



Magnet Field Building Construction – Introduction LN-150



Position
Partners
Shaping New Dimensions

Foreword

This document has been produced by Position Partners whose combined experience in surveying and civil engineering stretches over many decades. We acknowledge the contribution of customers in assisting us with the feedback that has aided in the development of this course.

This guide is designed to provide the user with an understanding of the requirements and settings used to create a job with LN Series and Magnet Field to conduct field set out from imported data.

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Shaping New Dimensions

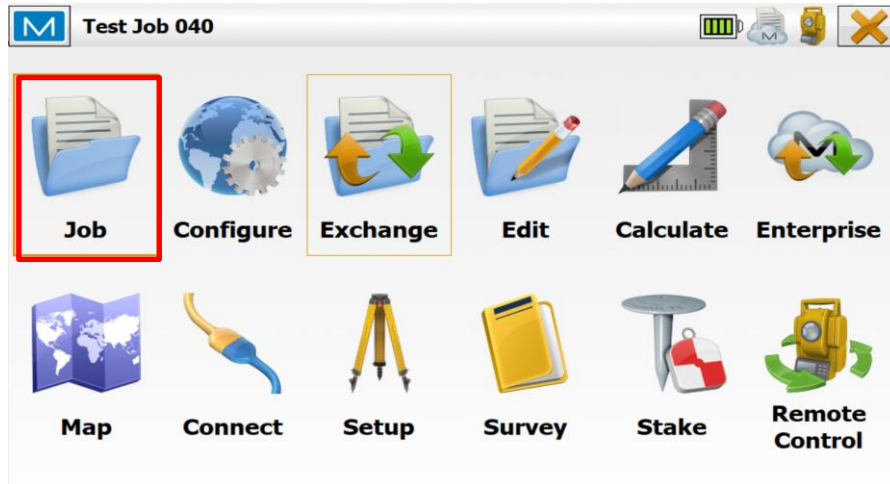
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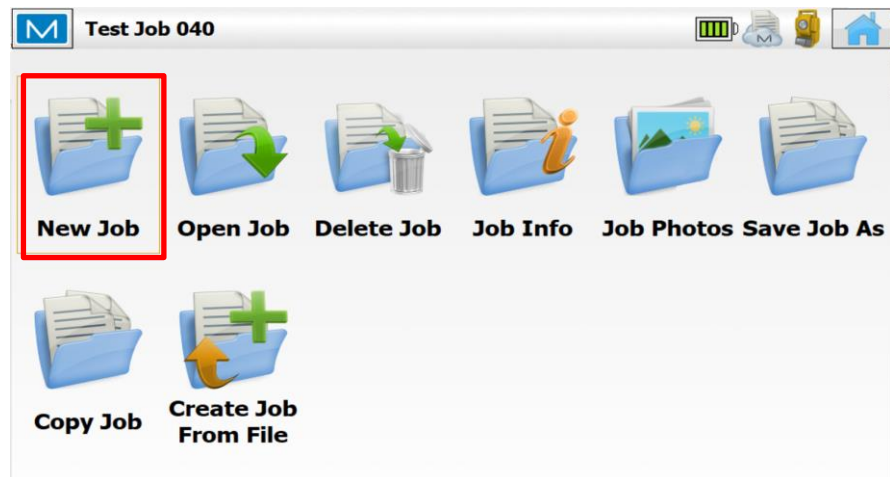
Create a New Job in Magnet Field



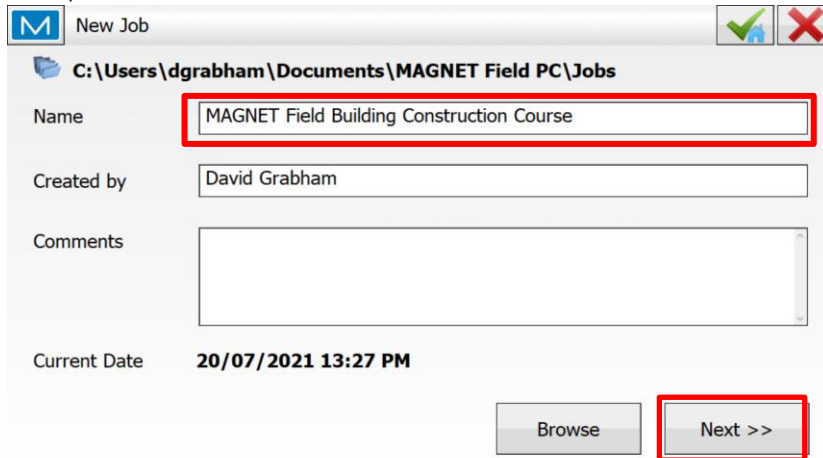
1. Open the **Magnet Field** software on the FC-6000
2. Once on the Magnet Field main screen, hit the **Job icon**



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



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



New Job

C:\Users\dgrabham\Documents\MAGNET Field PC\Jobs

Name: MAGNET Field Building Construction Course

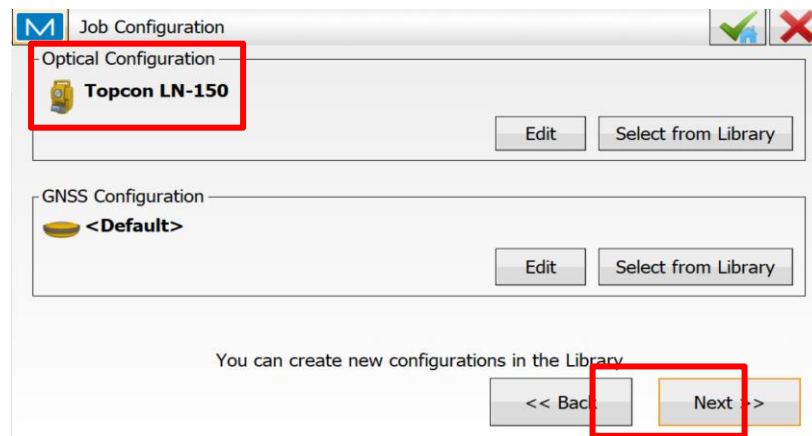
Created by: David Grabham

Comments:

Current Date: 20/07/2021 13:27 PM

Browse Next >>

5. Once the job configuration screen, ensure that optical configuration is LN and then hit the Next button.



Job Configuration

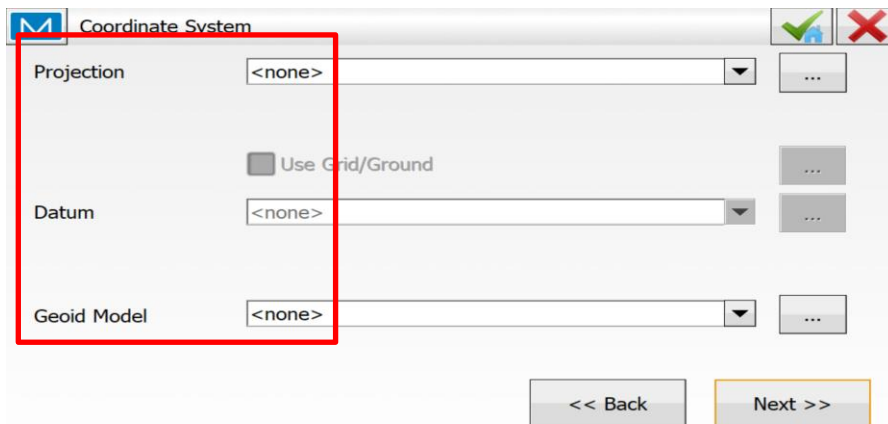
Optical Configuration: Topcon LN-150

GNSS Configuration: <Default>

You can create new configurations in the Library

<< Back Next >>

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**. Hit the **Green tick** button in top right corner to complete the job setup.



Coordinate System

Projection: <none>

Use Grid/Ground

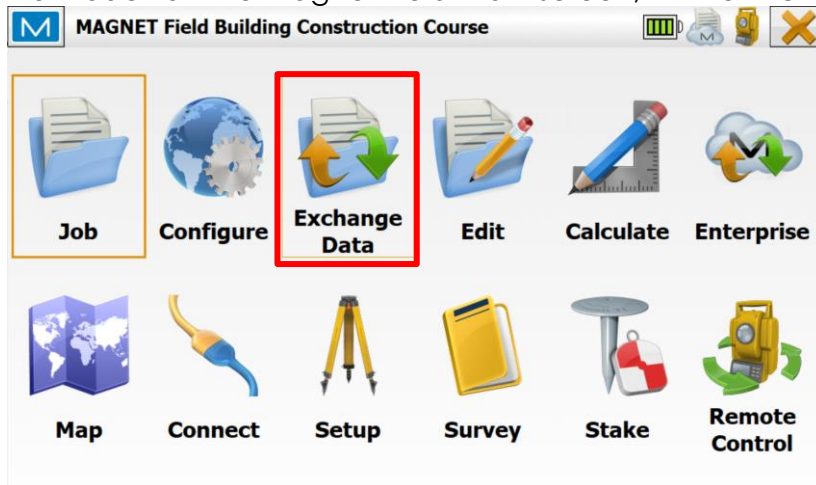
Datum: <none>

Geoid Model: <none>

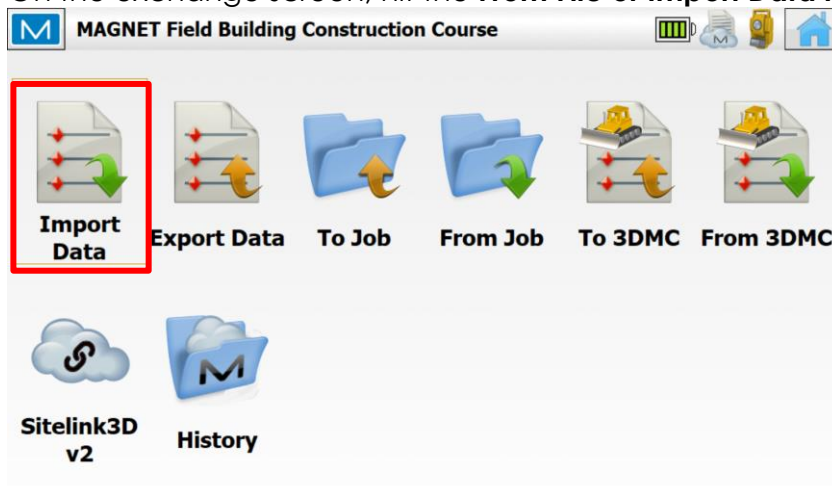
<< Back Next >>

Import Design Data into the Job

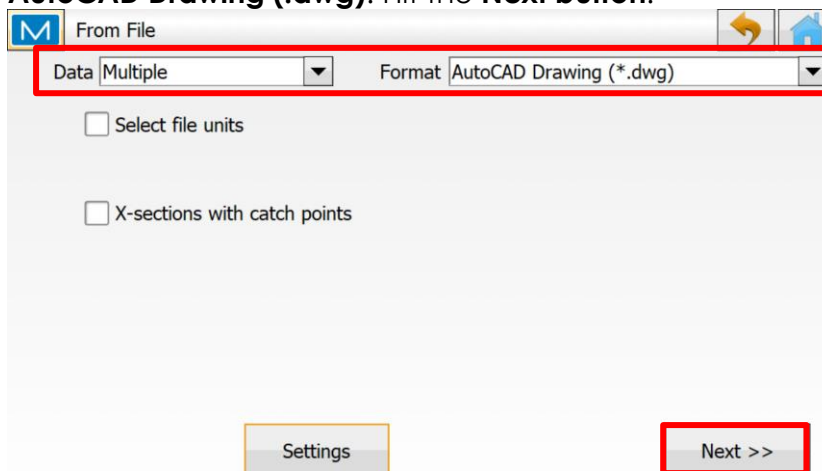
1. Now back on the Magnet Field main screen, hit the **Exchange** icon.



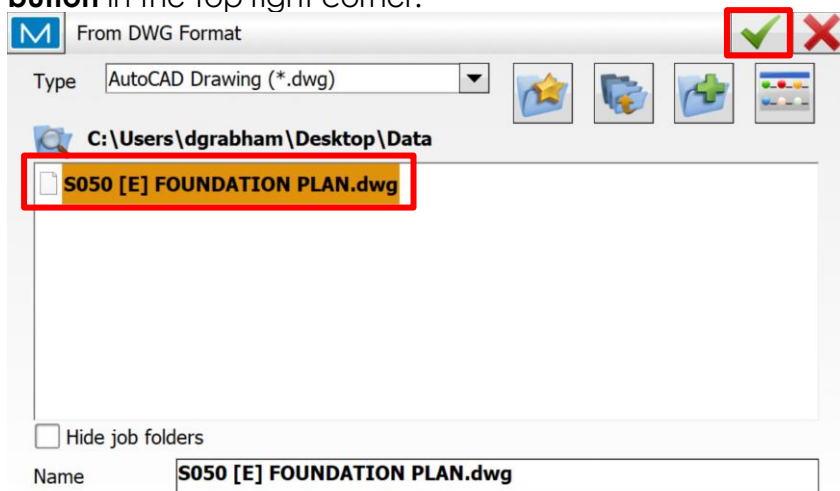
2. On the exchange screen, hit the **From File or Import Data** icon.



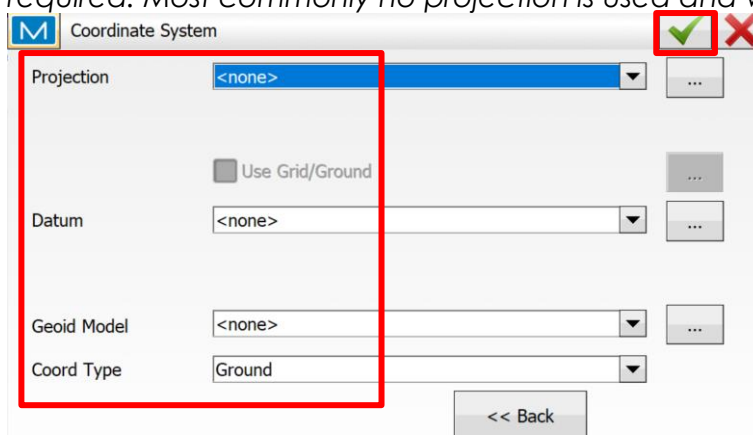
3. On the from file screen, ensure the *Data* is set to **Multiple** and the *Format* is set to **AutoCAD Drawing (.dwg)**. Hit the **Next** button.



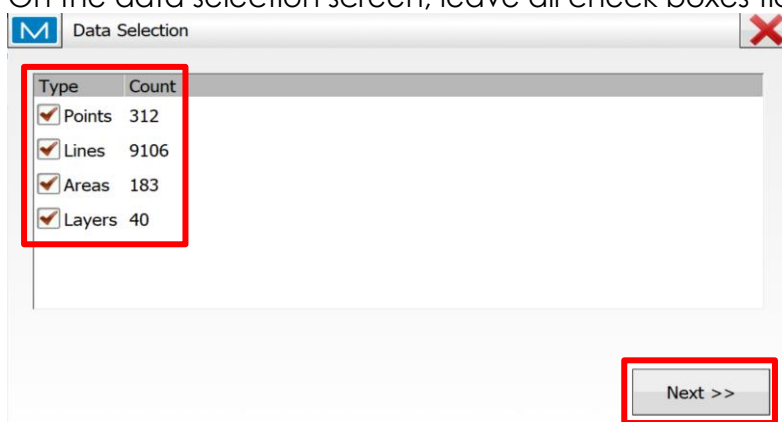
- On the from DWG format screen, navigate to where the design .dwg file is stored on the Data Collector or USB drive. Select the design .dwg file and hit the **green tick button** in the top right corner.



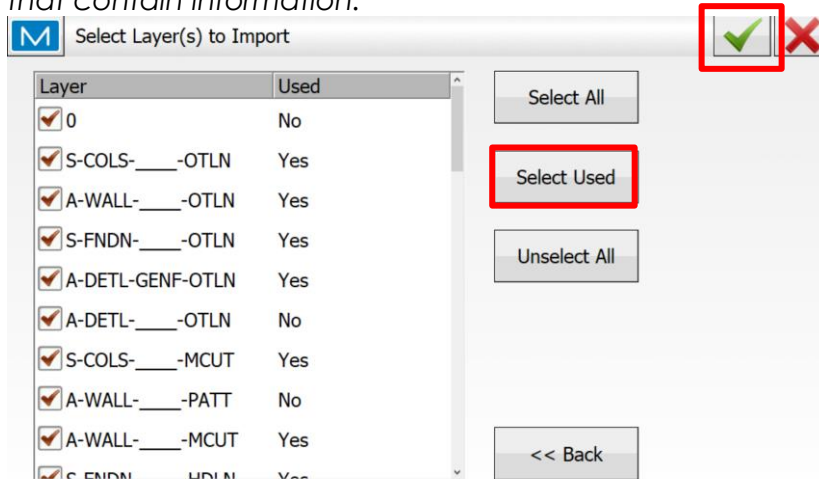
- On the coordinate system screen, ensure that *Projection* is set to **None**, *Datum* is set to **WGS84 or None**, *Geoid Model* is set to **None**, and *Coord Type* is set to **Ground**. Hit the **Green tick button** in top right corner. *Note: The surveyor may have used a grid system for the project and check with them on what projection and datum maybe required. Most commonly no projection is used and why software is set to none.*



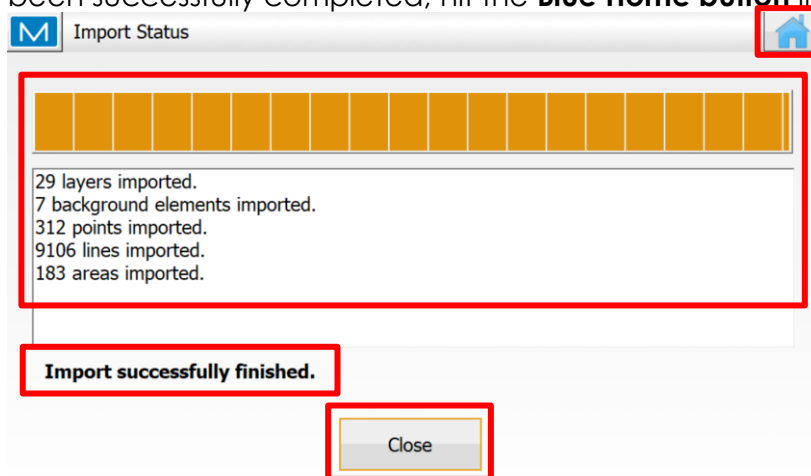
- On the data selection screen, leave all check boxes ticked to import all data.



- On the select layers to import screen, hit the **Select All button** to import all the *Layers* data. Once all boxes have been ticked, hit 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.*



- 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, hit the **Blue Home button** in the top right corner.



MAGNET Field Map Features

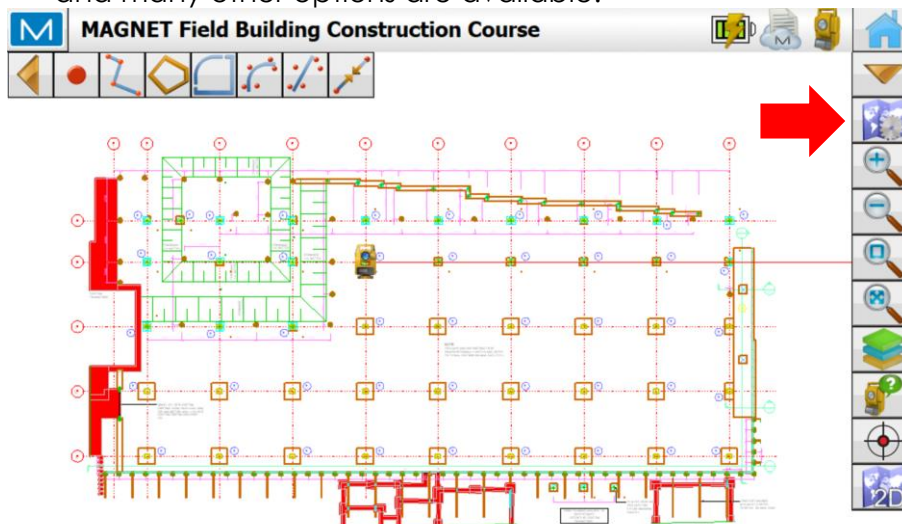
Main Map Walkthrough

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.

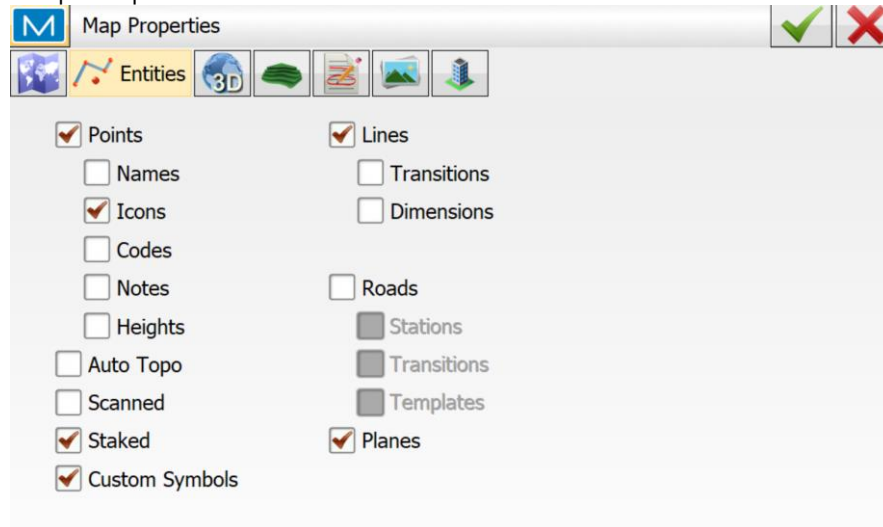


The **drop-down map menu** items on the **right-hand side of the screen** allow functions to be performed within the Map Screen and have Quick Access to features within the software. This **drop-down menu can be customized by the user** at any time by using the Customize Toolbar in the Map Properties button shows below.

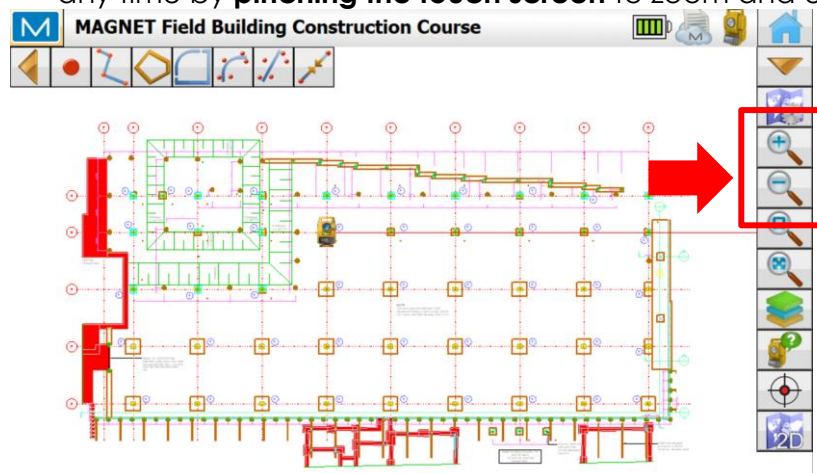
1. The **Map Properties** allows the user to define what they see on the map screen at any given time. This may include the point names, heights, staked points, surfaces and many other options are available.



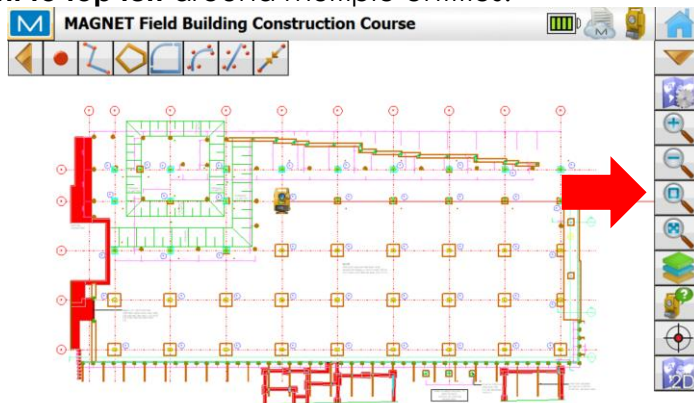
Map Properties **Entities Tab**



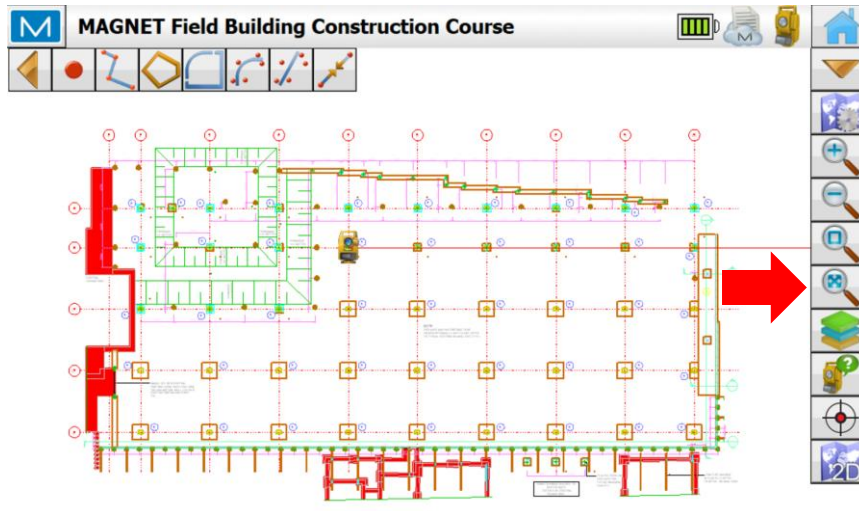
2. **Screen Zoom In/Zoom Out** allows the user to zoom in on the map to pick out points and lines more accurately from the Map View. This can also be done at any time by **pinching the touch screen** to zoom and expand the view.



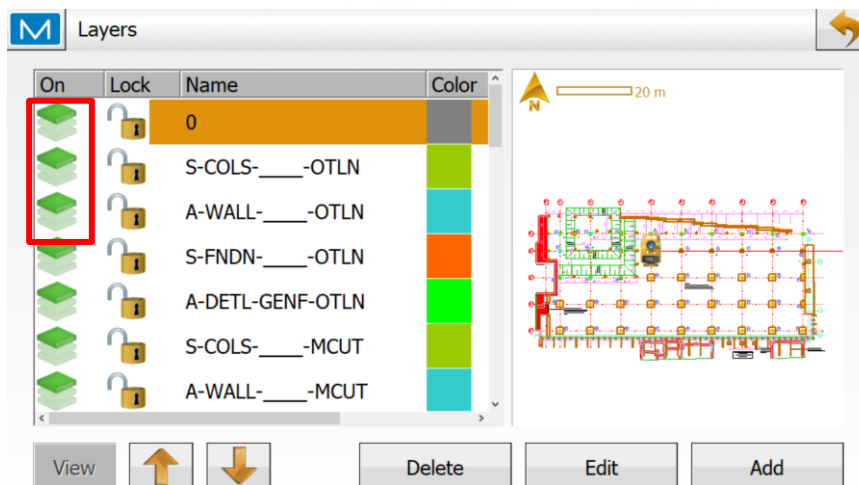
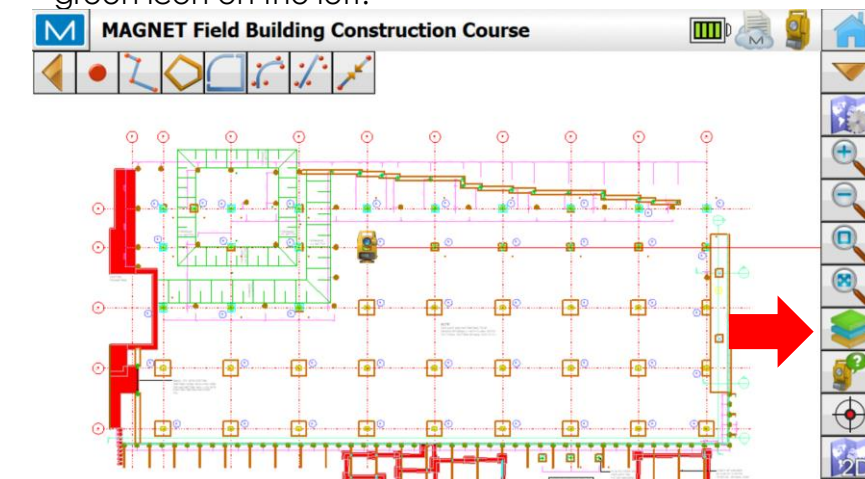
3. **Zoom Window/Multiple Select** function allows the user to draw a window by dragging their finger from **top left to bottom right** to zoom window. It also allows to select multiple points when user drags their finger **from bottom right to top left** around multiple entities.



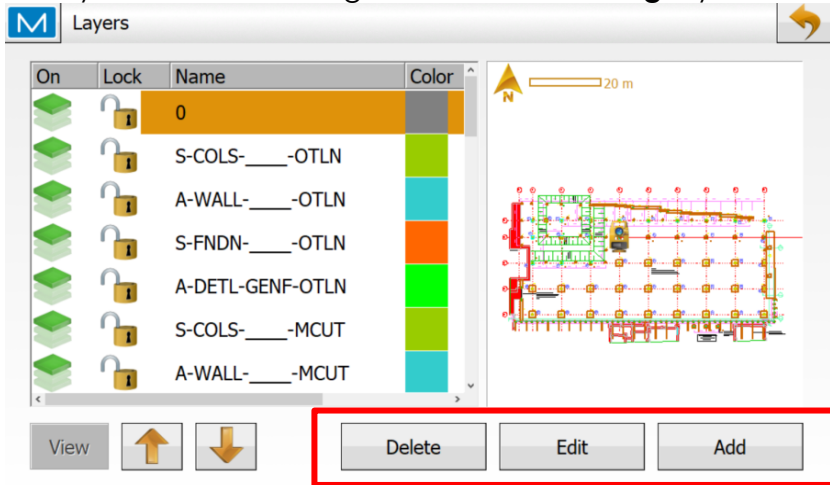
4. **Zoom ALL Data** function will bring all the design data held within the job to be centred on the screen with one touch.



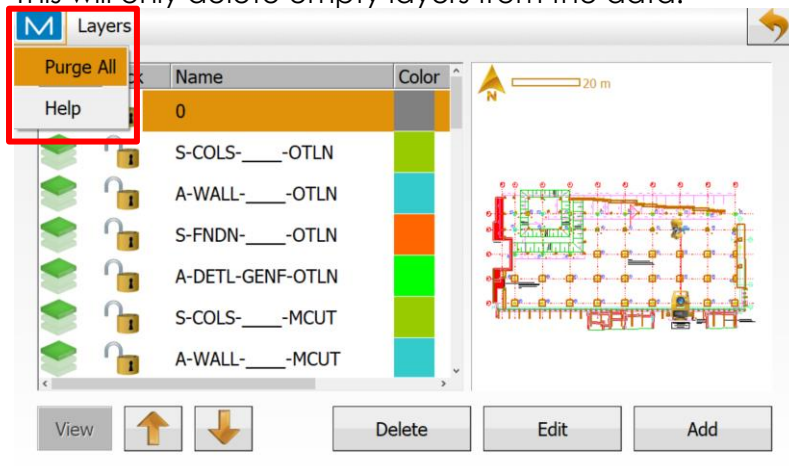
5. **Design Layers** function allows quick access to the design layers. Here the user can turn layers on and off on the map view by highlighting, or un-highlighting the green icon on the left.



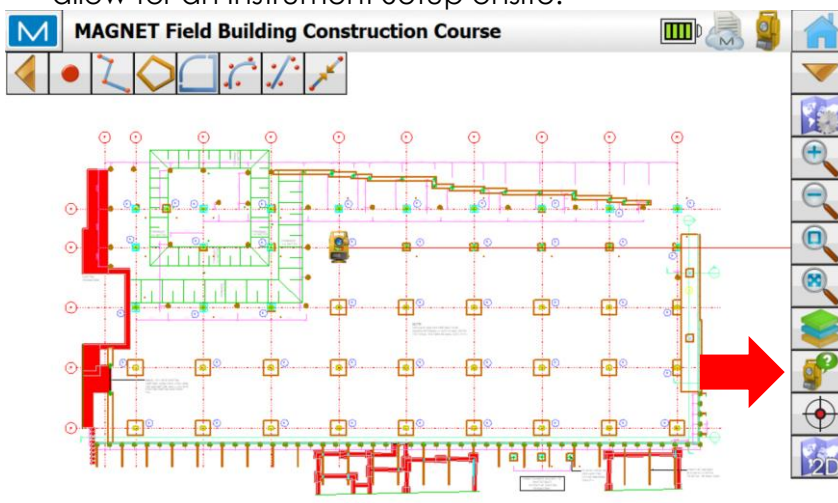
6. This screen also allows the user to **add new** layers into the design, **edit existing** layers within the design and **delete existing** layers from the design.



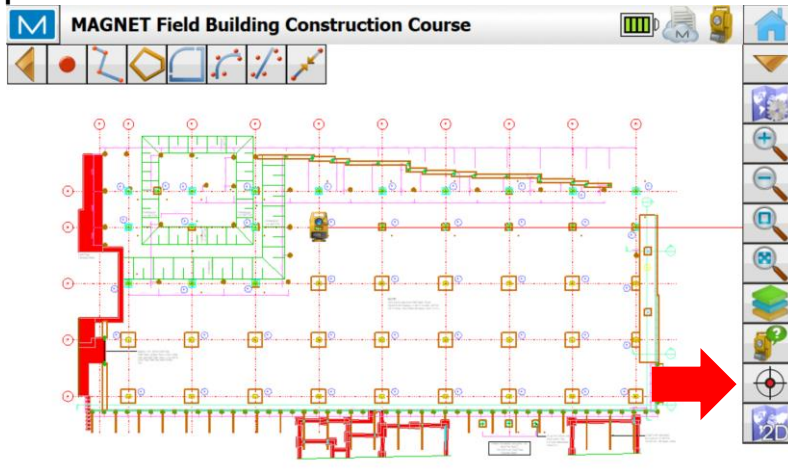
7. **Purge Empty Layers** can also be done from the Layers Screen. Select the **Blue MAGNET 'M' Logo** top left corner of the screen. Select **Purge All**. This will only delete empty layers from the data.



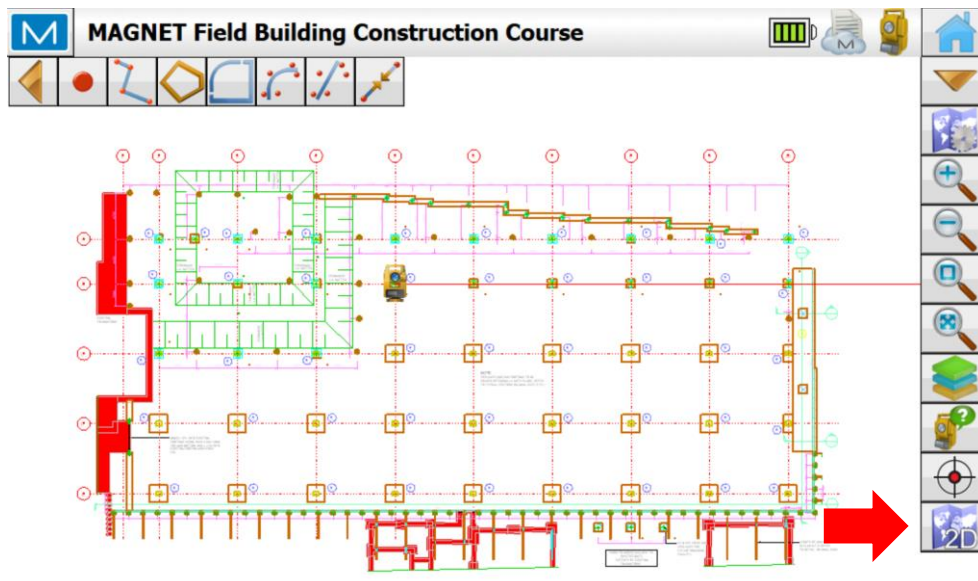
8. **Quick Access to Resection Setup** allows direct access to the Resection Screen to allow for an Instrument Setup onsite.

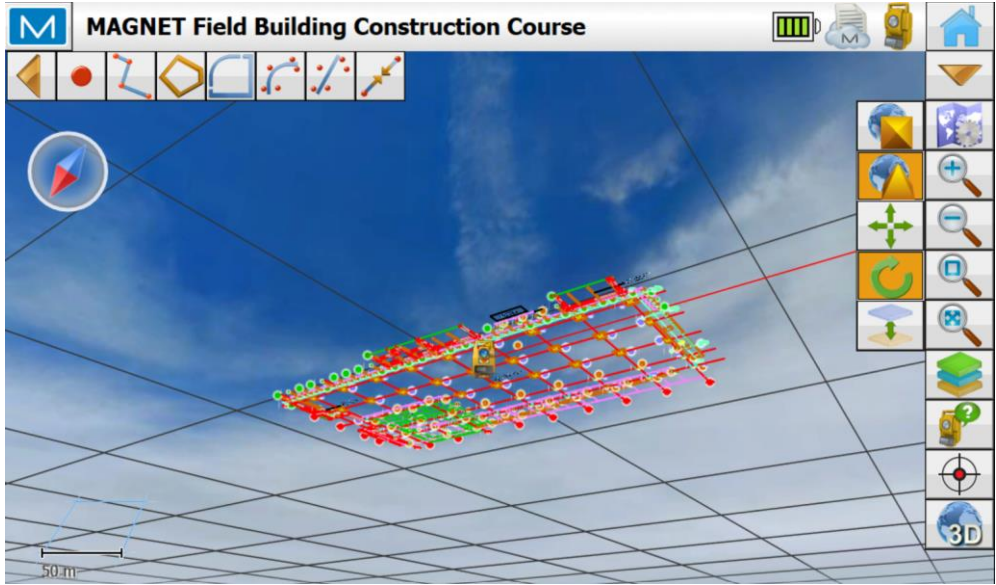


9. **Find Me Target** can be used within the Map to show the users current position onsite. The instrument must be locked onto the prism to show **the real time position of the user onsite.**



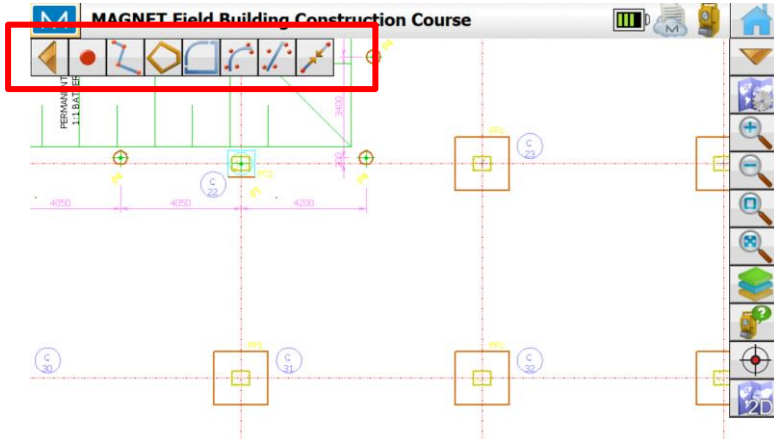
10. **2D/3D Toggle Switch** can be used to swap between the 2 dimensional and 3 dimensional views within the Map view.



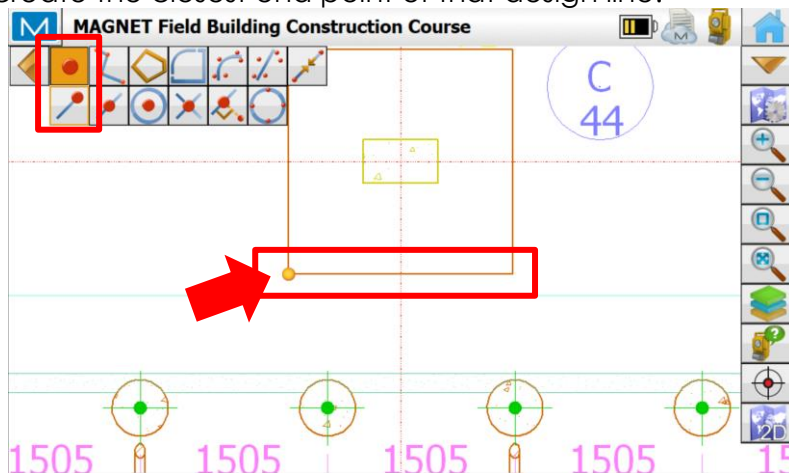


Point Creation Tab

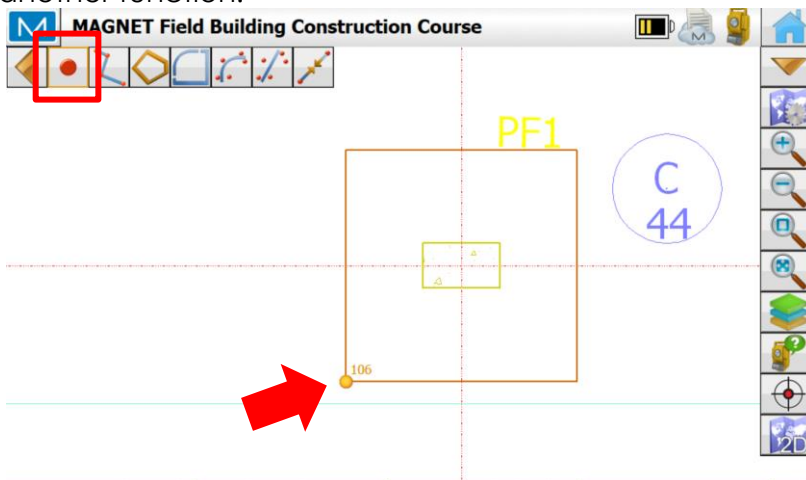
The Point Creation Tab allows points to be created within the design on-the-fly in the field, to allow for specific points to be found onsite, even if they did not exist in the original design data.



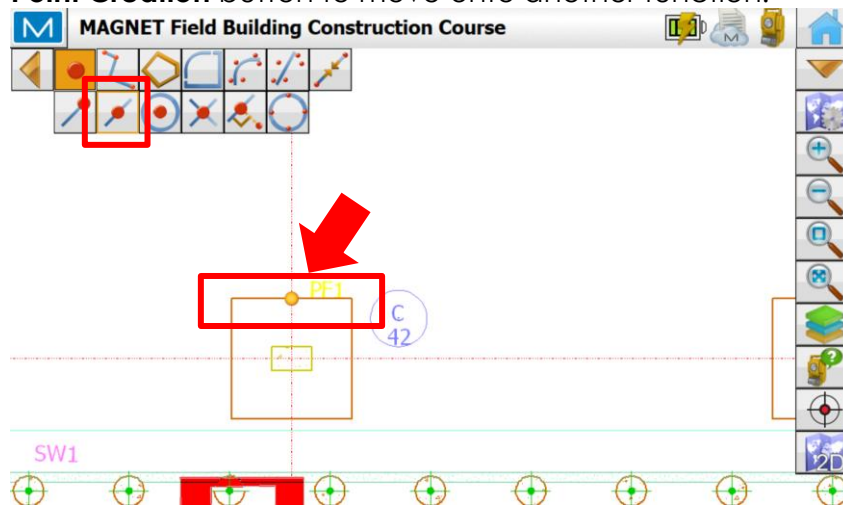
1. **Point Creation – At the end of a line.** Select the Point Creation button, select the 'create point at the end of a line', then select the line on the Map to automatically create the closest end point of that design line.



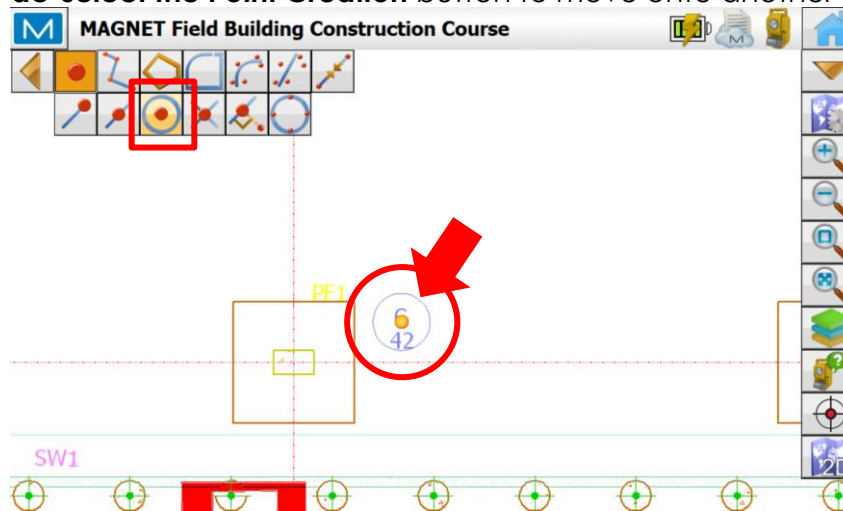
2. **Deselect the initial point creation** button up the top of the screen to move onto another function.



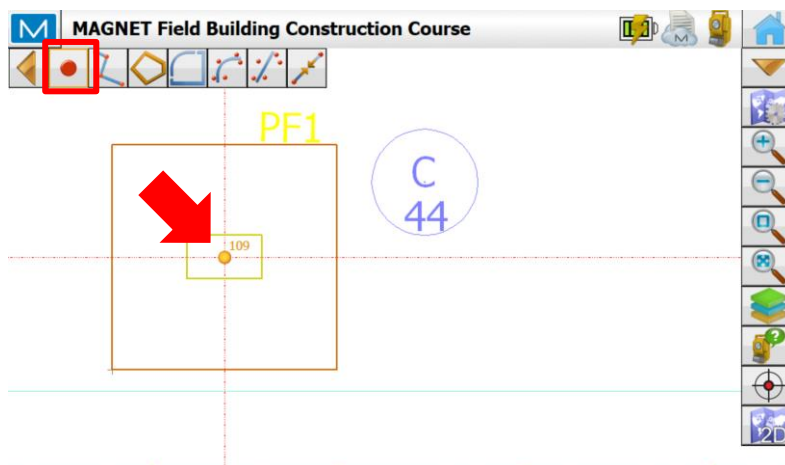
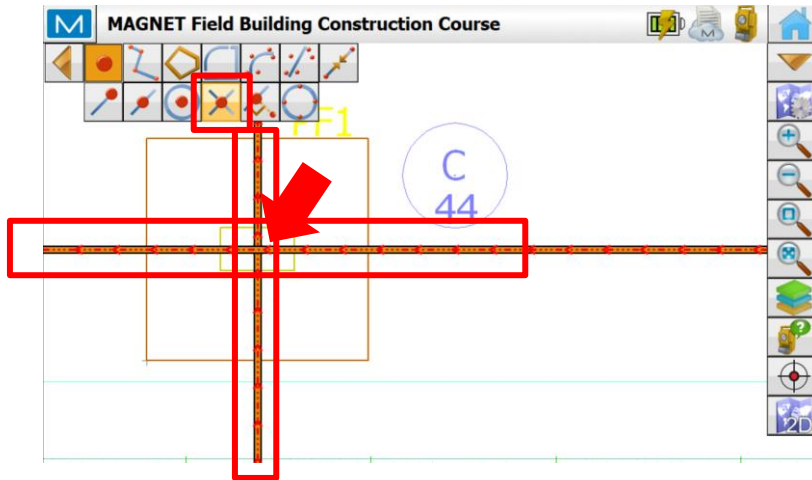
3. **Point Creation – In the middle of a line.** As above, select the Point Creation button, select the 'create point in the middle of a line', then select the line on the Map to automatically create the mid-point of that design line. Once again **de-select the Point Creation** button to move onto another function.



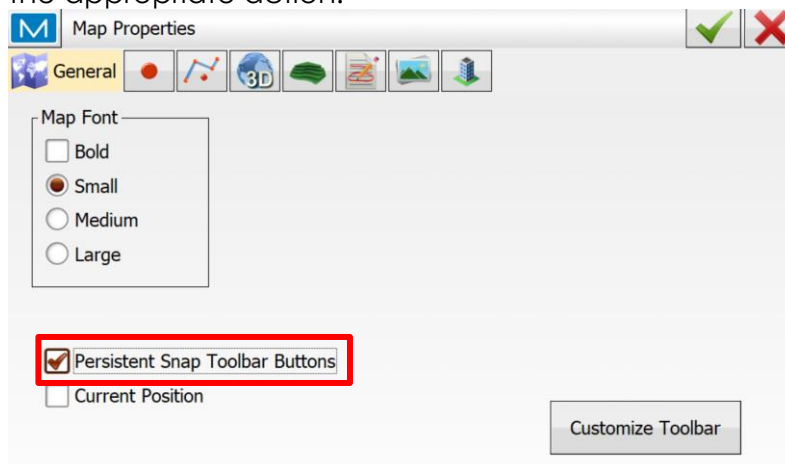
4. **Point Creation – In the middle of a Circle.** As above, select the Point Creation button, select the 'create point in the middle of a circle', then select the circle line on the Map to automatically calculate and create the middle of the circle. Once again **de-select the Point Creation** button to move onto another function.



5. **Point Creation – At the Intersection of Two Lines.** As above, select the Point Creation button, select the 'create point at intersection', then select the two lines that intersect on the Map to automatically calculate and create the intersection point of those two lines. Once again **de-select the Point Creation** button to move onto another function.



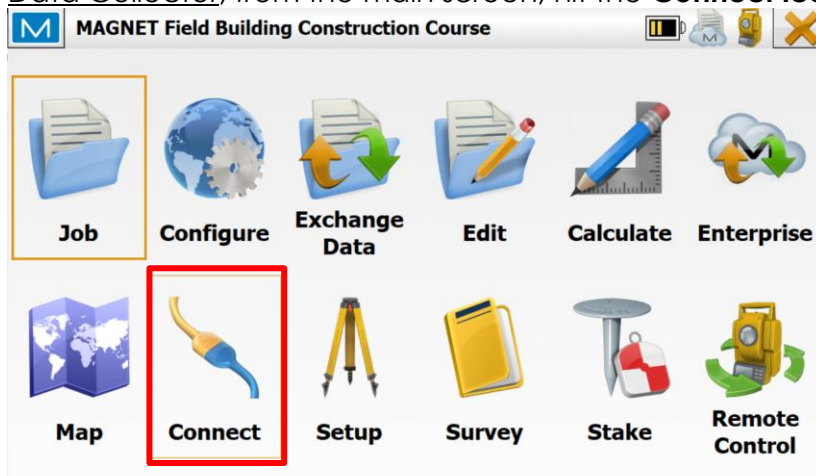
6. **Persistent Snap Toolbar Buttons** can be turned on within **Map Properties** to allow the selected point creation option to stay selected, allowing the user to continue to select lines, or circles, or intersections and create points without needing to re-apply the appropriate action.



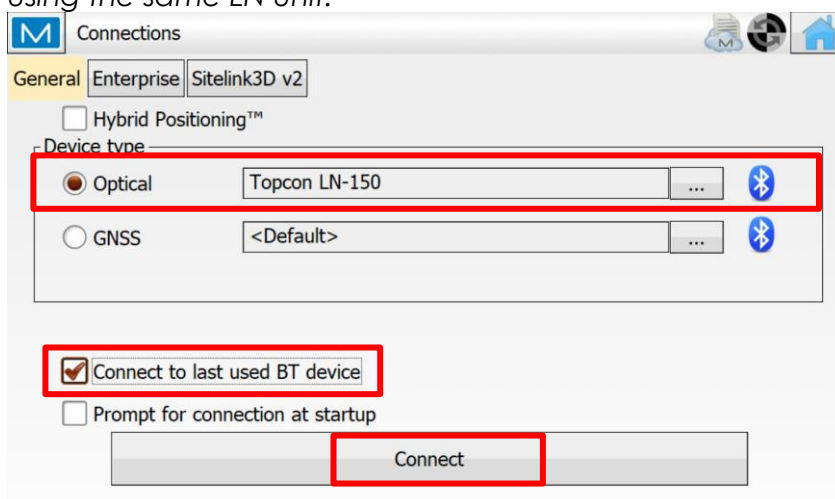
Setup LN

Connect to LN 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 LN 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 LN, press the green power button, and allow the instrument time to self-level. The instrument will spin 180 deg to check its level, and then spin back home when complete.
4. Once you have completed this setup routine, using the **Magnet Field software** on the Data Collector, from the main screen, hit the **Connect icon.**



5. On the connections screen, ensure that the *Optical* has a **Filled circle** and the **LN** is the device selected with a Bluetooth icon. Hit 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 LN unit.*



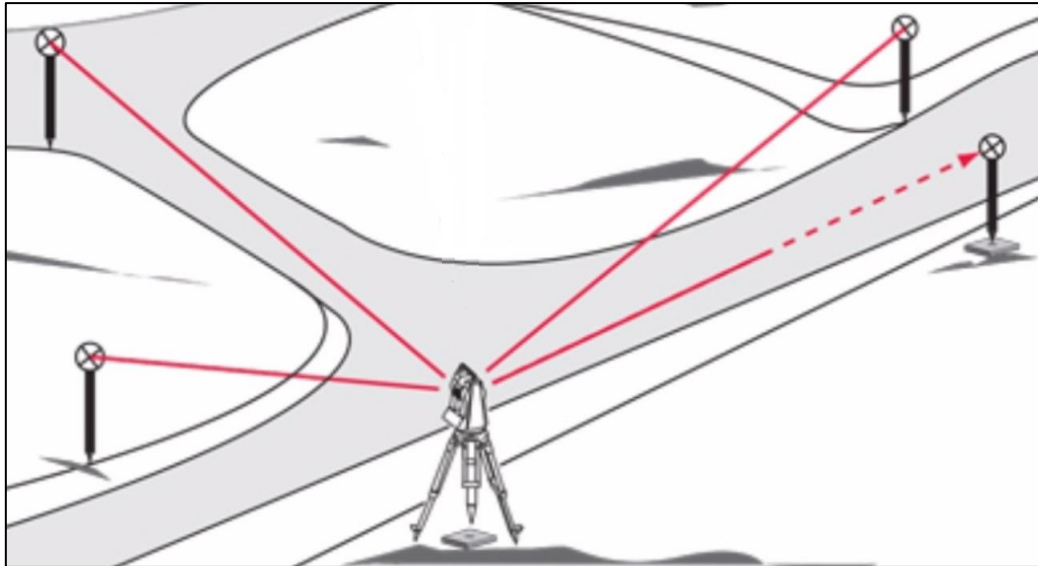
6. After approx. 10 seconds, the LN will connect to the software and be back on the main screen. The icon in the top right corner indicates a connection to the LN unit.



Resection

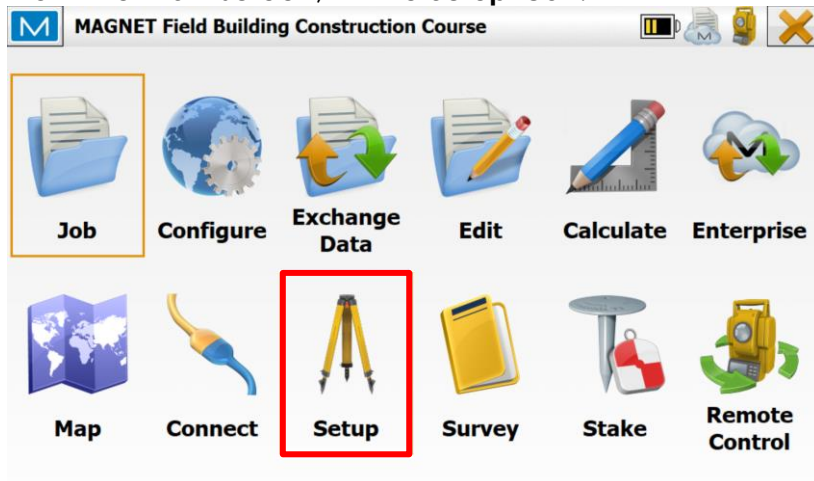
Best Practice

- 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.

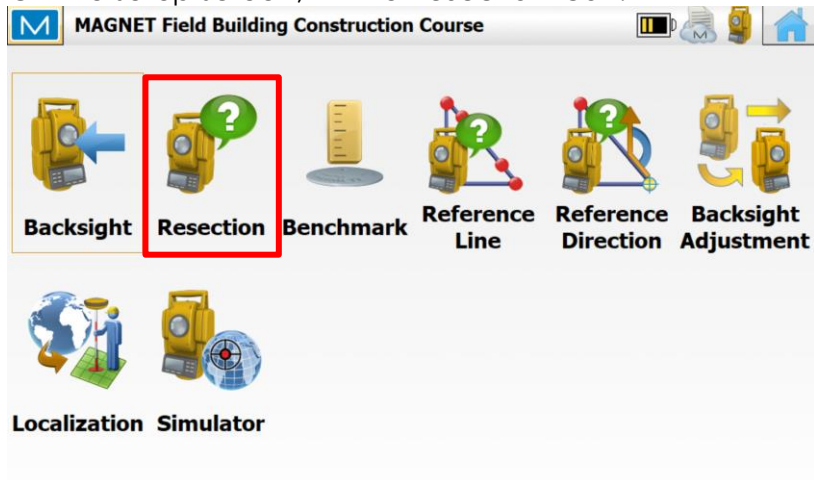


Setup LN via Resection

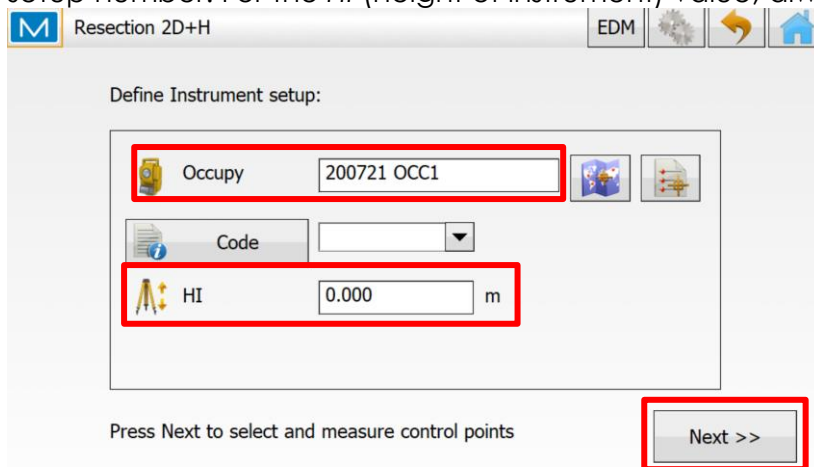
1. From the main screen, hit the **Setup** icon.



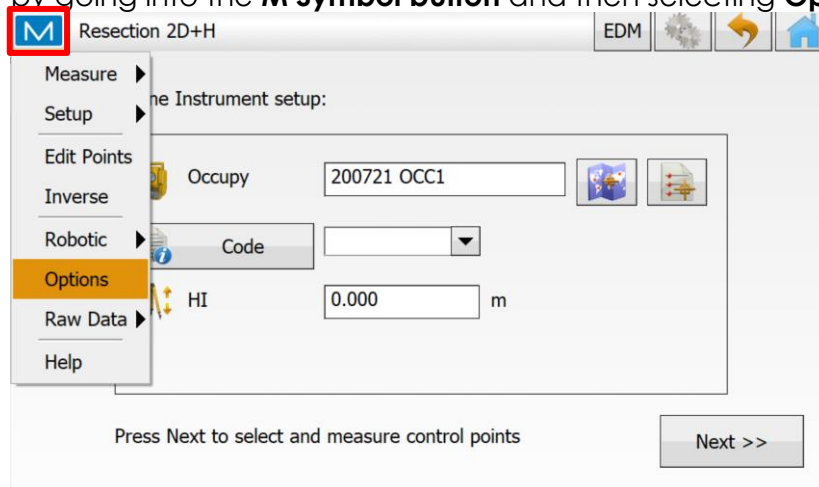
2. On the setup screen, hit the **Resection** icon.



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**.

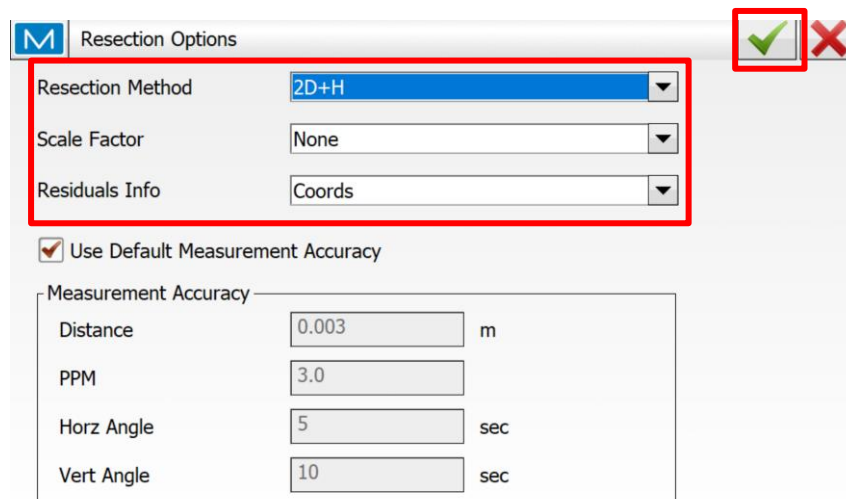


- Still on the resection screen, the user can change the resection method being used by going into the **M Symbol button** and then selecting **Options**.

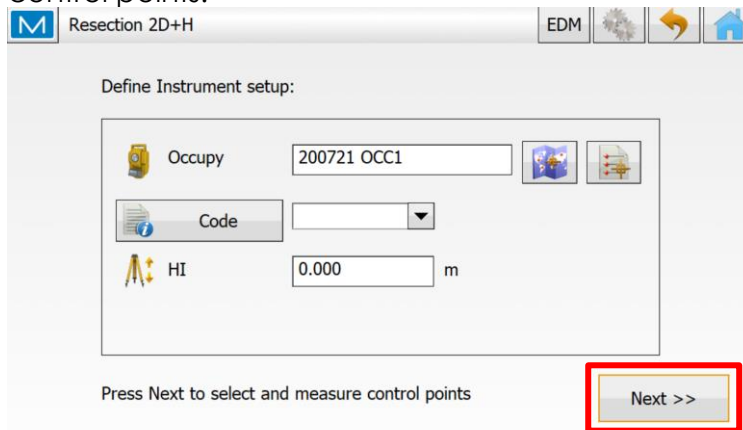


- On the **resection options** screen, the user can pick the resection calculation method used to calculate the resection position and the coordinates being observed from that point. Once selected the resection method, hit the **Green Tick button**. The different methods are:

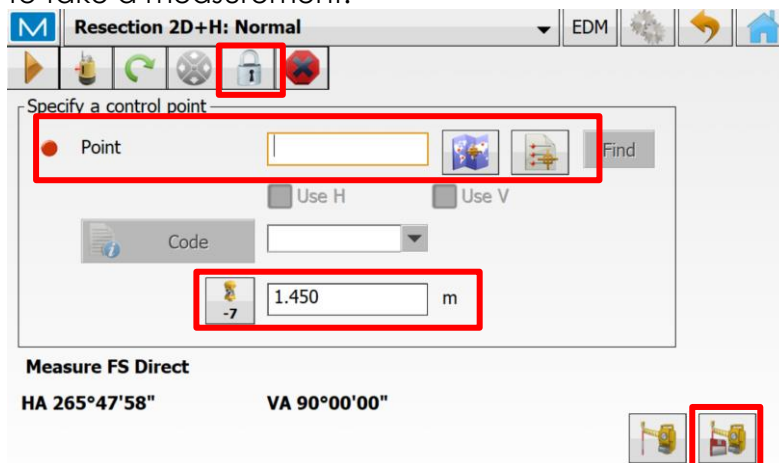
- 2D - Only calculates the horizontal coordinates (**Use ONLY for setting out coordinates with NO heights**)
- 2D+H - Calculates horizontal coordinates and vertical height separately (**Use for setting out coordinates WITH heights**)
- 3D Combined - Calculates horizontal coordinates and vertical height together (**Use for setting out coordinates WITH heights**)



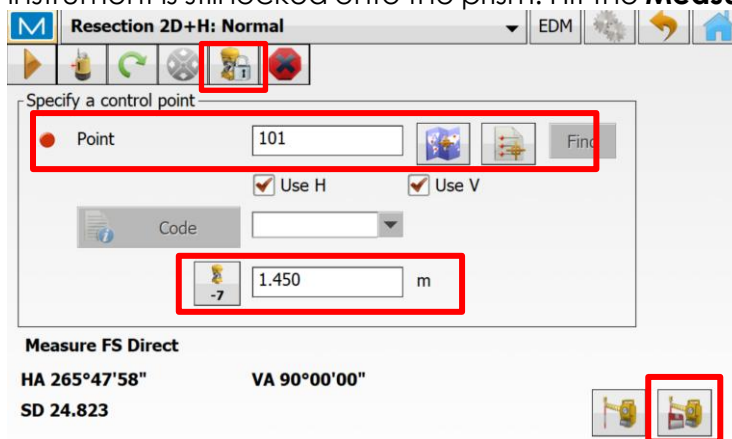
- Now back on the resection screen, once all information has been entered and resection method has been selected, hit the **Next button** to select and measure control points.



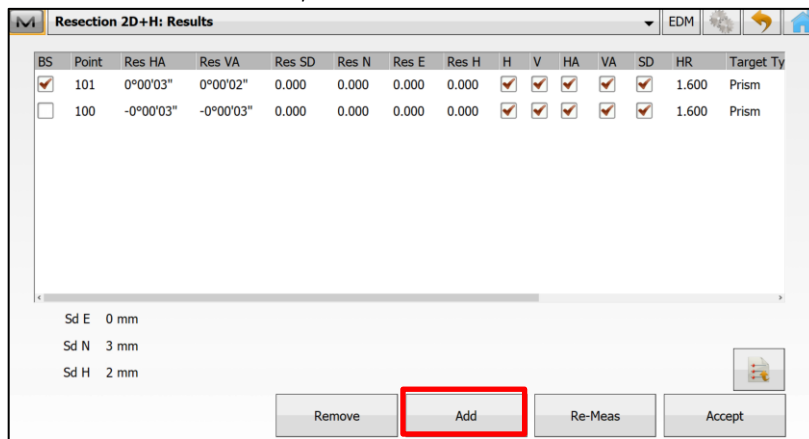
- On the resection screen, pick a point from the **Map or Point list** to use for the first resection point. Enter in the **Prism Pole height** which is the measurement from the bottom tip of the pole to the centre of the prism. Ensure the **ATP1 prism type** (-7mm 360 degree) is selected. Hit the **Lock icon** to lock onto the prism. Hit the **Measure button** to take a measurement.



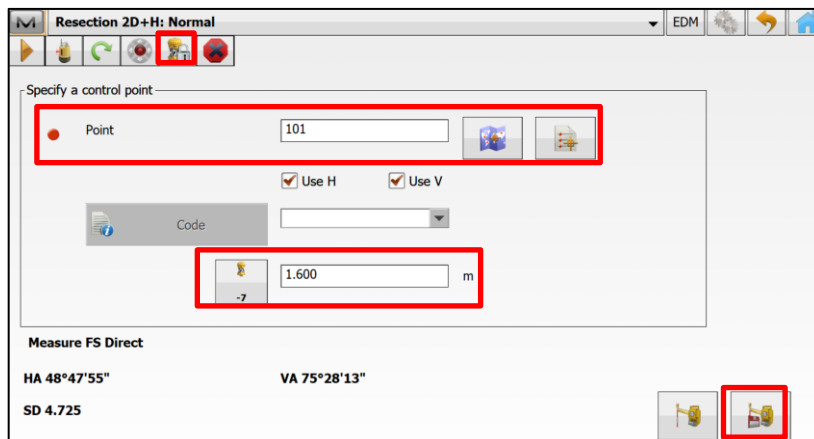
- Still on the resection screen, pick another point from the **Map or Point list** to use for the second resection point. Leave the **Prism Pole height** the same as first resection point. Confirm the **ATP1 prism type** is still selected. Ensure the lock icon still shows that the instrument is still locked onto the prism. Hit the **Measure button** to take a measurement.



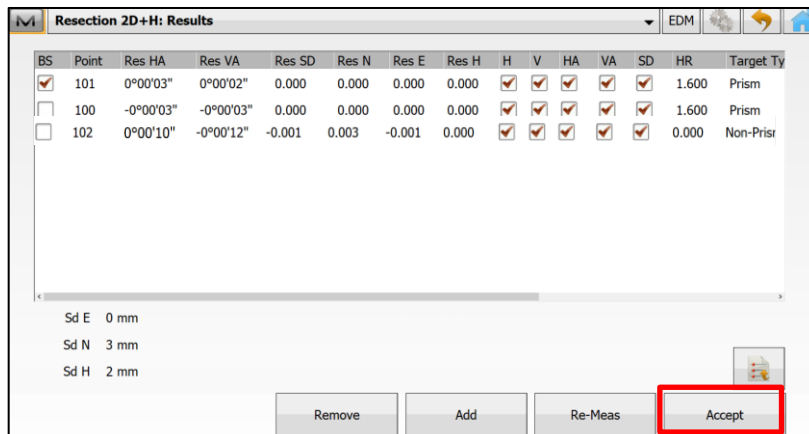
9. On the results screen, hit the **Add button** to make observations to the 3rd point.



10. Back on the resection screen, pick another point from the **Map or Point list** to use for the second resection point. Leave the **Prism Pole height** the same as first resection point. Confirm the **ATP1 prism type** is still selected. Ensure the lock icon still shows that the instrument is still locked onto the prism. Hit the **Measure button** to take a measurement.



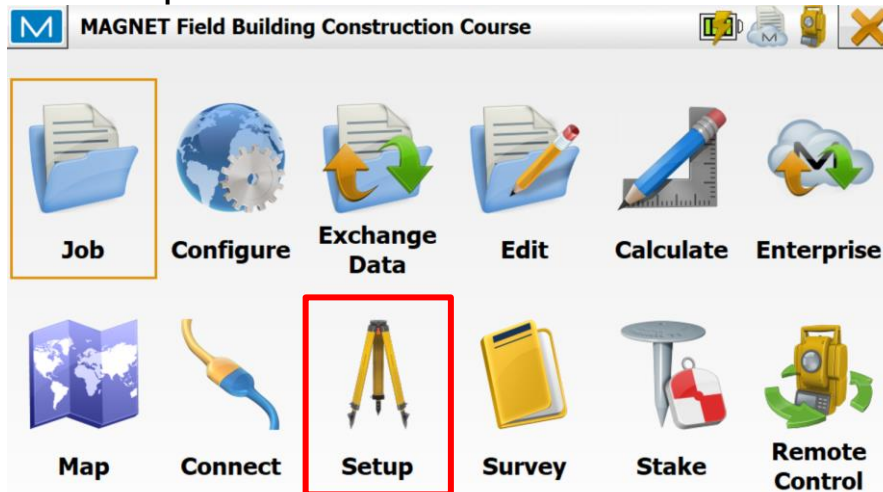
11. On the results screen, ensure the **difference in Easting, Northing and Height** are below the site requirement accuracies. If this is exceeded, then the wrong resection points may have been selected or reobservations are required. Hit the **Accept button** and the user will be returned to the main screen.



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.

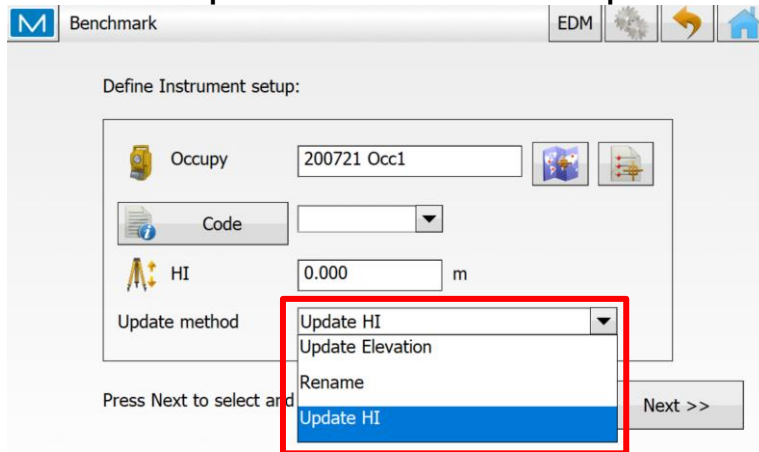
1. Select **Setup** from the Home Screen.



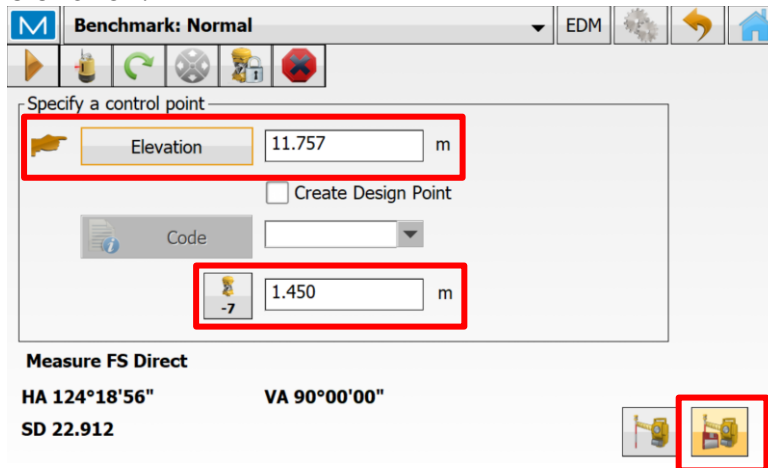
2. Select **Benchmark**.



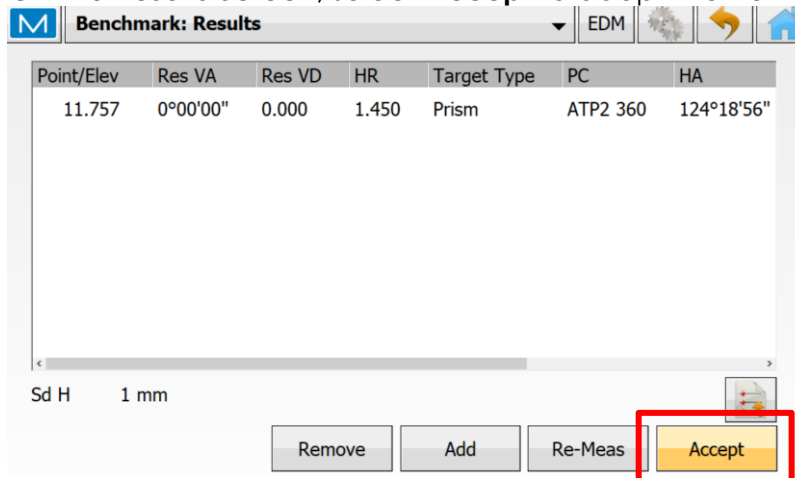
- Using the **same Occupation Point** as was set in the resection, use the drop-down menu under **Update Method** and select **'Update HI'**.



- 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 11.757**. Hit the measure button bottom right of the screen to measure the benchmark elevation.



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



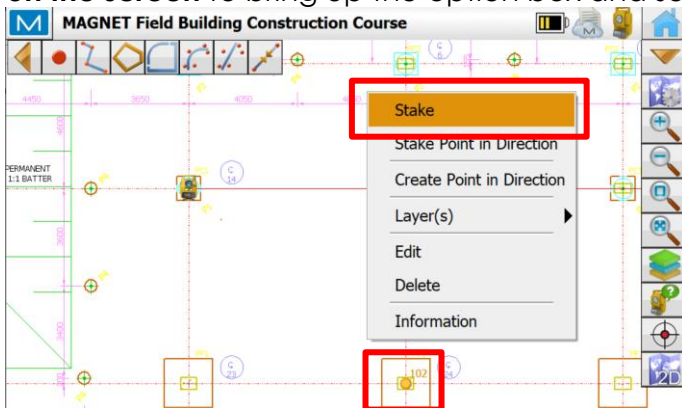
Setout

Setout Design Points

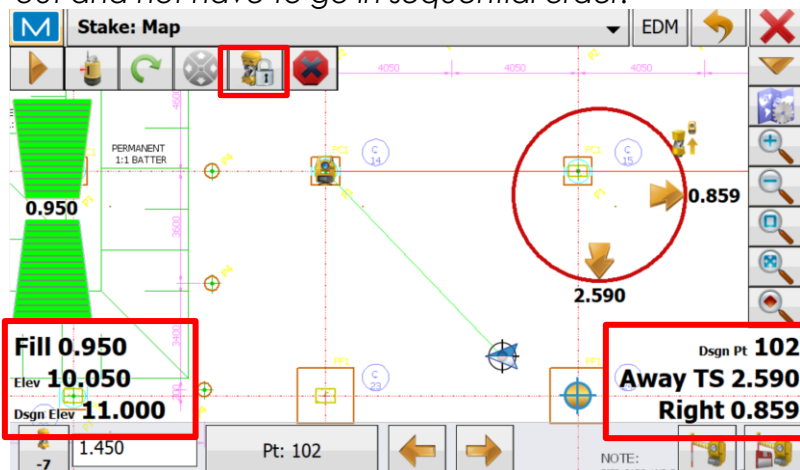
1. From the main screen, hit the **Map icon**.



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** 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, hit 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.*

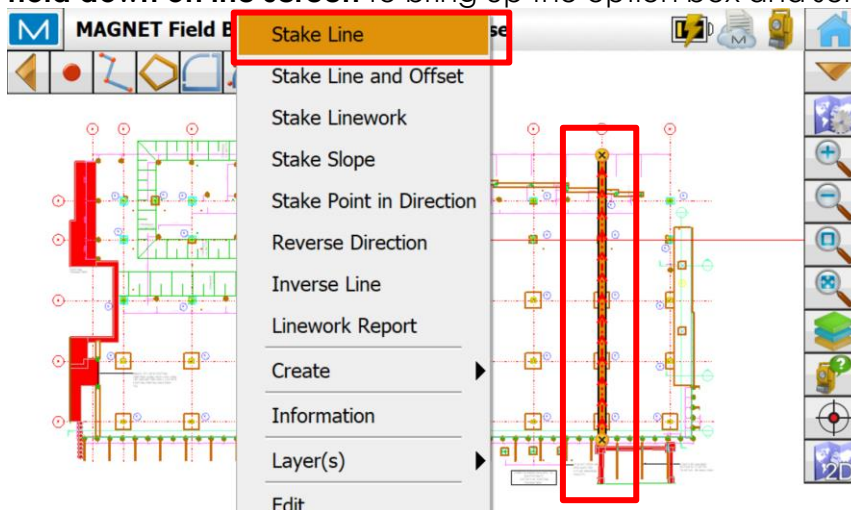


Setout Design Lines

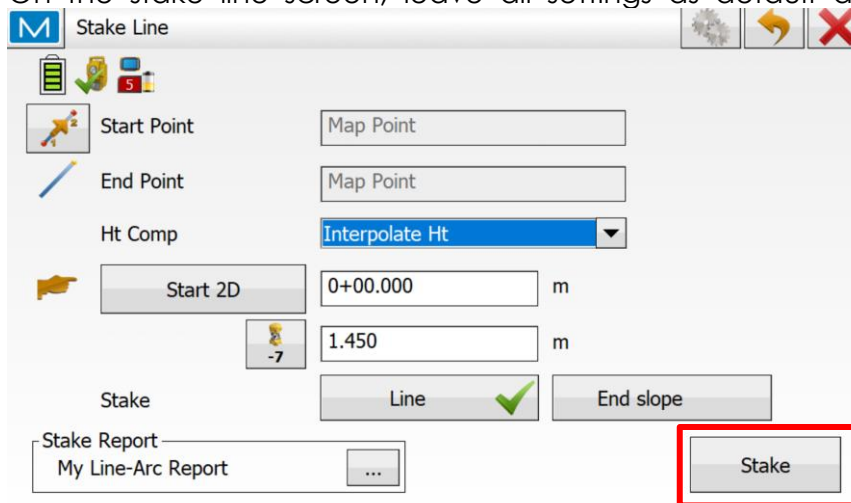
1. From the main screen, hit the **Map icon**.



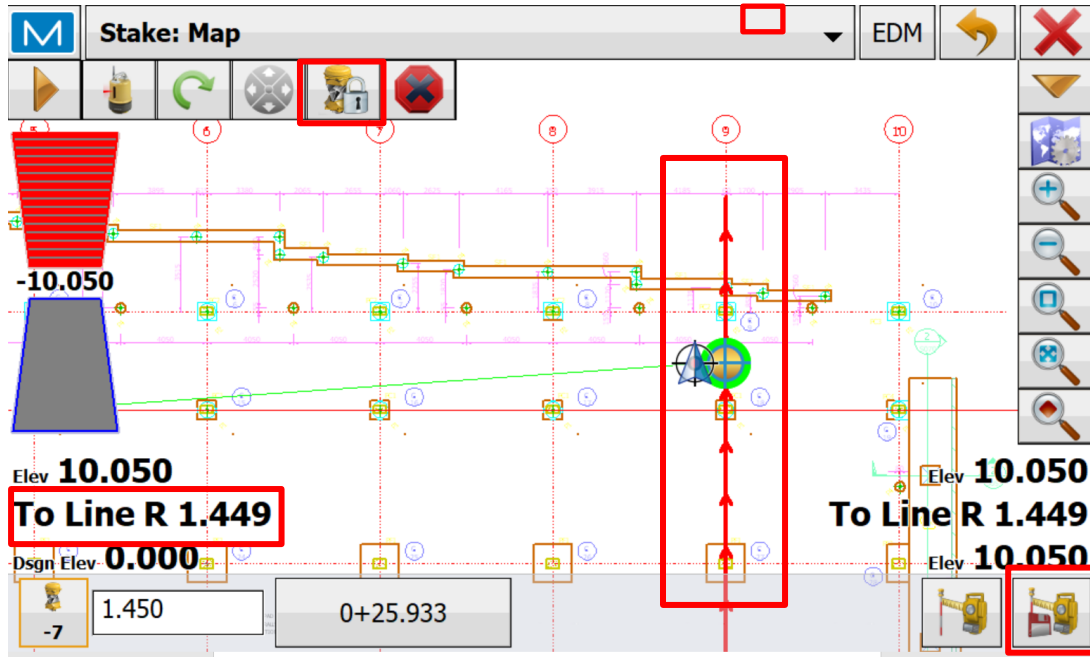
2. On the map screen, select a **Line or 2 Points** in the map to set out. Once selected, **hold down on the screen** to bring up the option box and select the **Stake Line** option.



3. On the stake line screen, leave all settings as default and hit 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. Hit the **Back button twice** in top right corner to go back to map screen to select a different line.

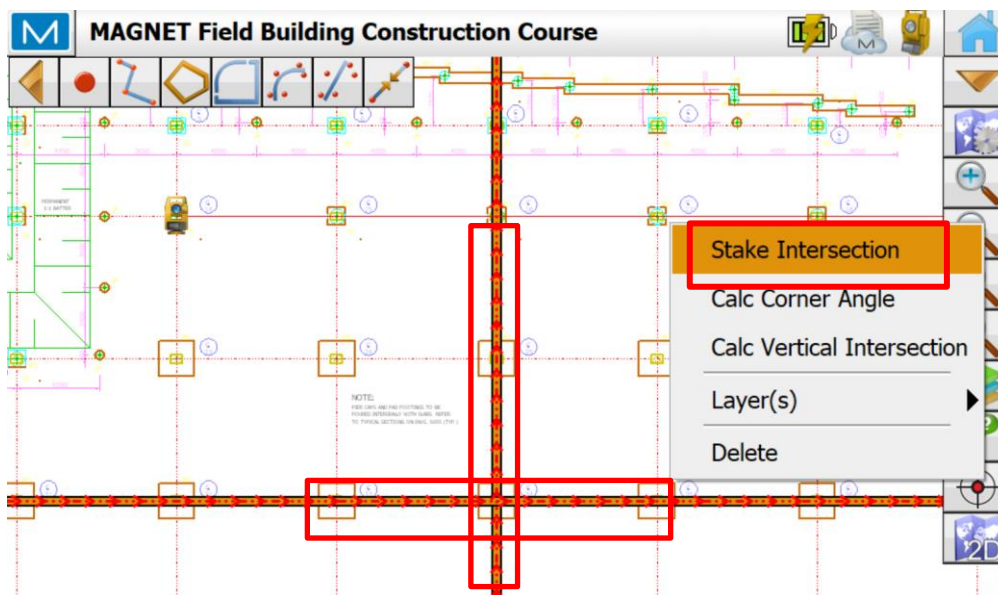


Setout Design Intersection Point from Lines

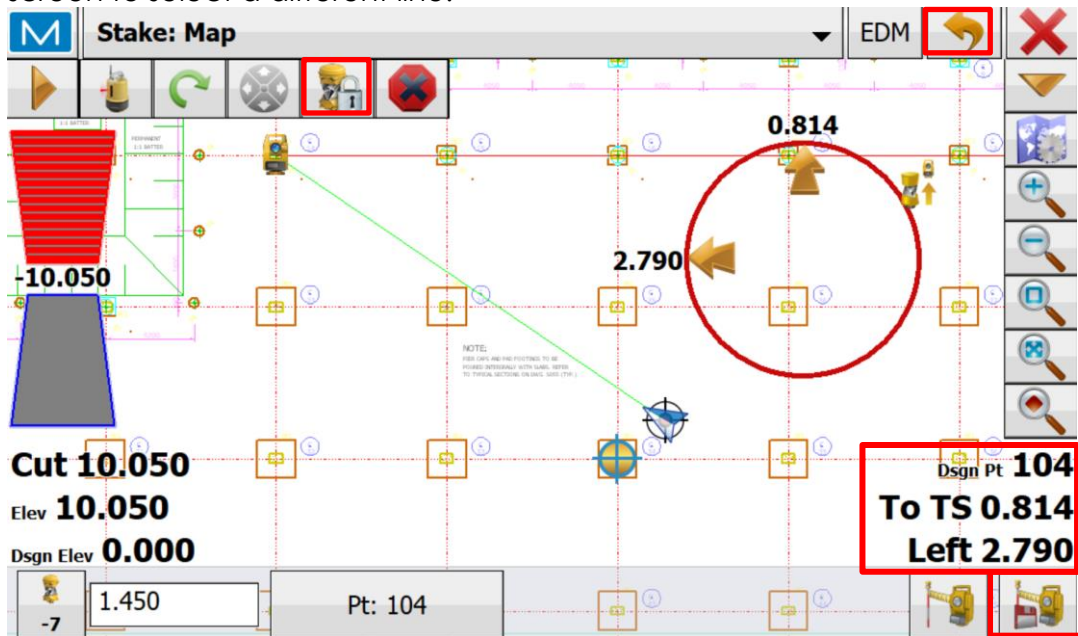
1. From the main screen, hit the **Map icon**.



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



Setout Design Surface – DTM's

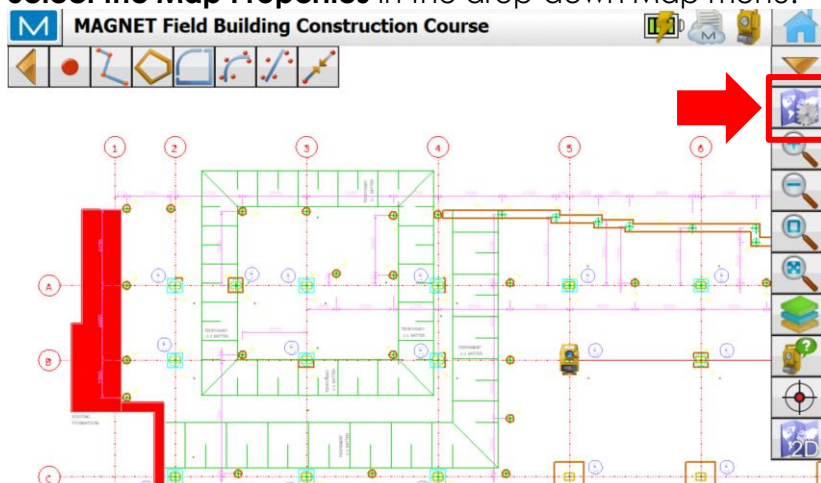
If the design you have uploaded into the FC-6000 field controller includes a DTM (Digital Terrain Model), this can also be staked out onsite to give the user real time Cut/Fill information as they move around their design surface.

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.

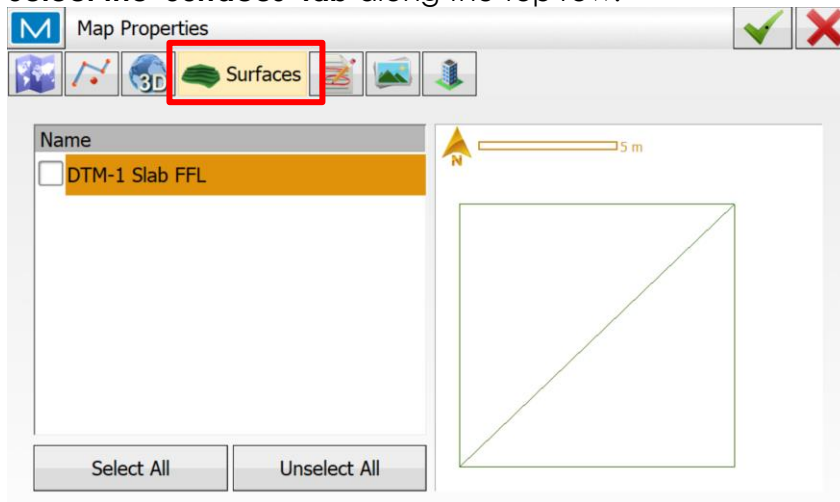
1. From the **Map screen**, you can visibly turn the DTM triangles on and off to easily view the DTM, and then to declutter the Map screen to perform other functions. Go to Map.



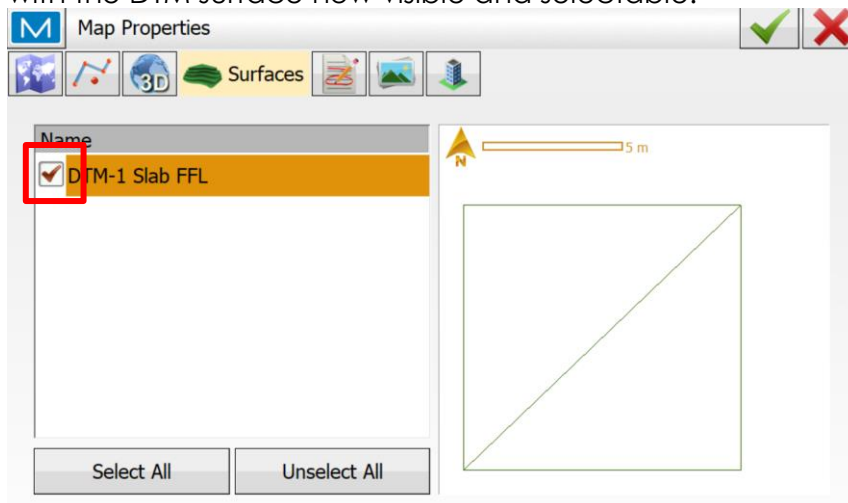
2. **Select the Map Properties** in the drop-down Map menu.



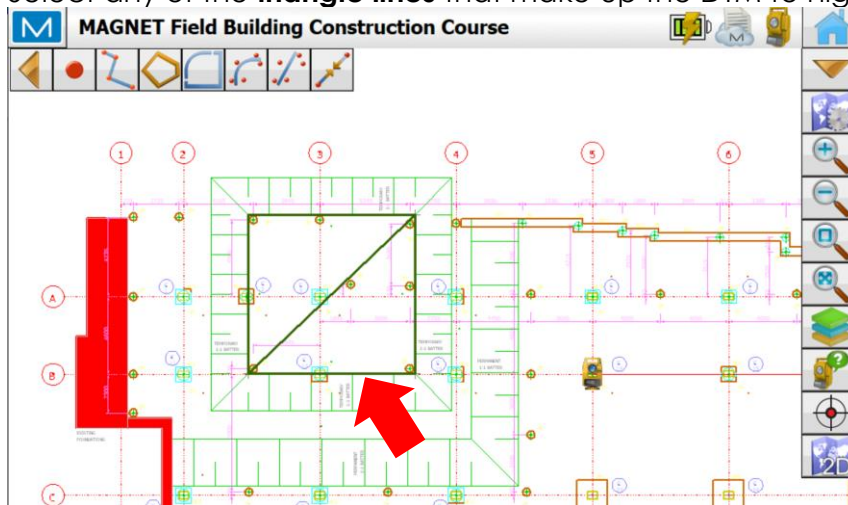
3. Select the 'Surfaces' tab along the top row.



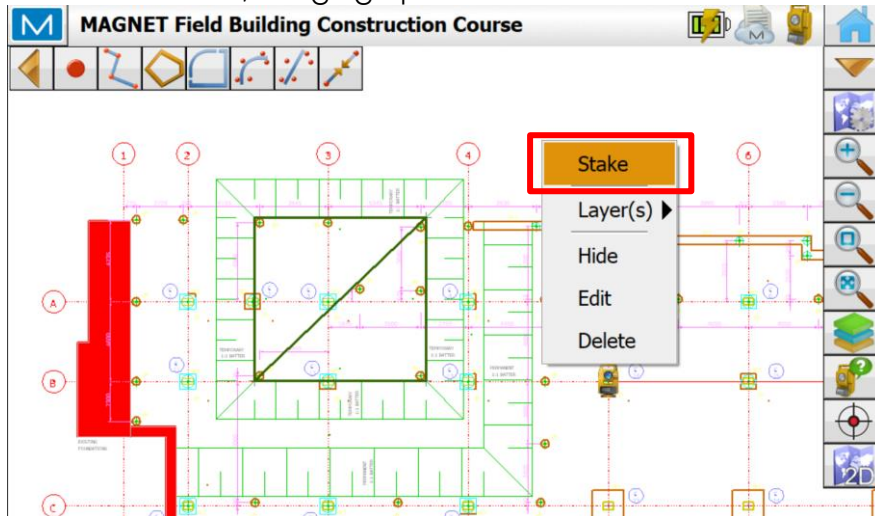
4. Place a 'tick' in the checkbox DTM you would like to view on the **Map screen** and hit the **Green Tick** in the top right of the screen. This will return you to the **Map Screen** with the DTM surface now visible and selectable.



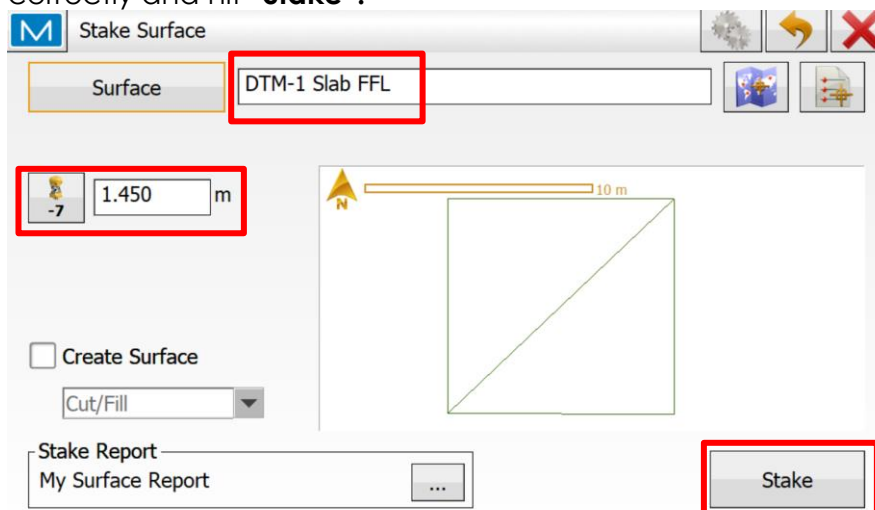
5. Select any of the **triangle lines** that make up the DTM to highlight it.



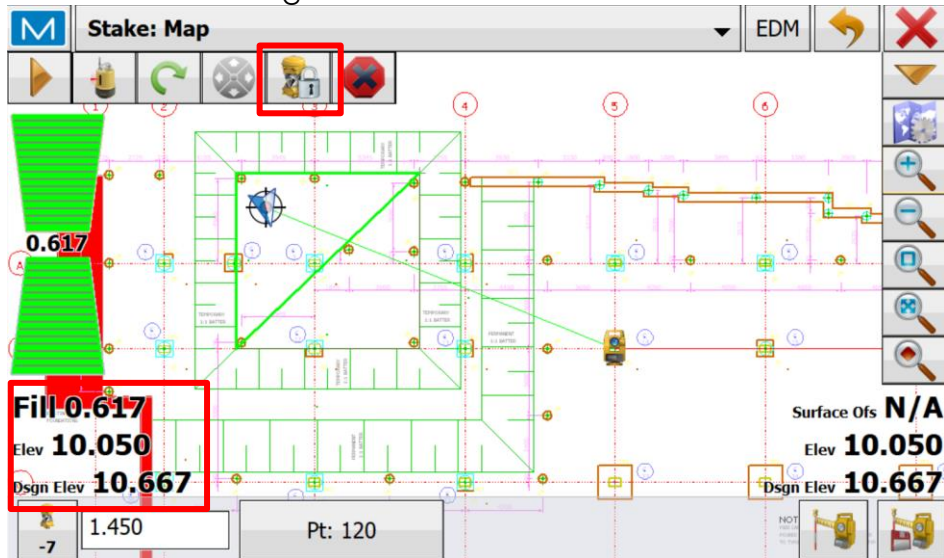
6. **Stake Out DTM** by having the DTM highlighted in the Map screen, press-hold-release the touchscreen, bringing up the **Actions Menu**. Select **“Stake”**.



7. Check that the **correct surface** is selected, the **pole height and prism** are set correctly and hit **“Stake”**.

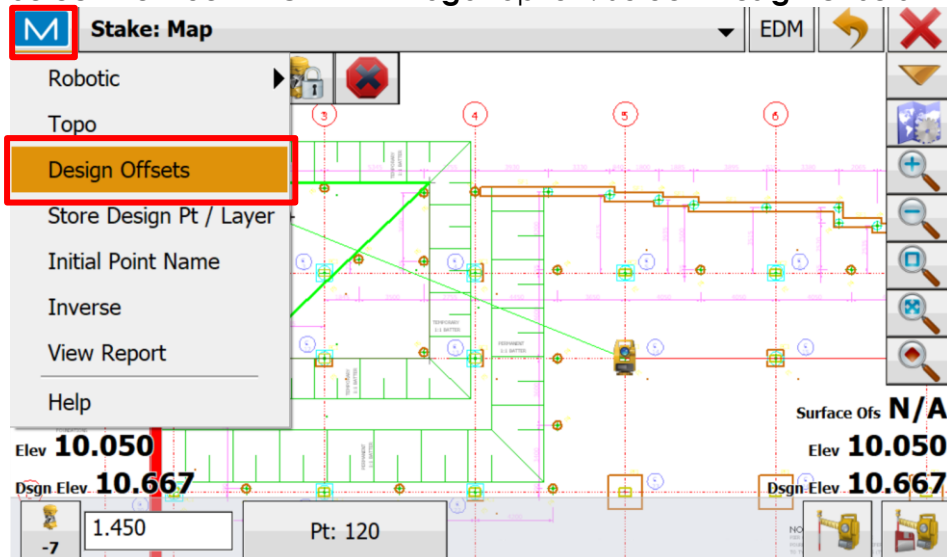


- The **Info Boxes in the bottom left** can be typically configured (by pressing on the to change the info) to show the **Cut/Fill Value**, the **Current Elevation & Design Elevation**. In this example, the Current Elevation is RL 10.050 & the Design Elevation at that individual spot on the DTM is RL 10.667. Therefore, the user is being told to FILL 0.617m to achieve the design elevation.

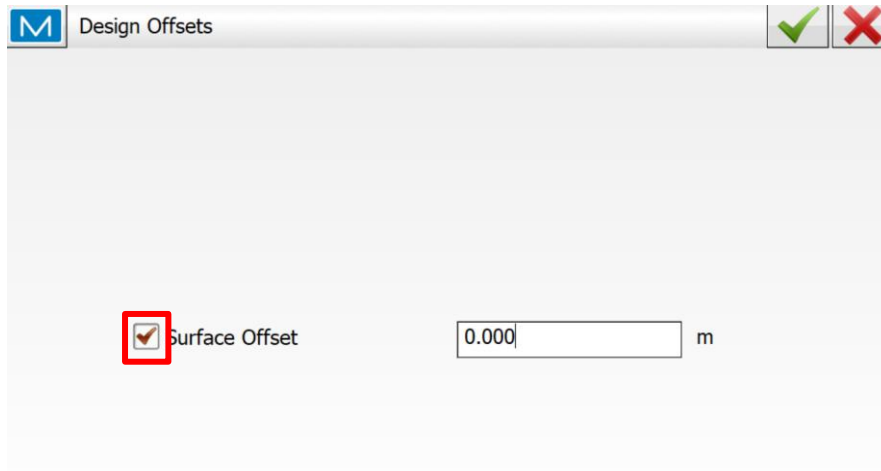


- Surface Design Offsets** can be applied whilst in the Stake Out Mode, raising or lowering the design surface. In this example the design surface DTM is referencing the FFL of the slab. If that slab is 200mm thick, a design offset can be applied to find the underside of slab level (excavation level).

Select the Blue MAGNET 'M' Logo top left. Select 'Design Offsets'



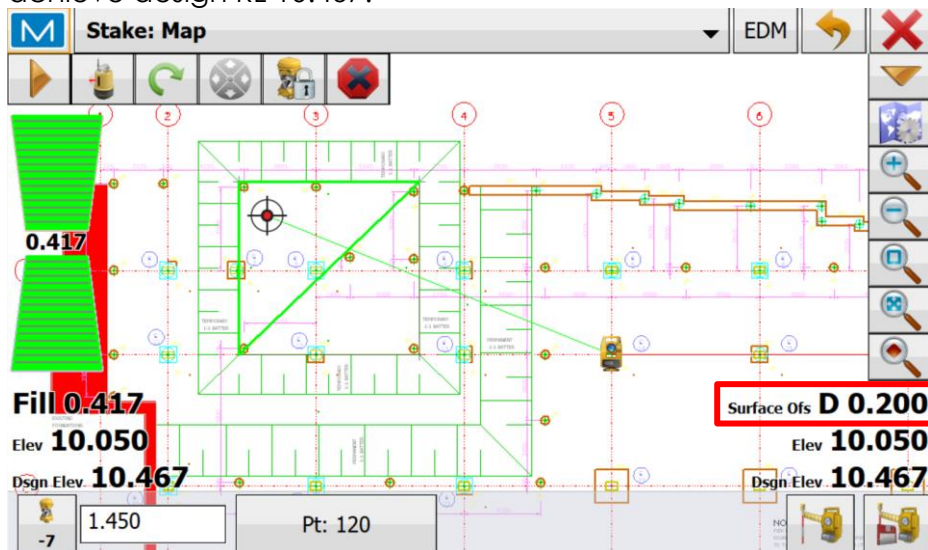
10. Place a **Tick in the Design Offset Box**, this will allow the user to input the desired **Offset**.



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)**.



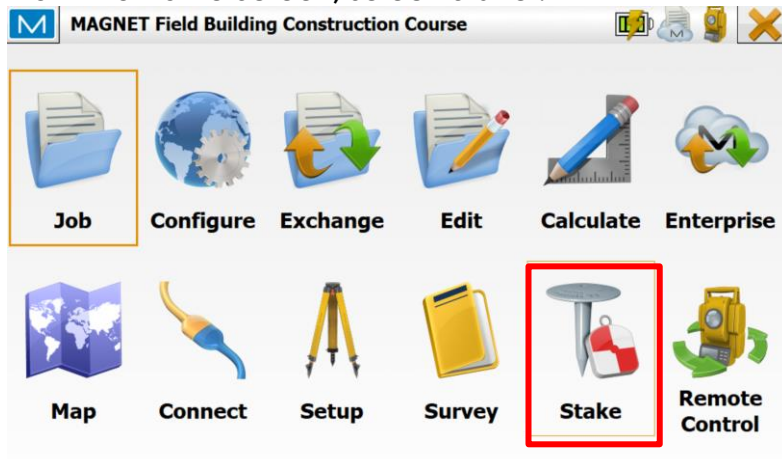
12. User will now see on the **Design Offset Info Box** (bottom right) that there is a **D 0.200** Offset being applied (down 200mm representing the underside of slab). In this example, this means that in this same position there is now a Fill of 0.417m required to achieve design RL 10.467.



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.

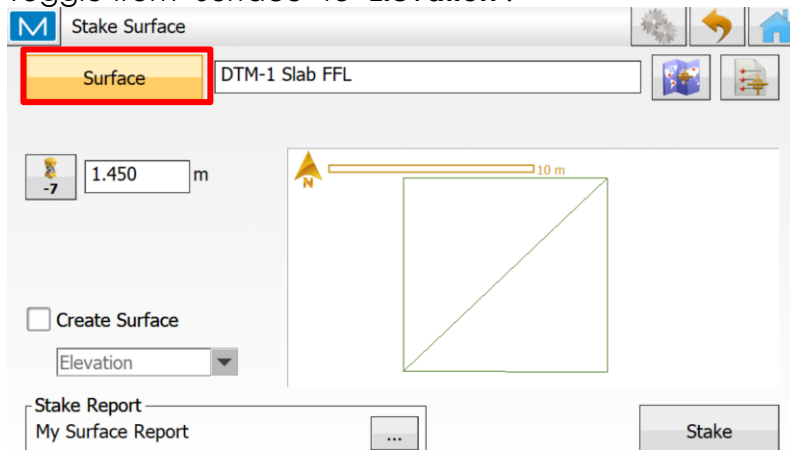
1. From the **Home Screen**, select **'Stake'**.



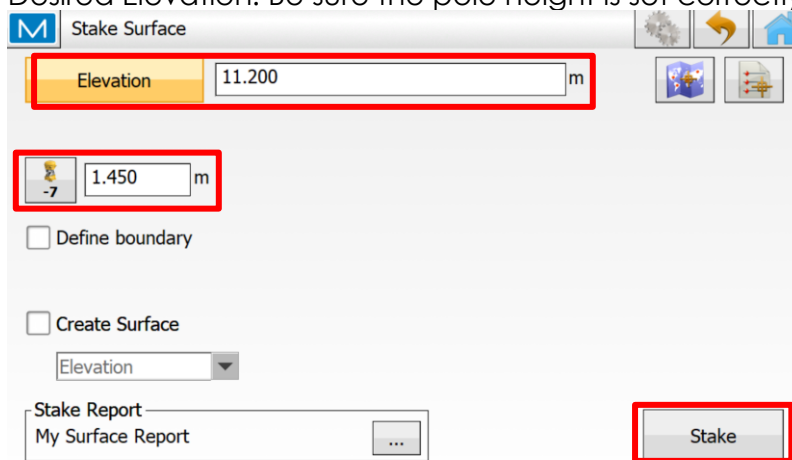
2. Select **'Surface'**.



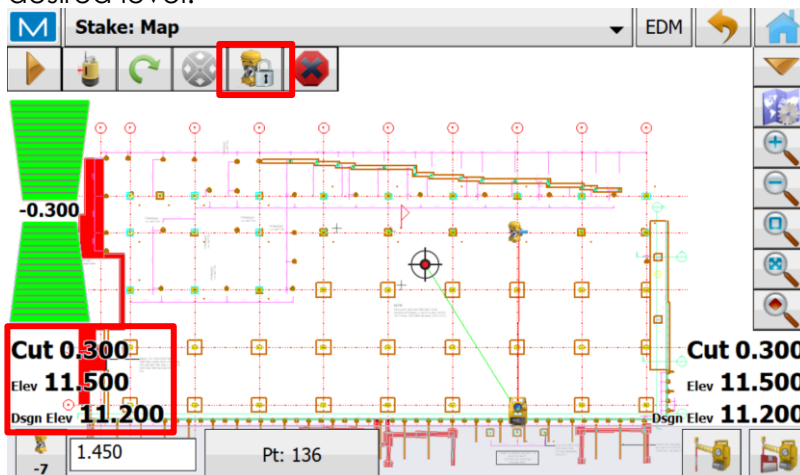
3. Toggle from 'Surface' to **'Elevation'**.



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. Hit '**Stake**'.



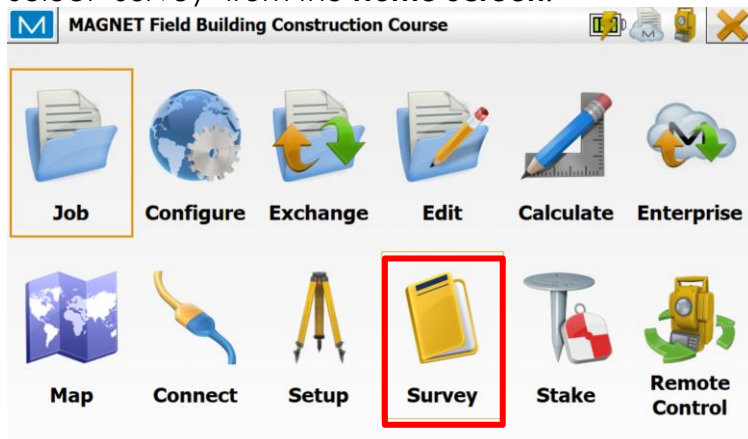
5. The user can now **lock onto the prism** and get a real time read out comparison between their Current Elevation, the Design Elevation (11.200 in this example) and a cut/fill calculation on their screen. In this example, the Current RL is 11.500, the desired RL is 11.200, hence there is an indicated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



Survey – As-Built

The Survey Topo feature is used to pickup 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.

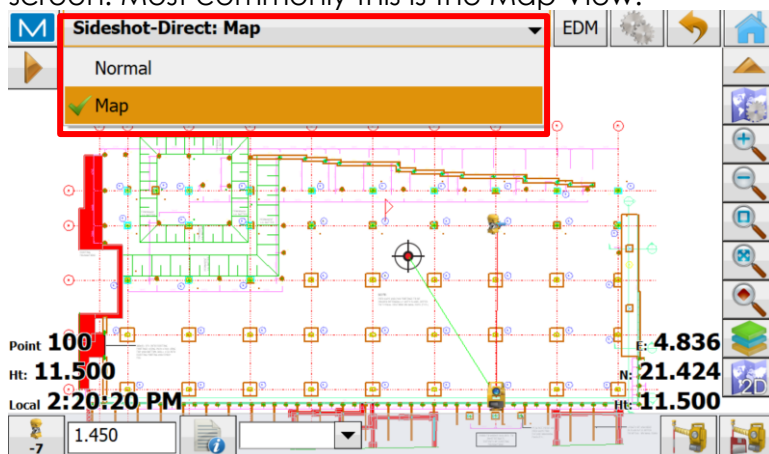
1. Select 'Survey' from the **Home Screen**.



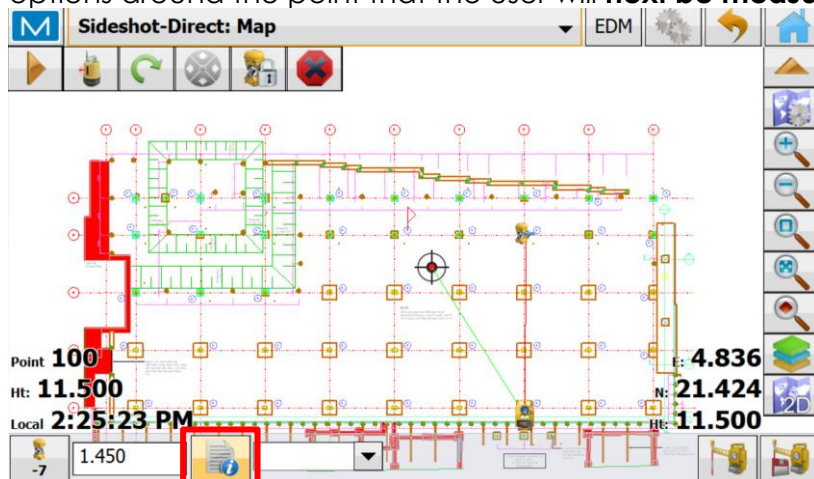
2. Select 'Topo'



3. Select the Screen View that is preferred from the drop-down menu at the top of the screen. Most commonly this is the Map View.

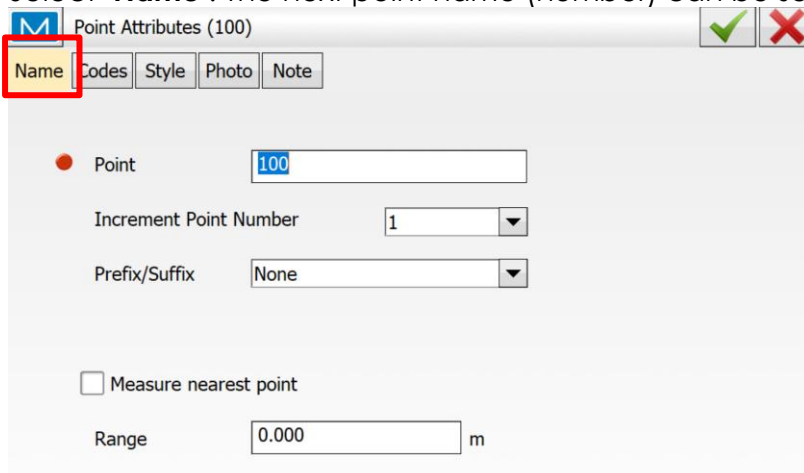


4. Select the 'Point Attributes' icon down the bottom of the screen to configure the options around the point that the user will **next be measuring**.

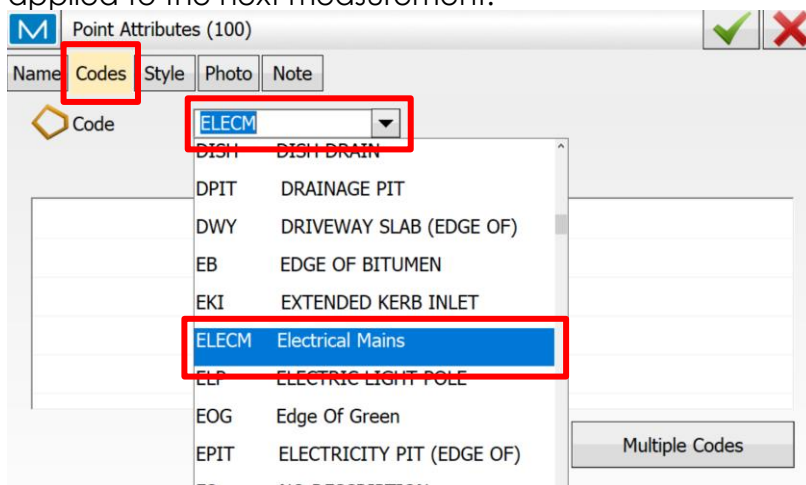


5. The user can use the tabs along the top of the screen to configure the next measurement to be taken.

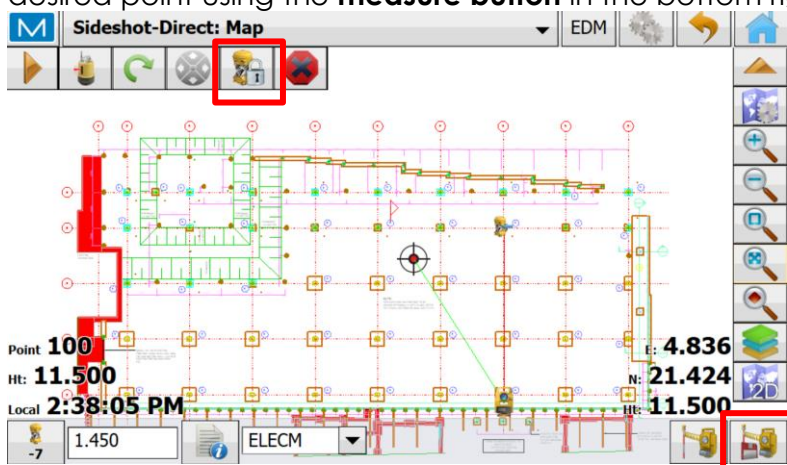
Select '**Name**'. The next point name (number) can be set.



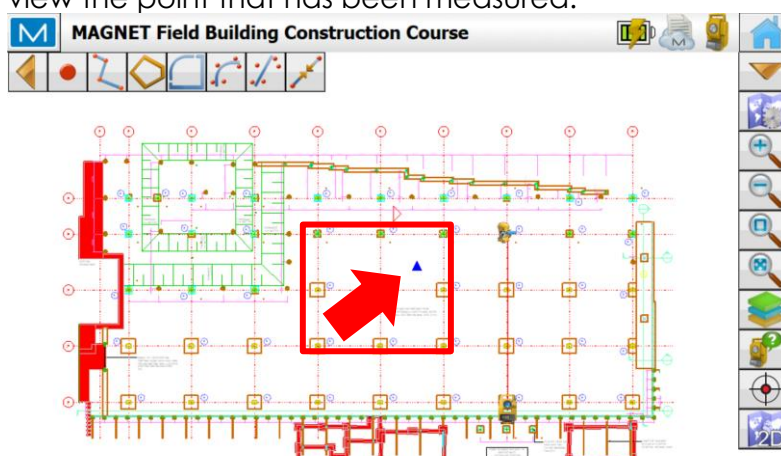
6. Select '**Code**' and use the drop-down menu to select the desired code to be applied to the next measurement.



7. 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.



8. After recording the point, return to the **Home Screen** and enter the **Main Map** to view the point that has been measured.



FAQ's

1. My Resection has errors of greater than my required tolerance for the set out. What should I do?

The residual easting and northing error in your resection should not be greater than the set tolerances for the project or activity. As a general guide, these errors should be sub 5mm for construction.

Doing your resection again and minimising as much error as possible is suggested if residual errors are too high. Taking your time with the resection set up and minimising any error in recording your points can reduce the residual error.

These errors might also be high due to using inaccurate control points in your resection.

2. When I perform a resection, I get an error message 'unable to compute instrument location'. What does this mean?

'Unable to compute instrument location' is the systems safeguard against setting up incorrectly and allowing incorrect set out onsite.

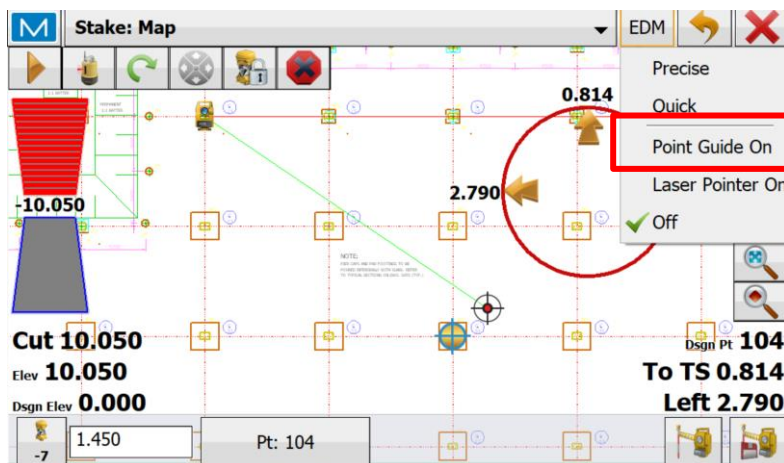
This error occurs when the points that have been measured do not match the distance and angle measurements being computed off the digital plan.

You may have selected the wrong point off the map view. Be sure that the control points or grid line intersections that you measure onsite correspond to the same point on the plan.

3. The red and green guide lights are no longer visible on the LN. How do I turn them back on in Magnet Field?

The red and green guidelights can turn off when changing jobs or after a period to save on battery power.

When connected to the instrument via Bluetooth, use the EDM button, then **'point guide on'**.



4. We have a Tokara Support Subscription with Position Partners and have an updated or new drawing we would like uploaded onto our controller. How do we go about having this uploaded while we are onsite?

You can call our Supports Service on 1300 867 266 and follow the prompts. When speaking to our support staff, they will ask you to email the .dwg file to:

NSW - nswsupport@positionpartners.com.au

ViC, NT, SA & TAS - vicsupport@positionpartners.com.au

QLD - gldsupport@positionpartners.com.au

WA - wasupport@positionpartners.com.au

From there, our team will ask you to leave your controller switched on and will remotely upload your drawing into a new job file for you to keep you productive onsite.