Aptella ACADEMY

GT Series Instruction Guide

Building Construction

SOFTWARE VERSION: V9 Topcon Field

SOLUTION READY

Advise | Enable | Support

Foreword

This course is designed to fulfil the needs of users from the surveying, mining and civil industry and has been produced by Aptella. Its contents are informed by many decades of experience in surveying, civil engineering, and related applications, coupled with technical expertise from manufacturer-trained employees. This guide is designed to provide the user with an understanding of the requirements and settings used to create a job with GT Series and Topcon Field to conduct field set out from imported data.

Aptella Technical Support

QR Code for Online Resources (Quick Guides, Videos, Manuals)

Technical Support Contact Details

This number will connect you to the closest branch for Technical Support.

AUS/NZ CAD Support Number	**1300 867 266 (Option 1)**
AUS/NZ CAD Support Email	**cadsupport@aptella.com**
NZ National Support Number	**0800 267 266 (Option 1)**
NZ National Support Email	**nzsupport@aptella.com**

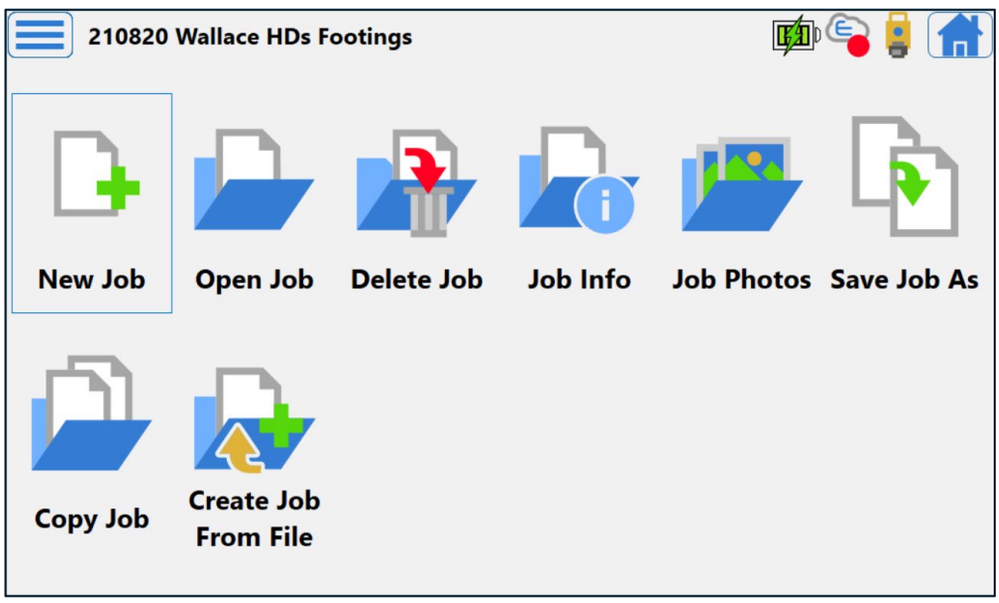
If you are unable to reach our regional support teams, please leave a voicemail so a support ticket is generated in our system. Our support team will get back to you as soon as possible to help with your inquiry.

Contents

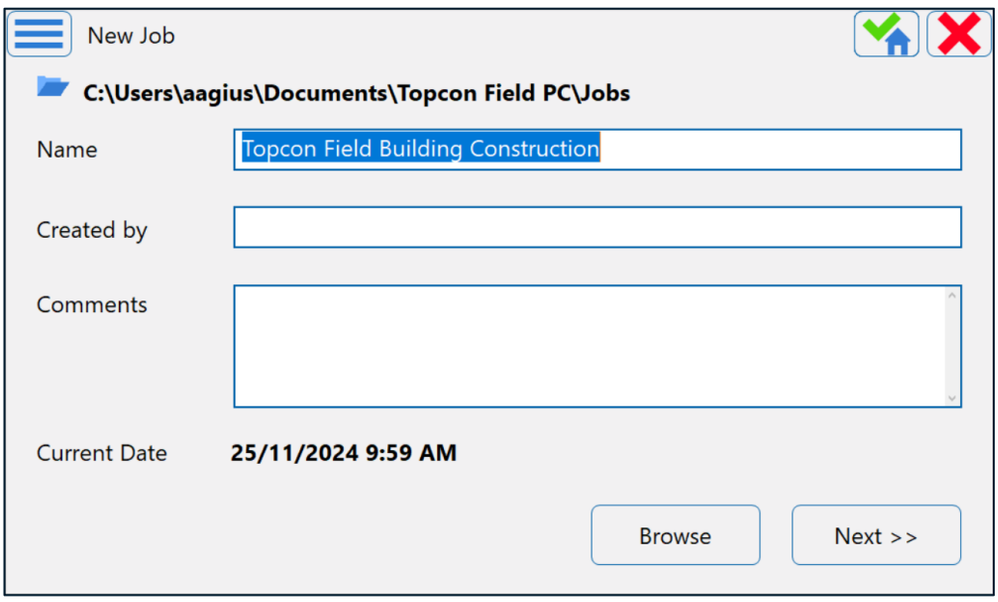
Create a New Job in Topcon Field

1. Open the **Topcon Field** software on the FC-6000/6400.
2. Once on the **Topcon Field** main screen, select the **Job icon**.

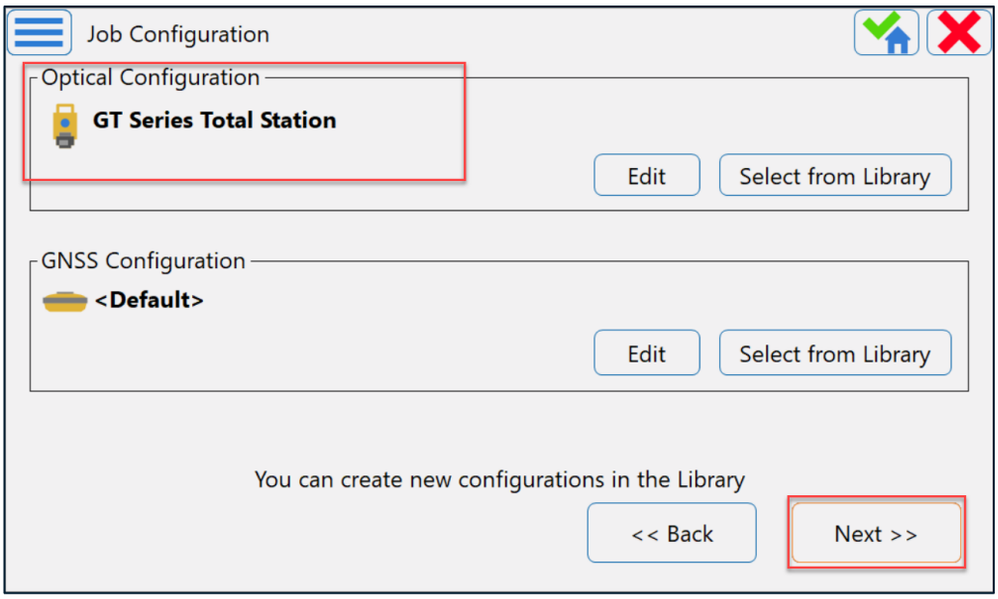
3. Once on the job screen, select the **New Job icon**.



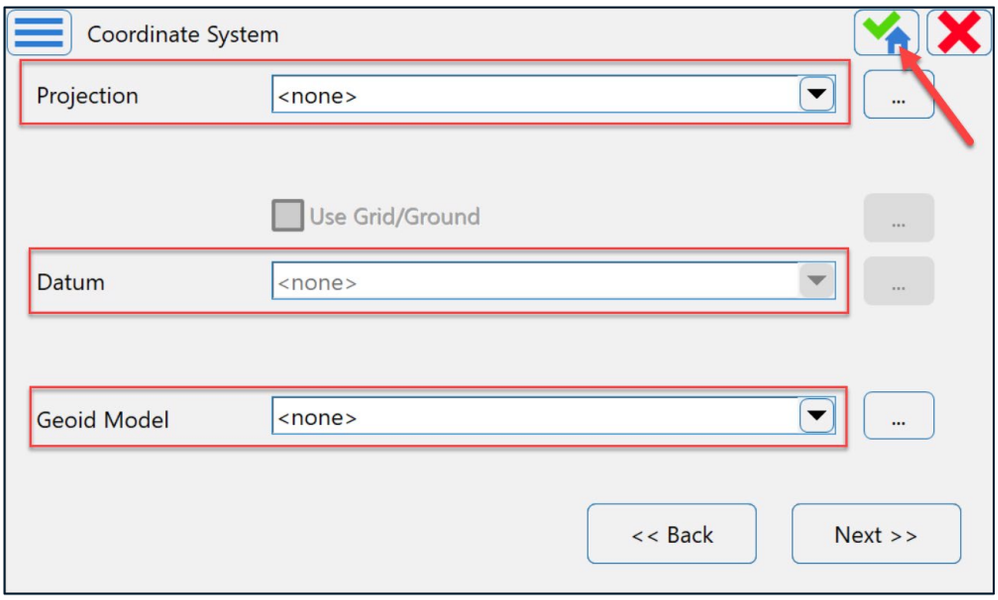
4. On the new job screen, enter in a **name** for the job. Once a name has been entered, select the **Next button**.



5. Once the job configuration screen, ensure that optical configuration is GT and then select the **Next button**.

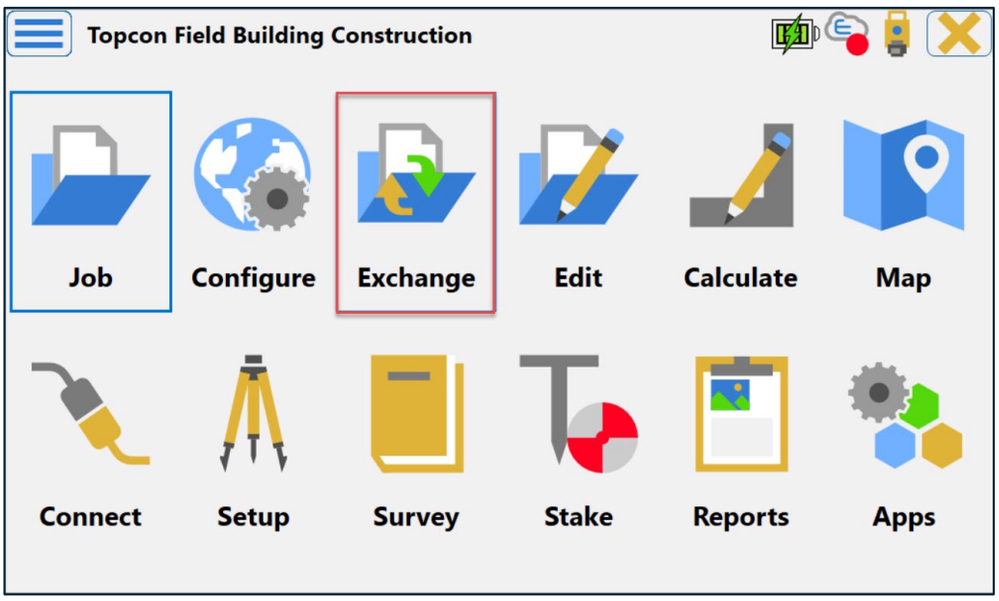


6. On the coordinate system screen, ensure that Projection is set to **None**, Datum is set to **WGS84 or None** and Geoid Model is set to **None**. Select the **Green tick** button in top right corner to complete the job setup.

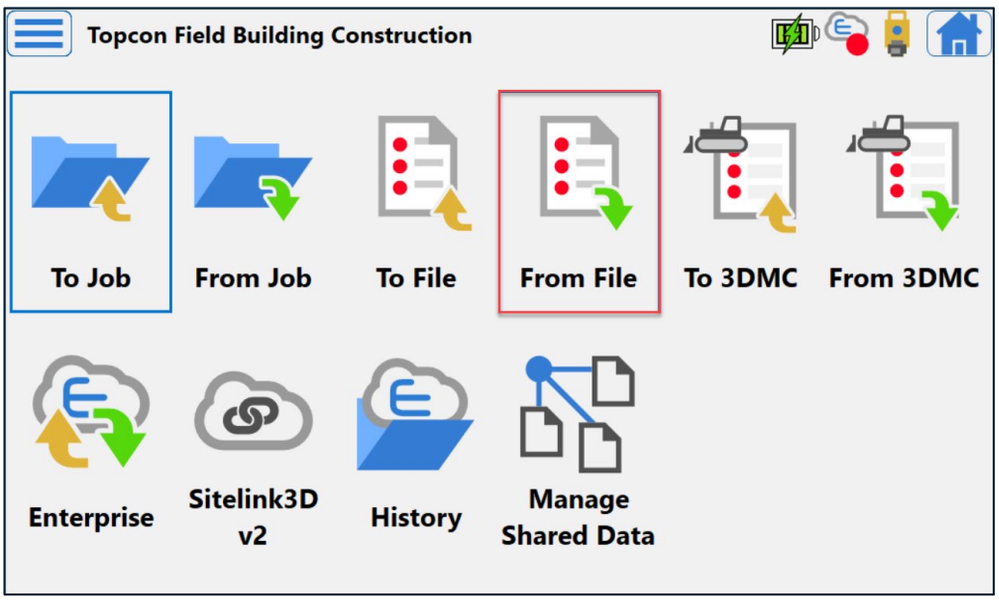


Import Design Data into the Job

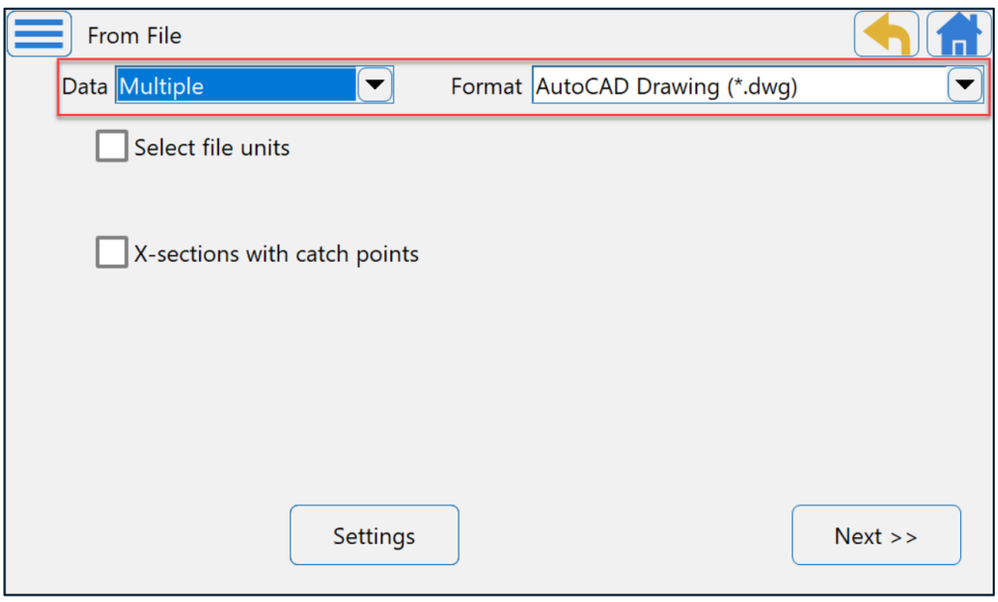
1. Now back on the **Topcon Field** main screen, select the **Exchange icon**.



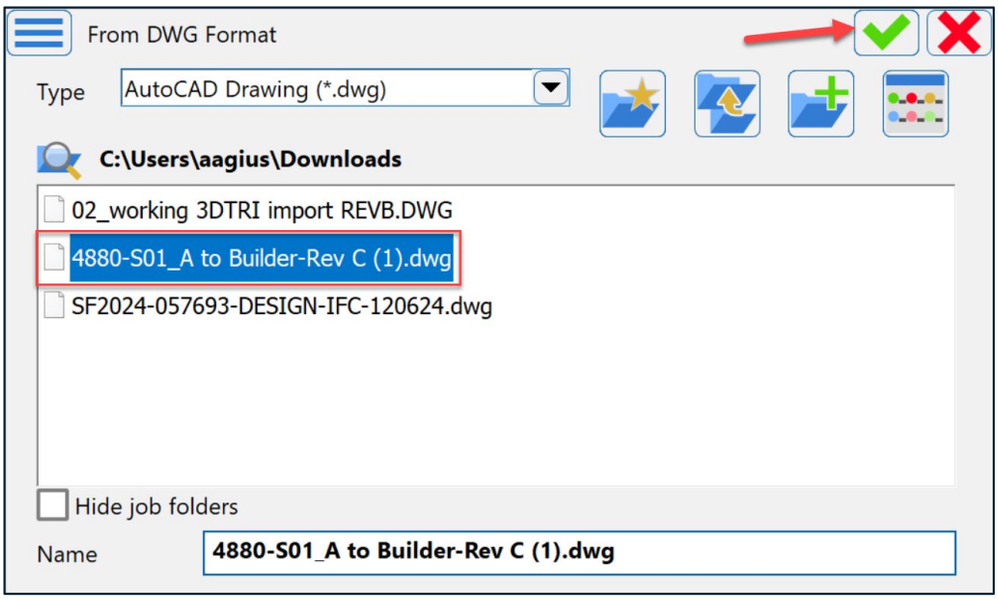
2. On the exchange screen, select the **From File icon**.



3. On the from file screen, ensure the *Data* is set to **Multiple** and the *Format* is set to **AutoCAD Drawing (.dwg)**. Select the **Next button**.

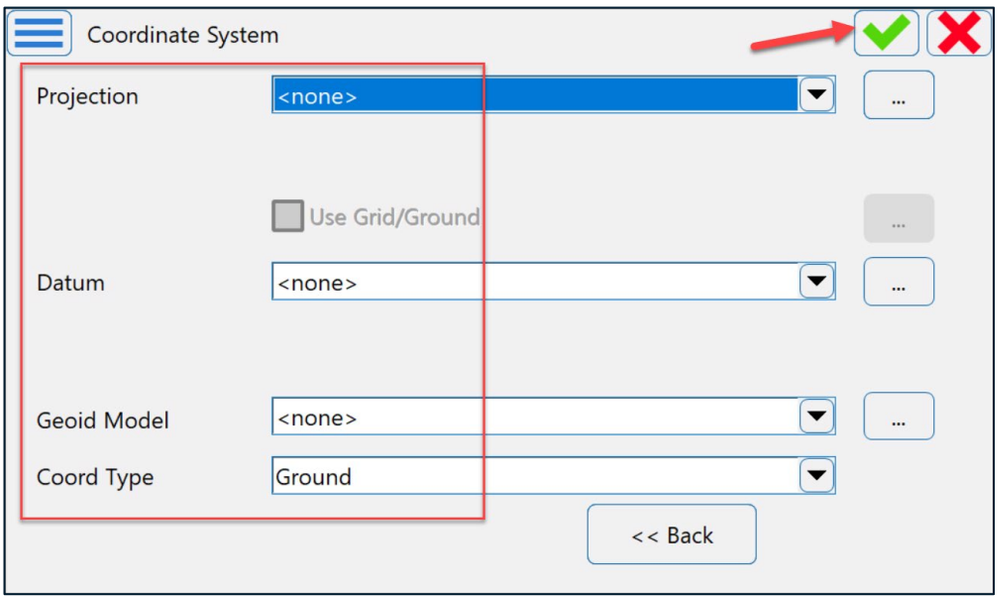


4. On the from DWG format screen, navigate to where the design .dwg file is stored on the Data Collector or USB drive. Select the design .dwg file and select the **green tick button** in the top right corner.



5. On the coordinate system screen, ensure that *Projection* is set to **None**, *Datum* is set to **WGS84 or None**, *Geoid Model* is set to **None,** and *Coord Type* is set to **Ground.** Select the **Green tick button** in top right corner.

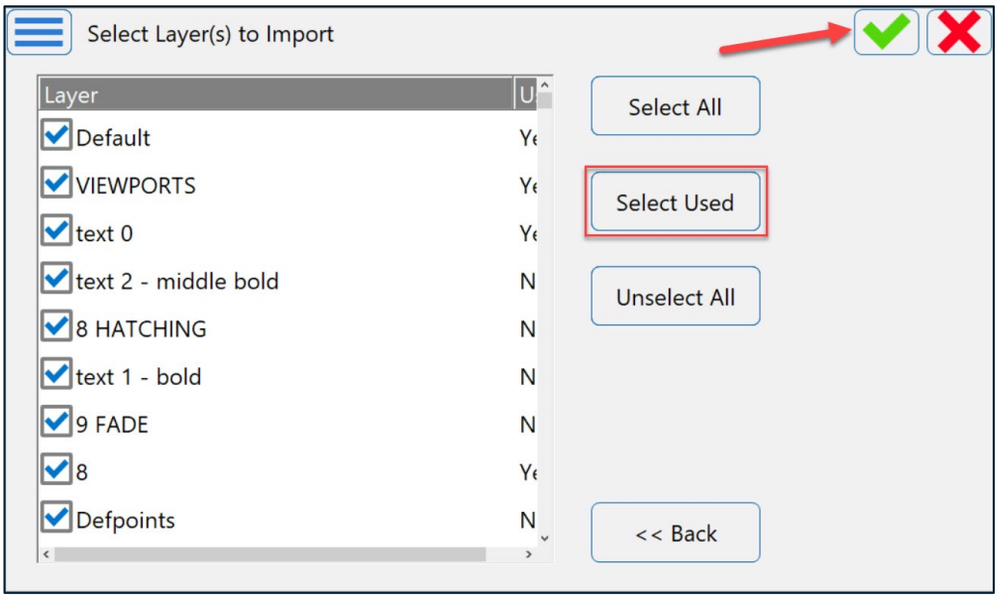
NOTE: The surveyor may have used a grid system for the project and check with them on what projection and datum maybe required. Most commonly no projection is used and why software is set to none.



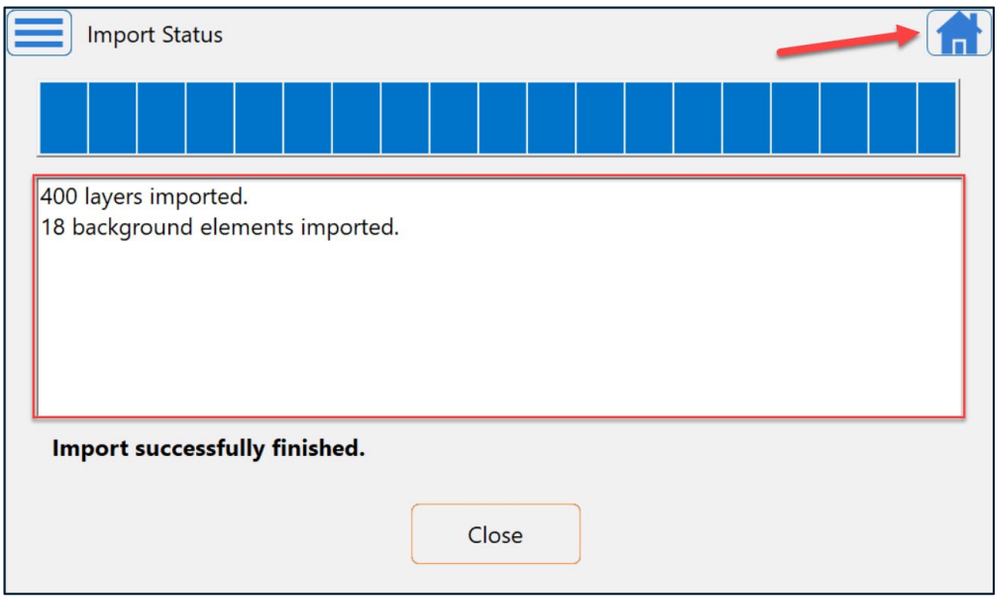
6. On the data selection screen, leave all check boxes ticked to import all data.

7. On the select layers to import screen, select the **Select All button** to import all the *Layers* data. Once all boxes have been ticked, select the **Green Tick button** in the top right corner.

*NOTE: if the user does not want all the layer data, they can manually select the layers containing the data required for set out or **select used** to import only layers that contain information.*



8. On the import status screen, the user can see a progress bar during the importing of the design data into the job and what information was imported. Once import has been successfully completed, select the **Blue Home button** in the top right corner



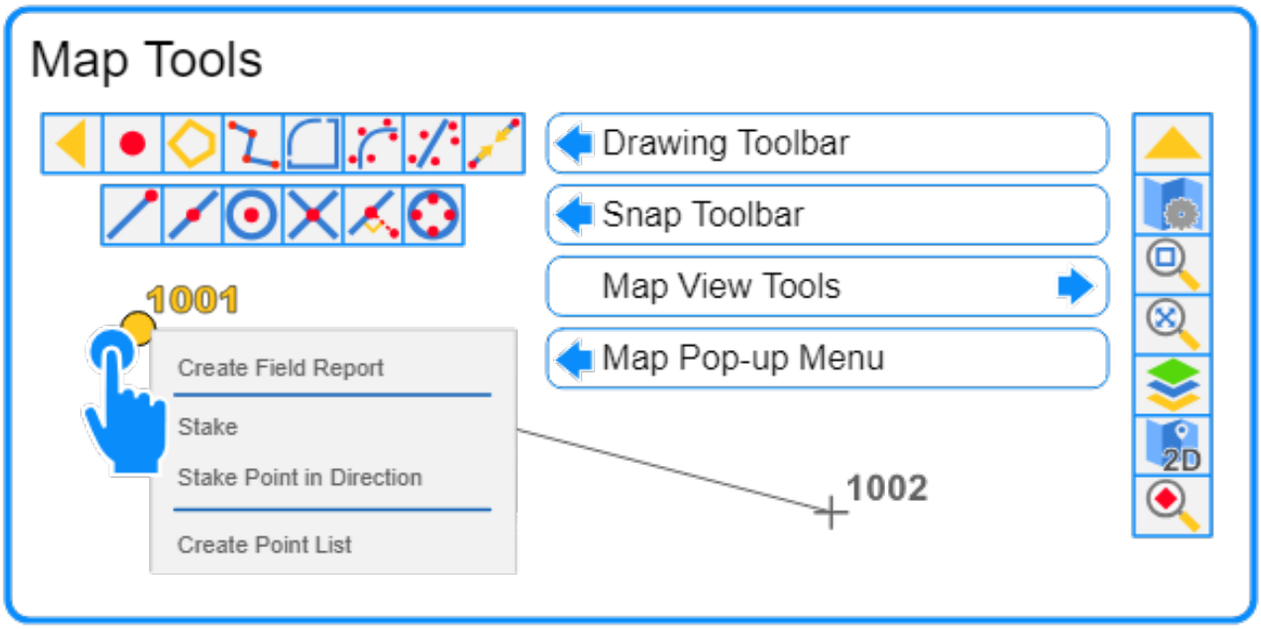
Topcon Field Map Features

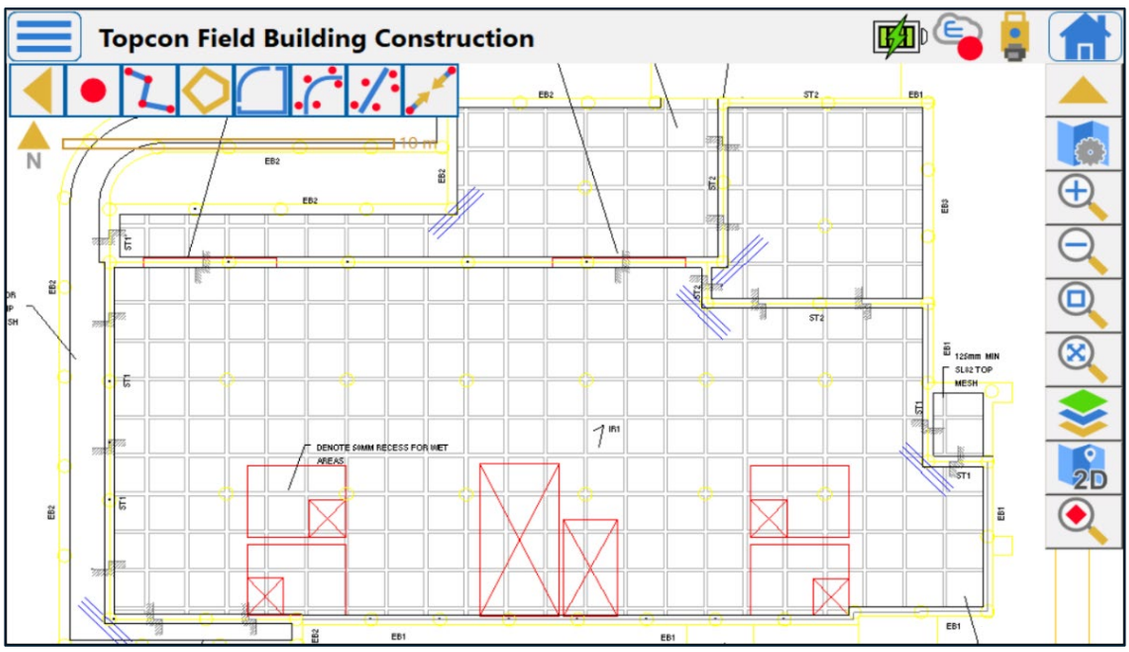
Main Map Walkthrough

The Main Map Icon will be used to check the newly imported design, orientate yourself onsite, create new points into the design to stake out, and enquire into line distances and directions.

The map always displays on-screen scale bar and compass (direction indicator) in both 2D and 3D modes. The map retains current job view including charted objects and settings, so user may quit map screen any time and return later.

Operate the map with four sets of interface instruments:





Customize the map look to meet your needs in the **Map Properties** screen, open it by clicking  in the **Map View Tools**.

Map View Tools

The map view tools displays on the right-hand side of the map view which can be toggled between on or off at the users discretion. The following options makeup the map view tools:

ICON	DESCRIPTION	ICON	DESCRIPTION
	**Map Properties** Open the Map Properties screen		**Zoom In** Zoom the plot inwards
	**Zoom Out** Zoom the plot outwards		**Zoom Window** Click this button and drag the pointer to define a rectangular area to scale and centre on
	**Zoom All** Scale and focus automatically to display all map objects in single view		**Centre to Point** Select a point through Select Points From List dialog for centering the plot
	**Edit Layers** Open the Layers dialog for quick access to layers manipulations		**Switch to 2D/3D** Switch the view of the map between 3D and 2D mode
When the 3D View is selected, an additional sidebar with more command buttons is displayed (below)			
	**Top View** The observer is located above the objects, looking perpendicular to the horizontal plane		**Perspective View** The observer is located in front of the objects and above them, the gaze direction is free

	**Pan Mode** Move the map by dragging the pointer in any direction while preserving scale and orientation. Perspective correction still applies while working in 3D View with Perspective View activated		**Rotate** Rotate the map around centre
	**Vertical Scaling** Change the vertical scale of all shown objects in the 3D view. Click the icon to activate and drag the pointer vertically up or down to scale		

Drawing Toolbar

The **Drawing Toolbar** offers tools to create new objects such as lines, polylines, areas, arcs, fillets. When used in combination with the **Snap Toolbar**, the **Drawing Toolbar** also allows you to create new points at specific positions relative to existing objects.

To open / close the **Drawing Toolbar**, click the  /  button in the top left corner of the map.

The **Drawing Toolbar** contains the following drawing tool buttons:

ICON	DESCRIPTION	ICON	DESCRIPTION
	**Point Drawing Tool** To calculate and generate a point at specific position relative to existing object(s). Use this tool in combination with the desired tool from the Snap Toolbar.		**Polyline Drawing Tool** To create a polyline through ordered point selection. Use this tool in combination with tools from the Snap Toolbar to calculate and include points with specific positions into the selection.
	**Area Drawing Tool** To create an enclosed area through ordered point selection. Use this tool in combination with tools from the Snap Toolbar to		**Fillet Drawing Tool** To calculate and generate a fillet between two lines with user-defined radius.

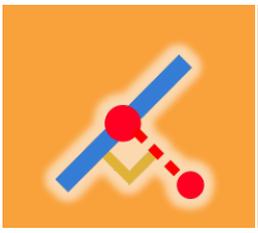
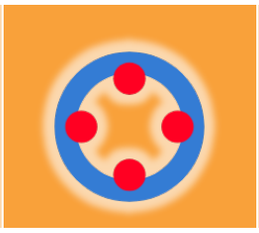
	calculate and include points with specific positions into the selection.		
	**Best Fit Arc Drawing Tool** To calculate and generate a circular arc as the best fit to the selected points. Use this tool in combination with tools from the Snap Toolbar to calculate and include points with specific positions into the selection.		**Best Fit Line Drawing Tool** To calculate and generate a line as the best fit to the selected points. Use this tool in combination with tools from the Snap Toolbar to calculate and include points with specific positions into the selection.
	**Join Lines Drawing Tool** To create a new polyline by joining multiple lines.		

Snap Toolbar

The **Snap Toolbar** acts as an addition to the Drawing Toolbar and offers tools to quickly calculate and create points at specific positions relative to existing map objects. Such points can be calculated and added directly when creating a new object with instruments on the Drawing Toolbar.

The **Snap Toolbar** contains the following snap tool buttons:

ICON	DESCRIPTION	ICON	DESCRIPTION
	**End Point Snap Tool** To create a point at the nearest end of the clicked line or segment of a polyline.		**Middle Point Snap Tool** To create a point, it the middle of the clicked line or segment of a polyline.
	**Circle Center Snap Tool** To create a point in the center of the clicked circular arc or circle.		**Line Intersection Snap Tool** To create a point at the intersection of two selected lines.

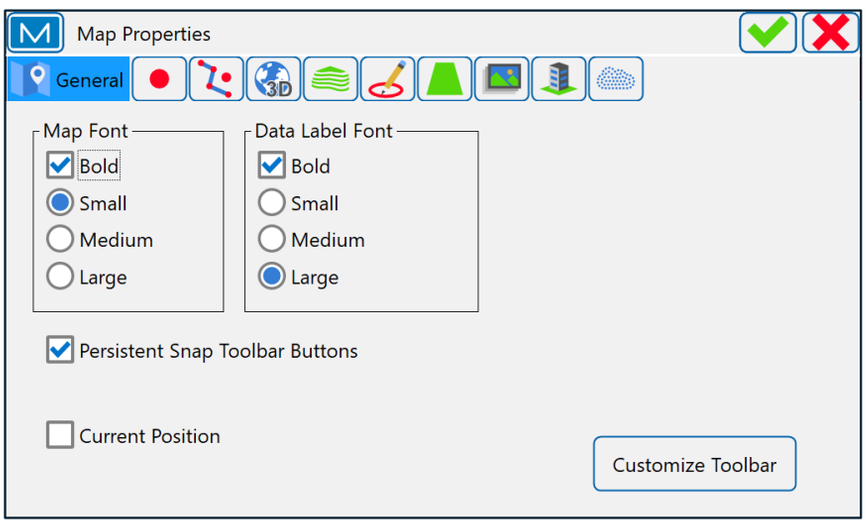
	**Perpendicular Snap Tool** To create a point projected from the selected point onto the clicked line or segment of a polyline.		**Quadrant Snap Tool** To create a point in the nearest quadrant of the clicked circular arc or circle.

Map Properties

The **Map Properties**  is located under the map view tools and allows the user to customise the map view depending on their preferences.

General This tab contains settings for tuning of the Map look and enabling and using of in-build map features. The user can alter font size and style of text on the map, and data label fonts for displayed values.

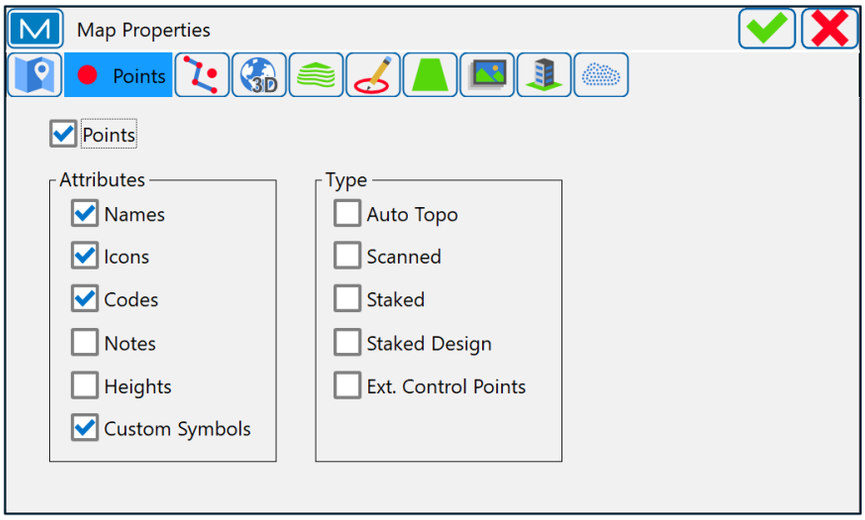
If the **Current Position** check box is selected, the current position  is displayed on the map.



Points

This tab configures types of points and specific point data to show or hide on the **Map**.

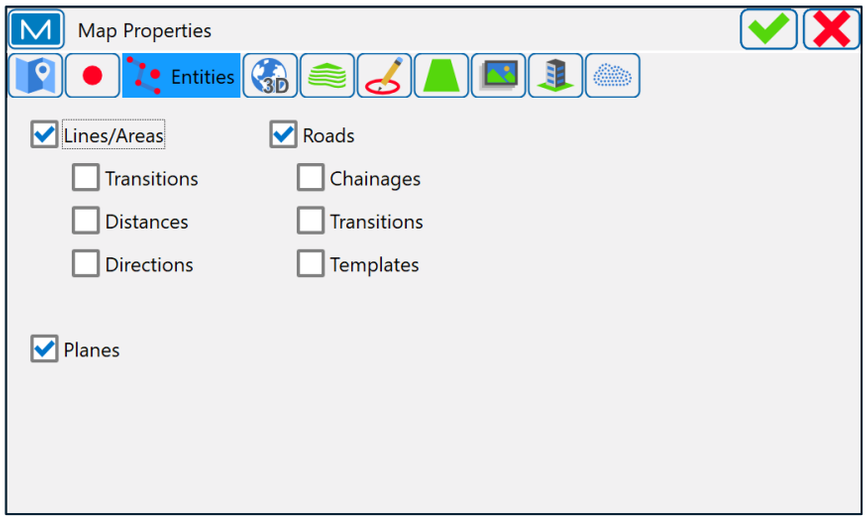
If the **Points** check box is deselected, the **Map** does not display points in the job.



Entities

This tab configures types of objects and specific data for these objects to show or hide on the **Map**.

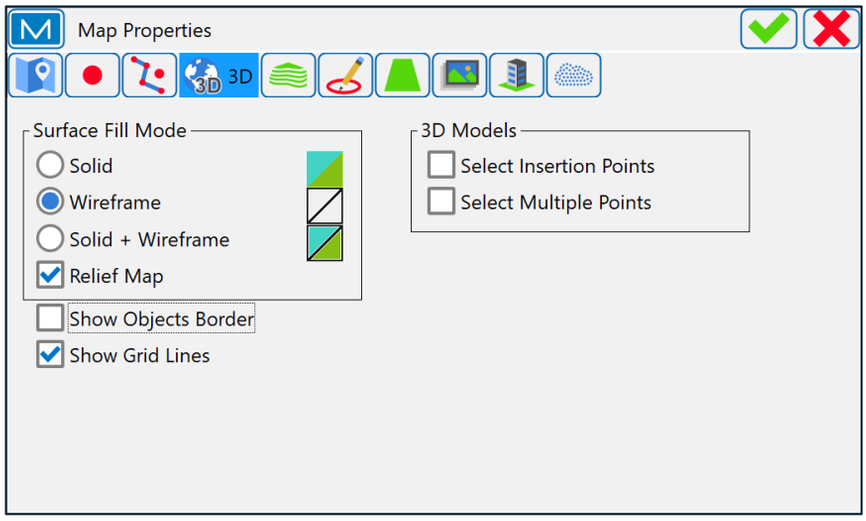
If the **Lines, Roads or Planes** check box is deselected, the **Map** does not display in the job.



3D

This tab contains settings for tuning of the **Map** look in 3D view and enabling and using of in-build specific 3D view features.

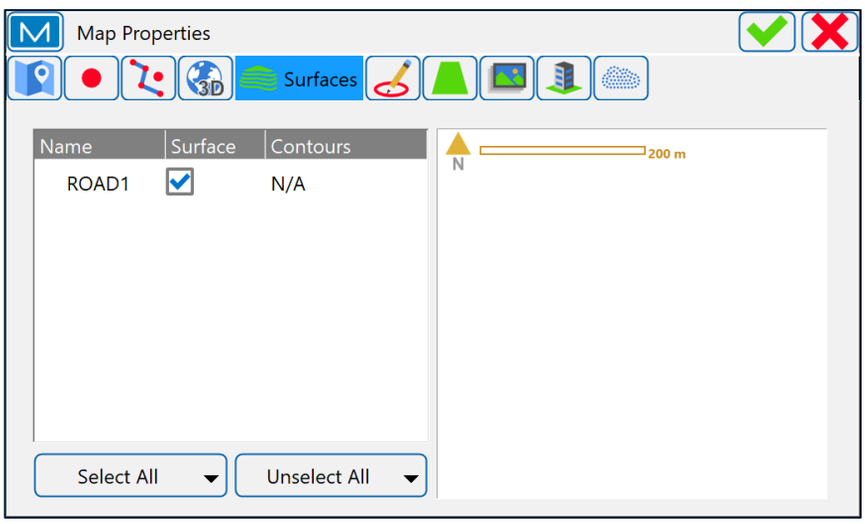
In this tab you can select the fill type of the surfaces, configure point selection on 3D model elements on the **Map** in 3D view.



Surfaces

This tab contains the list of available surfaces and their contours that can be visible on the **Map**.

The left panel of the tab contains the list of surfaces available in the current job as well as separate controls for each surface and contours visibility on the map. The right panel displays the highlighted surface preview in the horizontal plane.



Background

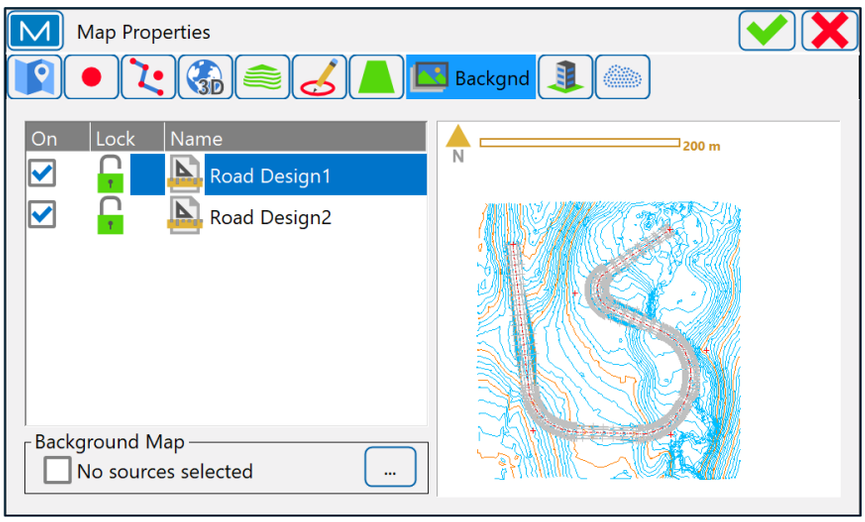
This tab contains the list of available backgrounds of different types that can be visible on the **Map**.

The left panel of the tab contains the list of the imported vector and raster backgrounds:

 is used for vector background

 is used for raster background

 is used for site scanned background



Setup GT

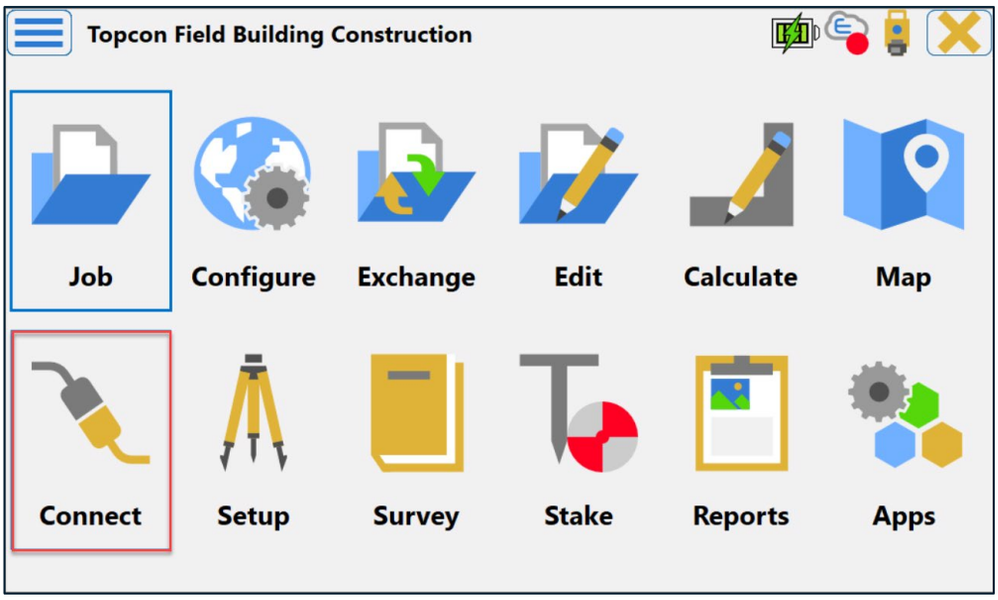
Connecting to GT via Bluetooth

1. Place the tripod in an area of the job site that has minimal foot/vehicle traffic and has **clear line of sight to the control points, and the area to be set out.**

2. Fix the GT onto the tripod via the tripod screw, keeping one hand on the instrument until it is secured in place.

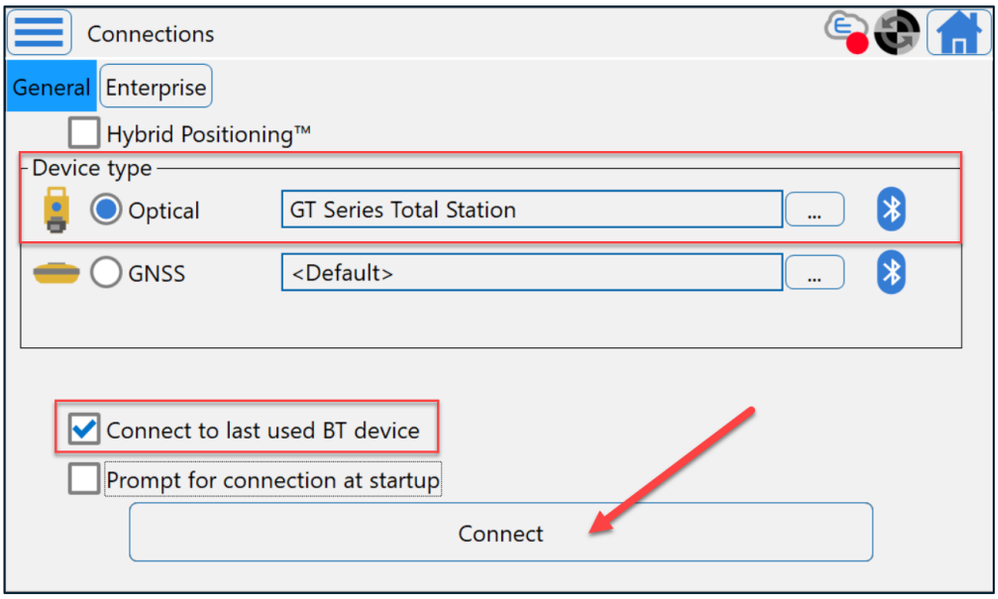
3. Place a fully charged battery into the GT and turn it on. Using the foot screws, level the GT, then use fine adjustments using the onscreen digital bubble to exactly level the instrument.

4. Once you have completed this setup routine, using the **Topcon Field software** on the Data Collector, from the main screen, select the **Connect icon**.

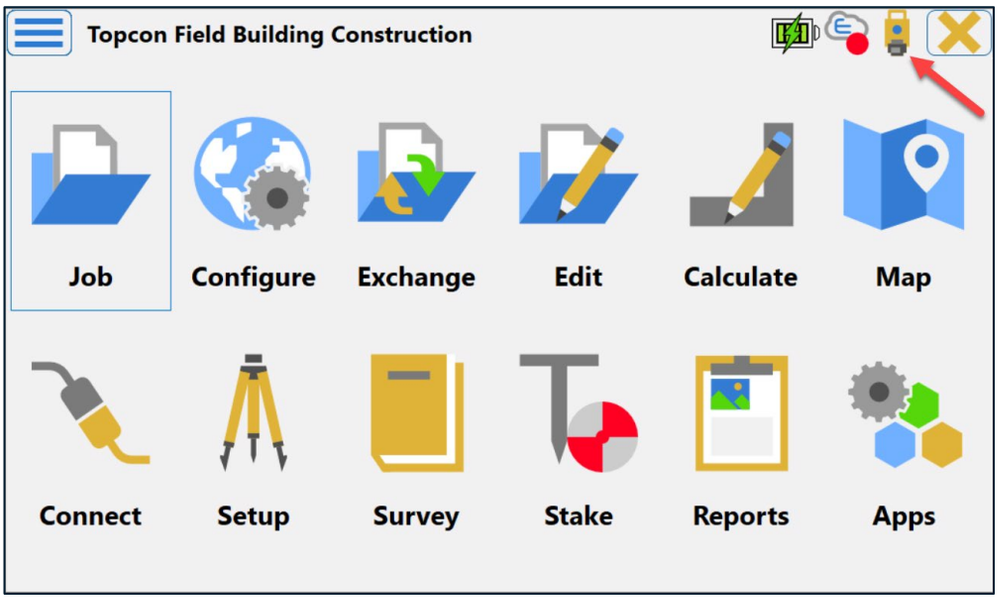


5. On the connections screen, ensure that the *Optical* has a **Filled circle** and the **GT** is the device selected with a Bluetooth icon. Select the **Connect button**.

NOTE: The user can tick on the connect to last used BT device to make a quicker connection if always using the same GT unit.

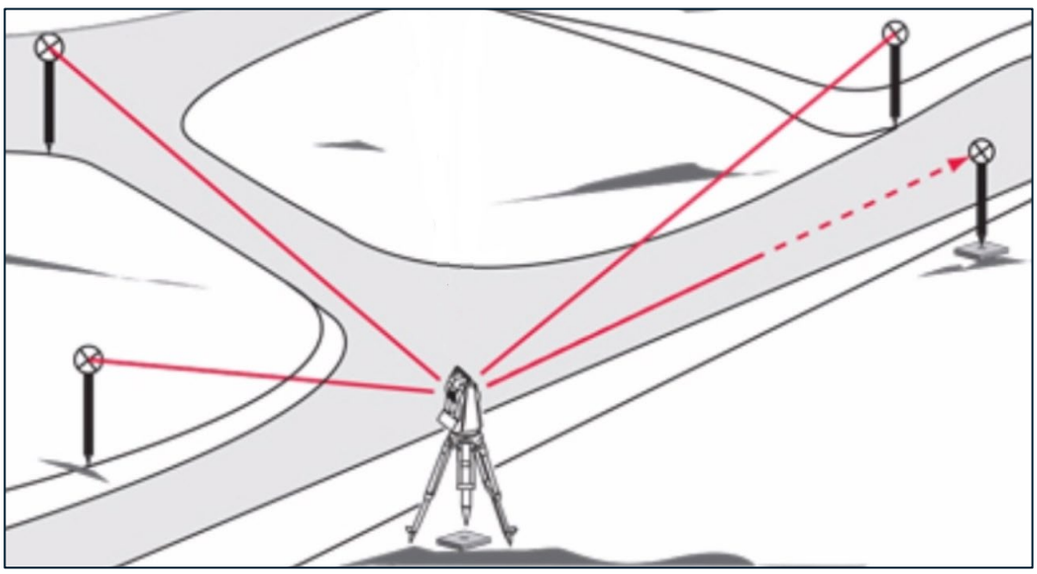


6. After approx. 10 seconds, the GT will connect to the software and be back on the main screen. The icon in the top right corner indicates a connection to the GT unit.



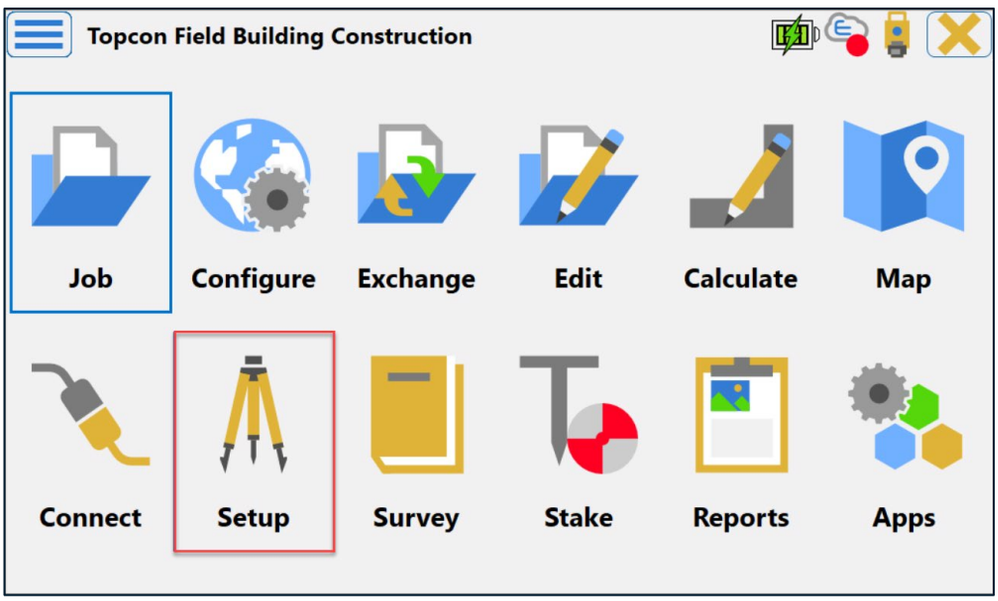
Best Practice Resection

- Use 3 control points in the resection with a 4th control point as a check shot.
- Visual line of sight between occupation point and all control points.
- Instrument is setup within the boundary of your resection control points.
- All observations should be taken in a clockwise direction.
- Observe the longest distance first as this has least amount of angular error.
- Height of all backsight targets or survey pole needs to be known.
- The instrument height is zero.
- The instrument does not need to be centred over a known control point.
- The instrument needs to be levelled before taking any observation.

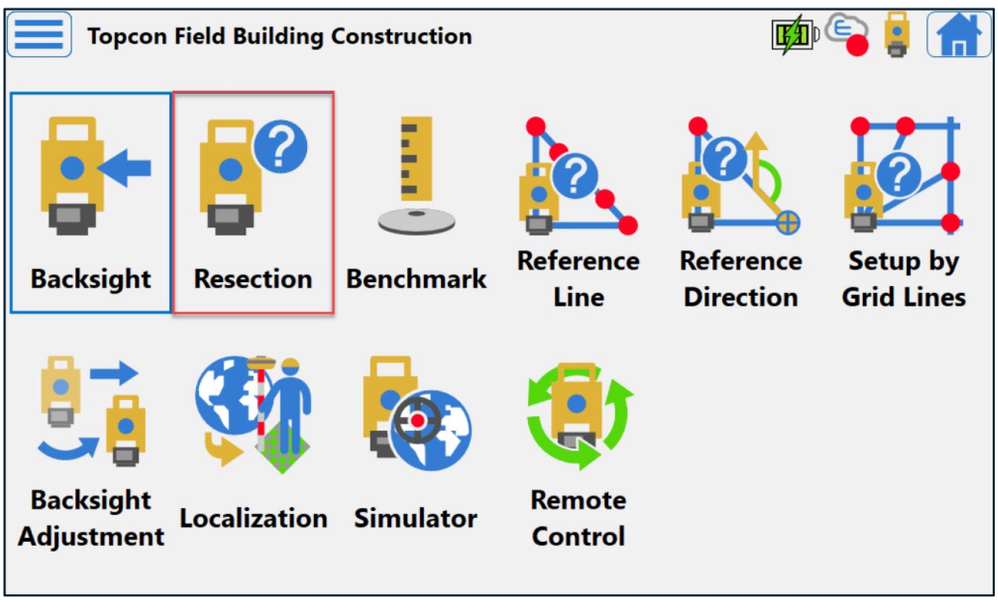


Setup GT via Resection

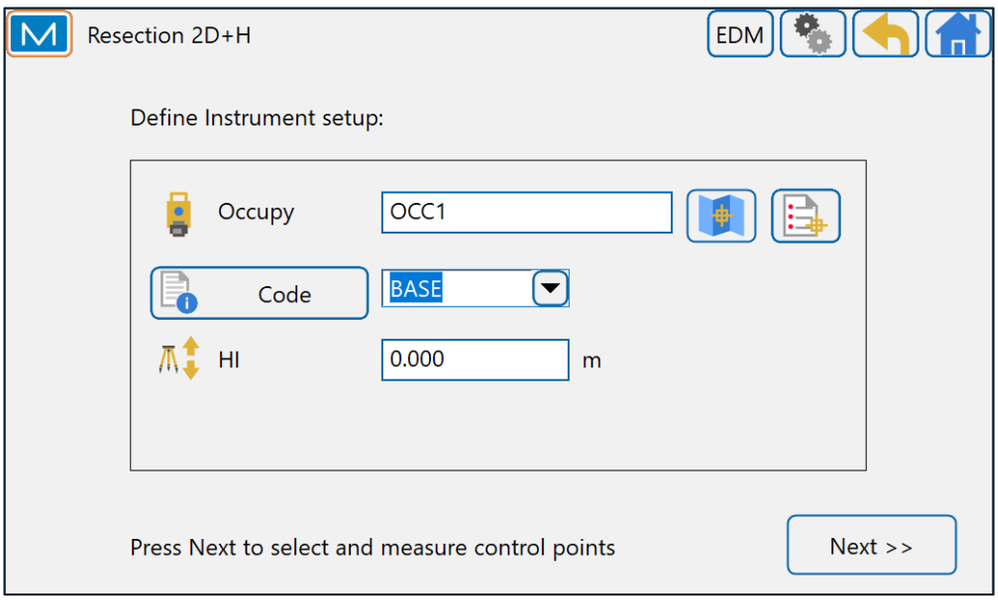
1. From the main screen, select the **Setup icon**.



2. On the setup screen, select the **Resection icon**.

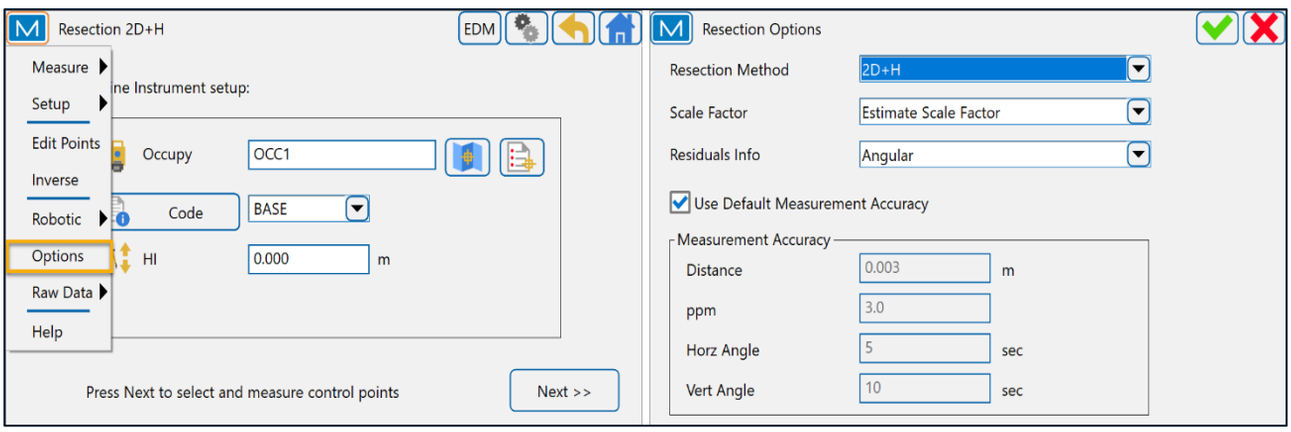


3. On the resection screen, enter in a **Name** for the *Occupy*. This name is usually something relevant to the users initials or the current date along with the instrument setup number.
For the *HI* (height of instrument) value, always ensure this is **0.000**.

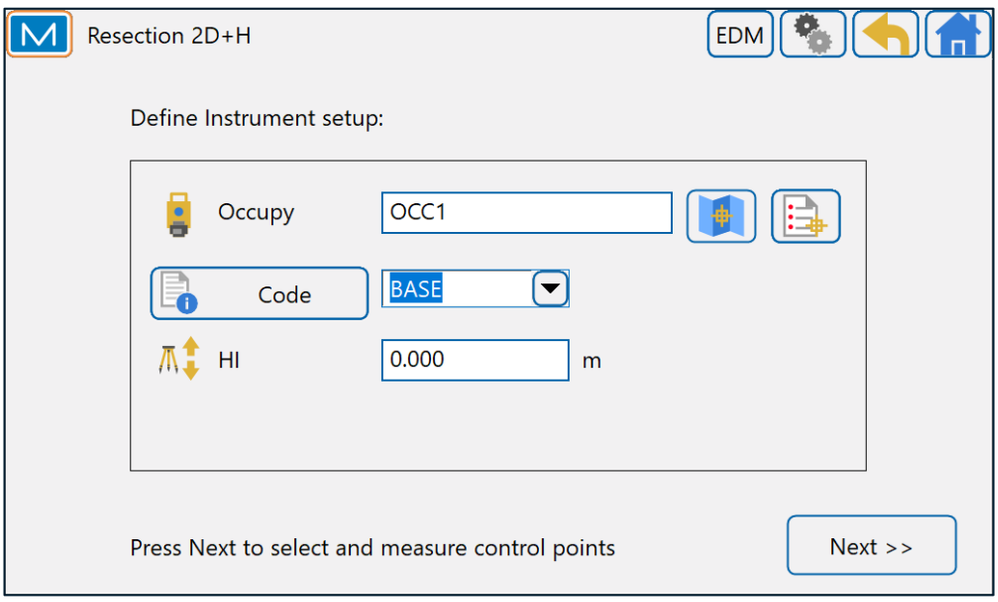


4. The user can edit the resection calculation methods by going into options under the Topcon Symbol , but the default **(2D + H)** settings are typically used.

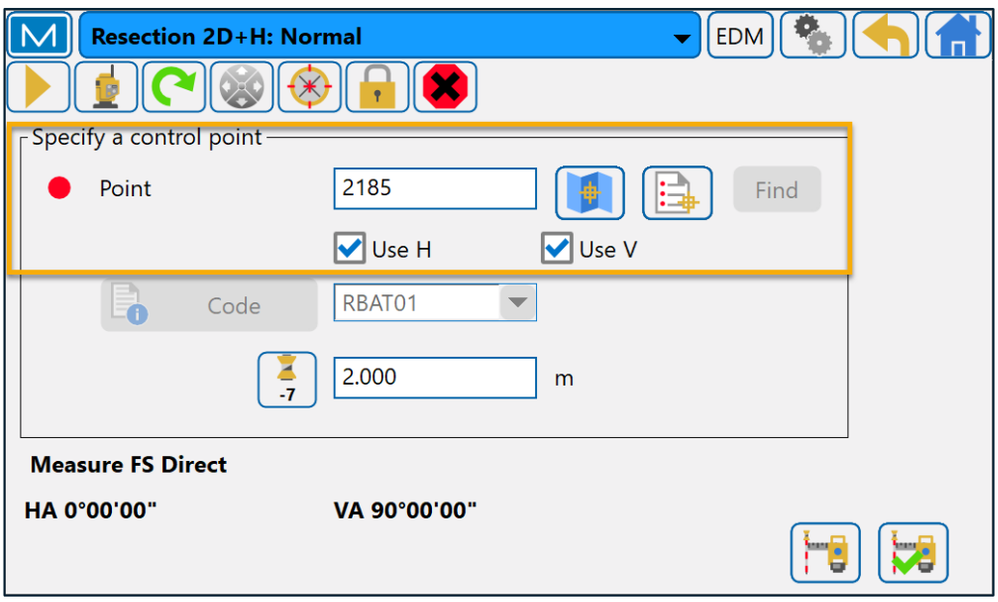
- **2D -** to calculate resection adjustments in the horizontal plane. This method is useful if known points have no elevation (2D points) assuming the occupation point obtains no elevation adjustment.
- **2D + H -** to separately calculate horizontal resection and vertical resection
- **3D Combined -** to calculate combined resection in both, horizontal and vertical planes



5. Now back on the resection screen, once all information has been entered and resection method has been selected, select the **Next button** to select and measure control points.

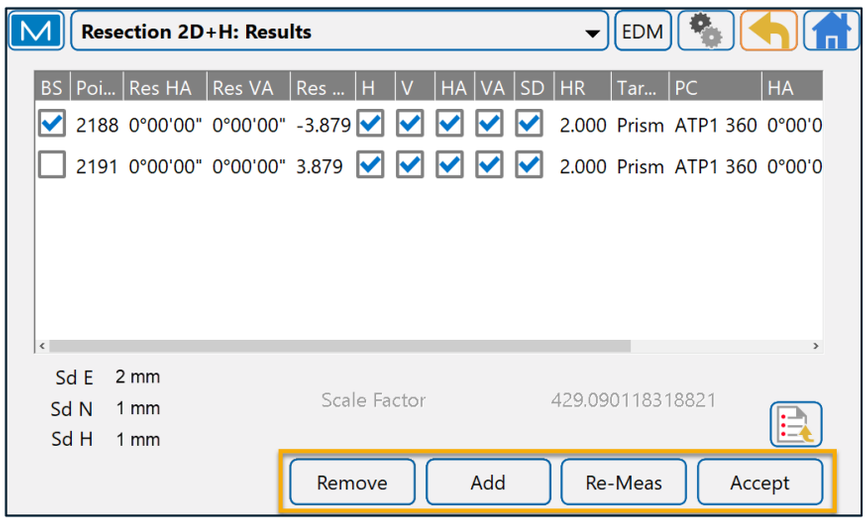


6. The user can use the toolbar to **Turn the Instrument** / **Search for the Prism** / **Quick Lock with RC-5** / **Track the prism** .
The user can see the HA, VA and distance to the control point observing and follow the routine until all control points have been observed. Select a control point from either the **Point List** or **Map** and enter in the height of prism (if necessary).



7. Still on the resection screen, pick another point from the **Map or Point list** to use for the second resection point, and so on.

   Measure and save the recorded point using the **Set and Measure** button  . Repeat this process for 3 points, then the user can view the resection results (the software will determine if the setup needs another point added or not).



The user can change the backsight point, add a new point to observe, re-observe a point if the desired aren't achieved and save the results out as a .txt file  for QA/QC purposes.

Use the available buttons to manage measurements and to accept the results of TS occupation calculation (resections should not be accepted unless we are seeing **1 – 3mm** in the residuals at the bottom left of the screen):

Remove to delete the highlighted measurement

Add to measure another known point in the resection and add it to the table

Re-Meas to delete the highlighted measurement and re-measure a known point

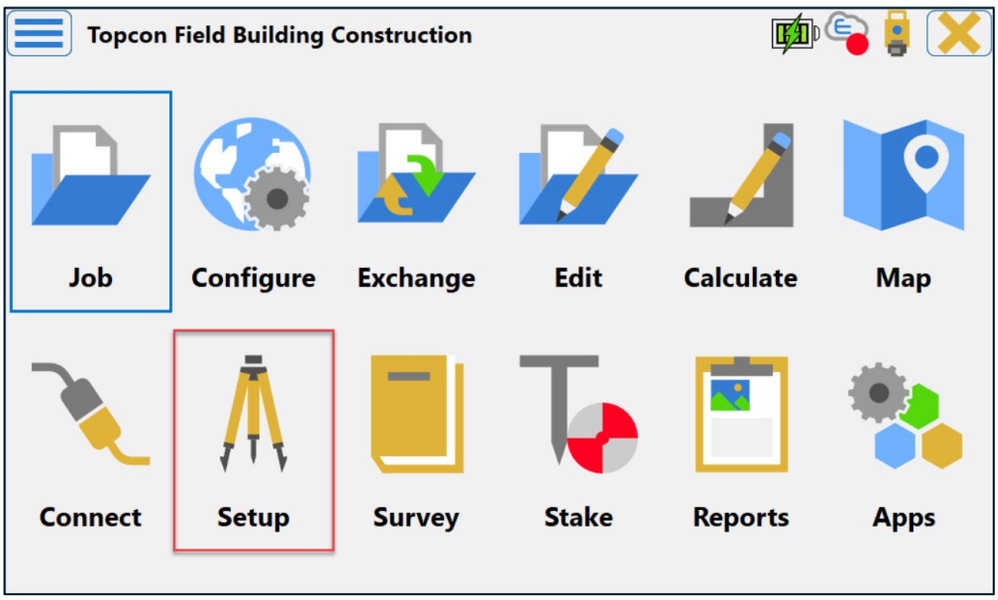
Accept to calculate the occupation point coordinates based on performed and approved measurements and to finish the Resection procedure by storing calculated occupation point to the current job

Once the user accepts the results, the resection point is automatically stored to the current job.

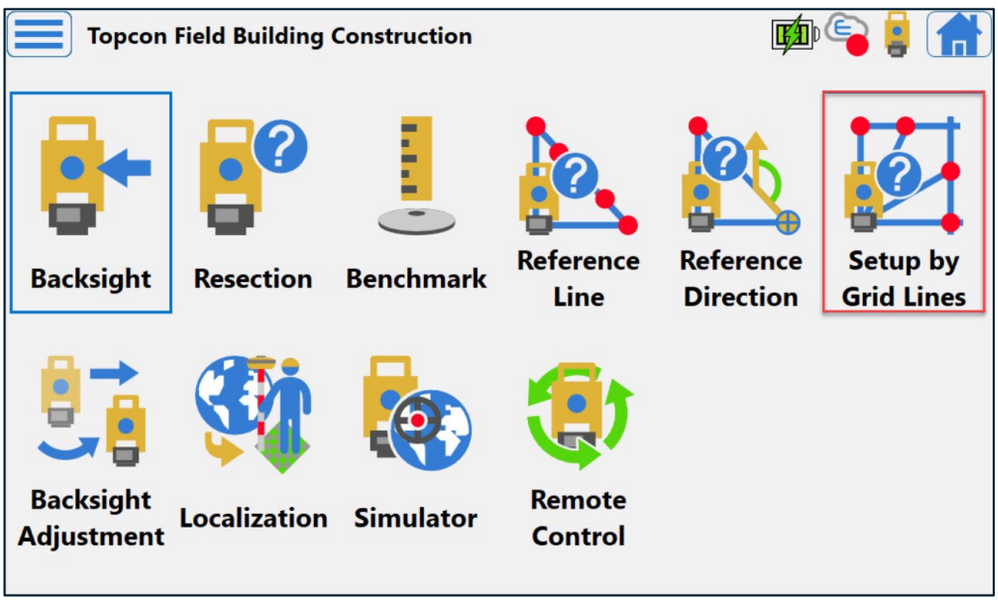
Setup GT via ‘Setup by Grid Lines’ Routine

Setup By Gridlines is a specific method used to setup the GT, calculating the instrument position onsite in reference to 2 intersecting grid lines. These marks placed onsite typically indicate the position of the grid, using 2 pins for each gridline.

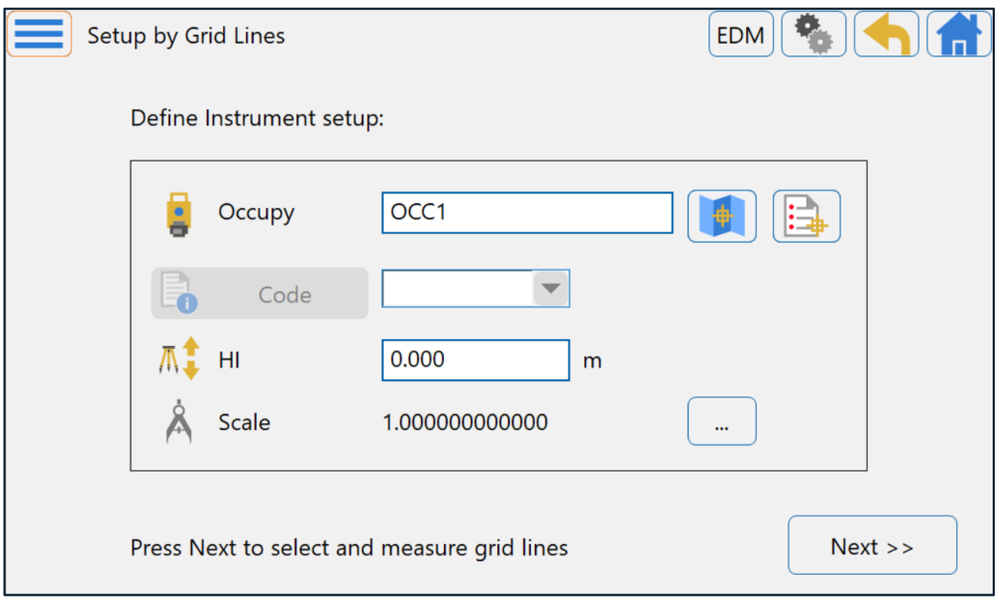
1. Select **Setup** from the **Home Screen.**



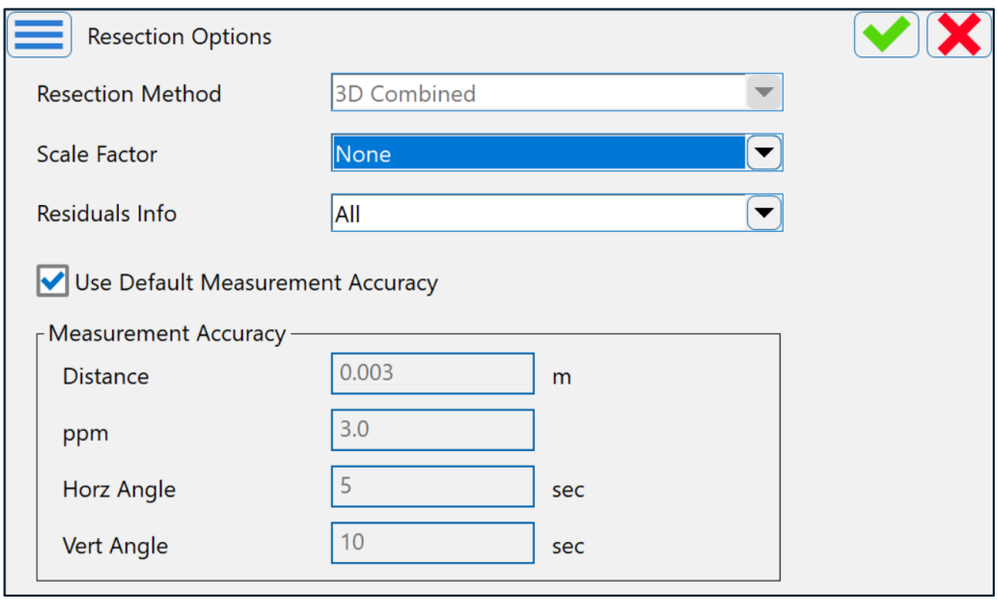
2. Select **Setup by Grid Lines.**



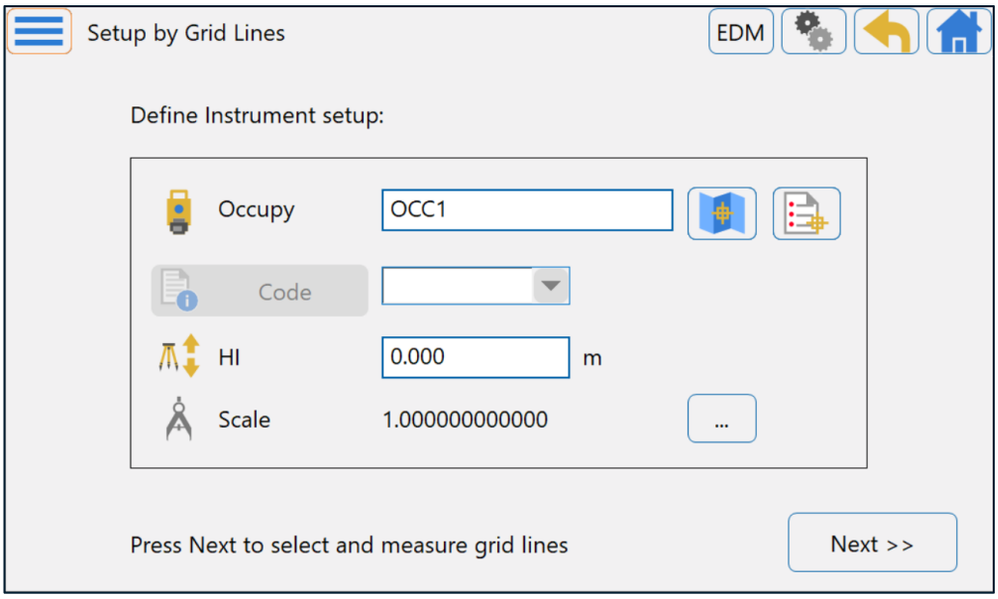
3. Defining the **Instrument Setup**, occupy should have a **new OCC number**, and instrument height should be set to **‘zero’.**



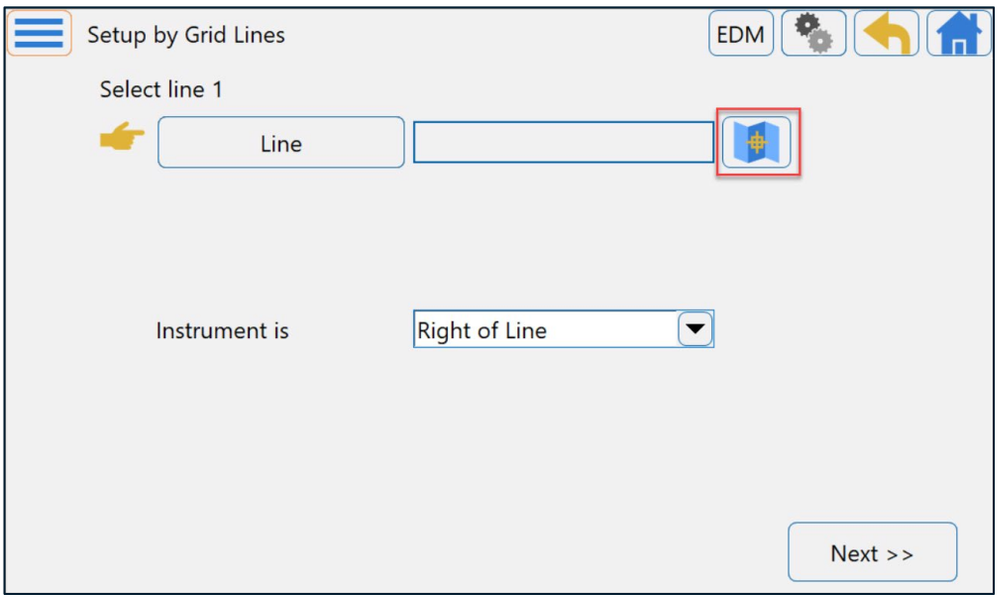
4. The user can edit the resection methods by going into **options** under the Topcon Symbol  . Use the dropdown menu to **select ‘2D’ resection method**. Ensure the **‘Scale Factor’ is set to None.** Then select the green tick.



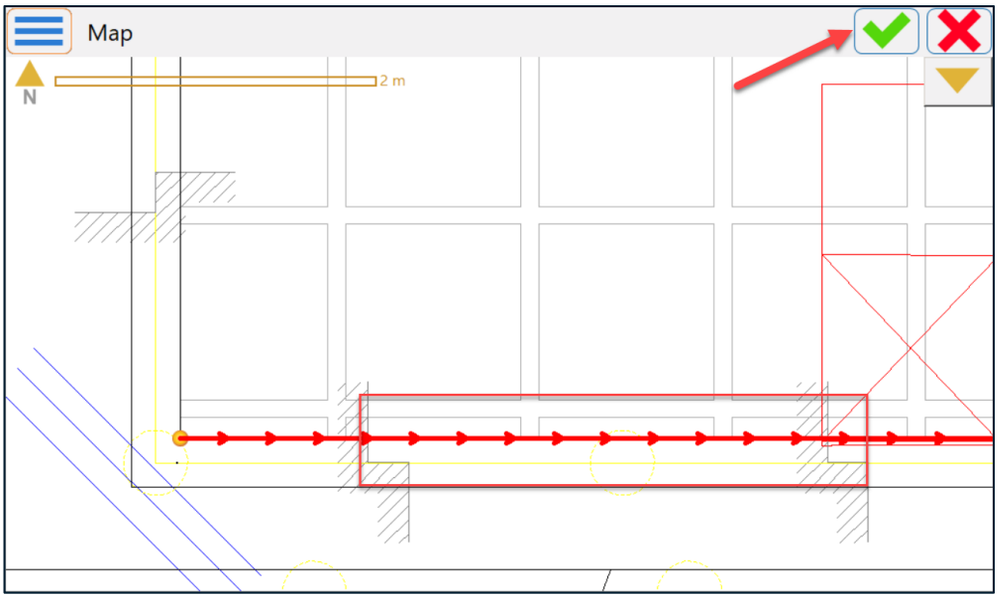
5. Select **'Next'** on the original setup screen.



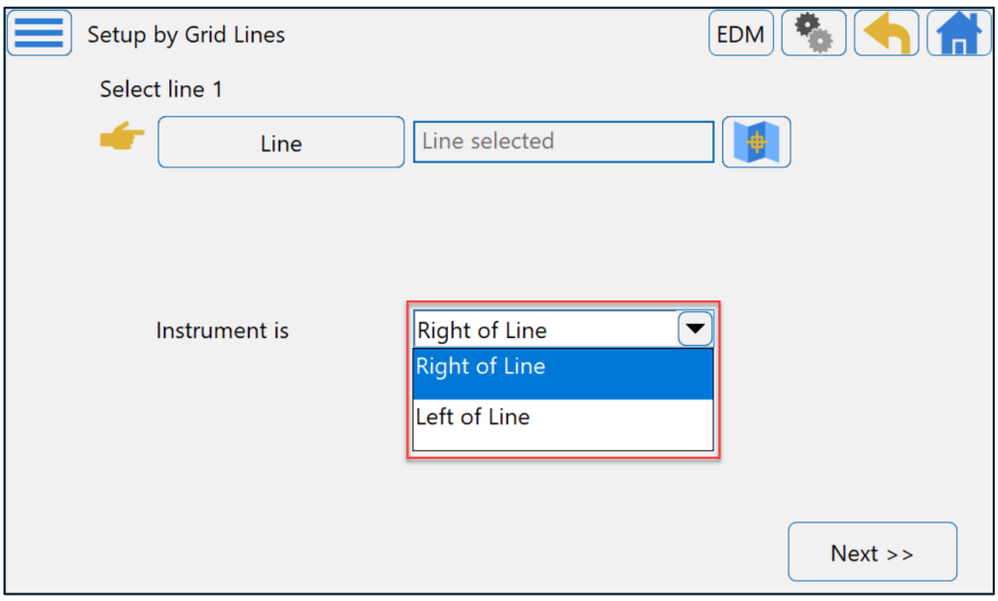
6. Select the **Map icon** to identify the **1st reference line** that will be measured onsite.



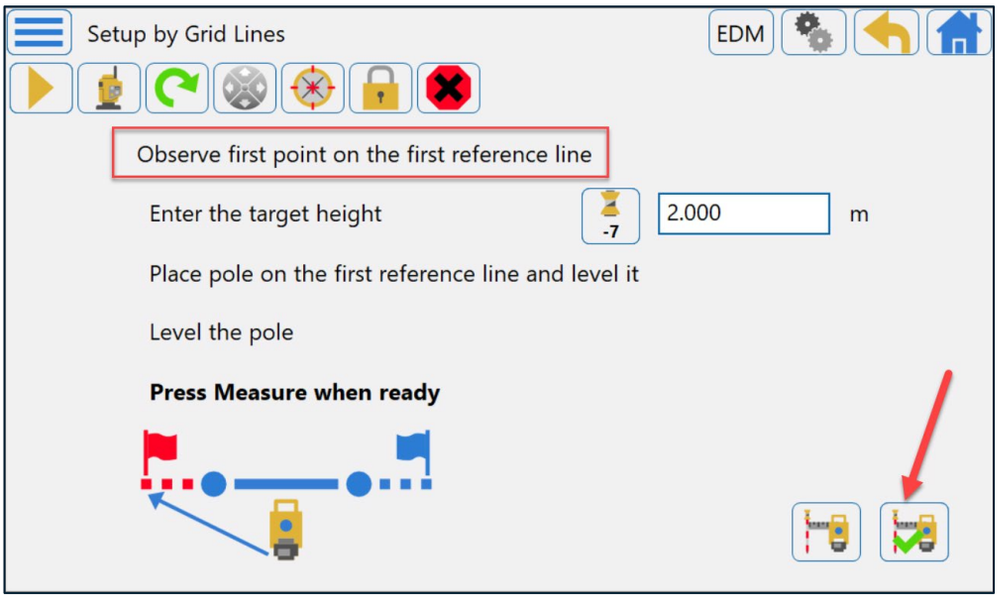
7. Highlight the line that is marked onsite, this will become **reference line number 1.**



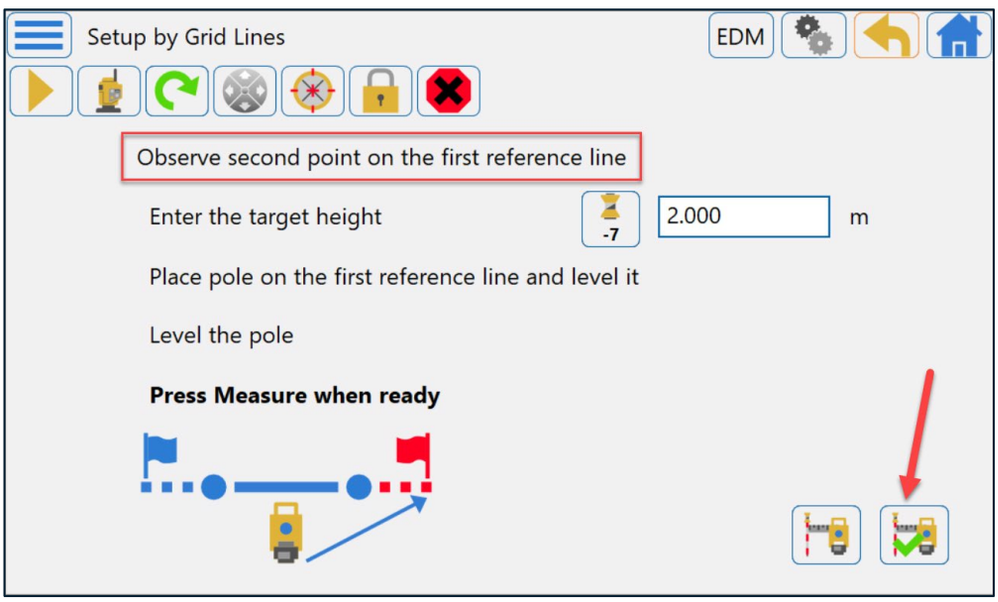
8. Visually identify onsite, **which side of this design line the instrument is positioned**. The **arrows** indicate the **direction of the line,** in the below example if the instrument is positioned onsite 'above' this line which runs from right to left across the screen, the instrument would be positioned to the **RIGHT of reference line 1.**



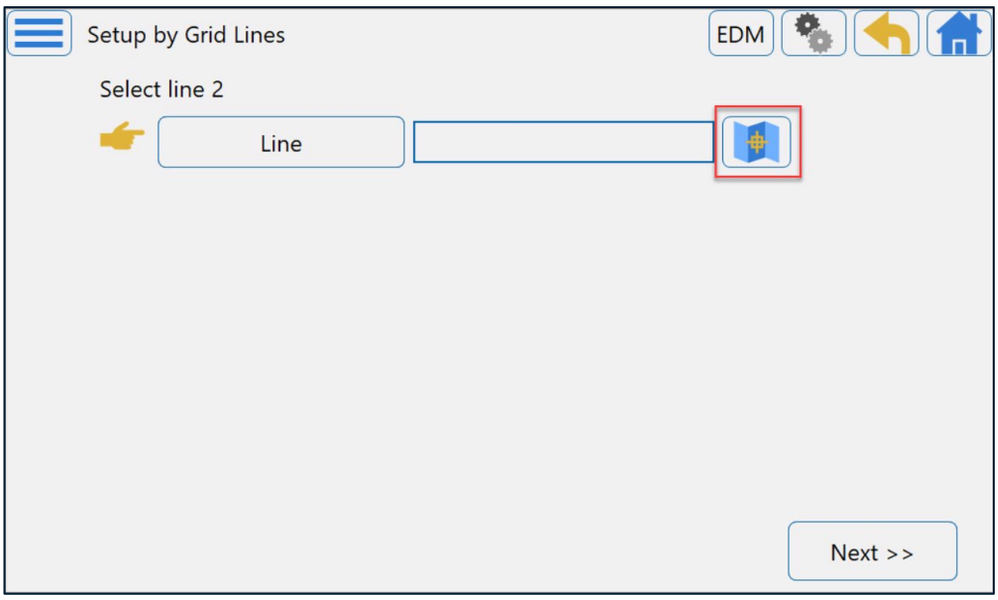
9. Defining the **First point on the 1st reference line** will give the first measured point. Once **locked onto the prism**, check your **pole height**, check that you are **on top of the correct line**, **centre the pole bubble**, and select the **'Store & Measure'** button in the bottom right.



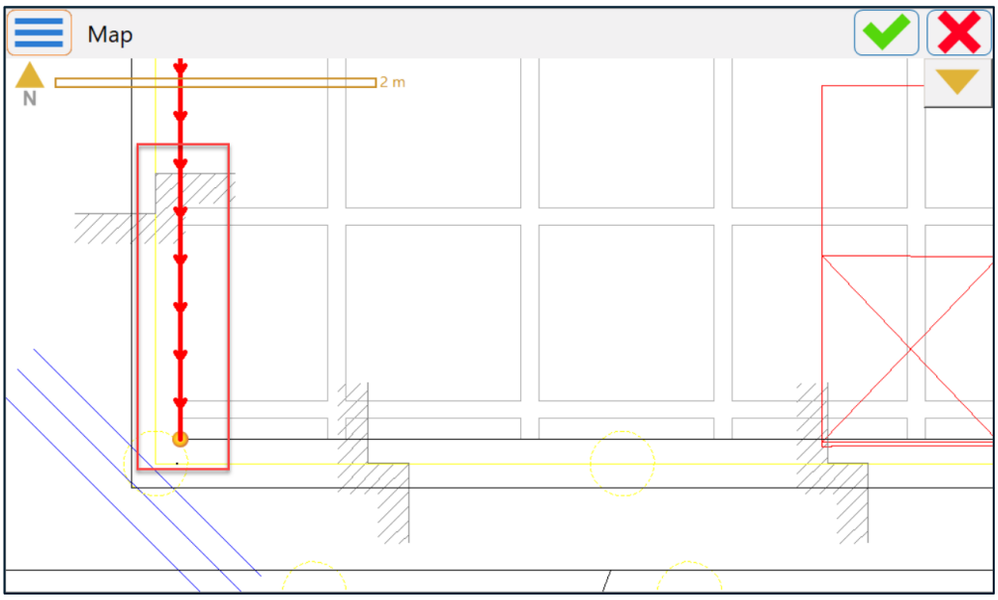
10. Define the **second point on the 1st reference line.** Once **locked onto the prism**, check your **pole height**, check that you are **on top of the correct line**, **centre the pole bubble**, and select the **'Store & Measure'** button in the bottom right.



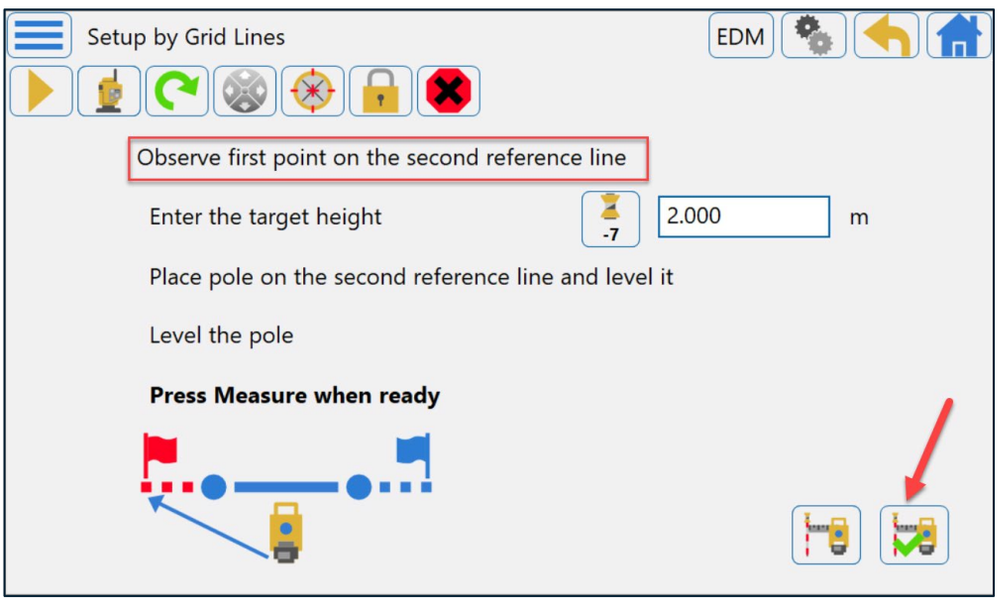
11. Select the **Map icon** to identify the **2nd reference line** that will be measured onsite.



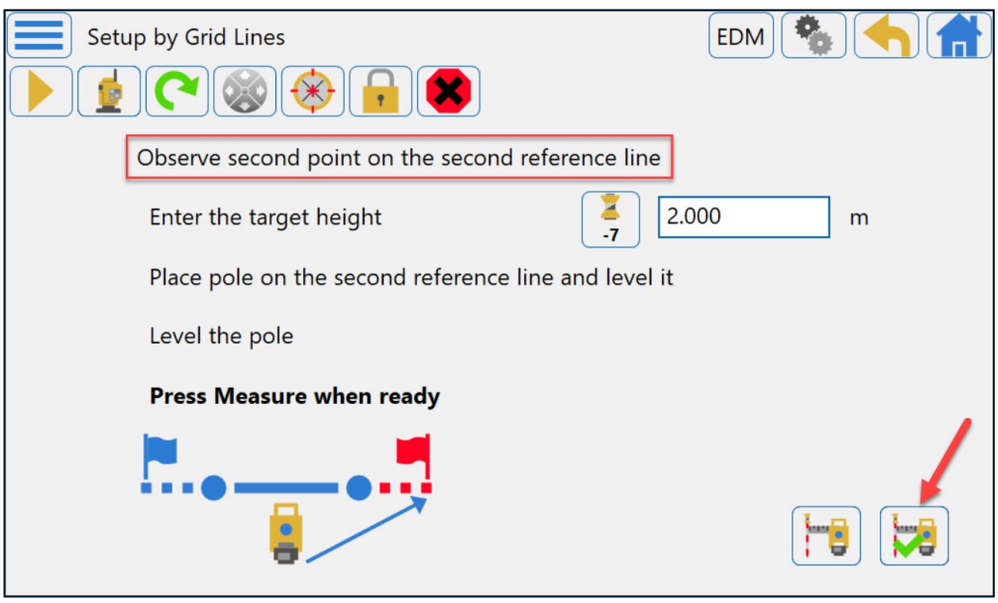
12. Highlight the line that is marked onsite, this will become **reference line number 2.** Select the **Tick Button** on the top right and the **Next** on the following screen.



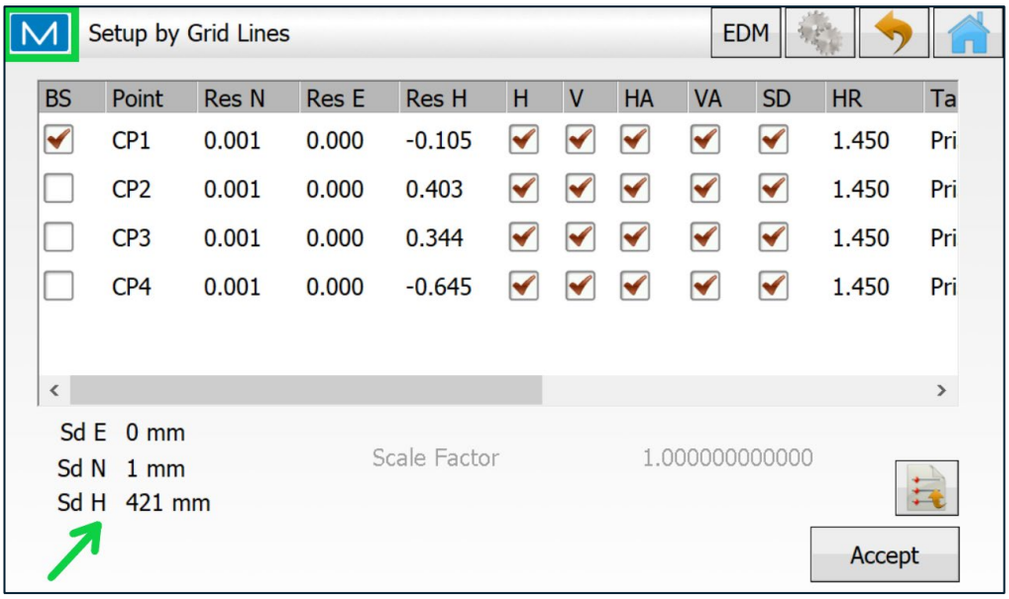
13. Defining the **First point on the 2nd reference line** will give the first measured point. Once **locked onto the prism**, check your **pole height**, check that you are **on top of the correct line**, **centre the pole bubble**, and select the **'Store & Measure'** button in the bottom right.



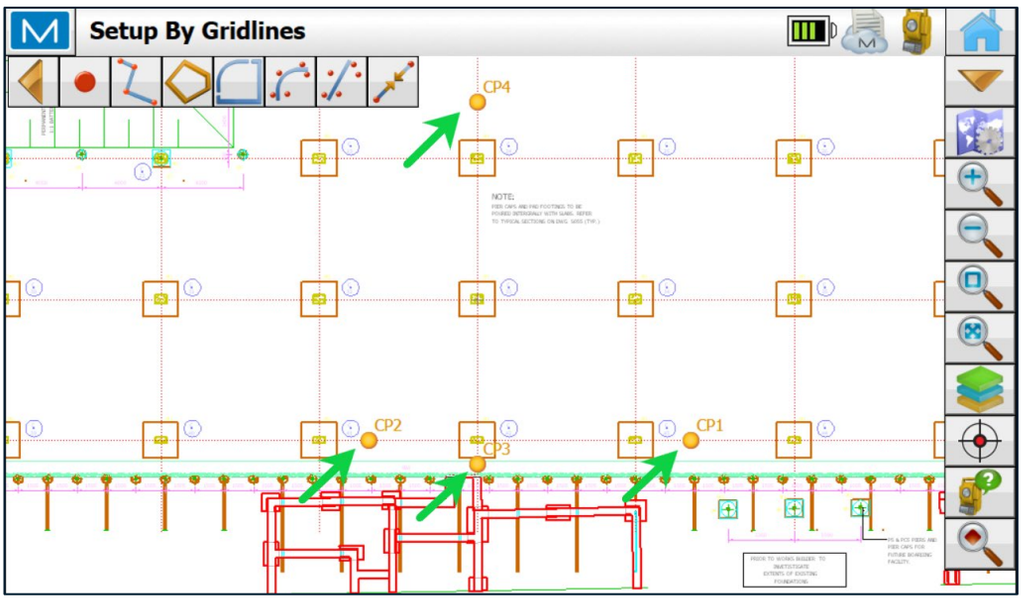
14. Define the **second point on the 2nd reference line.** Once **locked onto the prism**, check your **pole height**, check that you are **on top of the correct line**, **centre the pole bubble**, and select the **'Store & Measure'** button in the bottom right.



15. The user will be shown the **results screen** of the setup, in both horizontal and vertical residual errors.
The setup isn't taking into account the **H Residual,** this is purely the different in height from the highest and lowest point in the setup.



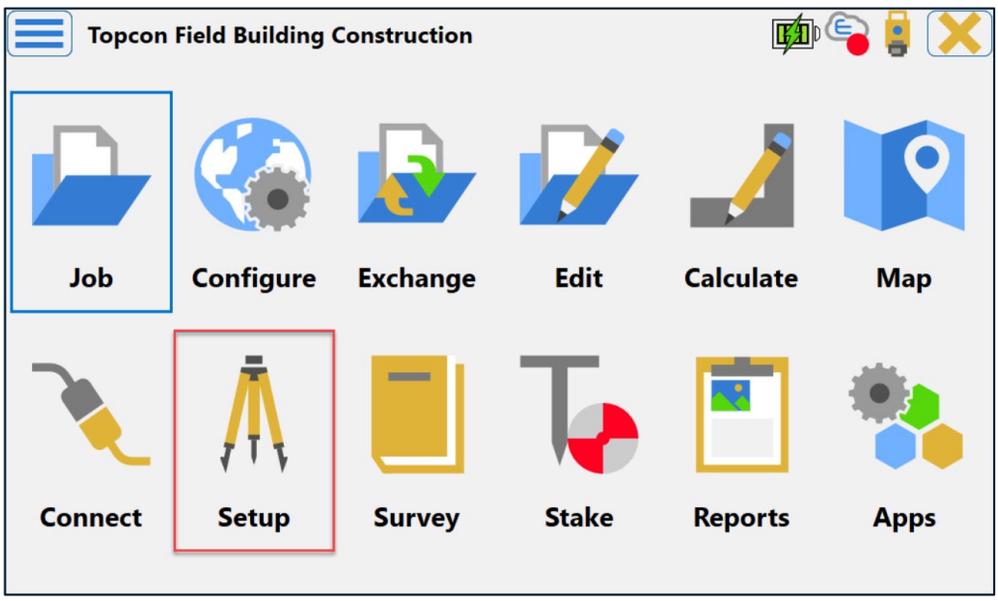
16. Returning to the **Main Map screen,** the user will now see the location of all 4 pins that have been measured, using the intersection of the two lines as the reference to calculate the position of these 4 measured points onsite.



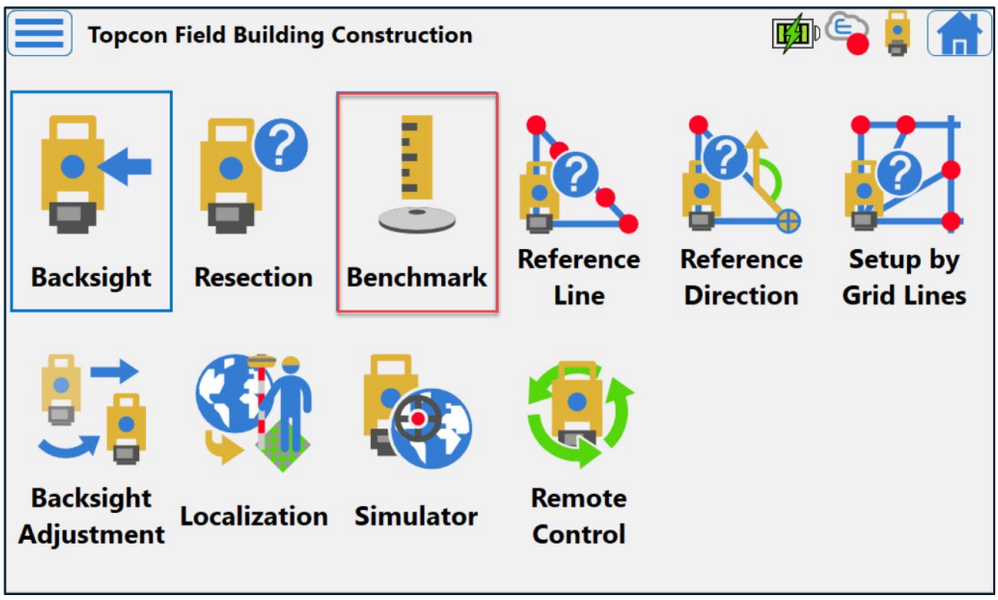
Benchmark Setup Routine

After a resection performed and accepted, an onsite Benchmark can be measured to set the height of instrument in reference to that benchmark height. This routine will then give the user their current RL onscreen using the benchmark as the height reference.

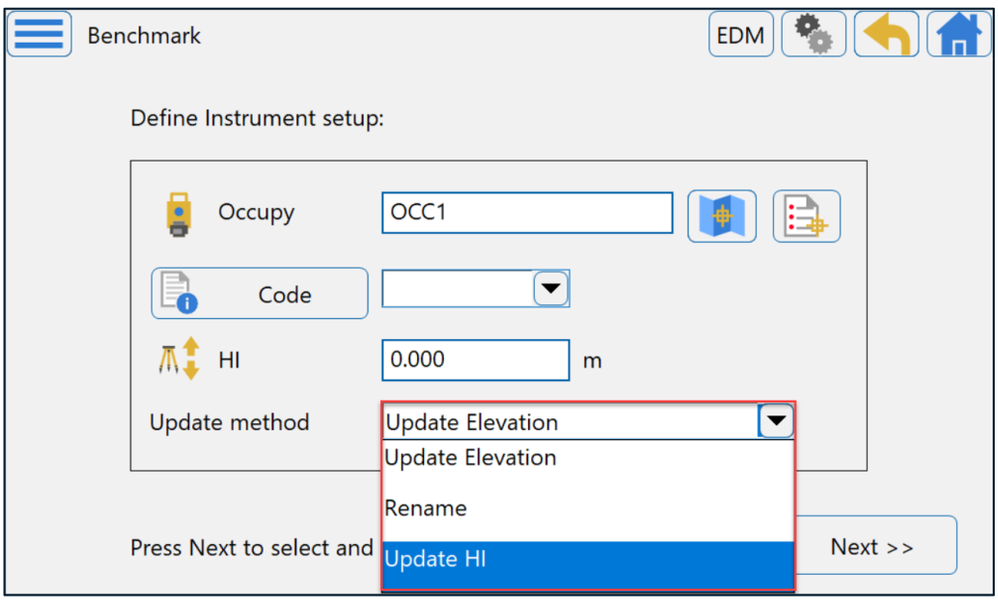
1. Select **Setup** from the Home Screen.



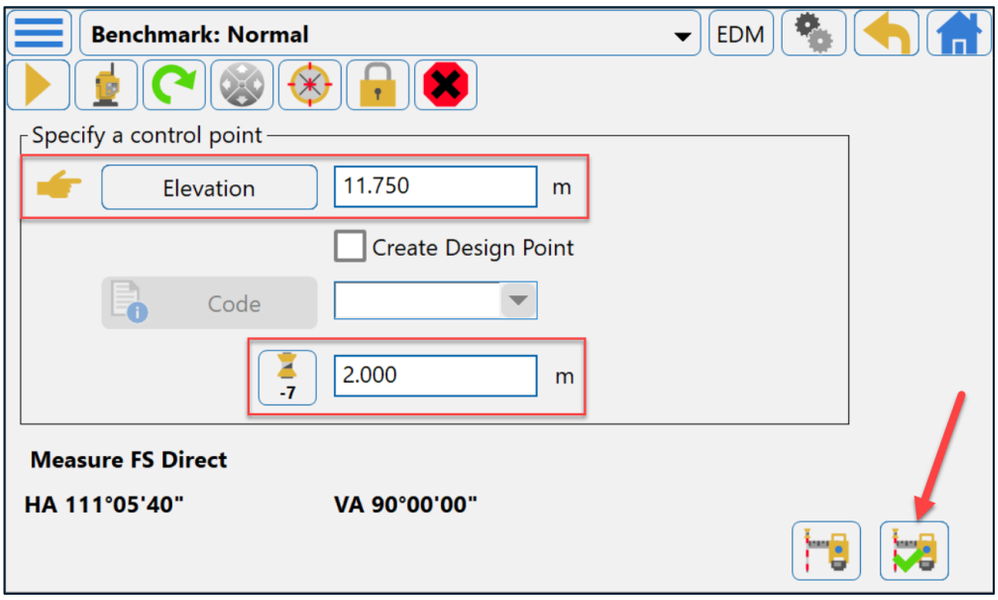
2. Select **Benchmark.**



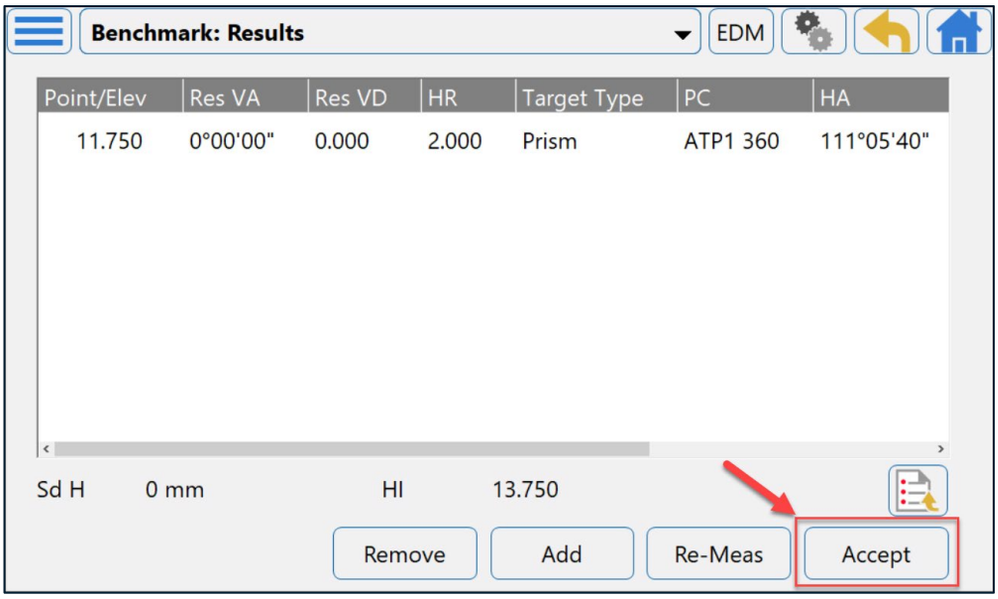
3. Using the **same Occupation Point** as was set in the resection, use the drop-down menu under **Update Method** and select **'Update HI'**.



4. **Toggle the 'Point' switch over to 'Elevation'**, located next to the pointing hand icon. Input the **benchmark height** that is being used onsite and ensure that the pole height is set correctly. In this example, the Benchmark RL being used is **RL 11.750**. Hit the measure button bottom right of the screen to measure the benchmark elevation**.**



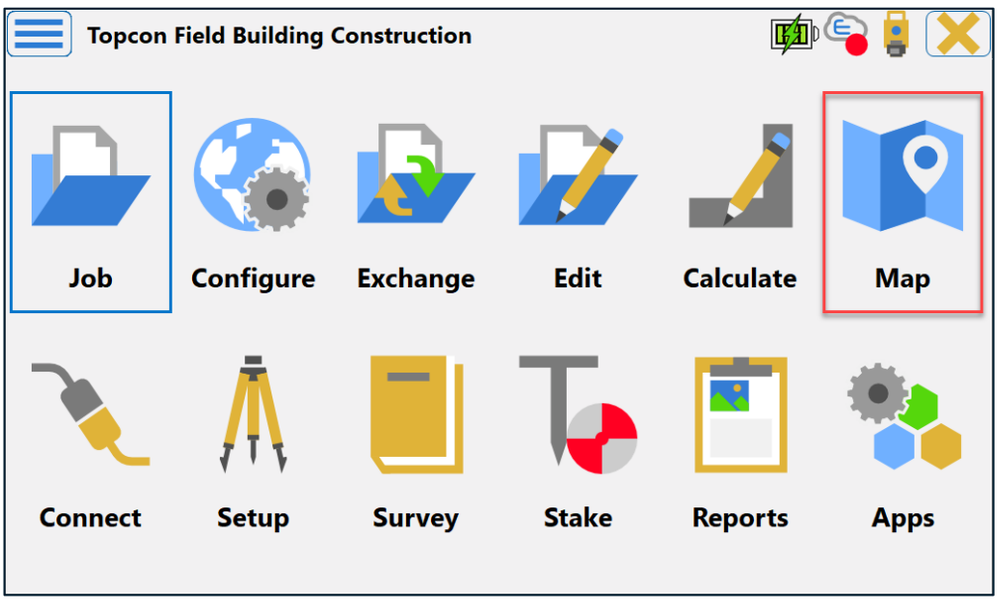
5. On the **Results Screen**, select **Accept** to adopt the new benchmark height.



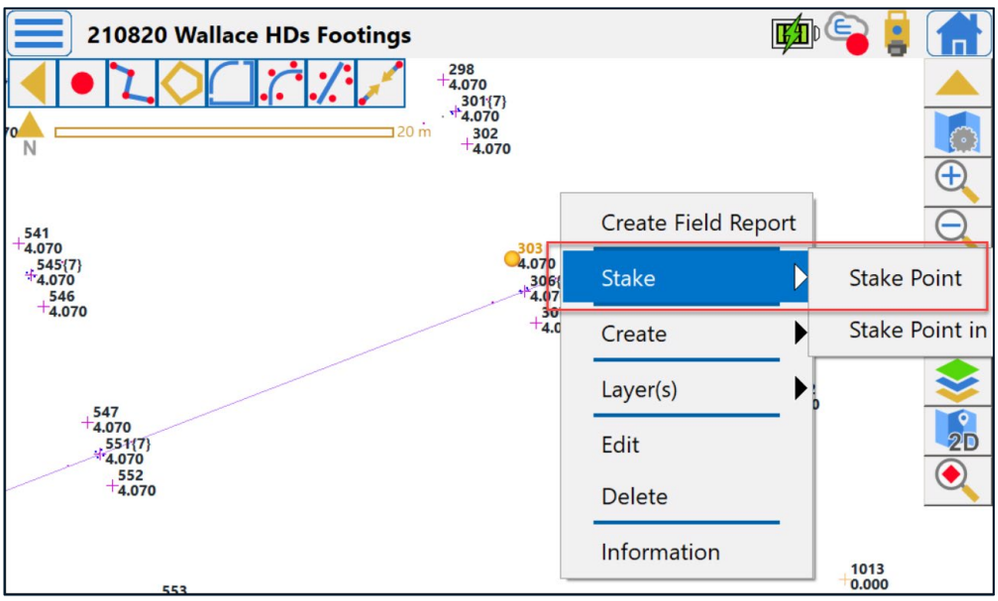
Setout

Setout Design Points

1. From the main screen, select the **Map icon**.



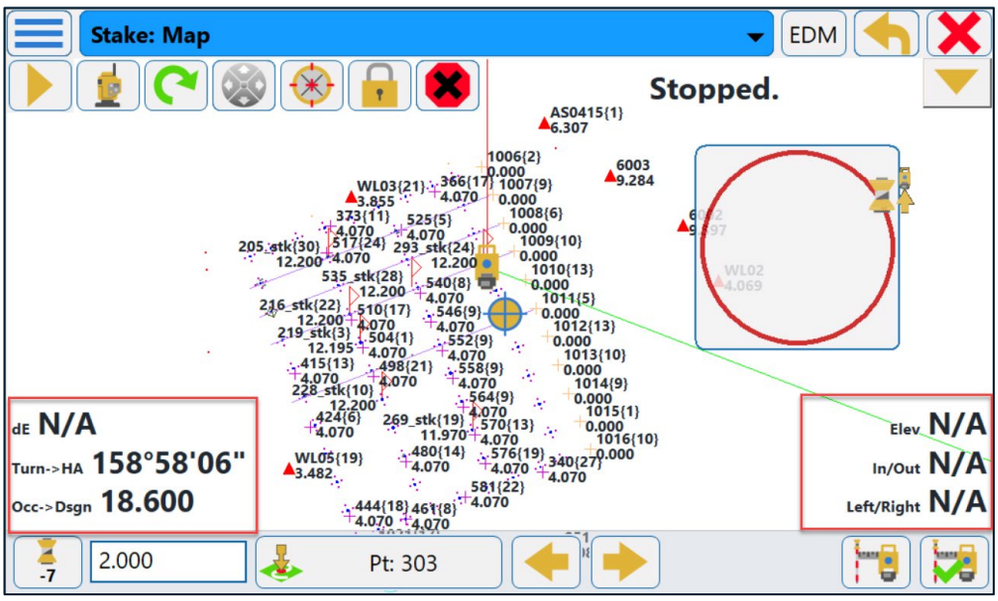
2. On the map screen, select a **Point** in the map to set out. Once selected, **hold down on the screen** to bring up the option box and select the **Stake > Stake Point** option.



3. The user can adjust the six display options to show information that will assist them during the set out. A cut/fill bar can be displayed along with a compass to guide the user to the point.

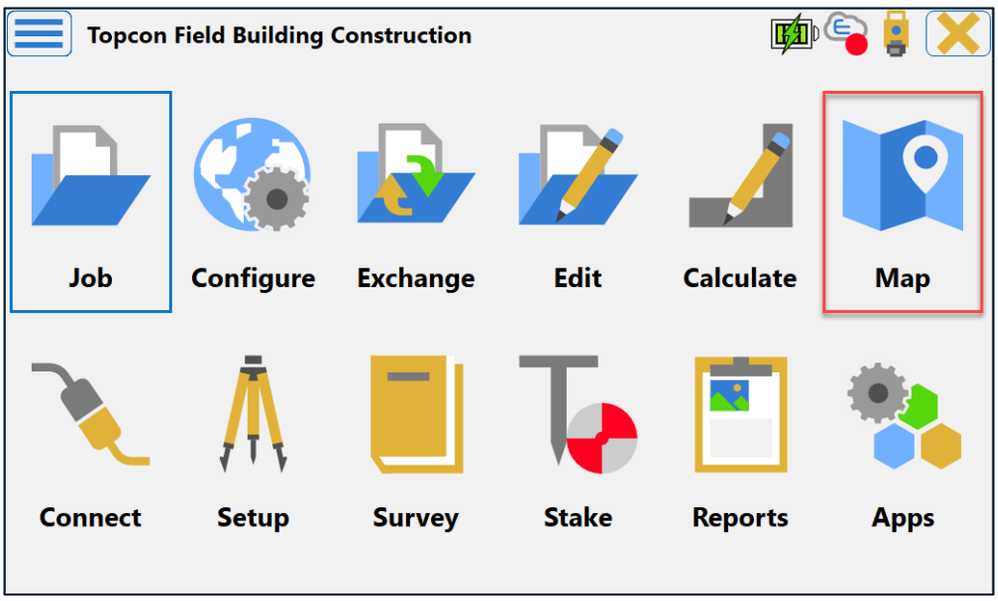
   The compass will show green when within the tolerance setting set by the user. When within the accuracy of the point, select the **Measure button** to store the staked point information.

NOTE: Any point on the screen can be selected to stake out and not have to go in sequential order.

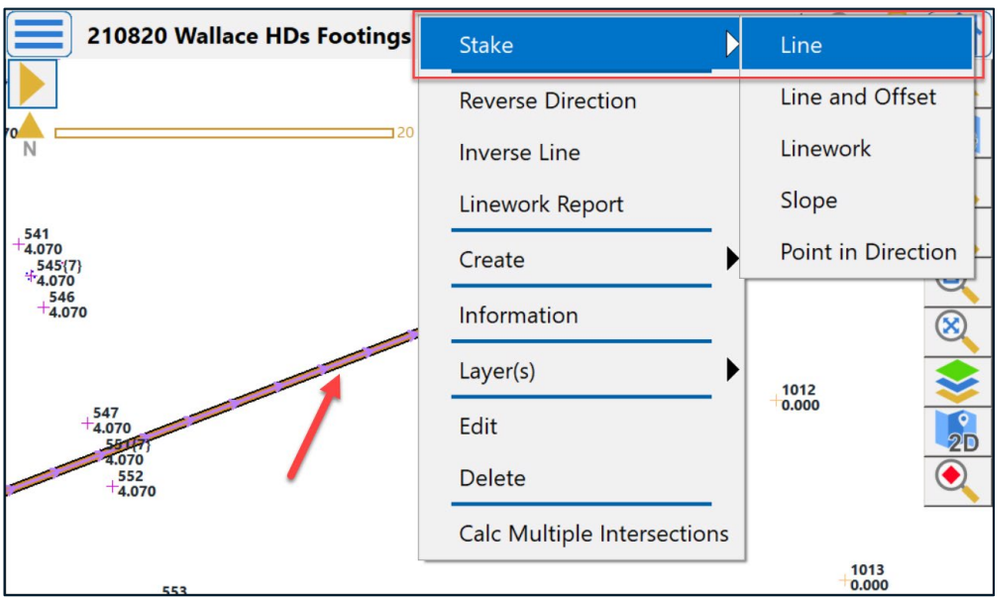


Setout Design Lines

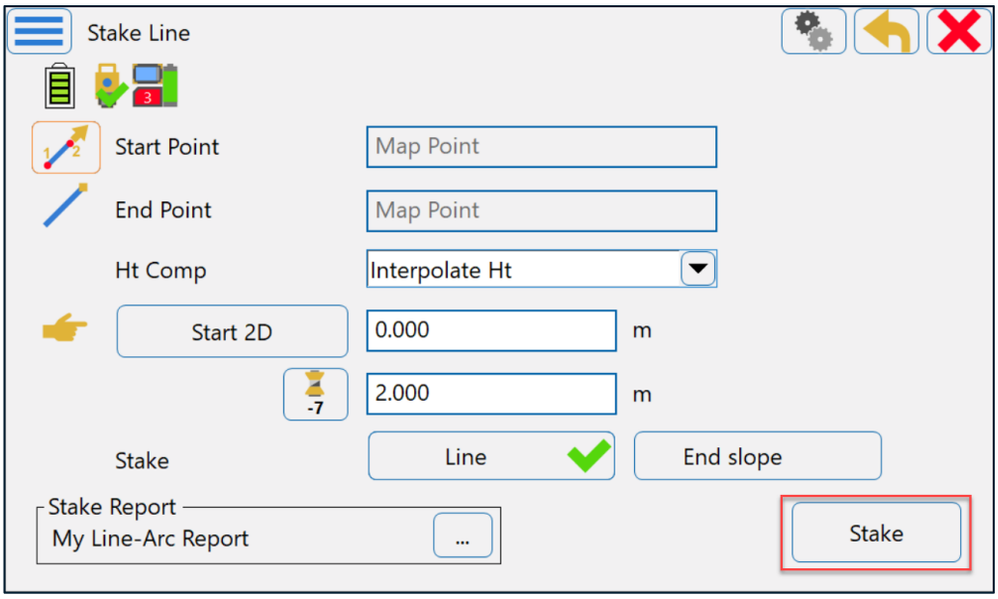
1. From the main screen, select the **Map icon**.



2. On the map screen, select a **Line or 2 Points** in the map to set out. Once selected, **hold down on the screen** to bring up the option box and select the **Stake > Line** option.

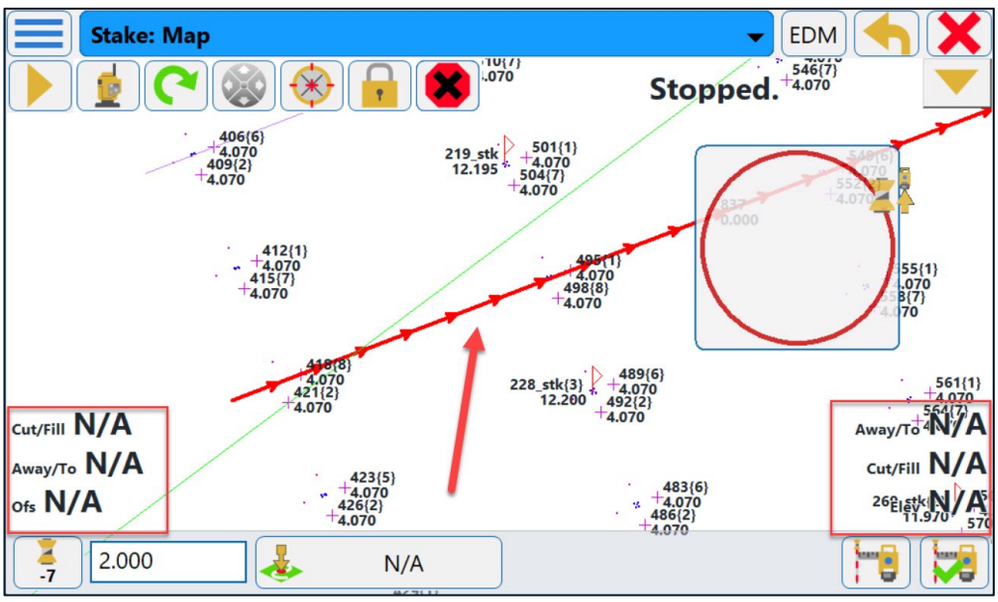


3. On the stake line screen, leave all settings as default and select the **Stake button**.



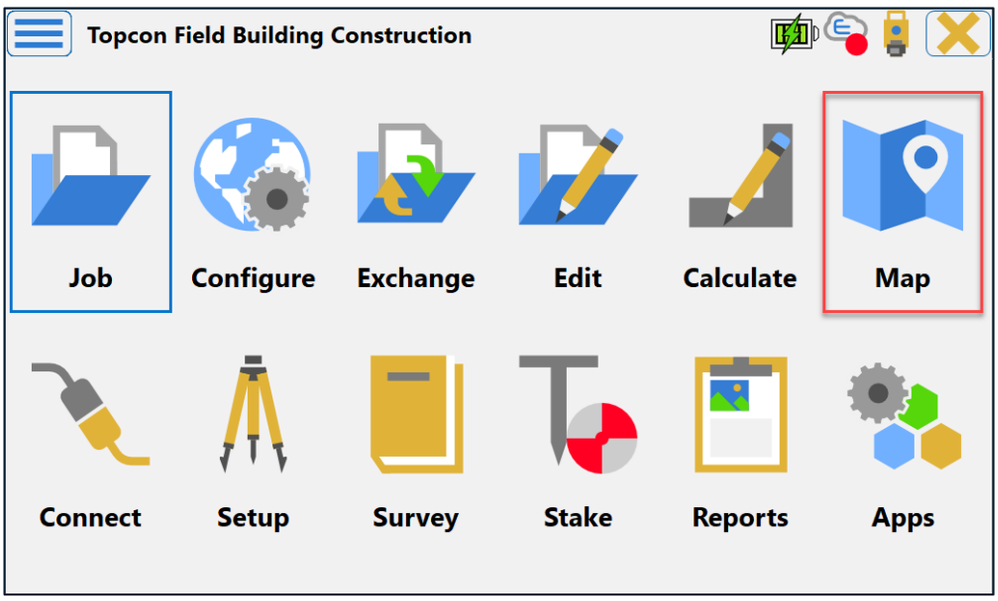
4. The user can adjust the six display options to show information that will assist them during the set out. A cut/fill bar can be displayed.

   When within the accuracy to the line, hit the **Measure button** to store the staked point information. Select the **Back button twice** in top right corner to go back to map screen to select a different line.

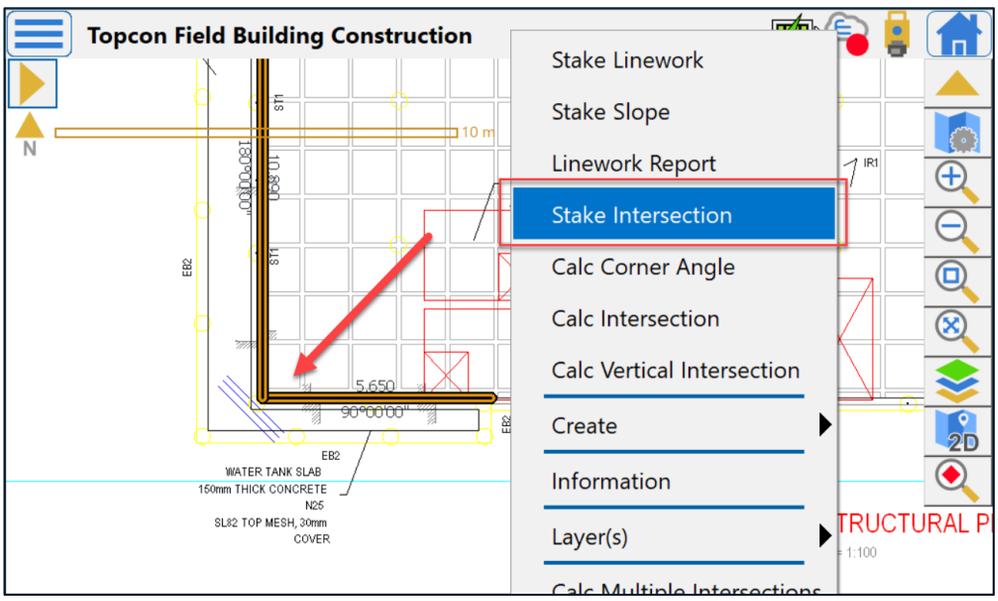


Setout Design Intersection Point from Lines

1. From the main screen, select the **Map icon**.

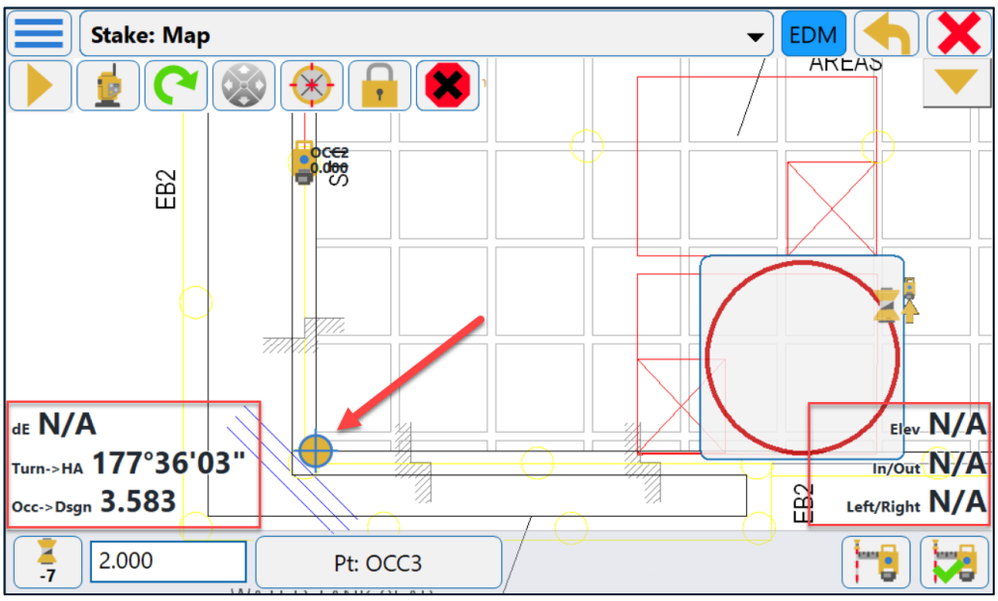


2. On the map screen, select **2 Intersecting Lines** in the map to set out. Once selected, **hold down on the screen** to bring up the option box and select the **Stake Intersection** option.



3. The user can adjust the six display options to show information that will assist them during the set out. A cut/fill bar can be displayed along with a compass to guide the user to the point. The compass will show green when within the tolerance setting set by the user.

   When within the accuracy of the point, select the **Measure button** to store the staked point information. Select the **Back button** in top right corner to go back to map screen to select a different line.

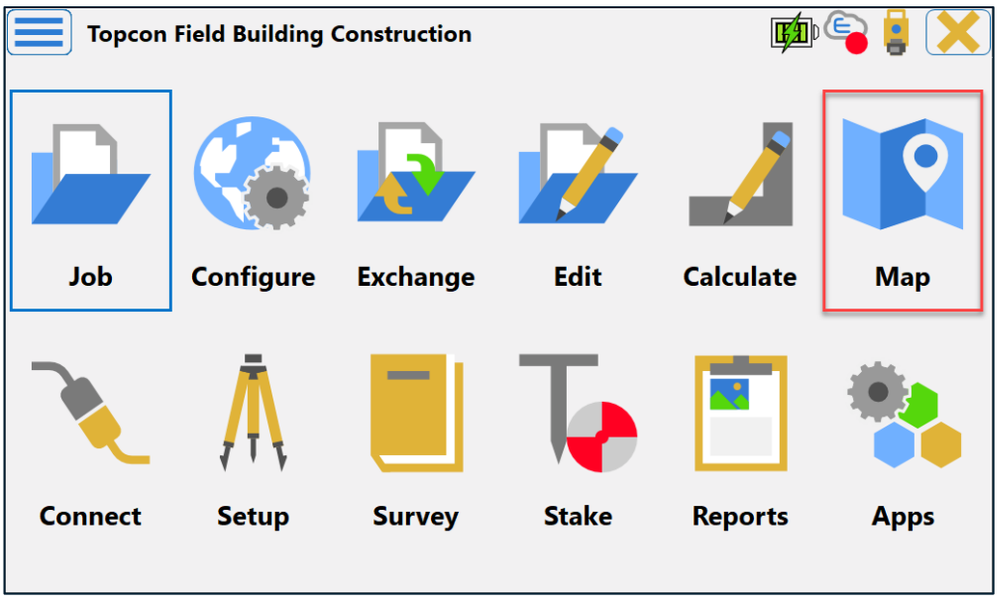


Setout Design Surface – DTM's

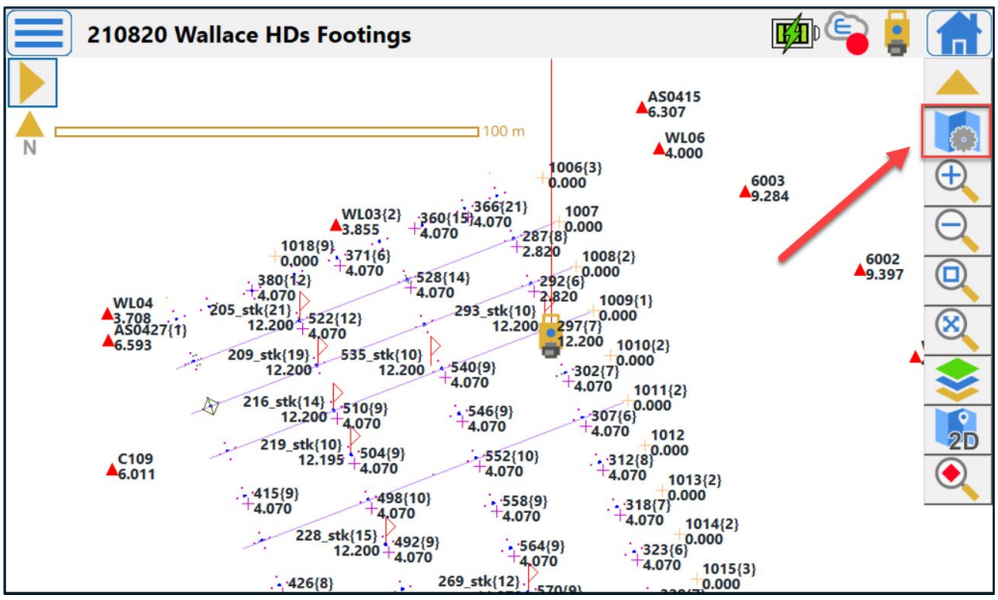
If the design you have uploaded into the FC-6000/6400 field controller includes a DTM (Digital Terrain Model), this can also be staked out onsite to give the user real time Cut/Fill information as they move around their design surface.

When using a 2D+H Resection or Benchmark Routine, the instrument knows the current elevation of the pole tip and any given time and can simply compare this current elevation to the design elevation, giving the user the cut/fill value anywhere on that design surface.

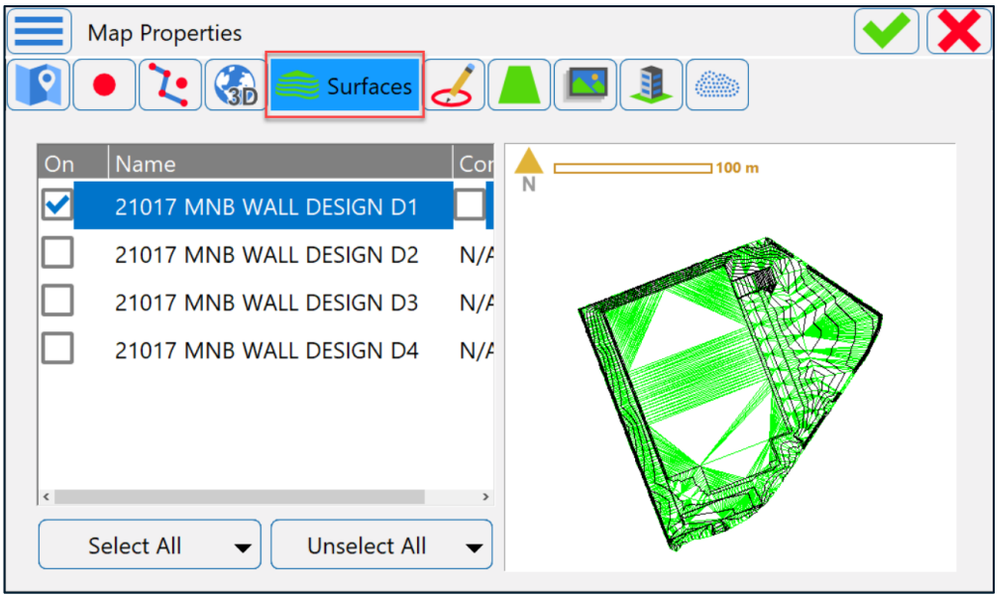
1. From the **Map screen**, you can visibly turn the DTM triangles on and off to easily view the DTM, and then to declutter the Map screen to perform other functions. Go to Map.



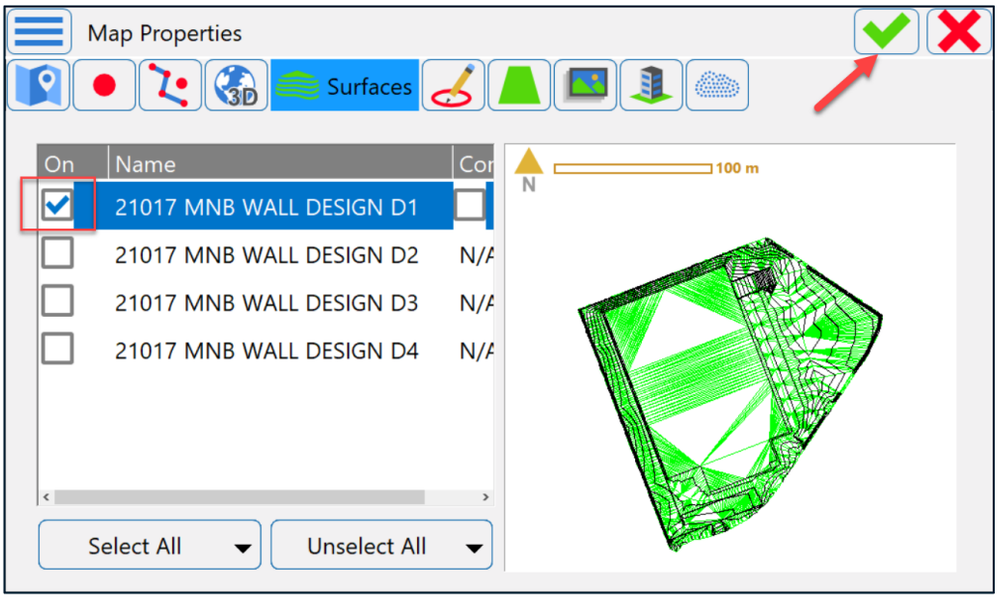
2. **Select the Map Properties** in the drop-down Map menu.



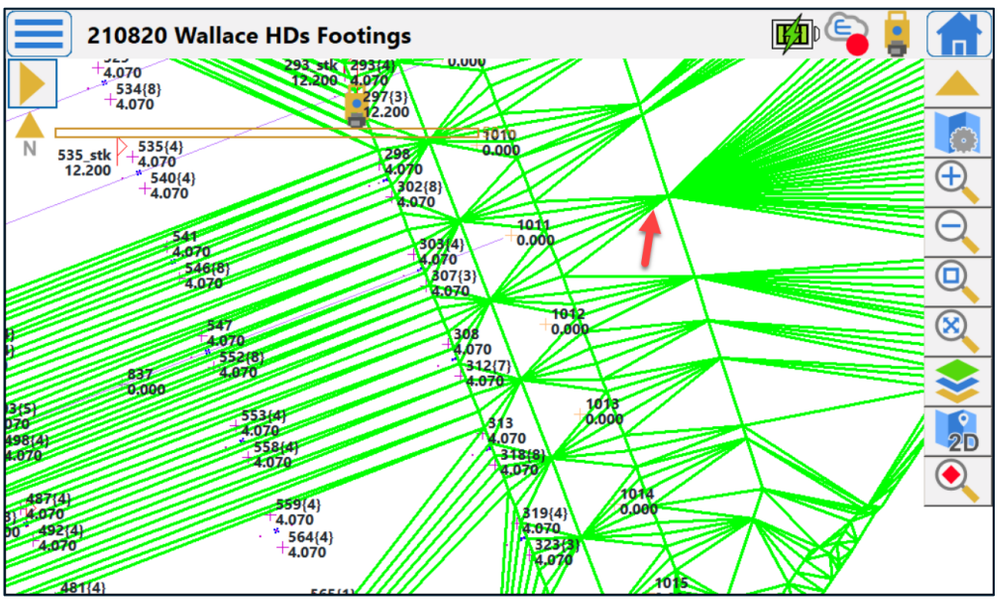
3. **Select the 'Surfaces' tab** along the top row.



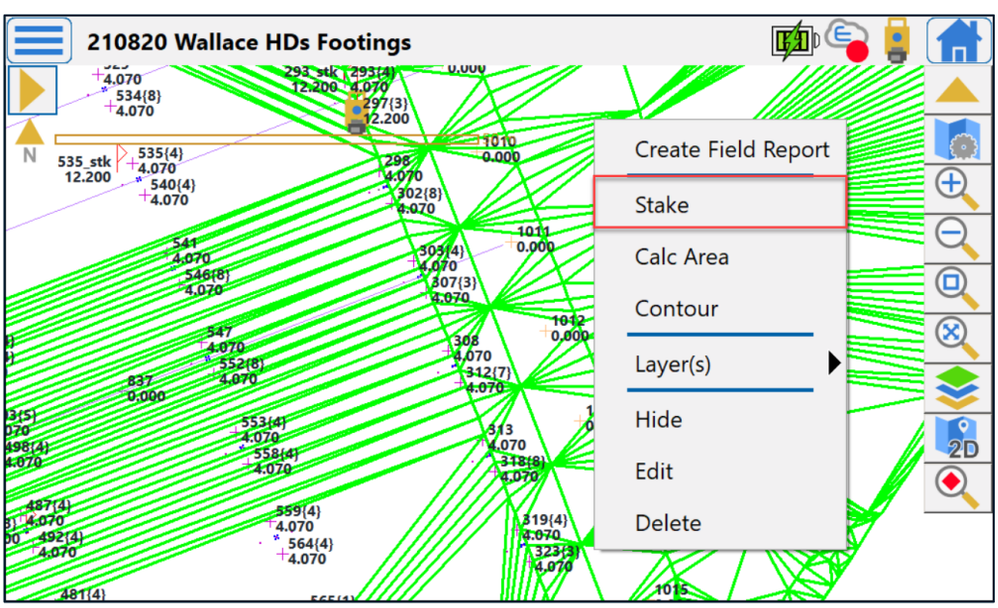
4. **Place a 'tick' in the checkbox** DTM you would like to view on the **Map screen** and select the **Green Tick** in the top right of the screen.
This will return you to the **Map Screen** with the DTM surface now visible and selectable.



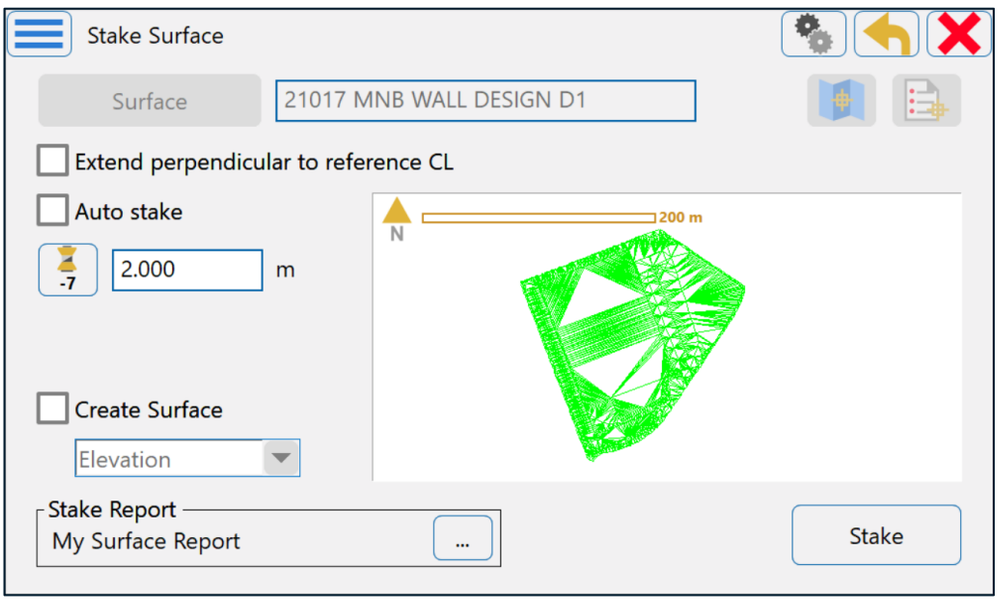
5. Select any of the **triangle lines** that make up the DTM to highlight it (highlights entire surface ready to stake out).



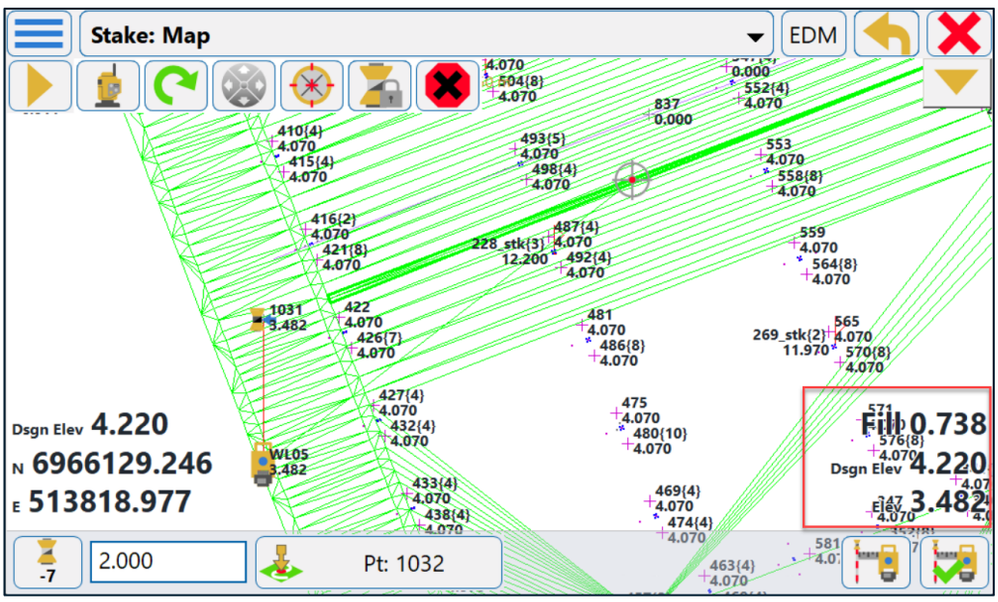
6. **Stake Out DTM** by having the DTM highlighted in the Map screen, press-hold-release the touchscreen, bringing up the **Actions Menu**. Select **"Stake".**



7. Check that the **correct surface** is selected, the **pole height and prism** are set correctly and select **'Stake'.**

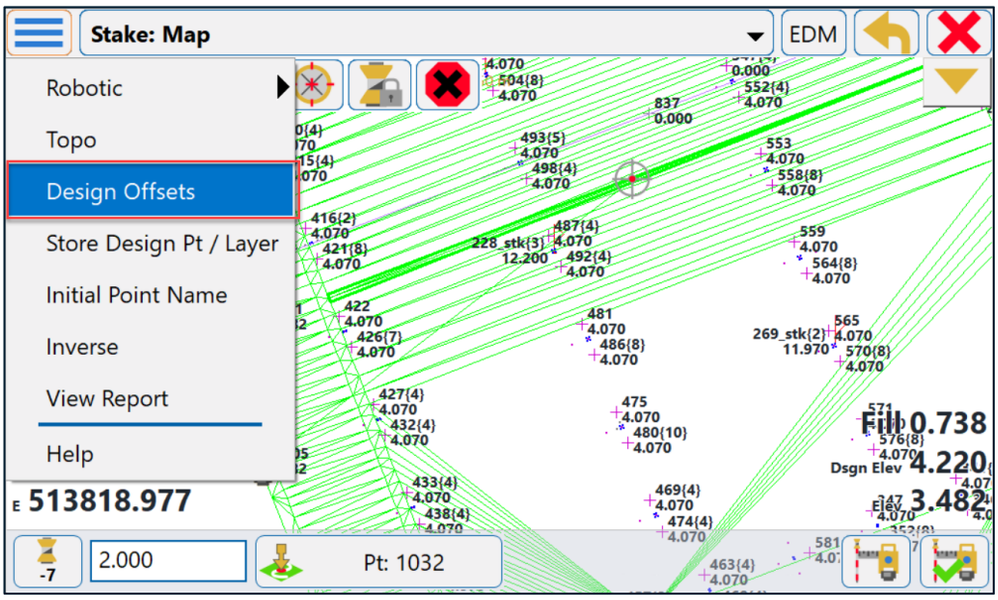


8. The **Info Boxes in the bottom left** can be typically configured (by pressing on the to change the info) to show the **Cut/Fill Value**, the **Current Elevation** & **Design Elevation**.
In this example, the Current Elevation is RL 3.482 & the Design Elevation at that individual spot on the DTM is RL 4.220. Therefore, the user is being told to FILL 0.738m to achieve the design elevation.

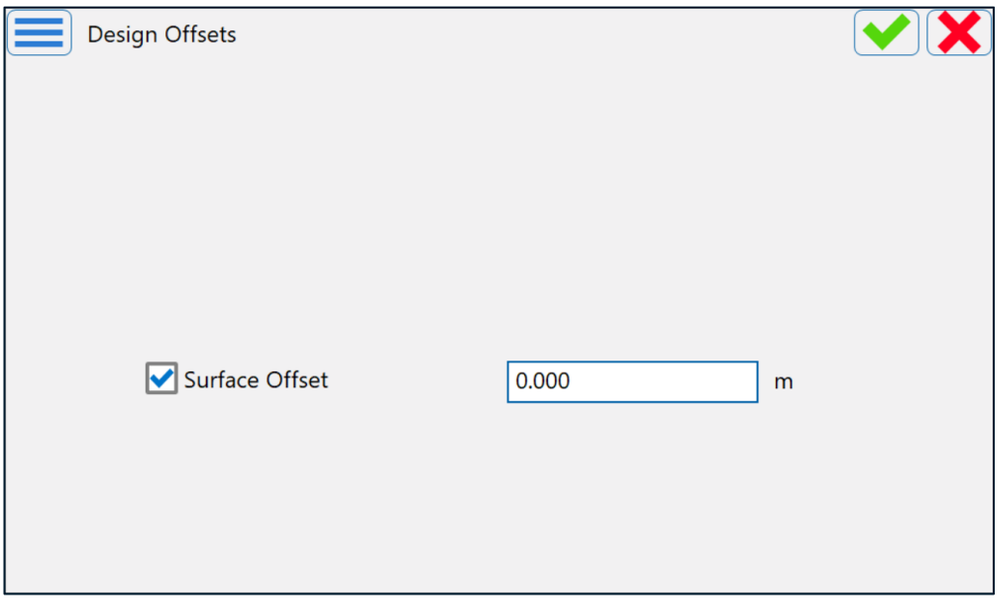


9. **Surface Design Offsets** can be applied whist in the Stake Out Mode, raising or lowering the design surface. In this example the design surface DTM is referencing the FFL of the slab. If that slab is 200mm thick, a design offset can be applied to find the underside of slab level (excavation level).

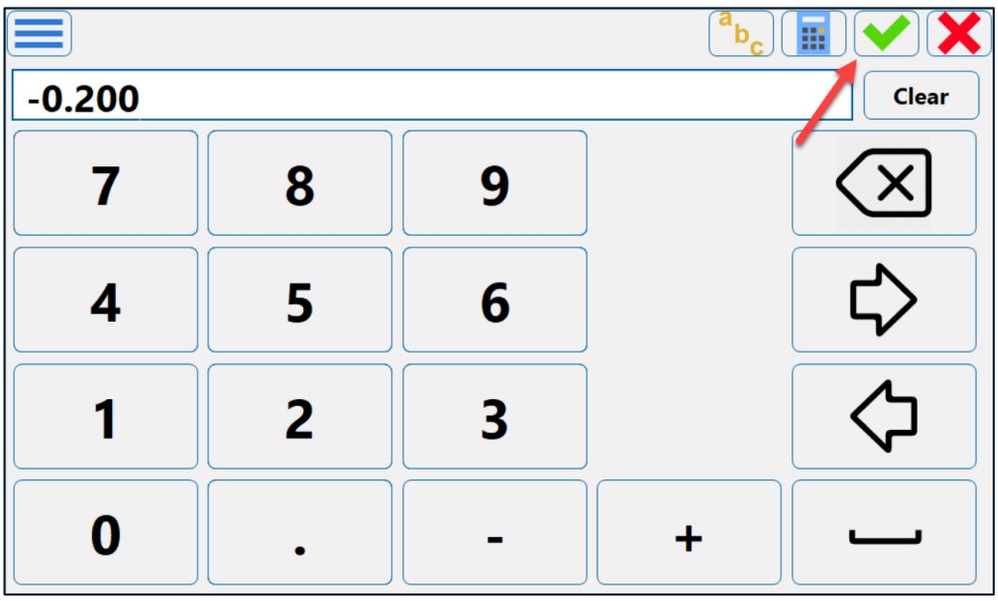
Select the Topcon Symbol top left. Select '**Design Offsets'.**



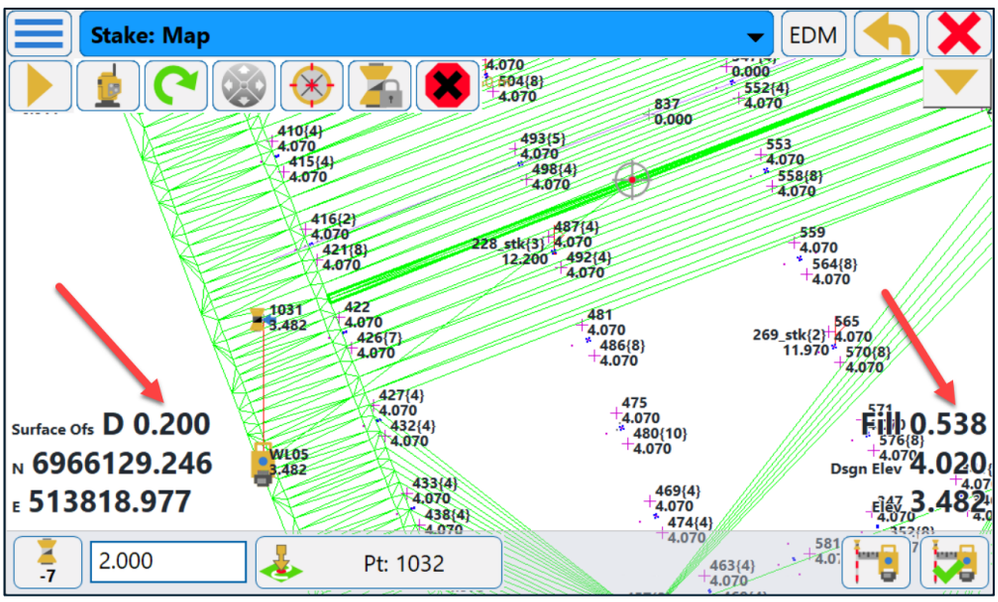
10. Place a **Tick in the Design Offset Box**, this will allow the user to input the desired **Offset**.



11. **Select the number input window** to type in desired **Up or Down Offset**. Be sure to use a Minus Sign for a negative (down) offset, or a Plus Sign for a positive (up) Offset. In this example the desired offset is Minus Two Hundred Millimetres **(-0.200m).**



12. User will now see on the **Design Offset Info Box** (bottom left) that there is a **D 0.200** Offset being applied (down 200mm representing the underside of slab).
In this example, this means that in this same position there is now a Fill of 0.538m required to achieve design RL 4.020.

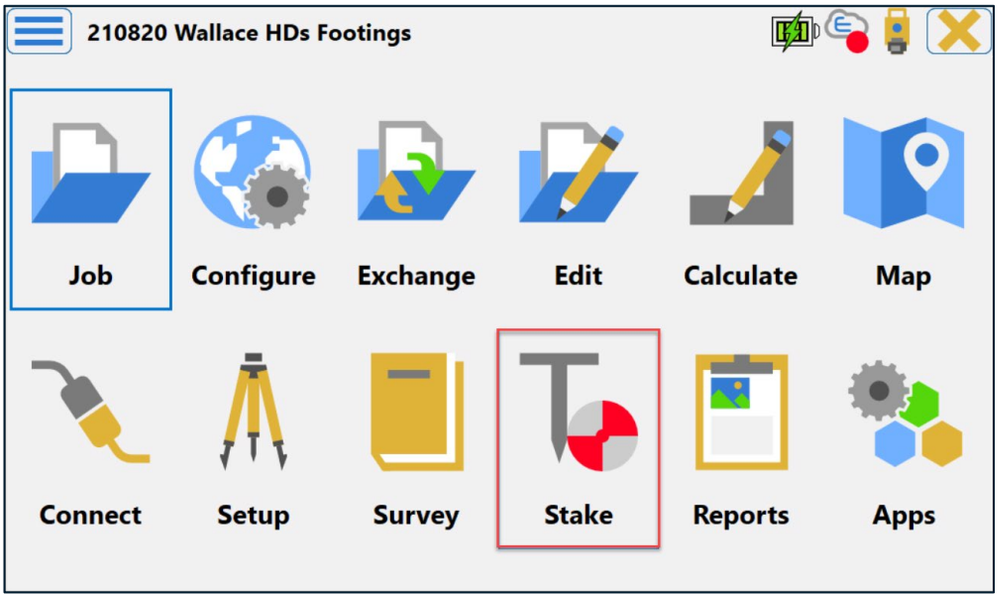


Stake Elevation

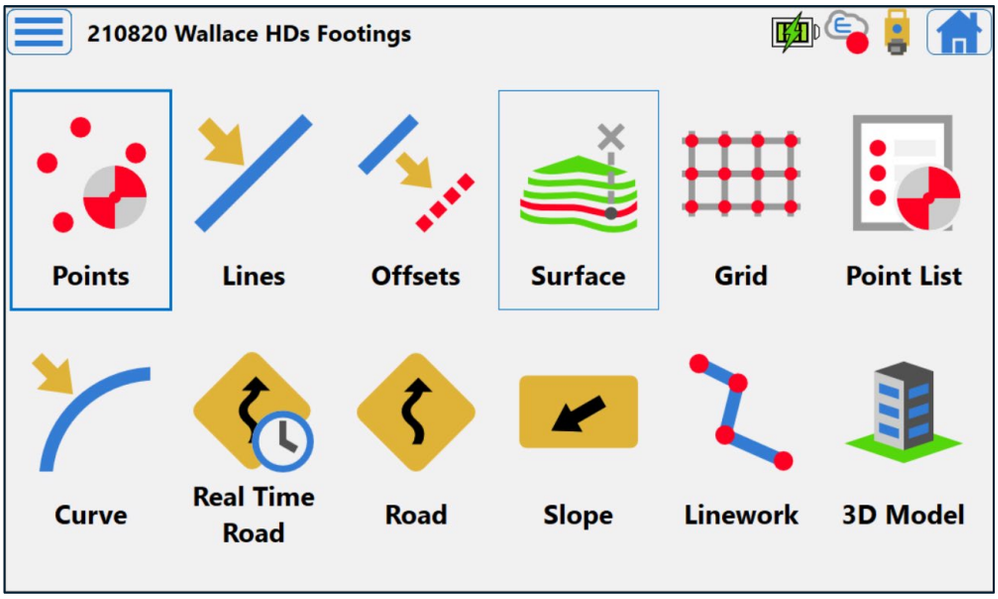
Once the height has been set for the instrument, either through a 2D+H Resection or using the Benchmark Setup Routine, the user then has the option of staking out an elevation.

When there is no DTM available in the data, this can be useful to obtain a cut/fill using your current elevation, against an input elevation.

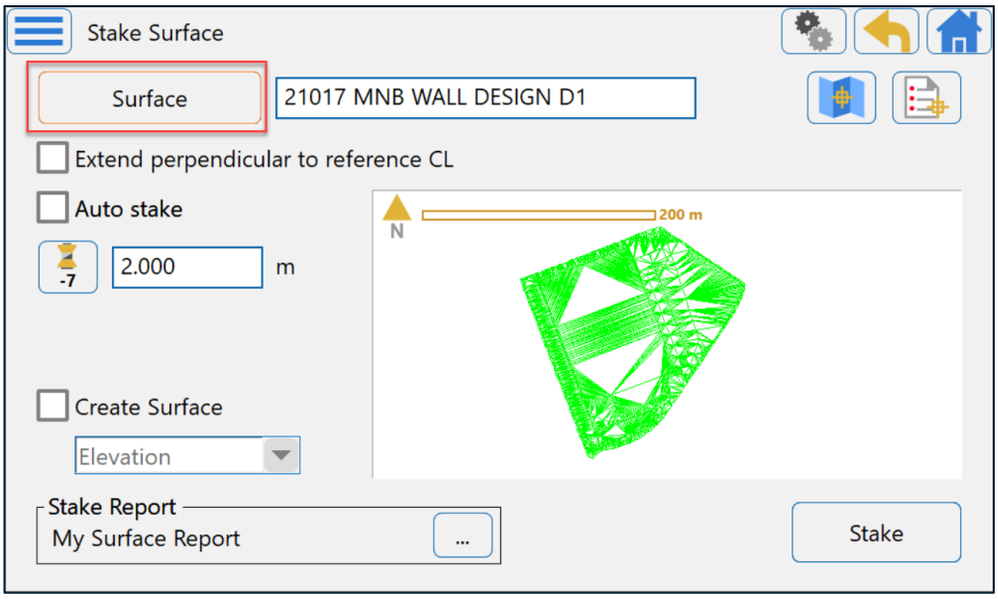
1. From the **Home Screen, select 'Stake'.**



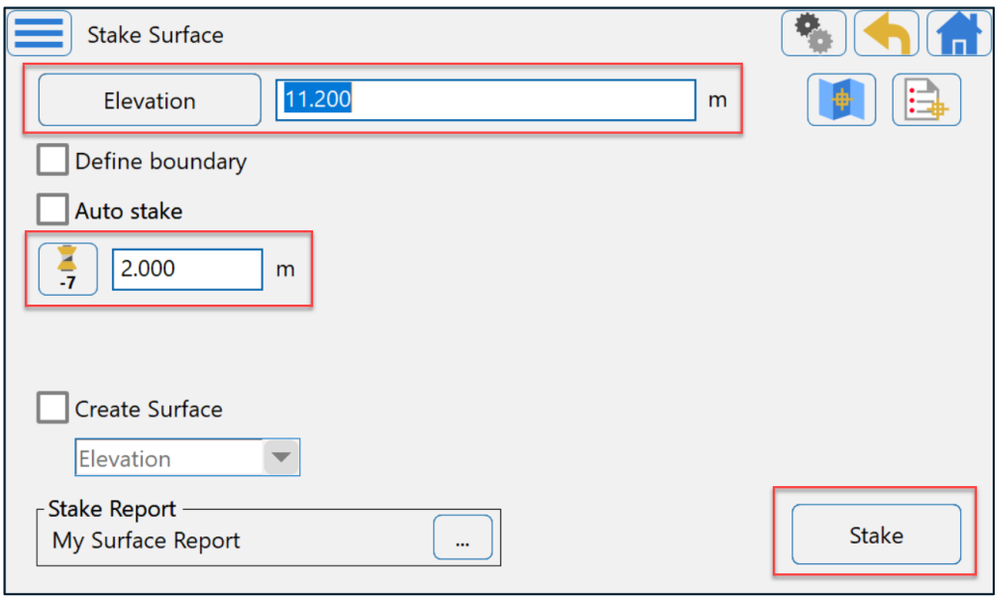
2. Select **'Surface'.**



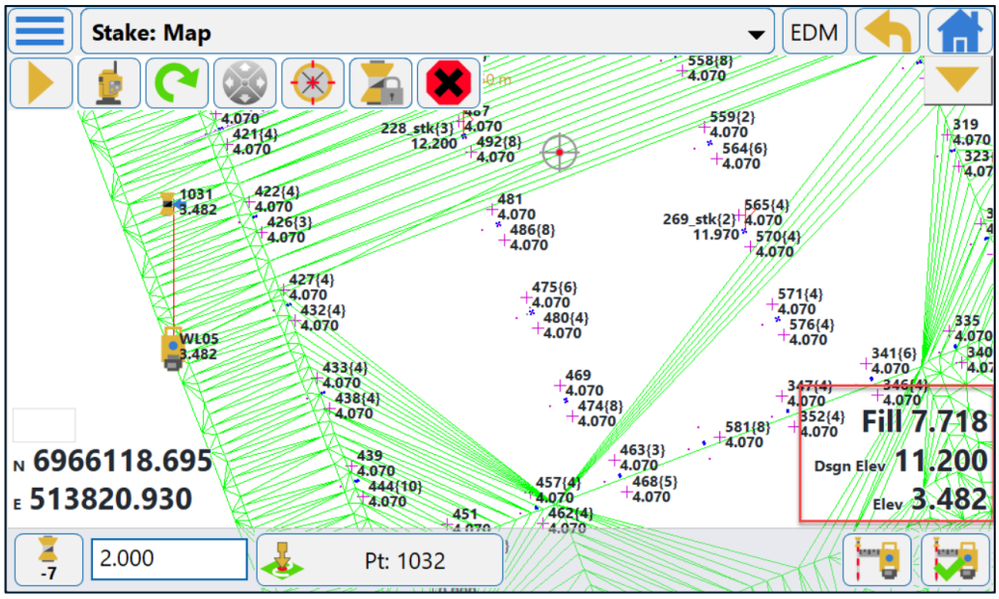
3. Toggle from ‘Surface’ to **‘Elevation’.**



4. **Input the required RL,** in this example the user is staking out the FFL of a slab known to be at **RL 11.200**.
The software will then be comparing your Current Elevation, to this Desired Elevation. Be sure the pole height is set correctly. Select **‘Stake’**.



5. The user can now **lock onto the prism** and get a real time read out comparison between their Current Elevation, the Design Elevation (11.200 in this example) and a cut/fill calculation on their screen.
In this example, the Current RL is 11.500, the desired RL is 11.200, hence there is an indicated **CUT 0.300m** needed to achieve the desired level.

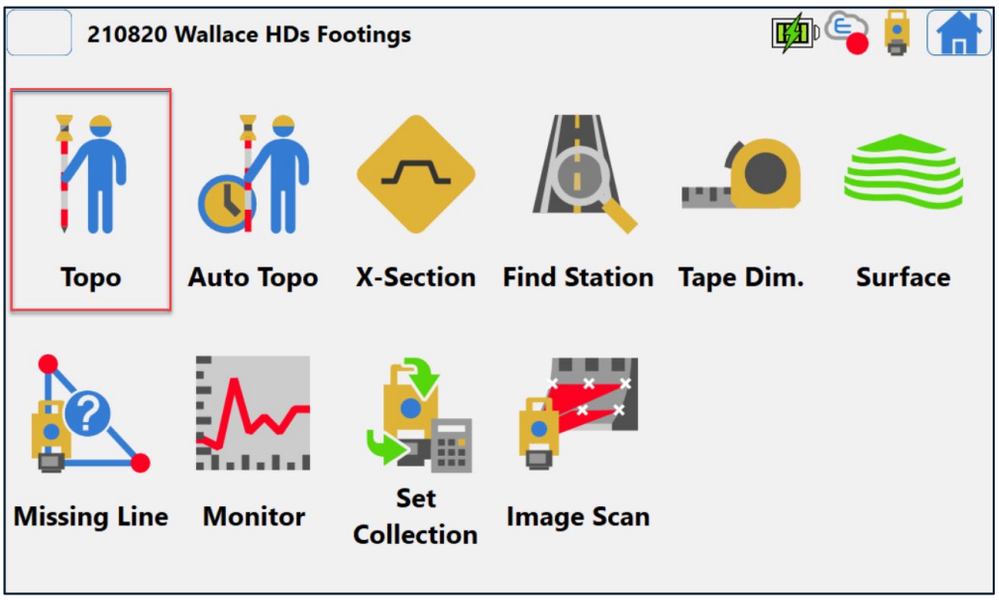


Survey – As-Built

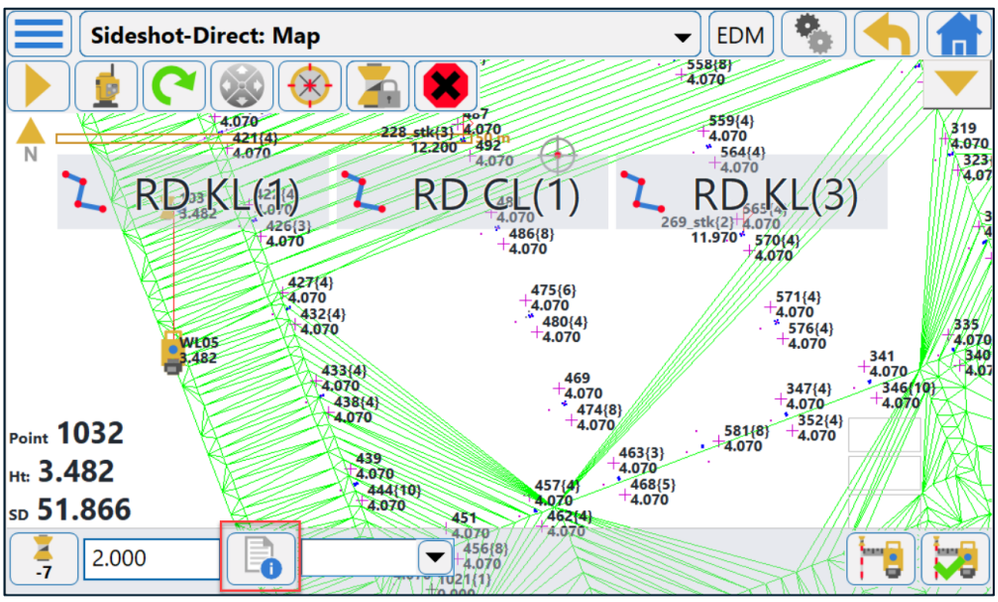
The Survey Topo feature is used to pick up points, lines, or assets in the field to measure and record their locations for design purposes, or to find the asset in the ground after installation.

1. Select 'Survey' from the **Home Screen.**

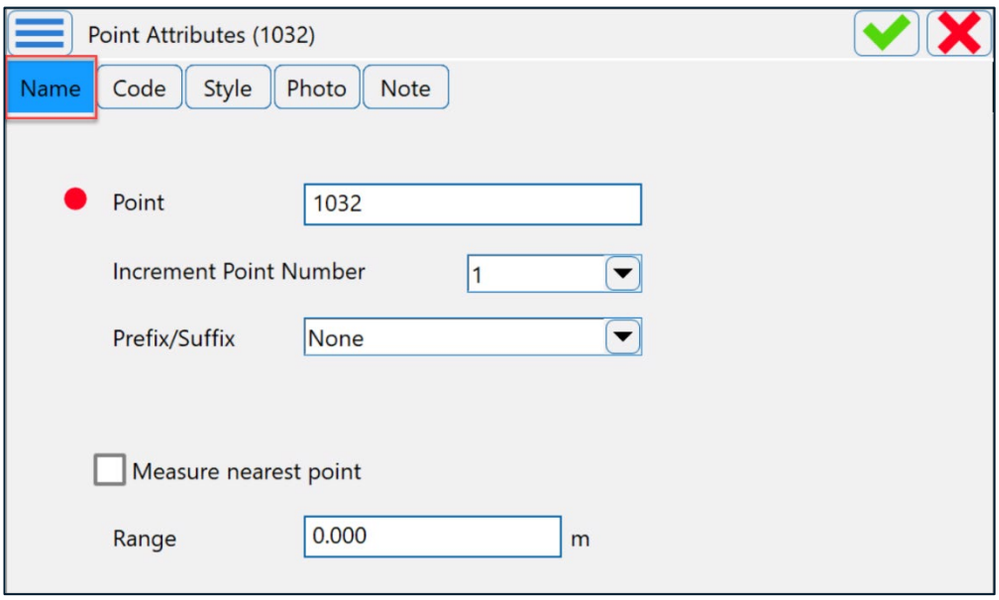
2. Select **'Topo'**



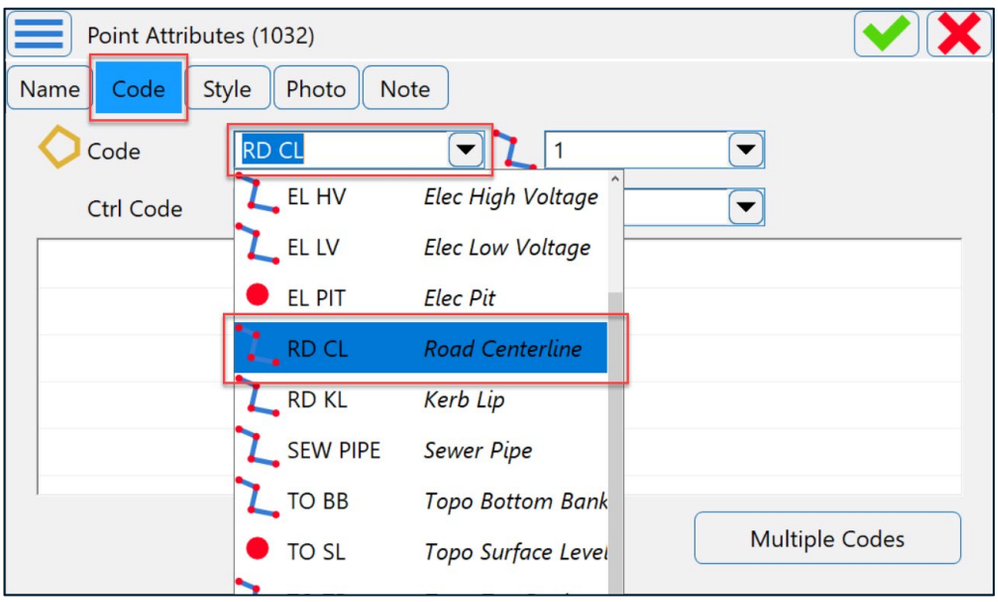
3. Select the **'Point Attributes'** icon down the bottom of the screen to configure the options around the point that the user will **next be measuring.**



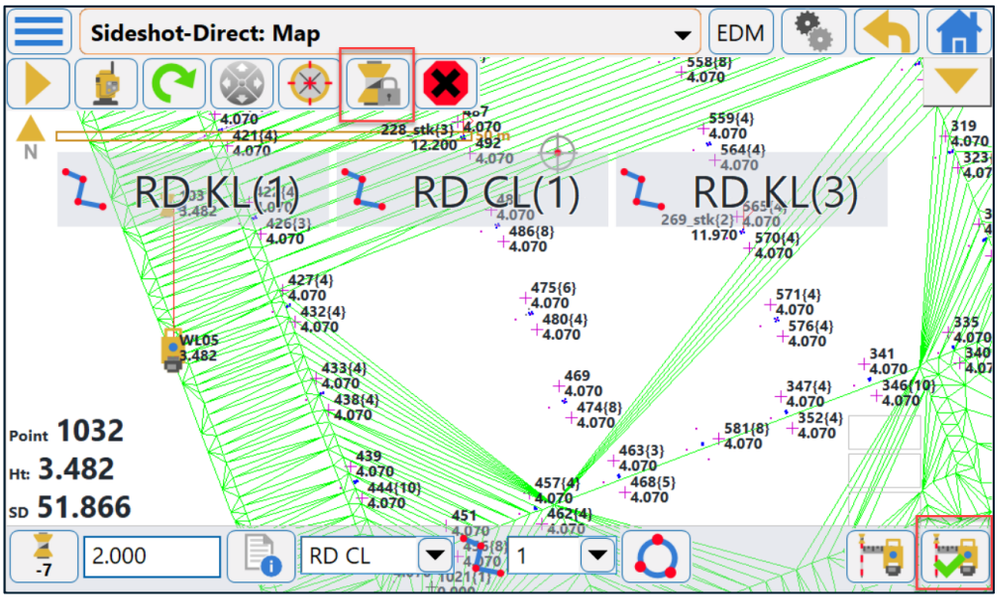
4. The user can the use the tabs along the top of the screen to configure the next measurement to be taken.
Select **'Name'**. The next point name (number) can be set.



5. Select **'Code'** and use the drop-down menu to select the desired code to be applied to the next measurement.



6. In the '**Survey Topo' Map Screen,** when ready and locked onto the prism, record the desired point using the **measure button** in the bottom right of the screen.



Initial Instruction Record

Please fill out the below details once the initial handover instruction has been completed by an Aptella Representative.

WO Number	
Operator Name	
Email Address	
Phone Number	

Operator Name	
Email Address	
Phone Number	

Operator Name	
Email Address	
Phone Number	

Operator Name	
Email Address	
Phone Number	

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