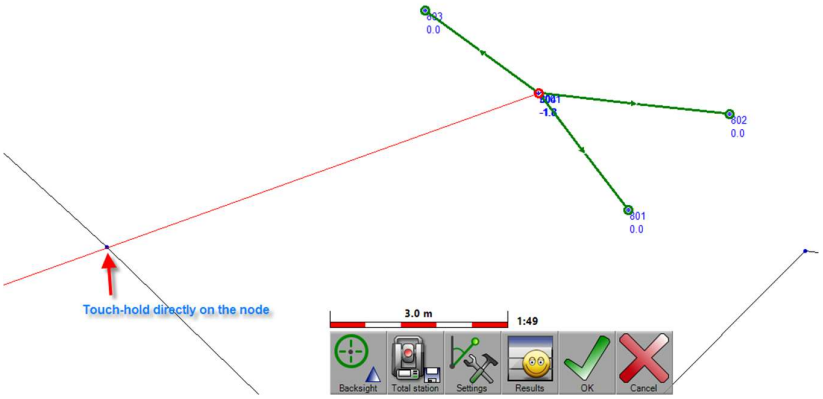
  c. Tap Stationing/Resection to open the stationing.

d. The known stationing menu opens. Make any changes if required, and tap . If you don't need to make any changes, just tap to activate the stationing.

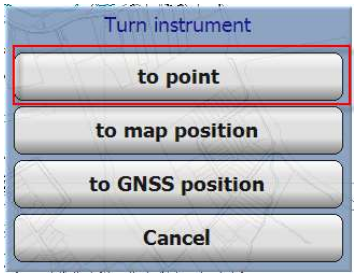
Turn to functions

Penmap offers three different **Turn to functions:**

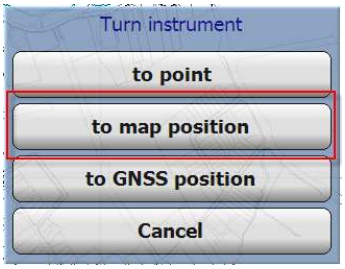
- To point
  a. On the map, **tap-hold** the node you want to turn to.



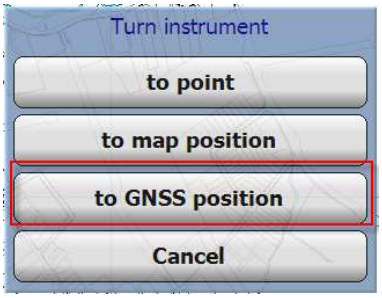
  b. On the **Turn instrument** dialog, tap **to point**. The instrument turns to the selected point, also visible by the current line of sight (light red line) on the survey.



- To map position
  a. On the map, **tap-hold** the node you want to turn to.
  b. On the **Turn instrument** dialog, tap **to map position**. The instrument turns to the selected map position, also visible by the current line of sight (light red line) on the survey



- To GNSS position:
  a. Make sure you are connected to a GNSS receiver (see Connecting to a GNSS receiver) and logging positions (see Logging GNSS positions).
  b. On the **Turn instrument** dialog, tap **To GNSS position**. The instrument turns to the current GNSS position.



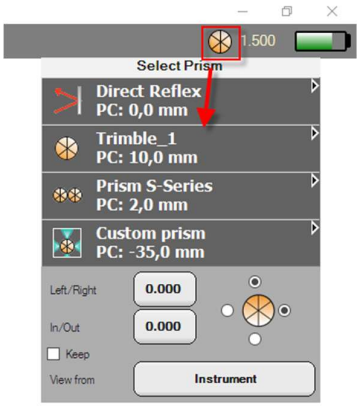
Target selection

⚠ **CAUTION FOR LEICA TOTAL STATION -** Before connecting Penmap for the first time with a Leica Total Station, set the prism constant to **"0" (Zero)** in the instrument. Once connected, Penmap transfers a user-defined prism with the Penmap prism constant to the instrument. The Leica constant is calculated internally. **DO NOT** therefore ever change the prism type / prism constant directly in the instrument when working with Penmap' doing so results in incorrect distance measurments and calculated results.

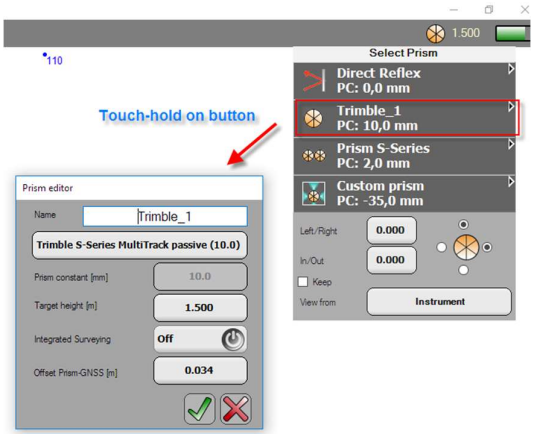
With Penmap, you can define three **Prism** methods and one **Direct Reflex** method.

1. Once connected to the instrument, either in the **Stationing method** or the **Total Station Method**, the target icon 

displays.
2. Tap the prism (or direct reflex) icon to open the selection and configuration list of the target.

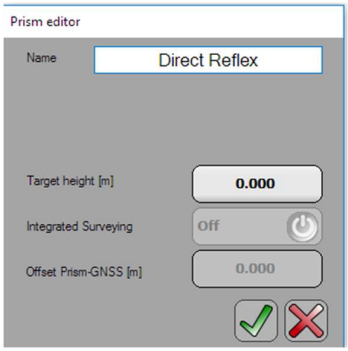


3. You can define and configure three **Prism** targets, and one **Direct Reflex** target. **Tap-hold** the required option in the list. The target editor dialog opens.



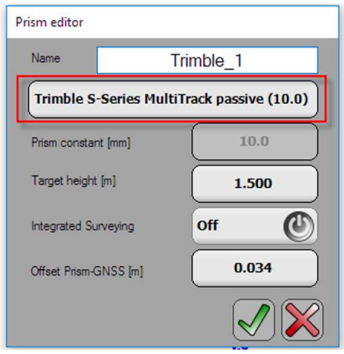
4. If you selected:

- the Direct Reflex target, enter a name and a target height, then tap  .



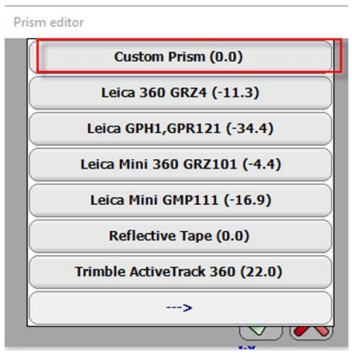
NOTE – *If you want to use an additional constant for Direct Reflex, you must configure an In/Out value. See* [*Total Station Measurement Distance Offset.*]

- A prism:
  a. Enter a name.
  b. Tap the prism button to open the prism list, then select the prism you want to use.



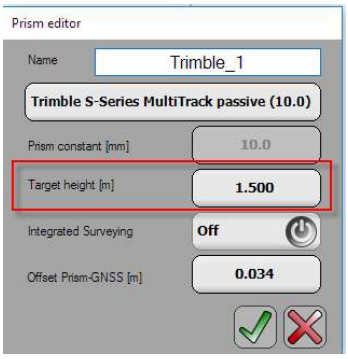
NOTE - *Use the Arrow at the bottom of the dialog to move down the list; use the Arrow at the top of the dialog to move back up the list.*

c. If the prism you want to use is not in the list, you can define a custom prism. Tap **Custom Prism** and define the prism constant for it by tapping on the button

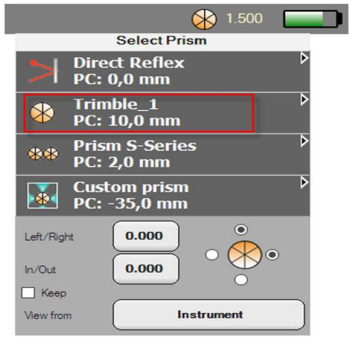


NOTE - *If you choose a pre-defined prism, you cannot to change the prism constant.*

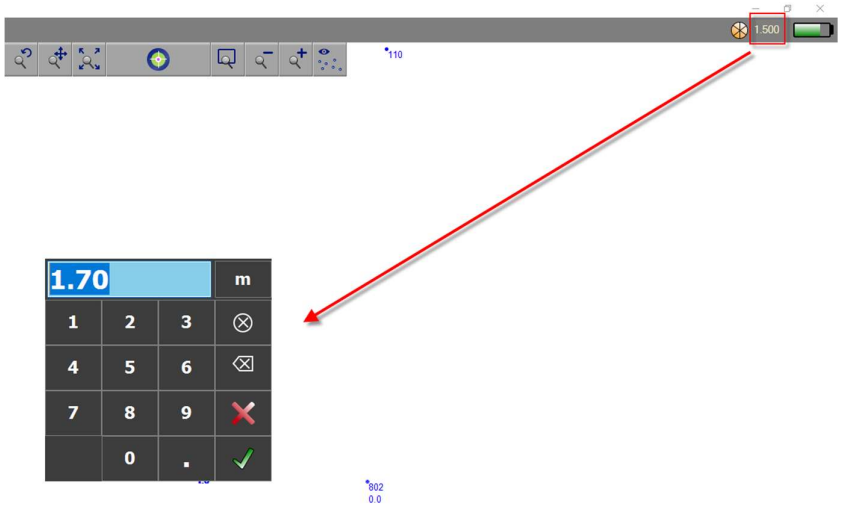
d. Tap the **Target Height button** and enter the target height.



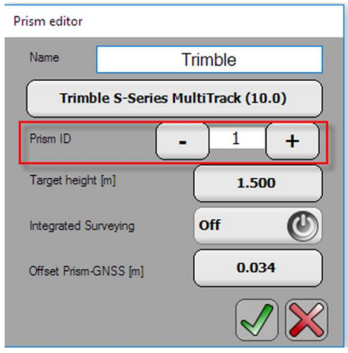
e. When you have configured the prism, tap the target you want to use for the measurement.



NOTE - *The configured target height of the selected prism is displayed and used for the measurement. To change it, tap on the target height value on the* ***Status*** *bar.*



NOTE - *If you want to use an active prism with prism ID, select the appropriate prism in the list, for example Trimble S-Series MultTrack, and enter the corresponding prism ID.*

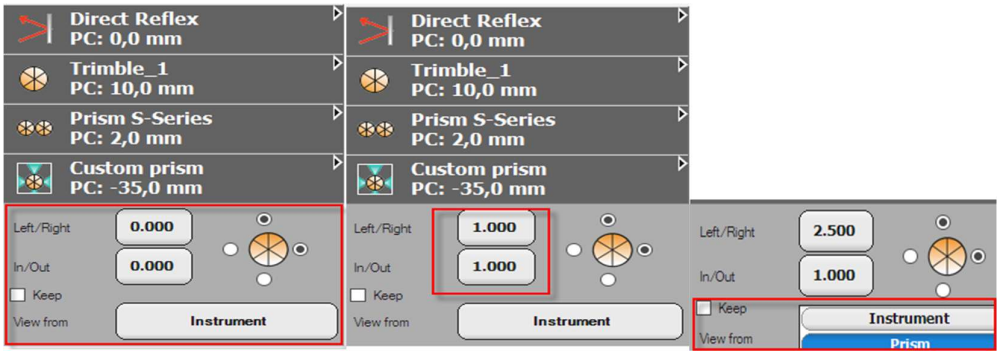


Total Station Measurement Distance Offset

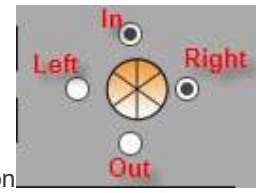
To measure nodes that cannot access directly, you can use the ***Left/Right*** and ***In/Out*** offset options.

1. When you are successfully connected to a Total Station, tap on the target icon 

on the **Status** bar.
2. At the bottom of the dialog that displays, define the values for the non-accessible nodes and the view from the instrument or prism. Tap **Left/Right** and **In/Out** to enter the values for the non-accessible node, then tap **View from** to define the view from **Instrument** or **Prism**.



NOTE - *When connected using a Radio or Bluetooth, use* ***view from prism****. When connected using a serial cable, use* ***view from instrument****.*



3. Use the visual graphic to set the direction of the nodes from your current position. For example:
   - View from instrument. Node is 1m on your left side and 2m behind you; enter 1m for Left/Right, and 2m for In/Out, then set the visual option to the following:
   - View from prism. Node is 2.5m on your right side and 1m in front of you; enter 2.50m for Left/Right, and 1m for In/Out, then set the visual option to the following:
4. Select the option **Keep** to keep the values for each measurement. If you deselect this option, the values you enter for Left/Right and In/Out are used only for the next measurement, and are then reset to zero.

12 Point List Manager + GIS View Manager

Point List Manager

The Point List Manager gives you a listed overview of all the current nodes in the project. You can filter the information by coordinate, point number, used stationing, unverified nodes, GNSS information. You can also edit some point information, add new nodes etc.

To open the Point List Manager, in the **Navigation** bar of the **Home** screen, tap  . You can:

- Tap  to focus a node in the middle of the map. Select the required node in the list then tap  . The map will be focused directly to the selected node.
- Tap  to add a new node. Enter a point number and then enter the coordinates (Easting, Northing, Altitude). Tap  to confirm, or  to discard the settings.
- Tap  to edit the node information. You can edit following options depending on the method that was used to generate the node:
  - Point number
  - Code/Comments
  - Stationing for open or edit the stationing/resection

- Altitude
- Method, i.e. changing of the antenna height or target height.
- 2D/3D, i.e. disable/enable the altitude

  NOTE – *You can select multiple nodes; tap on one node then hold the [Shift] button and tap the other required nodes.*

- Delete nodes. Select the node you want to delete, then tap . The button then changes to ; tap-hold to undo the deletion if required. you can also select multiple nodes (hold down the Shift key to select them) to delete.
- Start the stakeout node function. Select a node in the list then tap . For more information, see Stakeout, Navigation, Verification application. Start the verify node function. Select a node in the list then tap . For more information, see Stakeout, Navigation, Verification application
- **Configure the Point List view** (that is, the information you want shown) and use a filter.
  - View: you can define view settings for Point Number, Code, Method, Easting, Northing, and Level. 6 columns can be defined.
  - Filter: you can define filter options for All Nodes, Unverified Nodes, Stationing/Resection, Fixed GNSS only, or Measured distance. Change the filter to Stationing/Resection to view all used and generated stationing of the project and open/edit them by tapping .
- **Close** the Point List dialog.

GIS view manager

To open the GIS View Manager, in the **Navigation** bar of the **Home** screen, **tap-hold** . The button changes to . Tap it to view and filter a GIS object with its corresponding attributes which are include in the project.

1. Tap  to configure the filter and view options:
   - **Table:** Select the GIS object
   - **View:** Select what kind of information of the selected GIS object should be visible in the list.
   - **Filter:** Select the preferred filter.

   Tap  to accept, or  .
2. Tap  to focus the marked GIS directly in the middle of the map.

13 Edit functions

Deleting items

Use this to delete nodes, graphics, and GIS attributes.

> ⚠ **CAUTION -** If you delete nodes, all attached graphic elements and GIS objects are also removed from the map. If you delete only graphic elements, the surveying nodes remain in the map and can be used for other graphics and features to be attached to them.

In the **Home** screen, tap 

/ 

.

To delete a node:

1. Tap 

to delete a single node, then select the node from the map.

2. Tap 

to delete nodes in a defined rectangle. Use your finger or the pen on the map to define a rectangle containing all the nodes to delete.

3. Tap 

to delete nodes in a defined polygon. Use your finger or the pen on the map to define a polygon containing all the nodes to delete.

To undo a deletion, tap-hold on the relevant button.

To delete a graphic:

1. Tap 

to delete a single graphic object. Select the graphic on the map, then do one of the following:

   - tap **Delete graphic** to delete the whole graphic
   - tap **Delete part** to delete the selected line segment

NOTE - *If you delete a middle line segment of a feature, then the original GIS record is duplicated; a message shows to inform you of this. You may need to edit the GIS records.*

2. Tap 

to delete graphic elements in a defined rectangle. Use your finger or the pen on the map to define a rectangle containing all the graphics to delete.

3. Tap 

to delete graphics with the Lasso function. Use your finger or the pen on the map to define a polygon containing all the graphic to delete.

To undo a deletion, tap-hold on the relevant button.

Deleting GIS attributes:

You can delete the GIS attributes for a graphic object.

1. Tap 

and select the graphic object from the map. All graphics which have GIS attributes display 

.

2. Tap 

to delete the GIS attributes.

To undo a deletion, tap-hold on the relevant button.

Adjusting text and symbols

To adjust text:

1. In the **Home** screen, tap 

/ 

.
2. Select the text you want to adjust. The text is shown in a small red adjustment box.
3. Do any of the following:
   - Tap 

to move the text
   - Tap 

to rotate the text
   - Tap 

to resize / scale the text
   - Tap 

to edit the text.
4. Tap 

to confirm the changes.

To adjust a symbol:

1. In the **Home** screen, tap 

/ 

.
2. Select the symbol you want to adjust. The symbol is shown in a small red adjustment box.
3. Do any of the following:
   - Tap 

to move the symbol
   - Tap 

to rotate the symbol

- Tap 

to adjust the width of the symbol
- Tap 

to adjust the height of the symbol.
- Tap 

to resize / scale the symbol.
- Tap 

to confirm the changes.

Add Offset

The Add Offset function adds a parallel polyline to an existing line/area feature by a defined offset.

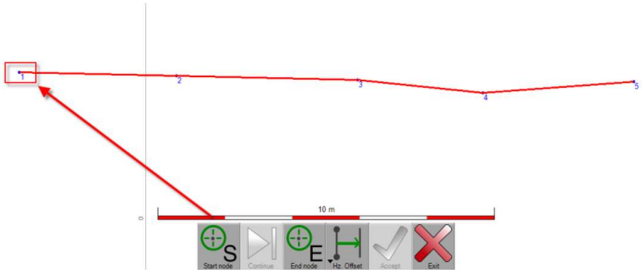
1. In the **Home** screen, tap 

/ 

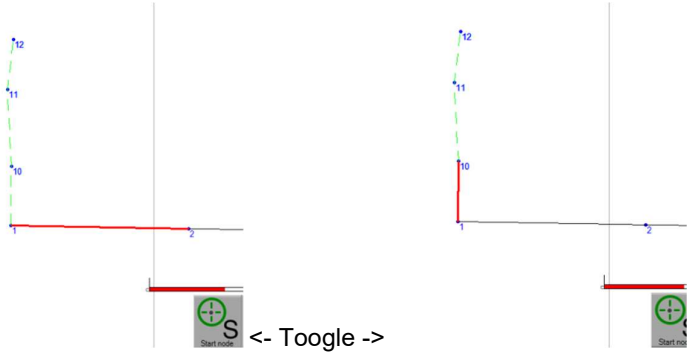
.
2. Choose the line feature and select the start position from map by picking a node.

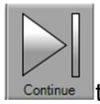
   If you select a node which is not related to more than one line object, the end of the line object is found automatically.

This function adds a parallel polyline to an existing line/area feature by a defined offset.

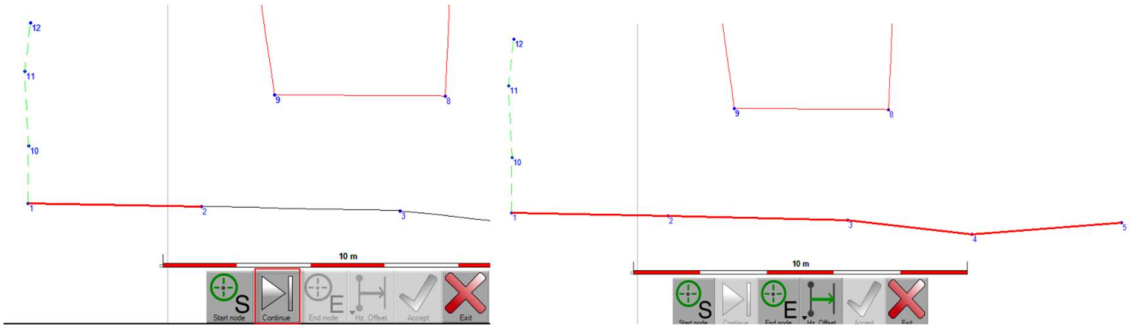


If the selected node relates to more than one line object, for example, an area object or two different line objects, you can toggle between two choices by tapping on the map.



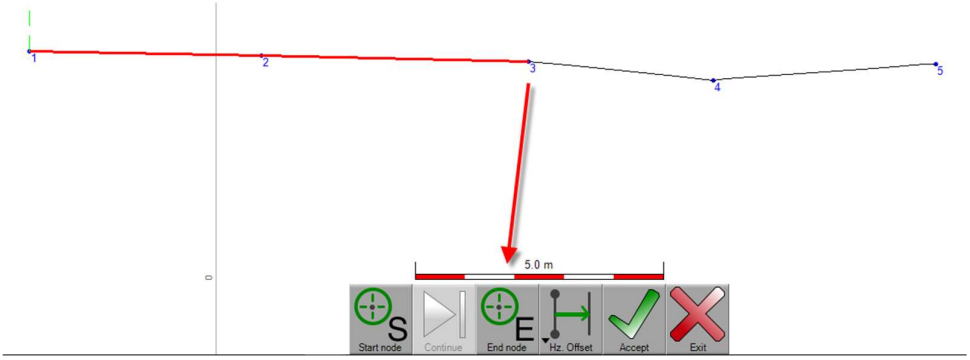
Tap Continue 

to select and end the whole line/area object automatically.



3. If you want to add a parallel line from a line segment of the whole line object, tap 

and pick the required node from the map.



4. Tap 

and enter the horizontal offset value. Tap-hold the Offset button to enter a vertical offset

***NOTE -** Tap on the map to toggle between the two possible solutions.*

5. Tap **Accept** and select the layer for the new line feature by tapping the previous/next button or selecting directly from the list.

6. Tap **Exit** to close the application.

Area Split

With the Area Split function it's possible to allow the user to partition polygon features.

1. In the **Home** screen, tap 

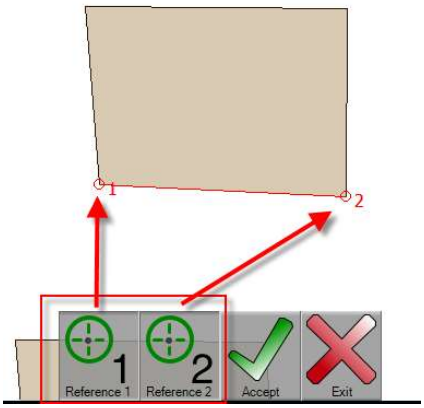
/ 

2. Tap 

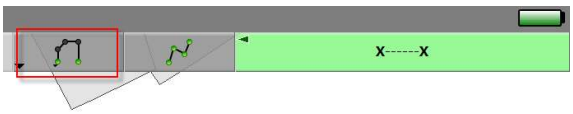
to select reference node 1, and tap 

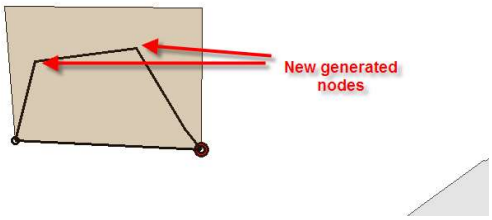
to select reference node 2, then tap 

. The area split is executed from this line.

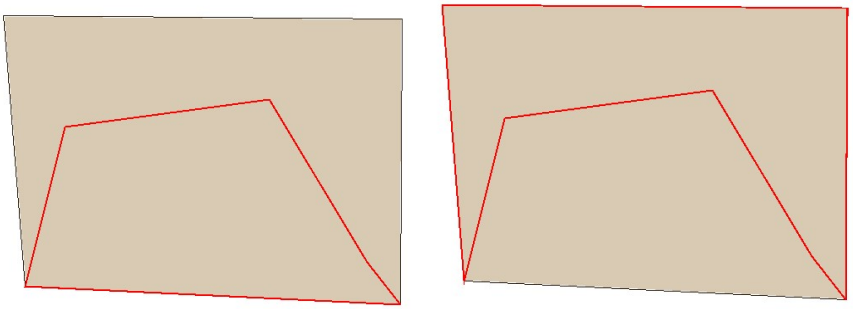


3. The Data Collection mode is launched automatically. You can now generate new nodes by measuring, calculating, or constructing nodes. When you have generated all the required nodes, tap the **Close Feature** button.





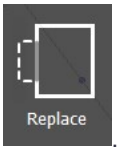
The polygon has been split into two separated area:



Replace

Use the Replace function to change wrong or imprecise objects by collecting new data and replacing the old objects .

1. In the **Home** screen, tap 

/ 

.

2. Tap 

and 

to select the last correct collected nodes.

3. Tap 

. The section between reference node 1 and reference node 2 is highlighted in red. This is the section that will be replaced with the new correct data. Tap 

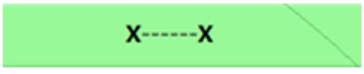
to choose the obsolete section which is to be replaced.

4. Tap 

. The Data Collection mode starts.

5. From the marked node (visible by a circle) you can now start the new data collection. Select the collection method you want to use (GNSS, Total Station, COGO, Snap, Free), and then collect the data.

6. To finish collecting data, tap  in the status bar. The new collected data replaces the old data and the selected section is replaced with the new one.

   NOTE - *Tap* 

in the status bar to discard the replacement.

Postprocessing

In the **Home** screen, tap **Edit / Postprocessing.**

For detailed information on using the postprocessing functionality in Trimble Penmap, watch the video on YouTube: https://www.youtube.com/watch?v=FJQQg1Muwf8

Clipboard

Use the Clipboard to easily copy and paste graphic objects from one project to another project. The projectS(s) you are copying to must use the same template and coordinate system as the project(s) you are copying from.

1. In the **Home** screen, tap **Edit** / **Clipboard**.

   NOTE - *If the option is not available on the **Edit Method** bar, go to **Settings** / **Custom** in the **Home** screen to add it.*

2. Tap **Copy**.

3. Select the graphic object. Use one the following options:

   - 

Select and add one graphic object by clicking directly in the map

   - 

Select and add graphic objects by defining a rectangle. All graphic objects are added for copying

   - 

Select and add graphic objects by using the Lasso function

4. The **Eraser** button shows you the graphic objects you are copying. Tap **OK** for confirming the settings.

5. Open the project you want to copy the objects to. In the **Home** screen, tap **Edit** / **Clipboard**. Tap **Paste**. The copied objects are added to the project.

   NOTE - *The Paste option is only active when you have an item copied to the clipboard.*

Edit GIS

For graphic objects (point, line or area) you can:

- Edit GIS
- Add GIS
- Change GIS type
- View GIS

To work with GIS data for objects (point, line, or area):

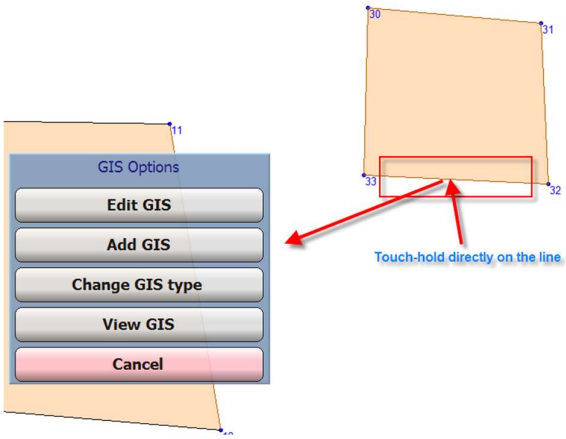
1. In the **Home** screen, tap-hold the graphic object you want to work with.

   If more than one object is detected, the query dialog displays in the lower section of the map, prompting you to select the required object.

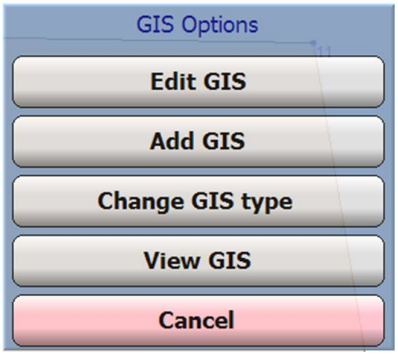
   Tap 

   to switch to the feature, then tap  to confirm.

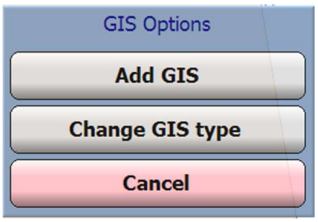
   NOTE - *You must snap to the boundary line of the object to open the GIS Options dialog:*



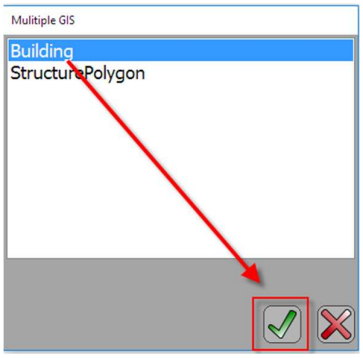
If the selected object has a GIS schema/attributes, the following options are available:

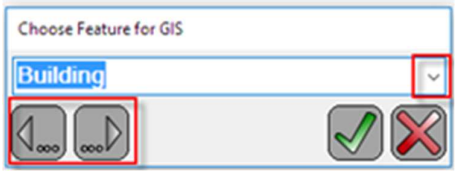
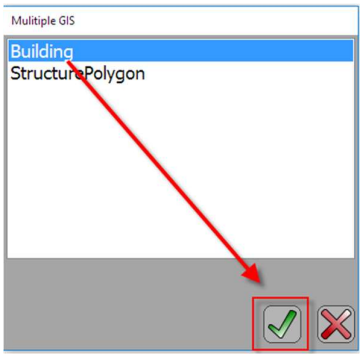
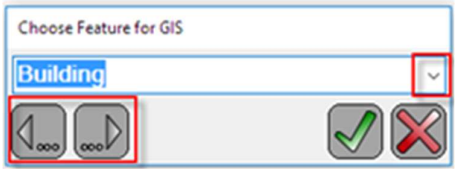


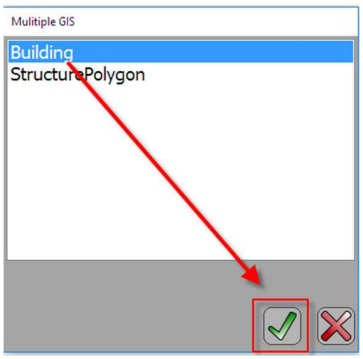
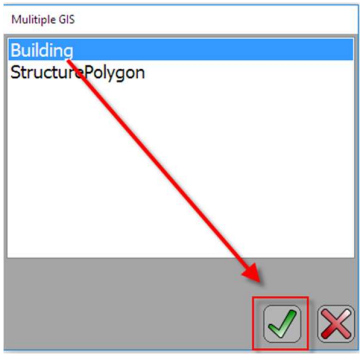
If the selected object does not have a GIS schema/attributes, the following options are available:



2. Tap the required option:

Tap...	To...
Edit GIS	Edit the existing GIS attributes. If more than one GIS is related to the object, select the one you want to edit in the **Multiple GIS** dialog. 
Add GIS	Add a new GIS to the object. In the **Choose Feature for GIS** dialog, use the drop-down menu or the previous/next buttons to select the GIS class.

	 Tap  . Then enter the GIS attributes, and tap  . To edit, view, or change any GIS, tap-hold on the object, then tap the required option (**Edit GIS**, **Add GIS**, **Change GIS type**), then select the GIS you want and tap  to edit it, view it, or change its type. 
Change GIS type	Change the GIS type. In the **Choose Feature for GIS** dialog, use the drop-down menu or the previous/next buttons to select the GIS class.  Tap  . Then enter the GIS attributes, and tap  . If more than one GIS is related to the object, select the one you want to edit in the **Multiple GIS** dialog.

	
View GIS	View the GIS attributes. You cannot make any changes here; all fields are greyed-out. If more than one GIS is related to the object, select the one you want to edit in the **Multiple GIS** dialog. 

14 Query Data

ID Node

In the **Home** screen, tap ***Query / Node*** and select the node you want to look at.

Tap...	To...
	Select the node you want to look at. This function shows information about the selected node such as coordinates, date collected, which method was used to create it, and other method-specific raw observation data.
	Edit information for the selected node: Point Number, Code/Comments, Altitude, Method (if you selected a measured node), 2D/3D.
	Open the **Point Information** dialog, which shows information about the selected node such as coordinates, date collected, which method was used to create it, and other method-specific raw observation data.
	Exit

ID Graphic

In the **Home** screen, tap **Query** / **Graphic** and select the node you want to look at.

Tap...	To...
Select	Select the graphic directly from the map. This function shows information about the selected graphic element, such as graphics type and layer. If more than once graphic is found, a dialog appears, enabling you to switch between the different elements; tap the item listed in the dialog to show details for that item. 
Edit	Tap to edit the layer type. Then tap .
Report	View information about the selected graphic.
Exit	Confirm any changes and close the dialog.

ID Measure

In the **Home** screen, tap **Query** / **Measure** to start measuring the distance between two nodes.

- Distance between two nodes in the map: tap Reference 1 to select the first reference node, then tap Reference 2 to select the second node. The distance and bearing between the two selected nodes is calculated and displayed.

- Distance between a node and a graphic element: tap 

to select the reference node, then tap 

to select the graphic element that you want to measure the distance to. The distance and bearing between the two selected items is calculated and displayed. To show the calculated distance directly on the map, tap 

.

Orthogonal

1. In the **Home** screen, tap **Query** / **Orthogonal** to start the orthogonal calculation.
2. Tap 

to select the first reference node for the construction line, then tap 

to select the second node for the construction line.
3. Tap 

to select the node to calculate the chain and offset to the defined construction line.

The calculation of chain and offset are displayed.

15 Export

Exporting a UNV file

1. In the **Home** screen, tap **Export / Export UNV**.
2. Enter a name, specify the target folder, and select the file type for the export.
3. Tap **Save** to start and save the export.

Exporting a DWG/DXF file

1. In the **Home** screen, tap **Export / Export DXF**.
2. Select the export options you want to use. If required, define a time frame; all data within the time frame will be exported.
3. Tap **Continue** and specify the target folder for the export.
4. Under **Save as type**, define the file format for the export.
5. Tap **Save**.

Exporting a CSV file

1. In the **Home** screen, tap **Export / Export CSV**.
2. Do one of the following:
   - To export a CSV file without using a template, tap **On/Off** to define the export options .
   - To use a template:
     a. Tap **Use Template**. To generate a CSV template, go to the **Home** screen, and tap **Export / Export CSV**.
     b. Tap **New/Edit** and then tap **New**.
     c. Name the template, select the required encoding and file type, and tap 
     d. Define the template: select an element in the **Available** column and tap the Arrow button to move it to the **Exported** column. Do this for all required elements.
     e. Select the required Separator.

     You can now use the template for the export.
3. Tap  then enter a file name. Select the target folder and file type, and tap **Save**.

Exporting a Shapefile

1. In the **Home** screen, tap **Export / Export SHP**.
2. Define the target folder for the export, then tap **OK**.
3. Select the **Shape Export** options for the kind of data to be exported. Tap  .