Aptella ACADEMY

Final Trim Solution Instruction Guide

LPS & MMGPS

POCKET 3D & 3DMC V15

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. In addition, we acknowledge the input from our customers and former students by assisting us with feedback on the contents of this course.

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 National Support Number 1300 867 266 (Option 1)

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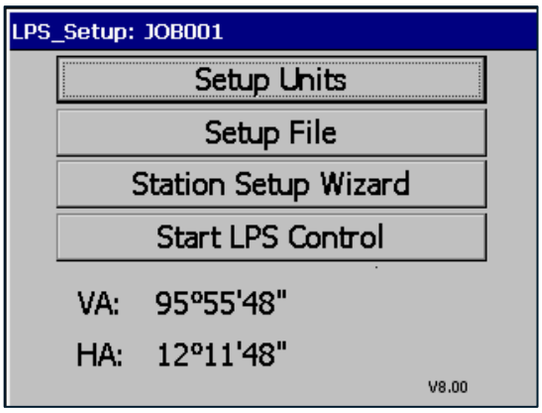
If you are unable to reach our regional support teams, please leave a voicemail so a support ticket is generated in our system. Our support team will get back to you as soon as possible to help with your inquiry.

Contents

LPS Setup – On-Board Software

Equipment Setup with LPS Setup Software

An LPS enabled Total Station features Topcon's LPS Setup on-board software utility, making equipment setup easy. LPS Setup is activated from the total station by double tapping on the **LPS_Setup** menu option.



The **LPS Setup** top menu has the following menu options:

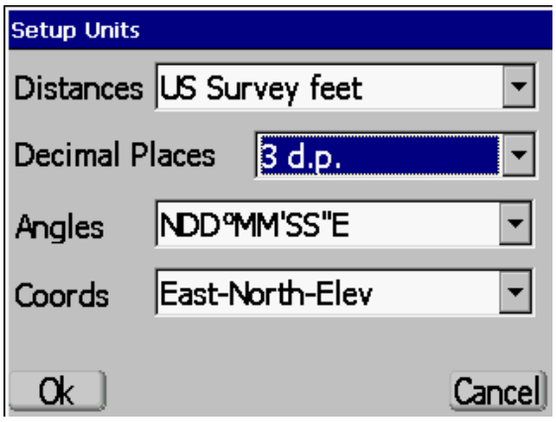
- Setup Units
- Setup File
- Station Setup Wizard
- Start LPS Control

Setup Units

1. To set project units, tap **Station Setup > Setup Units**.

2. On the **Setup Units** screen, select the units for each item from the drop-down list. Tap **Ok** to continue; LPS saves the selected units.

   - Distances – select either **Meters, US Survey feet, International feet**, or **Feet + Inches** (saves to a fraction of an inch).
   - Decimal Places – select either **0, 1, 2, 3,** or **4** decimal places.
   - Angles – select either **DD°MM'SS", NDD°MM'SS"E, Gons,** or **DD.DDDD°.**
   - Coords – select either **North-East-Elev, East-North-Elev, X-Y-Z,** or **X-Y-Z South Azimuth.**



Setup File

The LPS Setup menu uses the same GC3 control file used in Pocket-3D and 3DMC.

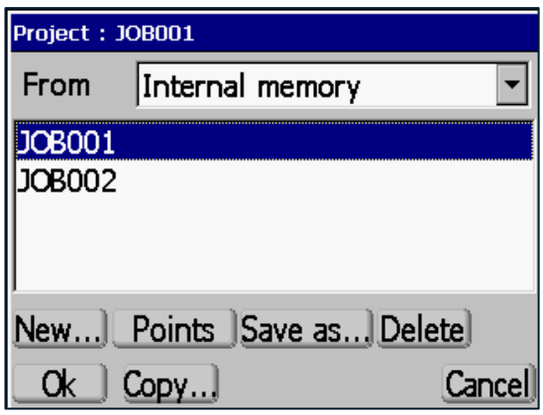
LPS Setup runs using GC3 files stored in the internal memory or on a USB Memory Stick.

Project File

1. To access available Project files or to create a new Project file, tap **Setup File > Project Files**. In the Project Files screen, the current file is highlighted. The screen also displays other available files.

2. To change the project file, select the location of the project file from the From drop down menu, select the required file from the list, and then tap **Ok**.

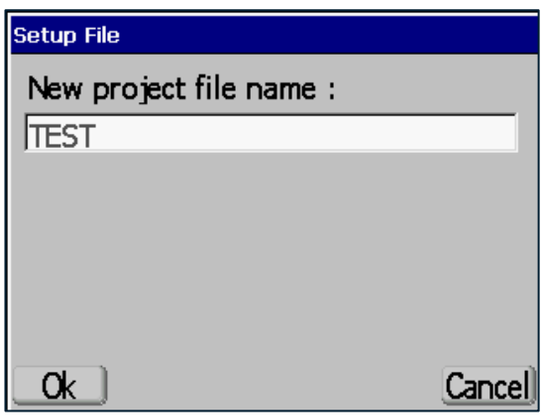
3. At the verification screen, tap **Yes** to use this Project file for the current project. Project files can be created, saved, copied, or deleted.



Adding a New Project File

1. Tap **New** to create a new project file and display the **New project file name** screen.

2. After naming the file, tap **Ok** to save the information.

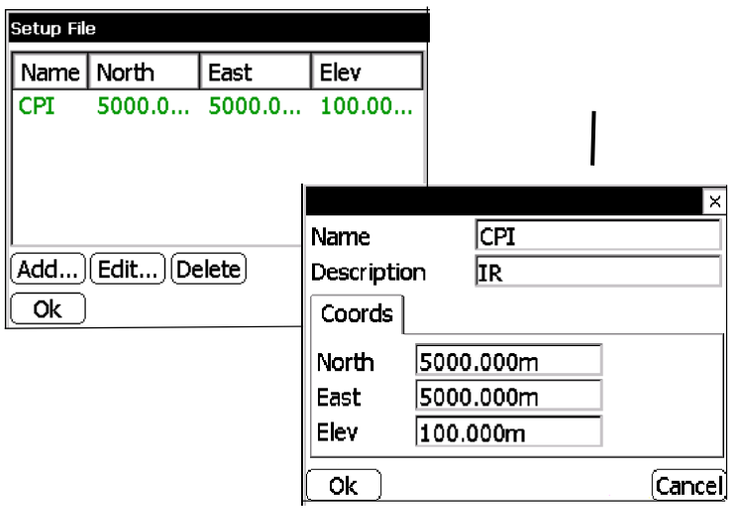


Points

1. Click **Points** to display the **Setup File** screen.

2. Add, Edit, or Delete a control point from the selected project file. Tap **Ok** to save the information.

    - Add: Tap **Add** to create a point, enter a point name and description (if preferred), and the coordinates for Northing (North), Easting (East), and Elevation (Elev) on the **Points Listing** screen, and then tap **Ok** to save the information.
    - Edit: Tap **Edit** to modify an existing point.
    - Delete: Tap **Delete** to remove an existing point from the project file.



Saving a Project File As Another File

Tap **Save As** to open the **New project file name** screen for saving the selected file as another file.

Deleting a Project File

1. Select a file from the **Project Files** screen.

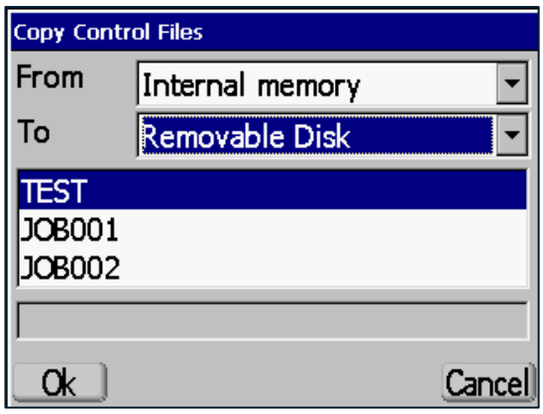
2. Tap **Delete** to remove an existing file from the memory (USB Memory Stick or internal memory).

3. The program always reminds the operator to confirm deletion of a selected file. Tap **Yes** to confirm the deletion or **No** to cancel.

Copying a Project File

1. Select a file from the **Project Files** screen, and tap **Copy** to copy a file from the Internal Disk to the USB Memory Stick.

2. Tap **OK**, or tap **Cancel** to return to the previous screen.

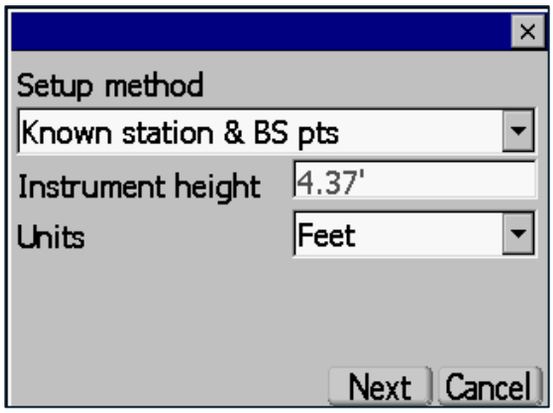


LPS Setup – On-Board Software – Station Setup Wizard

To set up the station for LPS, tap **Station Setup Wizard** then choose the appropriate **setup method** from the Setup Method Screen.

The following Setup methods are available:

- **Known station & BS pts:** Select a station point and backsight point from the list of Control Points for the job site.
- **Known station & azimuth:** Choose a station point from the list of Control Points and enter an azimuth value for the orientation.
- **New station by resection:** Add multiple control points to the resection and take a measurement to each point. Measurements may be a combination of “horizontal angle”, “horizontal and vertical angles”, or “horizontal and vertical angles and slope”. The minimum number of points required for a resection is two if they both have a measured distance or three if a distance is only measured to one point.
- Instrument height – enter the measured height of the Robotic Total Station.
- Units – select the units used to measure the height of the instrument.

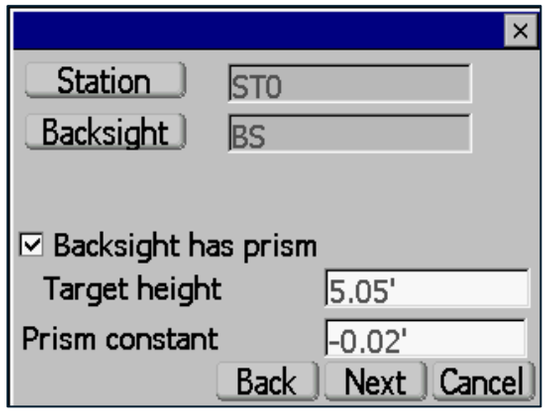


Known Station and Backsight Point

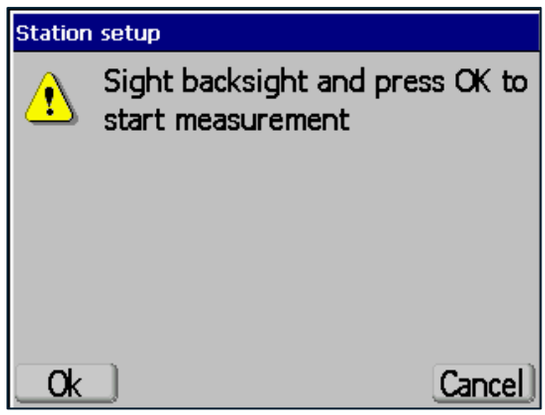
On the **Station and backsight** screen, set the following parameters, and tap **Next**.

- Station – select the control point over which the instrument is set.
- Backsight – select the control point used as the backsight.
- Backsight has prism – enable if the backsight has a prism.

- Target height – enter the height of the backsight prism.

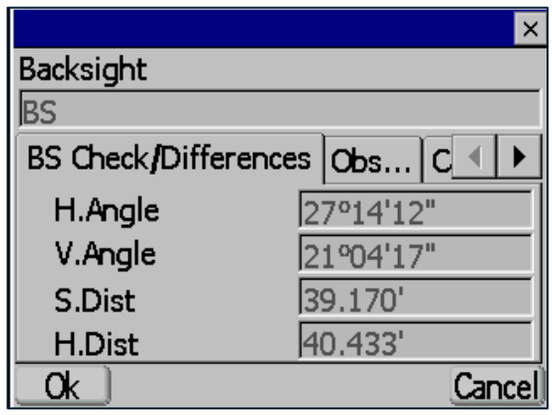


On the **Station Setup - Sight Backsight** screen, tap **OK** to sight the backsight and start the measurement.

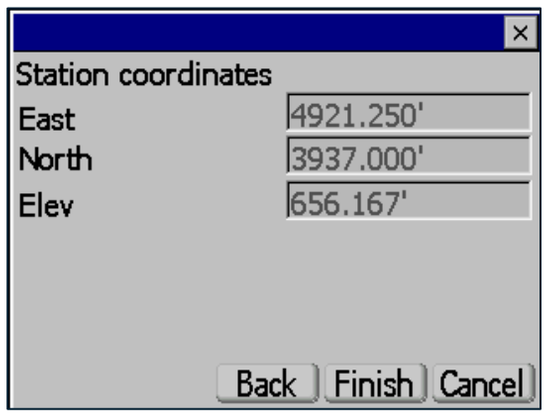


The **Backsight Results** screen, verifies backsight information. Tap **Ok** to continue.

- Backsight – displays the current control point being used as the backsight.
- H.Angle – displays the horizontal angle difference.
- V.Angle – display the vertical angle difference.
- S. Dist – displays the slope distance difference.
- H. Dist – displays the horizontal distance difference.



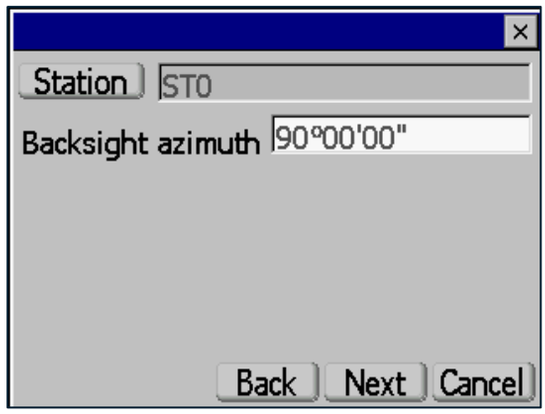
The **Station Coordinates** screen, verifies the Easting (East), Northing (North), and Elevation (Elev) coordinates for the station. Tap **Finish** when done.



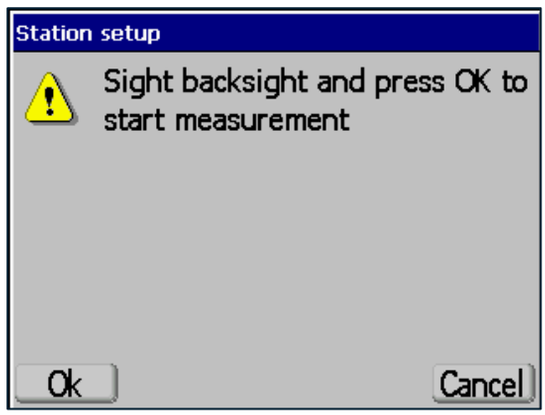
Known Station and Azimuth

In the **Station Setup Wizard**, select **Known station & azimuth** as Setup method and tap **Next**.

- Station – the control point the instrument is over displays.
- Backsight azimuth – enter the backsight azimuth.

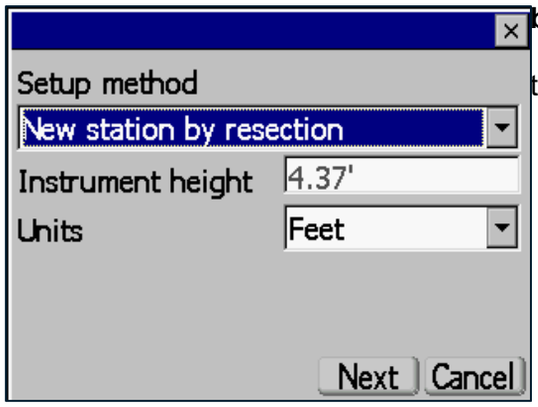


The **Station Setup - Sight Backsight** screen, sights the backsight. Tap **Ok** to continue.



New Station by Resection

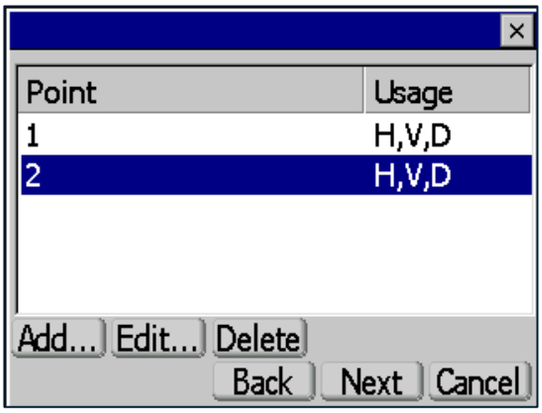
1. In the **Station Setup Wizard**, select **New station by resection** as the Setup method, and tap **Next.** The **control points** screen displays all points used in resection.

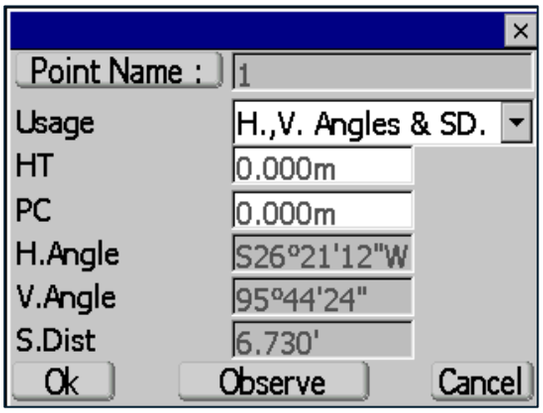


2. After adding the preferred number of control points, tap **Next** to continue.

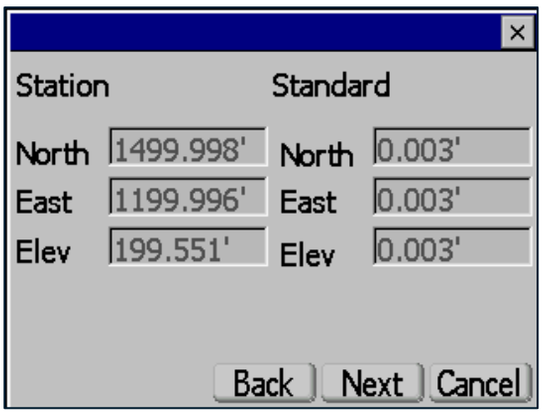
- **Add** – on the **Control Points** Screen, add a control point to the resection. The **Resection Parameters** screen displays to enter the control point parameters and to take a measurement of the control point.
    - Point Name: select the control point to be used in the resection.
    - Usage: select how the control point is used. Either *horizontal angle, horizontal and vertical angles,* or *horizontal and vertical angles and slope*.
    - HT: enter the height of the control point's prism.
    - PC: enter the prism constant of the control point's prism.
    - H.Angle: after tapping the **Observe** button, system displays the horizontal angle to the selected control point.
    - V.Angle: after tapping the **Observe** button, system displays the vertical angle to the selected control point.
    - S. Dist: after tapping the **Observe** button, system displays the slope distance to the selected control point. **Edit** – On the **Control Points** screen, edits the selected control point.
- Observe: Press Observe to measure the control point.
- **Ok -** Press **Ok** to save the information. Repeat these steps for each control point.
- **Delete** – On the **Control Points** screen, tap **Delete** to delete the selected control point.

The program always confirms the deletion of a selected point. Select **Yes** to confirm the deletion.





The **Station Coordinates/Standard Deviations Results** screen, verifies the station coordinates results. Tap **Next** when done. Station coordinates:

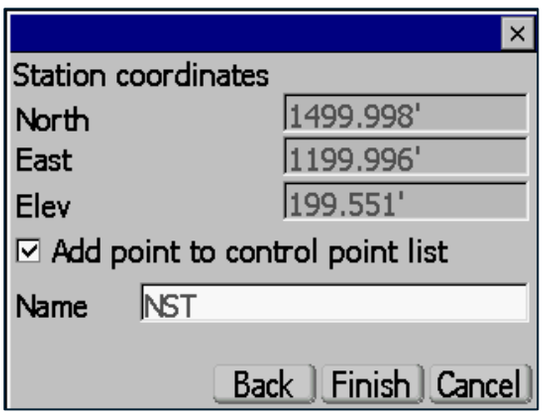


- North – displays the northing for the new control point.
- East – displays the easting for the new control point.
- Elev – displays the elevation for the new control point.

Standard deviations:

- North – displays the standard deviation for the northing
- East – displays the standard deviation for the easting
- Elev – displays the standard deviation for the elevation

The **Sight Control Point** screen, verifies station coordinates. Enter the parameters you want and tap **Finish**.



- Station coordinates:
  - North: displays the northing for the new control point
  - East: displays the easting for the new control point
  - Elev: displays the elevation for the new control point
- Add point to control point list – enable to add the new point to the control point list.
- Name – enter the name of the new control point.

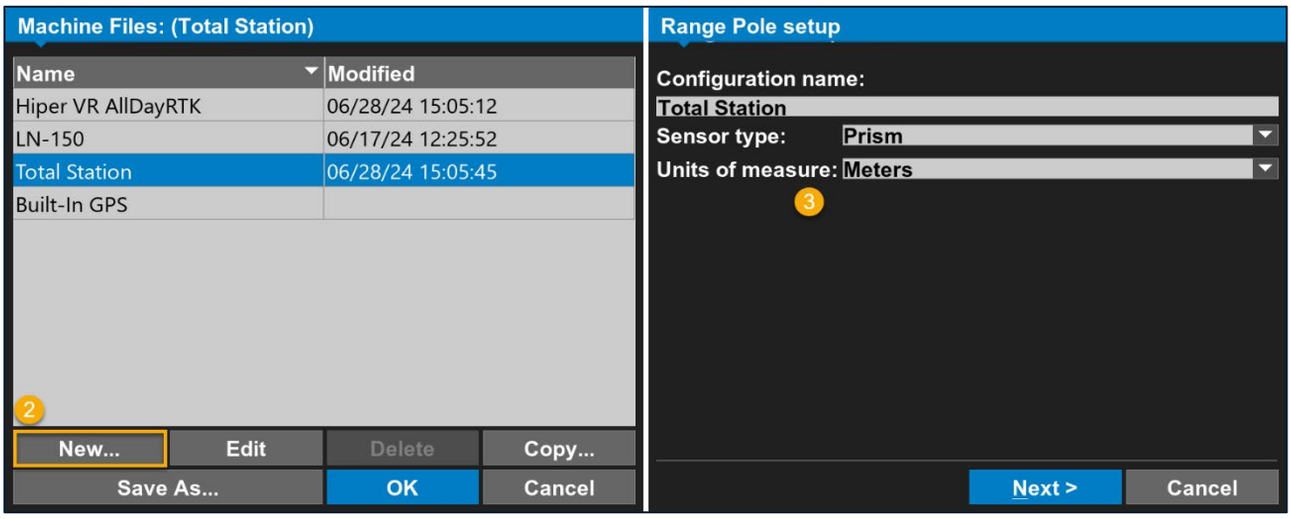
LPS Setup – Pocket 3D Software

For total station applications, the **Control** menu allows you to create and manage machine files for prisms/range poles and configure total station setups.

Create a Total Station/LN Machine File

1. Tap **Control > Machine Setup.** The **Machine Files** screen appears.

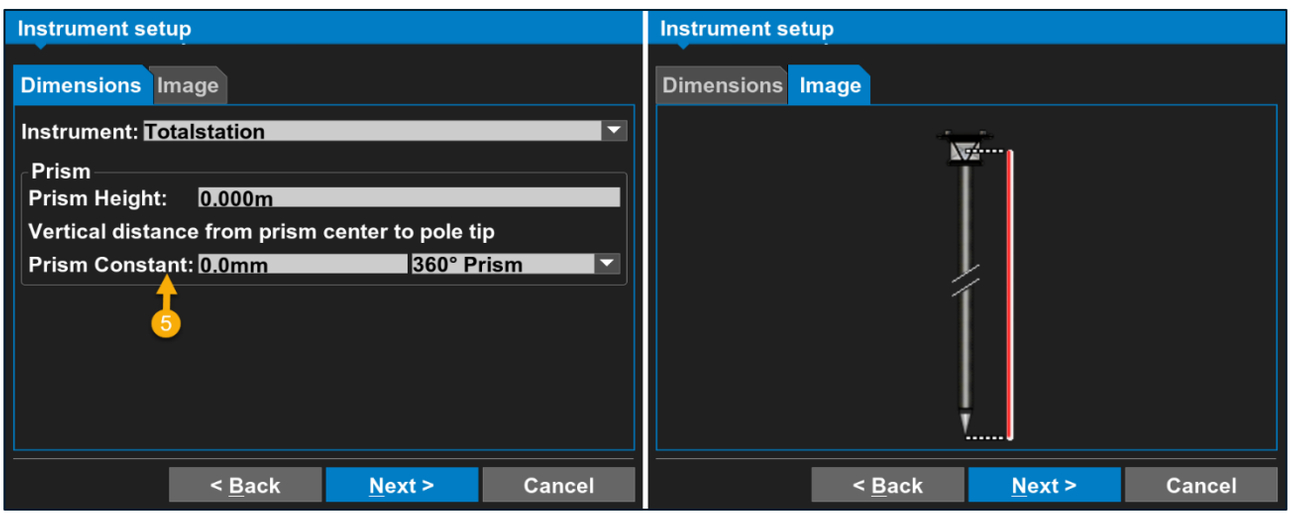
2. Tap **New.** The **Range Pole Setup** screen appears.



3. Set the following parameters:

   - **Configuration Name –** enter a name for the equipment configuration.
   - **Sensor Type –** Select **Prism** from the drop-down menu.
   - **Unit of measure –** select the unit of measure (Meters)

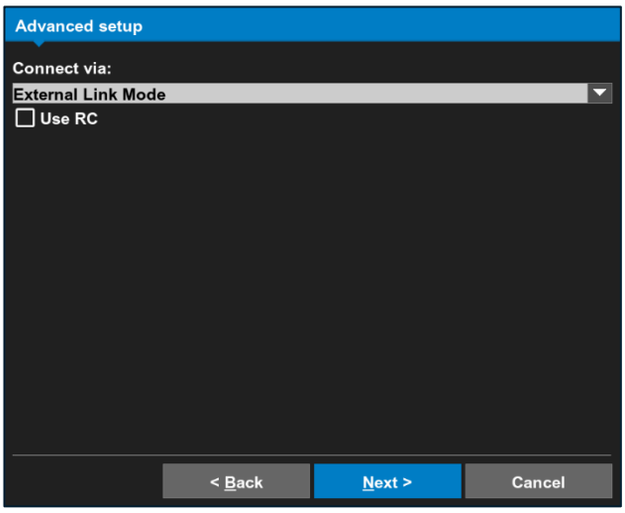
4. Tap **Next.** The **Instrument Setup** screen appears.

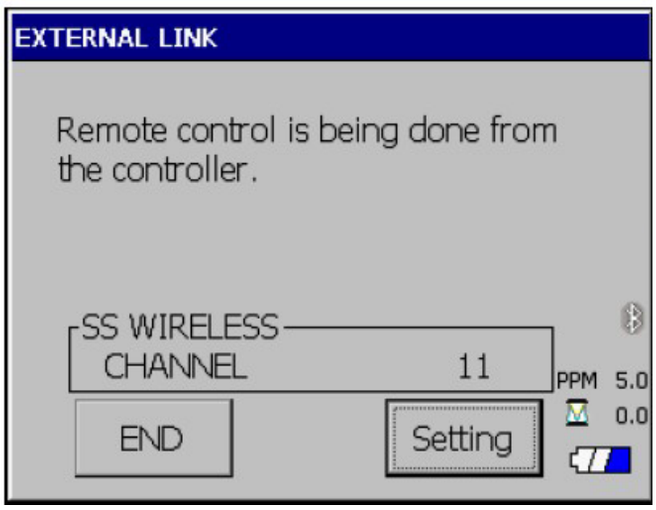


5. Set the following parameters:

- **Instrument –** Select the type of instrument (**LN Series** or **Total Station**)
- **Prism Height –** enter the vertical height of the prism. The height is taken from the center of the prism eye to the tip of the prism pole. Tap the **Image** tab to see the location and the prism height must be measured too.
- **Prism Constant –** enter the prism constant.

6. Tap **Next.** The **Advanced Setup** screen appears.
   - **Connect via –** Select **External Link Mode** for the connection to the Total Station. External Link is the same screen the Total Station needs to be on for LPS control when connected to the machine.





7. Tap **Next**. The **Connection Setup** screen appears. Select **Bluetooth** as the connection type used by Pocket 3D to connect to the Total Station.

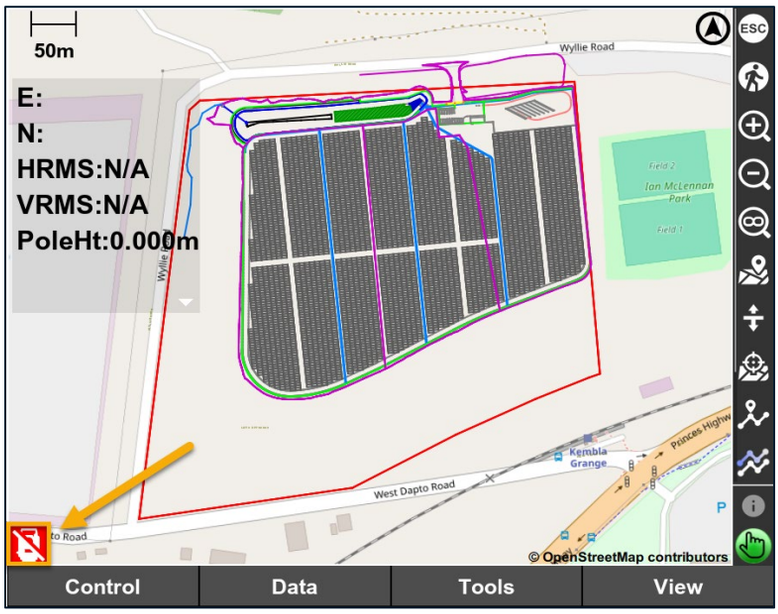
8. Tap **Finish** to save the machine file configuration and return to the **Machine Files** screen.

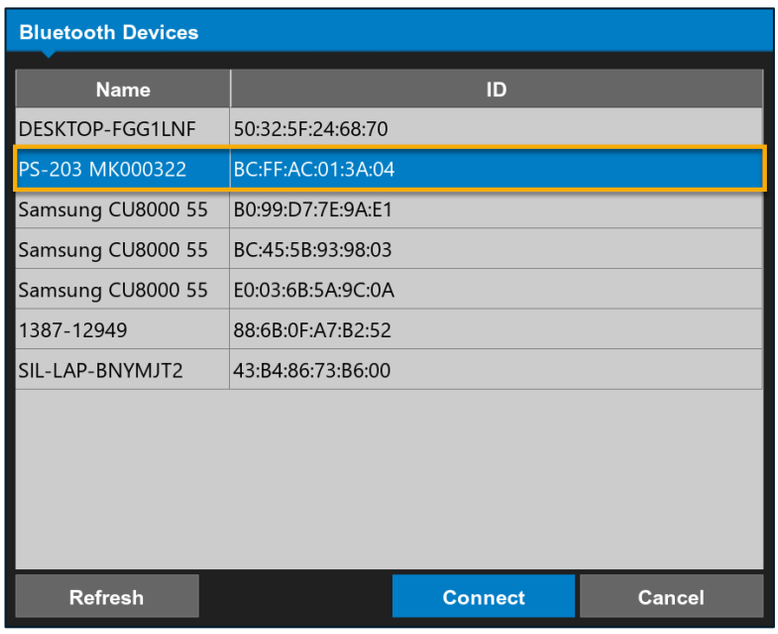
Connecting to a Total Station

1. Load and Activate the machine file for the instrument.

2. Tap either the **Status Indicator** button  or **Tools > Connect**

   - As the machine file connection type was set to Bluetooth, the **Bluetooth Devices** screen appears. Select the total station and tap **Connect.** The **Connecting to receiver** dialog box appears and Pocket-3D initiates a connection to the total station.





When Pocket-3D is successfully connected, the colour of the **Status Indicator** button on the main screen changes from red to green (tracking)  .

Station Setup

To use a total station for site measurement or stake-out operations, the position and orientation of the total station must first be set.

The **Station Setup** menu allows you to set the position and orientation of a total station in several ways:

- **Known Station and BS Points**
- **Known Station and Azimuth**
- **New Station by Resection**
- **Unknown Point**
- **Backsight Check**

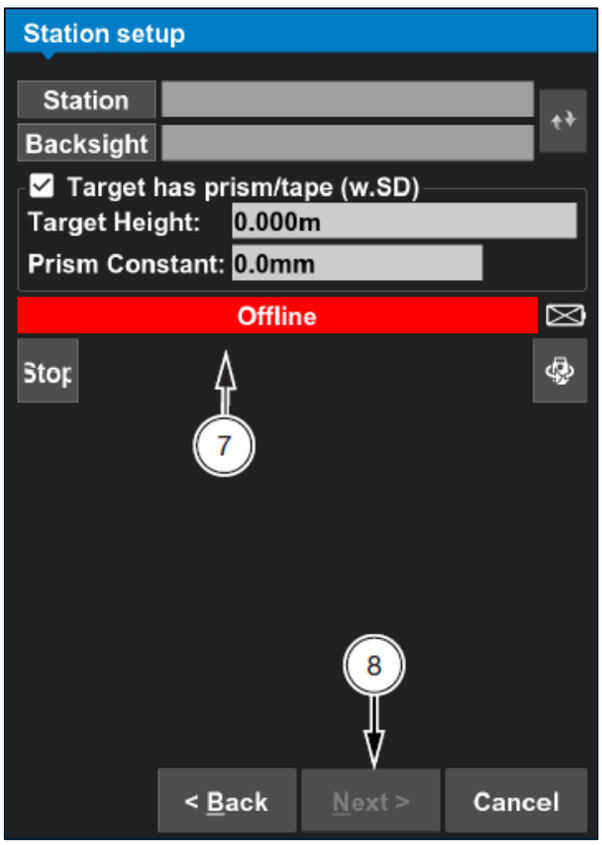
Known Station and Backsight Points

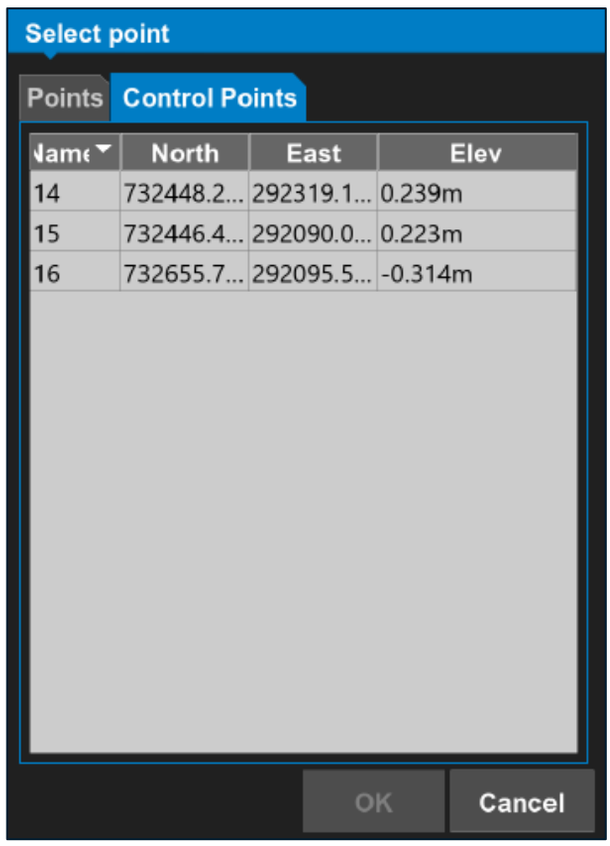
The total station is set over a known control point and then a measurement is made to a reference backsight control point to establish the total station's position and orientation on the jobsite. The known control point and backsight control point are selected from the list of control points for the project file/jobsite.

To set up a station using known station and backsight points:

1. Load the required equipment file.
2. Position the total station over a known control point and within range of a reference backsight control points.
3. Position the prism range pole over the backsight control point.
4. Tap **Control > Station Setup.** The **Station Setup** screen appears
5. Set the following parameters:
    - **Setup Method –** select **Known Station and BS Points**
    - **Instrument Height –** enter the measured height of the total station (not prism height)
    - **Units –** select the units used to measure the height of the instrument **(Meters).**

6. Tap **Next.** The **Station Setup** screen appears.





7. Set the following parameters:

- **Station –** tap to select the point or control point over which the total station is positioned. The **Select Point** screen appears. From either the **Points** or **Control Points** tab, select the point/control point and tap **OK** to return to the **Station Setup** screen.
- **Backsight –** tap to select the point or control point used as the reference backsight. The **Select point** screen appears. From either the **Points** or **Control Points** tab, select the point/control point and tap **OK** to return to the **Station Setup** screen.
- **Inverse Arrow –** tap  to reverse the selected **Station** and **Backsight** points.
- **Target has prism/tape (w. SD) –** select this option if the backsight has a prism or tape survey target and if so, set the following parameters:
  - **Target Height –** enter the height of the backsight target.
  - **Prism Constant –** enter the prism constant.
- **Turn Instrument Button –** tap  to enable controls to turn the total station. The **Turn Instrument** screen appears. Tap **Close** to return to the **Station Setup** screen.

8. Tap **Next**.

9. Sight the backsight with the instrument.

10. Tap **OK** at the prompt to start the measurement.

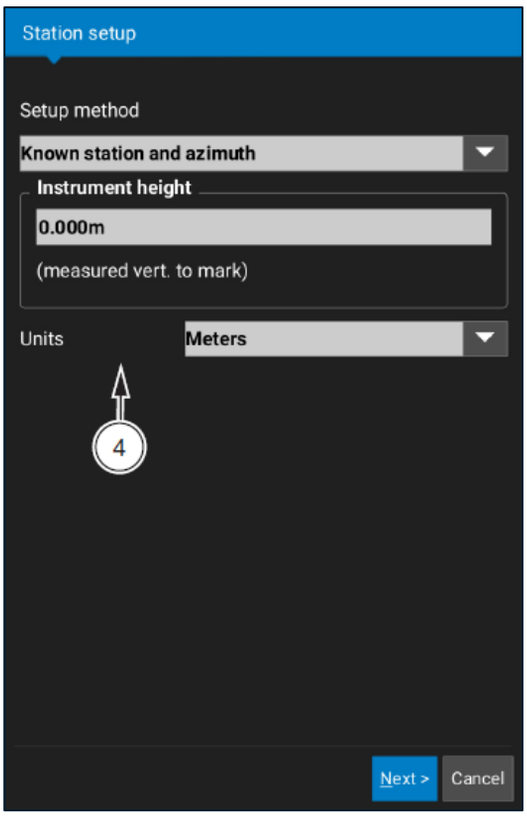
11. When the measurement is finished, the **Station Setup** screen appears and displays the total station's coordinates.

12. Tap **Finish** to save the station setup and return to the main screen. The total station is now referenced to the project control points.

Known Station and Azimuth

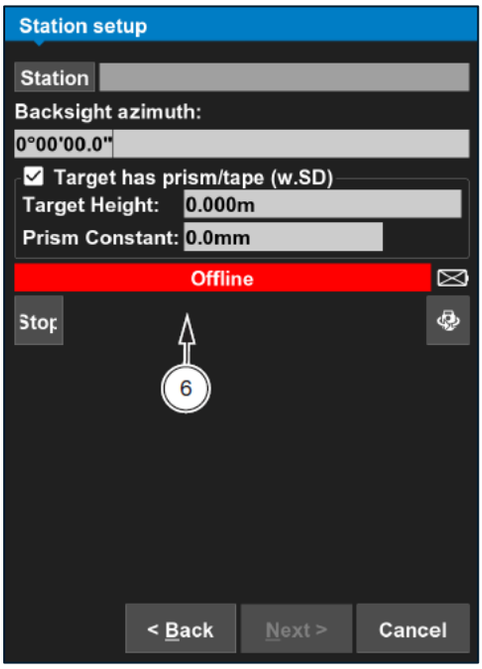
This setup method is useful for one-time total station setups. It uses a single known control point and a direction (azimuth) for the backsight to orientate the instrument.

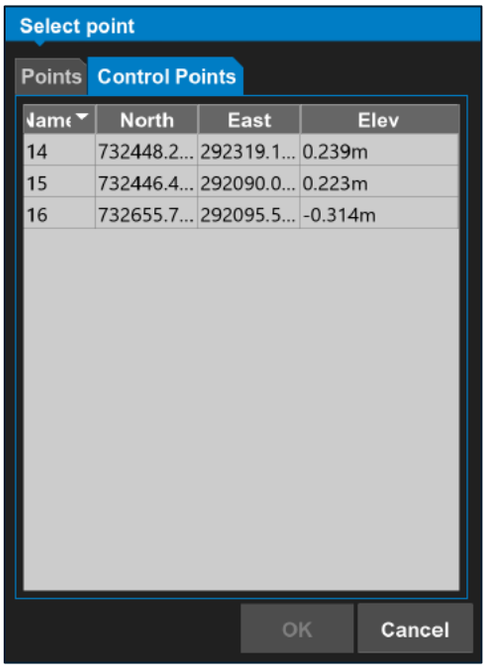
The total station is positioned on a known control point and is pointed at a prism/tape target or at a specific direction. The direction determines the orientation of the total station.



To set up a station using a known starting point and azimuth:

1. Load the required equipment file.
2. Position the total station over a known control point.
3. Tap **Control > Station Setup.** The **Station Setup** screen appears.
4. Set the following parameters:
    - **Setup Method –** Select **Known Station and Azimuth**
    - **Instrument Height –** enter the measured height of the total station (not prism height).
    - **Units –** select the units used to measure the height of the instrument **(Meters).**
5. Tap **Next.** The **Station Setup** screen appears.





6. Set the following parameters:

- **Station –** tap to select the point or control point over which the instrument is set. The **Select Point** screen appears. From either the **Points** or **Control Points** tab, select the point and tap **OK.**

- **Backsight Azimuth –** enter the backsight azimuth.

- **Target has prism/tape (w. SD) –** select this option if the backsight has a prism or tape survey target and if so, set the following parameters:

    - **Target Height –** enter the height of the backsight target.
    - **Prism Constant –** enter the prism constant.

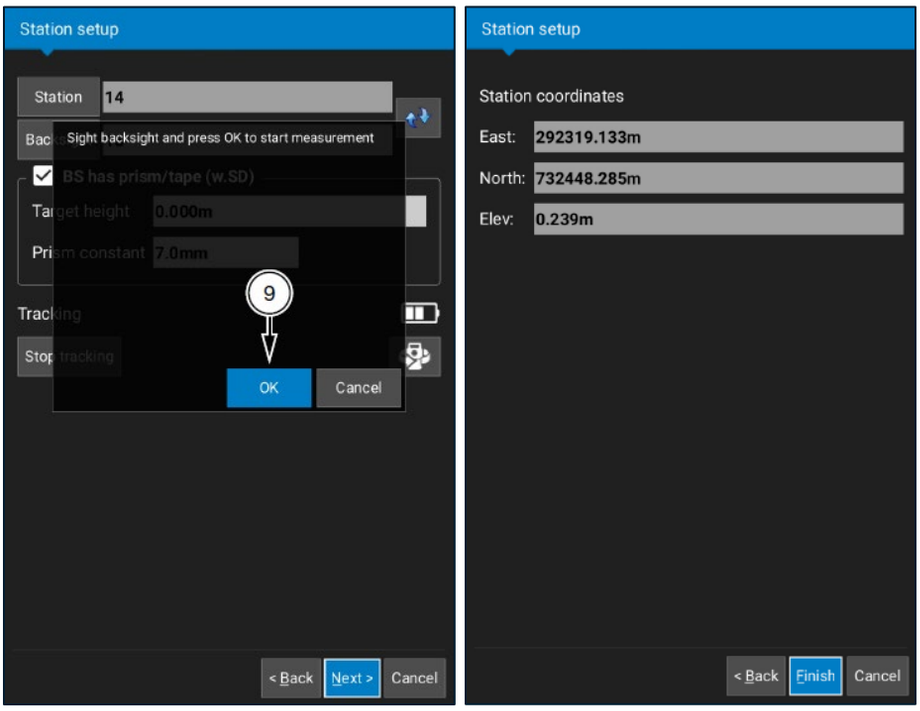
- **Turn Instrument Button –** tap  to enable controls to turn the total station. The **Turn Instrument** screen appears. Tap **Close** to return to the **Station Setup** screen.

7. Tap **Next.**

8. Sight the backsight with the instrument.

9. Tap **OK** at the prompt to start the measurement.

10. When the measurement is finished, the **Station Setup** screen displays the total station's coordinates.



11. Tap **Finish** to save the station setup and return to the main screen.

New Station by Resection

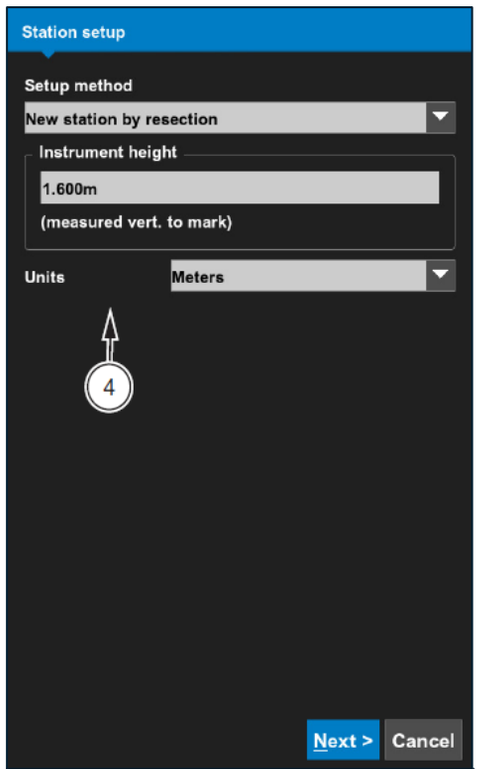
This setup method, also known as free station, allows you to set up the total station in an unknown location. The angle and distance to known points are measured to determine the total station's position and orientation.

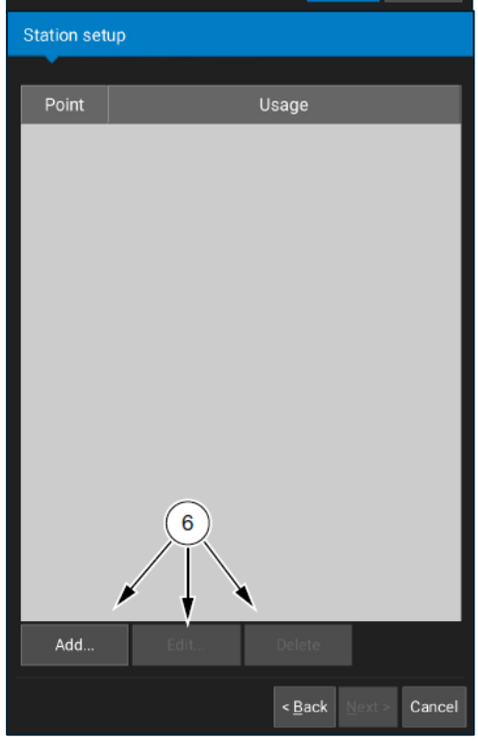
When station setup is complete, the station location can be added to the project file as a control point.

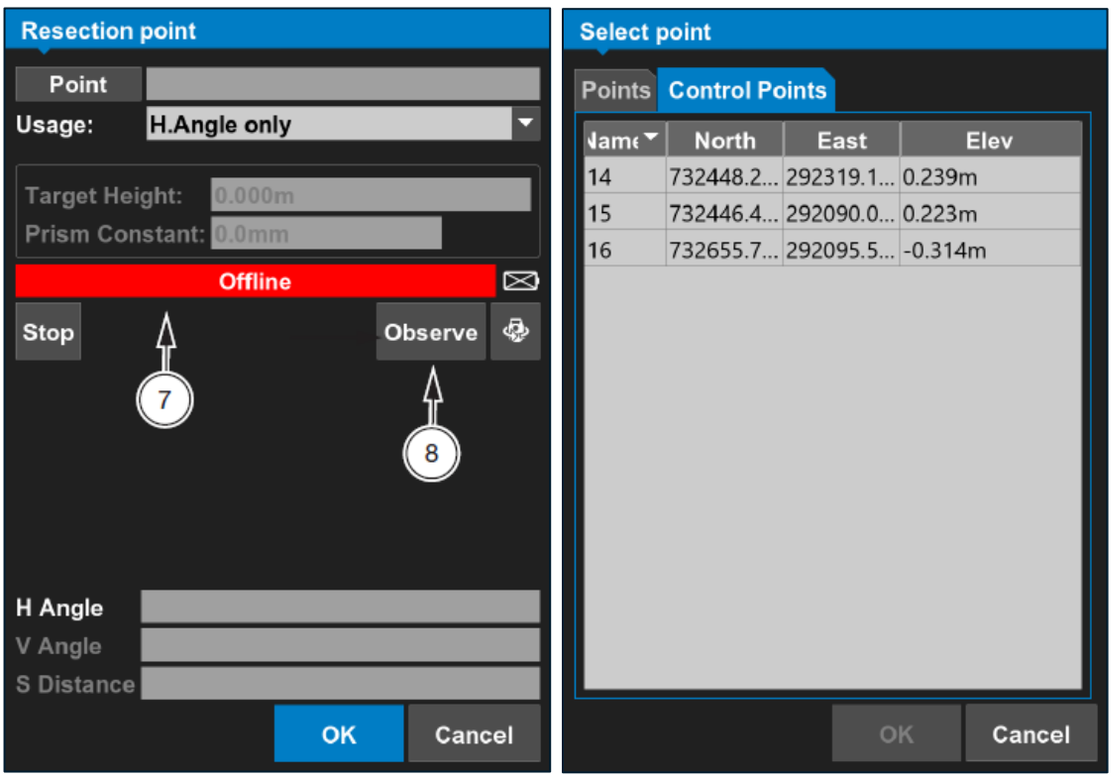
To set up a new station by resection:

1. Load the required equipment file.
2. Position the total station at the desired location (not over a control point).
3. Tap **Control > Station Setup.** The **Station setup** screen appears.
4. Set the following parameters:
    - **Setup Method –** select **New Station by Resection.**
    - **Instrument Height** – enter the measured height of the total station (not prism height).
    - **Units –** select the units used to measure the height of the instrument **(Meters).**
5. Tap **Next.** The **Station Setup** screen appears.
6. Select an option:
    - **Add** – tap **Add** to add a new point/control point to the resection. The **Resection Point** screen appears.
    - **Edit –** tap **Edit** to edit a selected point/control point, the tap **OK** to return to the **Station Setup** screen.
    - **Delete –** tap **delete** to delete a selected point/control point then tap **OK.** Tap **YES** to confirm deletion or **No** to cancel.

NOTE: You can use any number of points, but at least 3 points should be used for an accurate resection. Once computed, add the new resected point to the control point list of the project file.







7. Set the following parameters:

   - **Point –** tap to select the point or control point over which the instrument is set. The **Select Point** screen appears. From either the **Points** or **Control Points** tab, select the point and tap **OK.**
   - **Usage –** select how the point or control point is used (**H.Angle Only, H.&V. Angles, H..,V. Angles & SD,** or **Disabled**)
   - **Target Height –** enter the height of the prism.
   - **Prism Constant –** enter the prism constant.

8. Tap **Observe.** Values are measured for the following parameters:

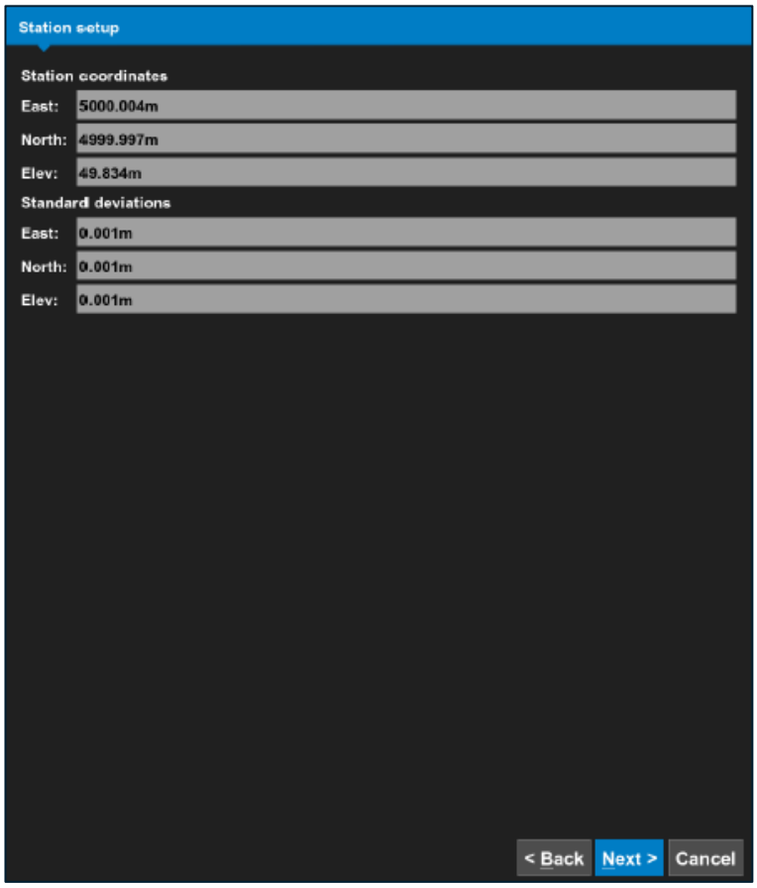
   - **H Angle –** the horizontal angle difference.
   - **V Angle –** the vertical angle difference.
   - **S Distance –** the slope distance difference.

9. Tap **OK** to continue to the next backsight. The **Control Point** screen appears with the added point.

10. Repeat steps 5 through 8 until at least two more points are added.

11. Tap **Next** when all points are added. Pocket-3D shows the resection results with the accuracy of the calculations.

12. When satisfactory resection results are obtained, tap **OK** to set the station coordinates and the orientation of the total station. When finished, the **Station setup – Station Coordinates** screen appears.



13. Tap **Next.**

14. Select the **Add point to control point list** check box.

15. Enter a name for the control point.

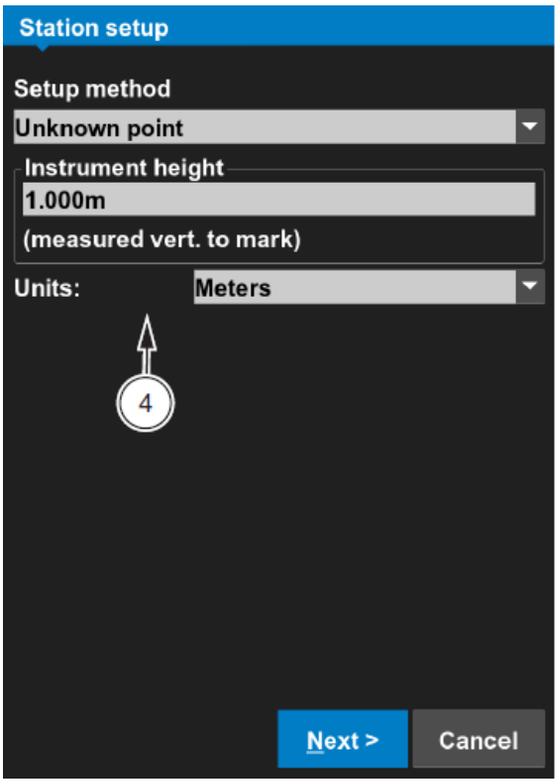
16. Tap **Finish** to save the control point and return to the main screen.

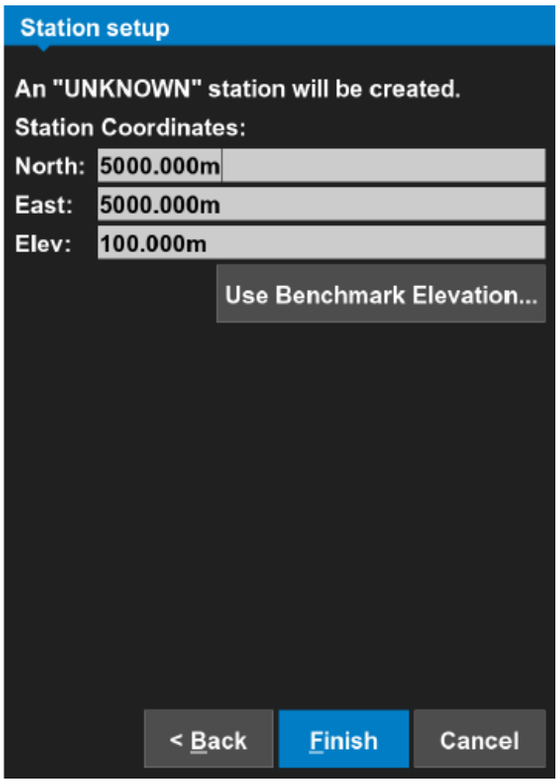
Unknown Point

This setup method allows you to set up the station at an unknown point. The point is automatically created, named “unknown”, and added to the control point list.

To set up a station at an unknown point:

1. Load the required equipment file.
2. Position the total station at the desired location
3. Tap **Control > Station Setup.** The **Station Setup** screen appears.



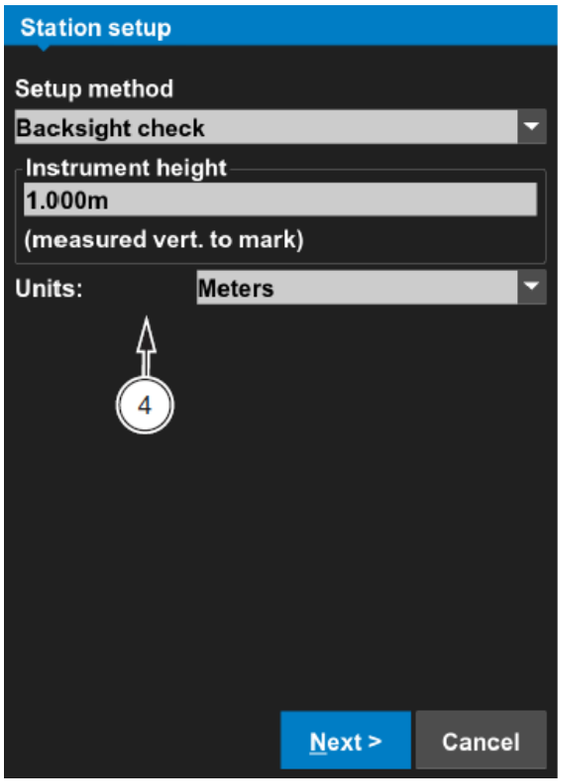


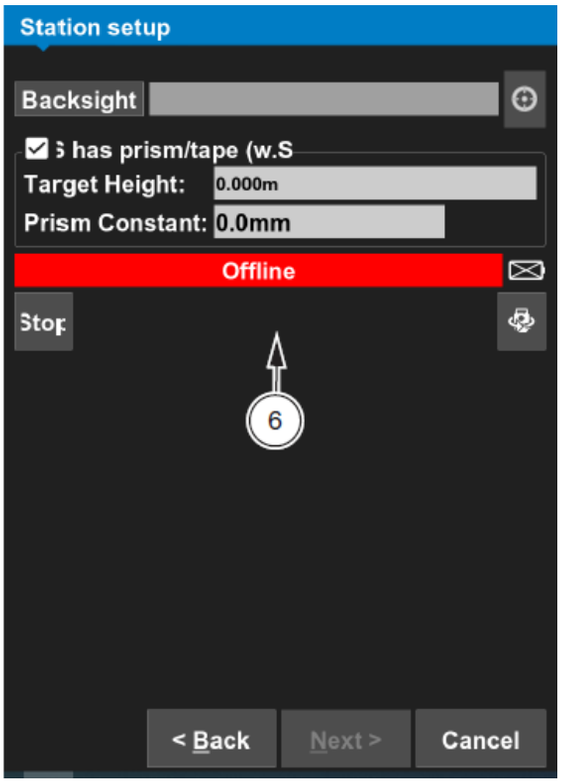
4. Set the following parameters:
   - **Setup Method –** select **Unknown Point.**
   - **Instrument Height –** enter the measured height of the instrument (not prism height).
   - **Units –** select the units used to measure the height of the instrument **(Meters).**
5. Tap **Next.** The **Station Setup** screen appears showing the coordinates for the unknown point.
6. Tap **Use Benchmark Elevation** to transfer the height from a known elevation or control point with a known elevation. This can be used to fit into an existing height system; for example, when using on drainage and there is a need to set a specific elevation.
7. Tap **Finish.** The station is programmed, and the main screen appears.

Backsight Check

To perform a backsight check:

1. Load the required equipment file.
2. Position the total station at the desired location.
3. Tap **Control > Station Setup.** The **Station Setup** screen appears.





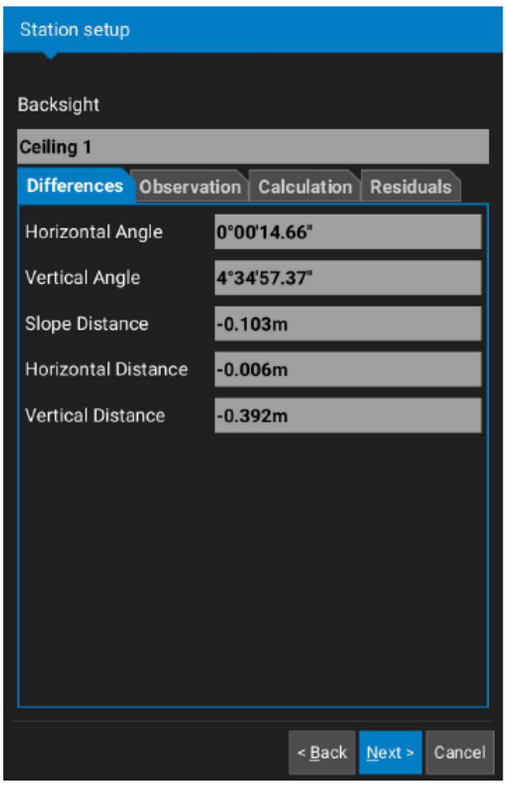
4. Set the following parameters:
   - **Setup Method –** select **Backsight Check** from the drop-down menu.
   - **Instrument Height –** enter the measured height of the total station (no prism height).
   - **Units –** select the units used to measure the height of the instrument **(Meters).**
5. Tap **Next.** The **Station Setup** screen appears. Station coordinates and the backsight are automatically pre-filled with the previously selected “known station and backsight parameters.
6. Set the following parameters:
   - **Backsight has prism/tape (w. SD) –** select this option if the backsight has a prism or tape survey target and set the following parameters:
     - **Target Height –** enter the height of the backsight target.
     - **Prism Constant –** enter the prism constant.

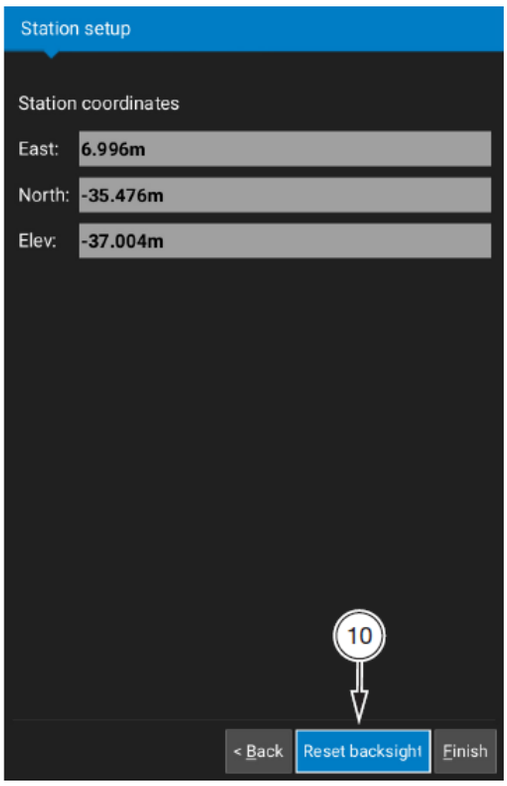
7. Set the backsight and tap **Next.** The **Station Setup – Backsight** screen appears and populates with the horizontal and vertical values and slope distance.

8. Tap **Next.** The **Station Setup – Station Coordinates** screen appears and displays the errors since the last “Known Station and Backsight” setup was performed.

9. If you need to reset the backsight, tap **Reset Backsight.** The **Station Setup – Backsight** screen updates and appears. If you need to start over, tap **Back** until the **Station Setup** screen appears. Otherwise, tap **Finish** to apply the backsight results.

10. If you did not reset the backsight, tap **Finish.**

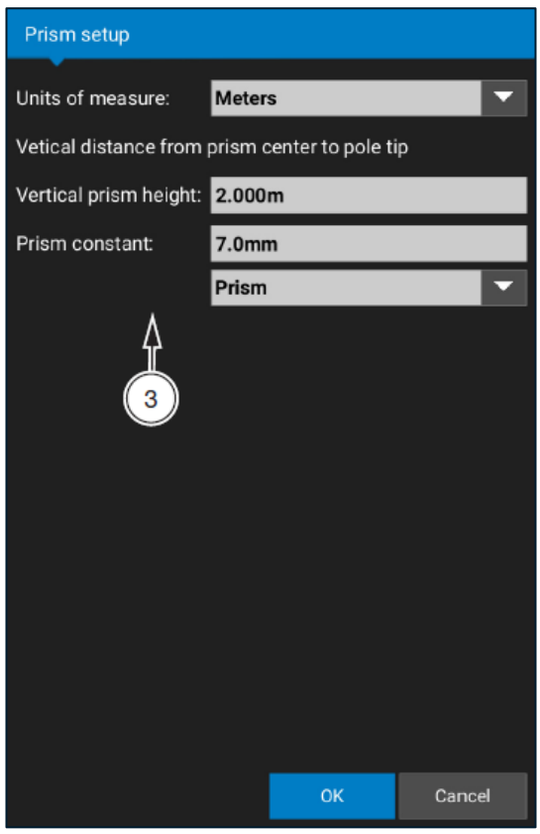




Range Pole

The **Range Pole** menu option allows you to quickly view and edit the range pole configuration for the current total station equipment file:

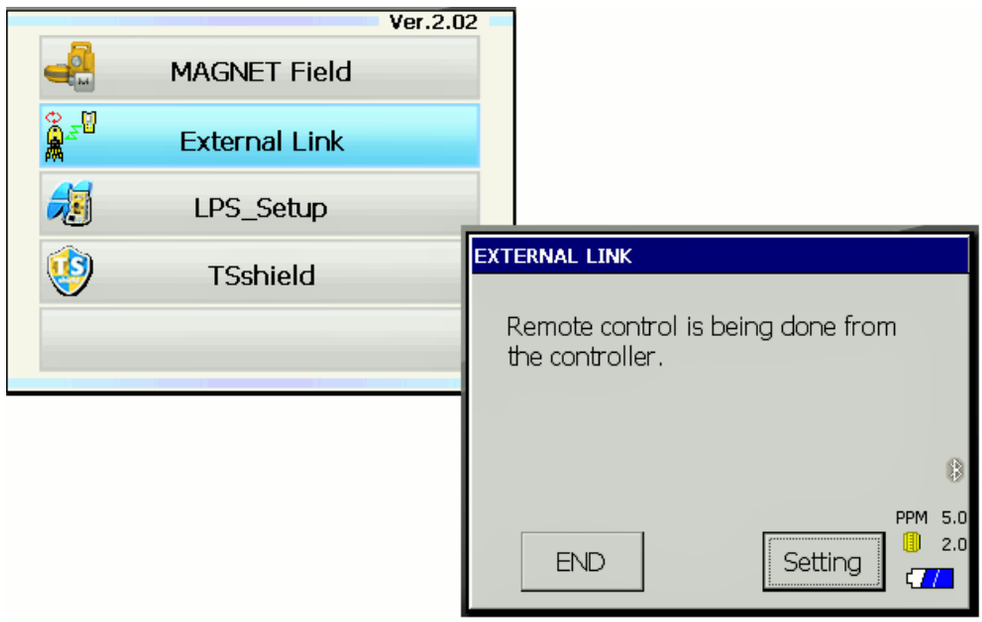
1. Load the required machine file.
2. Tap **Control > Range Pole.** The **Prism Setup** screen appears.
3. Se the following parameters:
    - **Units of measure –** select the units used to measure the range pole heights (**Meters**).
    - **Prism Height –** enter the vertical height of the prism.
    - **Prism Constant –** enter the prism constant and select the prism type (**prism, Sheet, 360° Prism**).
4. Tap **OK** to save the changes to the range pole setup and return to the main screen.



Starting LPS Control

To start machine control mode, tap **Start LPS Control**.

Point the Robotic Total Station at the prism on the machine, then select **External Link** to begin controlling the machine with the Total Station.



NOTE: Be sure to make a note of the PS's Bluetooth MAC Address. The LMAC address entered into 3DMC must match the MAC address in the PS in order for LPS communication to function.

*NOTE: The total station must remain on the **External Link** screen while running LPS.*

LPS Machine Setup with 3DMC

When setting up the machine for the LPS, the control box (Screen) and 3DMC software provides the interface for building machine files.

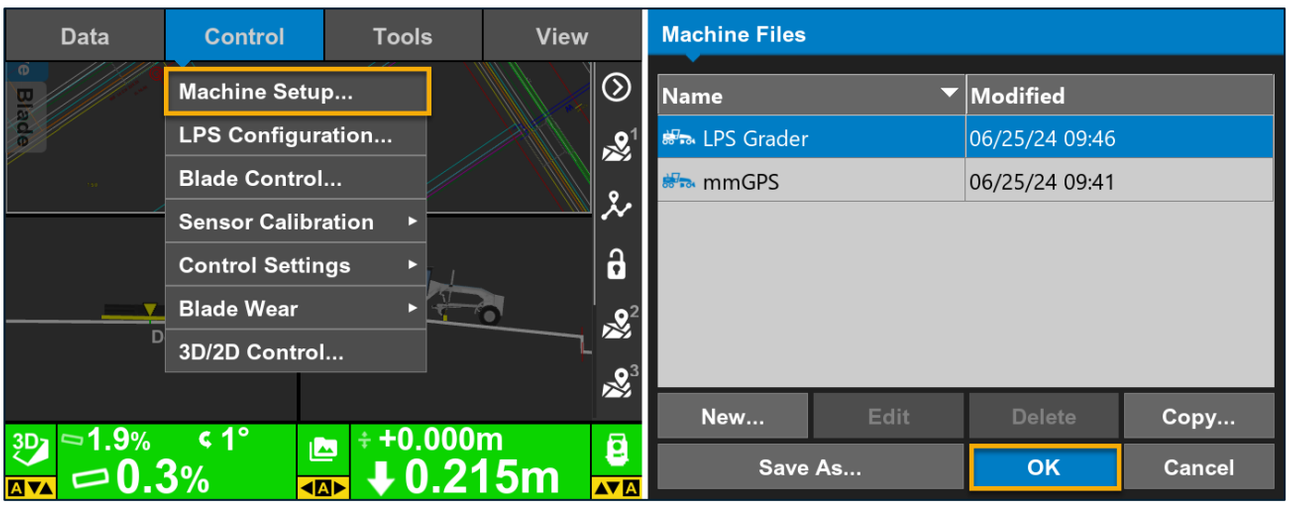
Selecting a Machine Configuration File

The machine configuration file provides vital information about the type of machine, the setup of the components on the machine, machine measurements, and radio configuration information.

You must have a Machine Configuration file before beginning to grade.

1. Tap **Menu Button > Control > Machine setup**. The **Machine files** Screen displays.

2. Select the LPS-configured machine configuration file, and tap **Ok**.



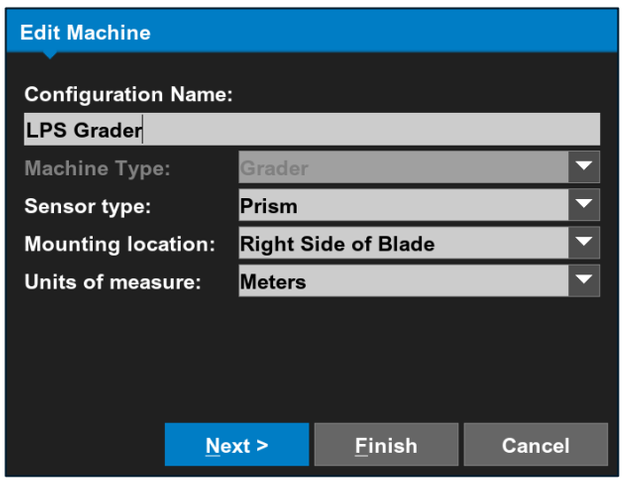
Creating an LPS Machine Configuration File

1. Tap **Menu Button > Control > Machine setup**.

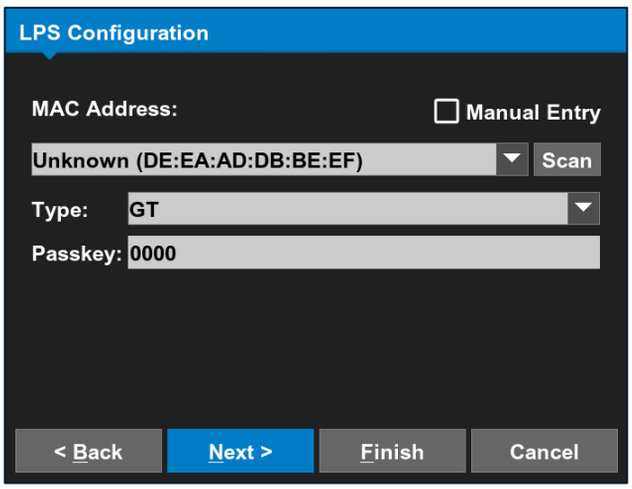
2. Tap **New** to create a new configuration file or select an existing configuration file. Tap **Edit**.

3. Enter or select the following configuration and equipment parameters. Then tap **Next**.

    - Configuration name – enter a name for the machine. For easy identification later, include application type.
    - Machine type – select the type of machine.
    - Sensor Type – for LPS application, select Prism.
    - Mounting Location – select the sensor's location on the machine.
    - Units of measure – select the unit of measure used in the project (meters, feet, inches, or centimeters)



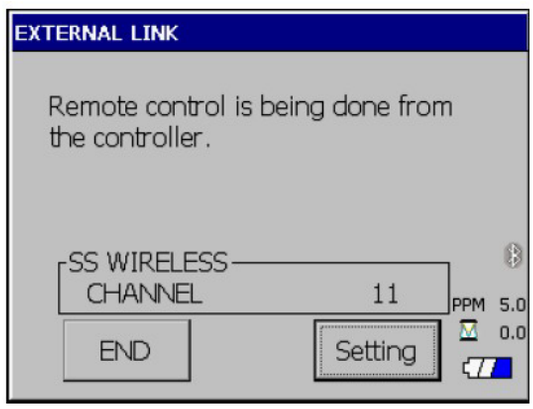
4. Select and enter sensor information, and then tap **Next** 12 times to access the **LPS Configuration** screen.



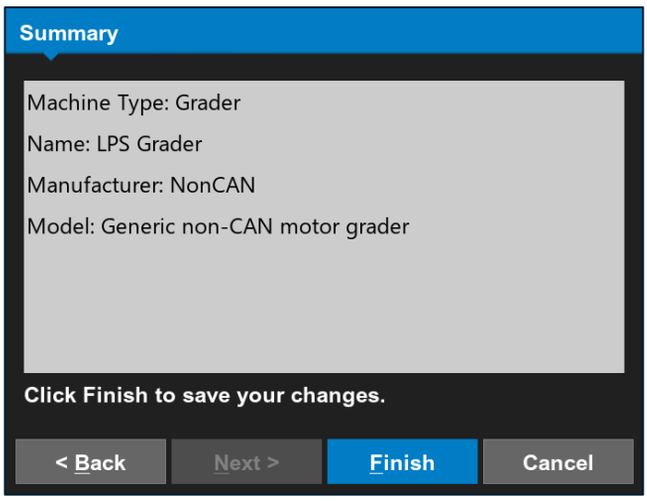
When using a Longlink Bluetooth connection to the total station, on the **LPS Configuration** connection screen select the following parameters, then tap **Next.**

- MAC Address - The scan function will search for any LongLink Bluetooth Device (Total Station), where you select the correct instrument from the list.
- Type – Select the correct type of total station

*NOTE: The total station must be set on the **External Link** screen for LPS operation.*



5. Tap **Finish** to complete and save the machine configuration file.



6. Select the machine configuration file on the **Machine Files** Screen and tap **Ok** to set this as the machine for the job.

LPS Operations in 3DMC

Viewing LPS Information

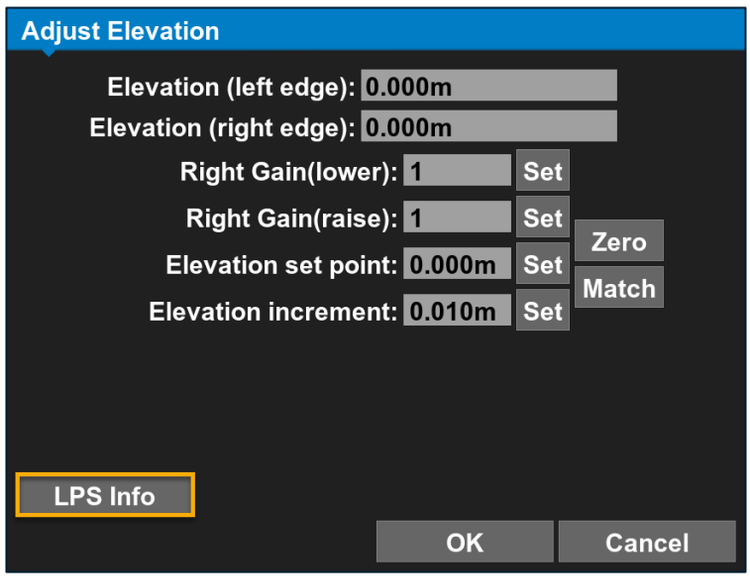
To access available LPS information, tap the **2D/3D Elevation Mode and Status Indicator/Button.**

LPS Adjust Elevation

Once initialised, to display the following elevation settings for LPS applications, tap the **Elevation Control** button. The **Adjust Elevation** screen displays.

- **Elevation (left edge)** – displays the elevation of the left edge of the blade based on local site coordinates.
- **Elevation (right edge)** – displays the elevation of the right edge of the blade based on local site coordinates.
- **Elevation gain (raise/lower)** – displays the current valve setting for elevation control. The gain (raise/lower) setting determines the speed of the hydraulic response during Automatic Control. A higher setting speeds up the response; a lower setting slows down the response. Tap **Set** to adjust or lock this value in place.
- **Elevation set point** – displays the current cut/fill offset, or amount of additional height applied to the Design Surface. Tap **Set** to adjust or lock this value in place.
- **Elevation Increment** – allows the user to set the desired value for the increment plus (+) or minus (–) buttons on the machine joystick. These red increment buttons are situated next to the auto switches on the joystick.
- **Match** – sets the current Design Surface to the elevation of the cutting edge, changing the cut/fill reading to zero. The cut/fill offset number then displays the distance from the new, matched grade to the original Design Surface. This button allows you to quickly adjust the grade to a more manageable cut or fill.

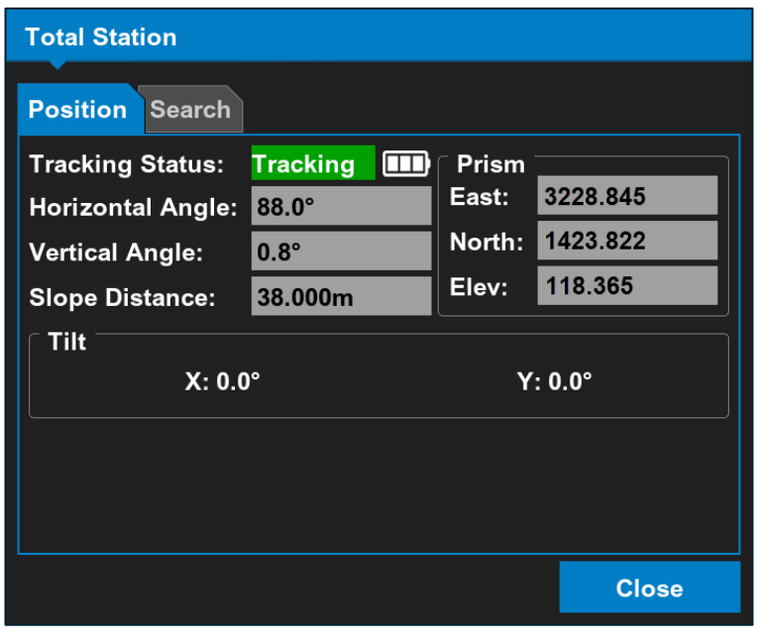
- **Zero** – sets the elevation set point value to zero.
- **LPS Info** – displays the **Total Station** screen



Tap the **LPS Info** button to display the **Total Station** screen, which has a **Position** and **Search** tab.

Position Tab

The **Position** tab displays current locations for the left and right sides of the cutting edge, in real time. These values are based on the local site coordinates, providing quick position and elevation checks at particular points on the project. The “Z” values on this tab match the elevation numbers on the **Adjust elevation** Screen.



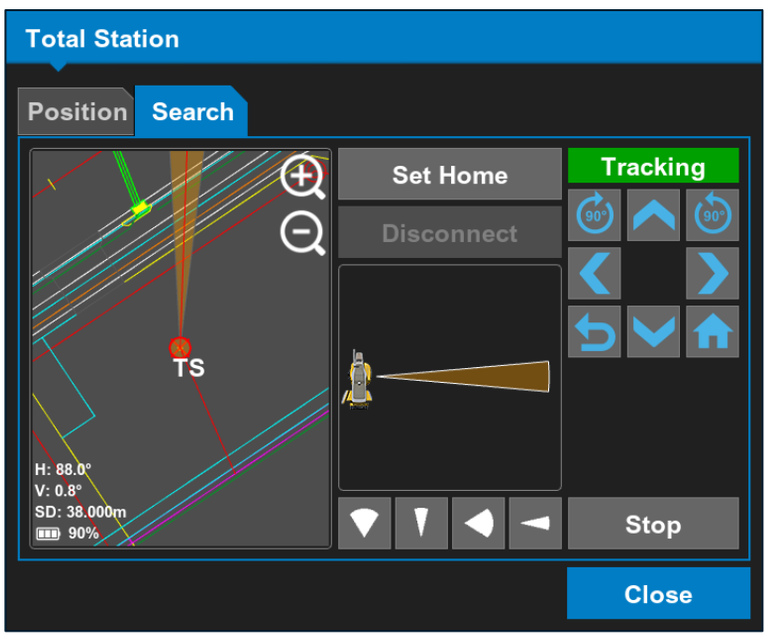
Search Tab

The Robotic Total Station uses the **Search** tab to control movement.

The **Search** tab relocks the prism when the Robotic Total Station loses the prism. The main screen displays the position relative to Robotic Total Station and the machine and Working Surface can be recognized. This helps determine the rough position of the machine. The actual search window, which can be modified, displays.

The Robotic Total Station is rotated using the vertical and horizontal remote control keys. The searching area also rotates in-sync with the rotation of the Robotic Total Station.

The search area is changed using the vertical and horizontal searching area keys.



- **Set home** 

– sets the current position coordinates of the machine as the home position.

- **Home Symbol**  – causes the Robotic Total Station to turn directly to the home point (the **Set home** position coordinate) and begins searching for the prism with the currently defined search window.

    - If the Robotic Total Station cannot find the prism using the normal searching procedures, you can always go back to the position recorded. The Robotic Total Station turns to this position and relocks the prism.
    - The **Home Symbol** function is also useful when driving fast backwards at a short distance from the Robotic Total Station to start at the beginning of a new track again.

- **Go Last**  – causes the Robotic Total Station to turn to the last tracking point where the Robotic Total Station lost the prism.

- If the Robotic Total Station cannot find the prism using the normal searching procedure, you only have to go back to the last tracking point. Total Station turns to this position and relocks the prism.

- Start tracking – searches for the prism and tracks.

Relocking the Prism in 3DMC

When the prism is lost, use the following guidelines to relock onto the prism from the control box.

As soon as you tap a function key in the **Search** tab of the 3DMC software, the Robotic Total Station stops searching/tracking in order to receive commands from the MC-X.

1. Navigate to the **Search** tab in 3DMC.
2. Use the remote control horizontal keys to turn the Robotic Total Station horizontally toward the prism.
3. Use the remote control vertical keys to turn the Robotic Total Station vertically toward the prism.
4. Depending on the situation, reduce/enlarge horizontal search window.
5. Tap the **Start tracking** button.

NOTE: The horizontal and vertical search windows are very important in reducing searching time. The smaller the search area, the faster the Robotic Total Station finds the prism.

mmGPS Setup – Pocket 3D Software

When setting up the PZL-1 or LZ-T5 transmitter and PZS-1 sensor, Pocket-3D provides the interface for building equipment files, calibrating the transmitter, and initializing the sensor.

Creating an Equipment File

Equipment configuration files contain information on the specific machine, laser or GPS, prism, radio, etc. for the job application and setup. Pocket-3D uses this information to accurately portray jobsite information on the main screen.

Before initializing or localizing a GPS system, there must be an equipment configuration file defined in Pocket-3D. The following procedure is an example of a Hiper receiver configuration for mmGPS applications.

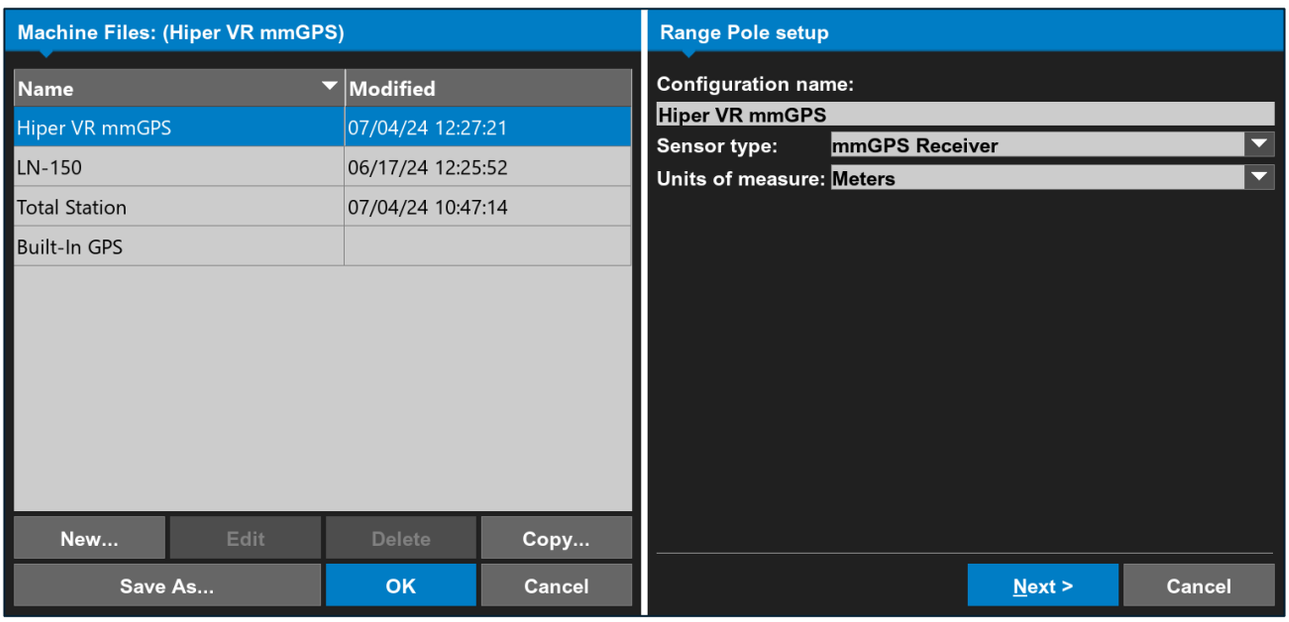
NOTICE: Incorrect measurements or typographical errors directly affect grading accuracy.

1. Press **Control > Machine Setup** to create or select an equipment configuration file.

2. On the **Machine files** dialog box, press **New** to create the equipment configuration, or press **Edit** to change an existing equipment configuration.

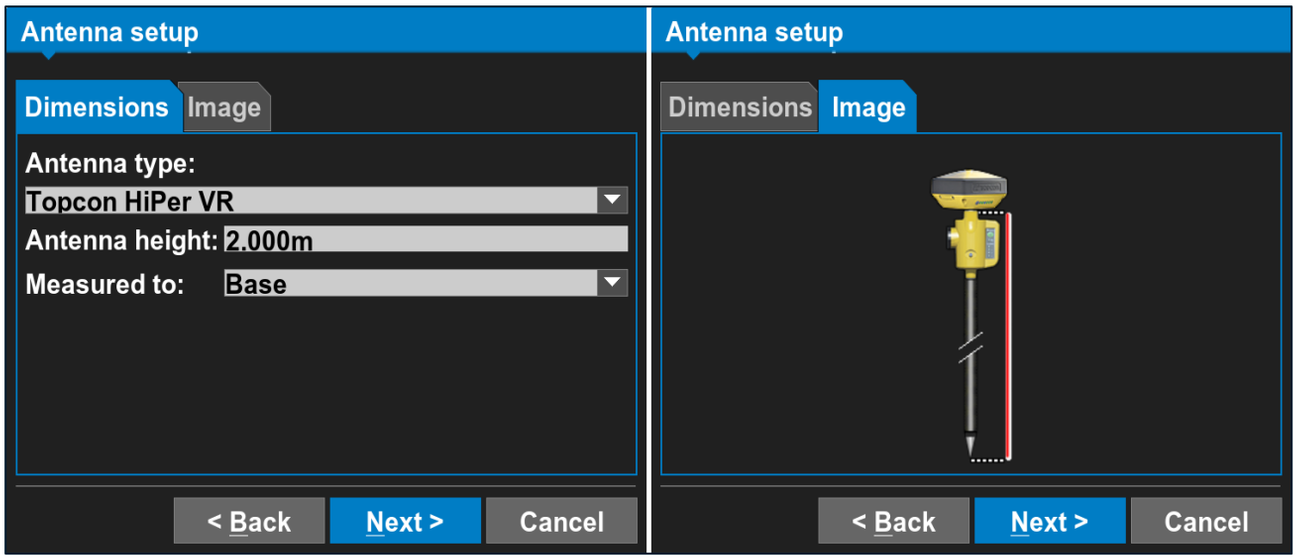
3. For mmGPS application, apply following equipment parameters, and press **Next**

    - **Configuration name –** enter a name for the configuration file
    - **Sensor Type –** select **mmGPS Receiver** from the drop-down list
    - **Units of Measure –** select the type of unit measurement (**Meters**).



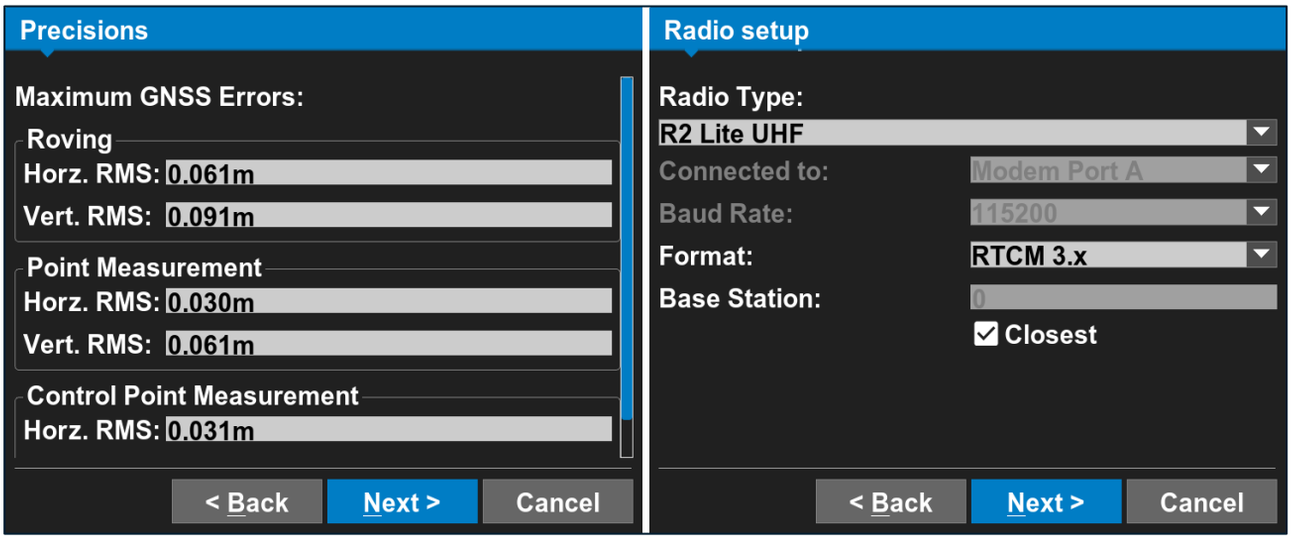
4. Enter the antenna information using the same units of measure entered in the previous step, then press **Next** to continue. These settings have a corresponding Image tab to illustrate the setup.

   - **Antenna type –** select a mmGPS antenna selection
   - **Antenna height –** enter the height of the range pole
   - **Measured to –** select either Base or Rim



5. Leave the GPS **Precisions** settings as per the default values and press **Next.** Set the radio parameters, and press **Next** to continue

   - **Radio type –** select **R2 Lite UHF** or **Direct Network Connection** if you are connecting to a Network Base.
   - **Connected to – Modem Port A** (already defaulted to preset value)
   - **Baud rate –** select **115200** (already defaulted to preset value)
   - **Format –** select **RTCM 3.**

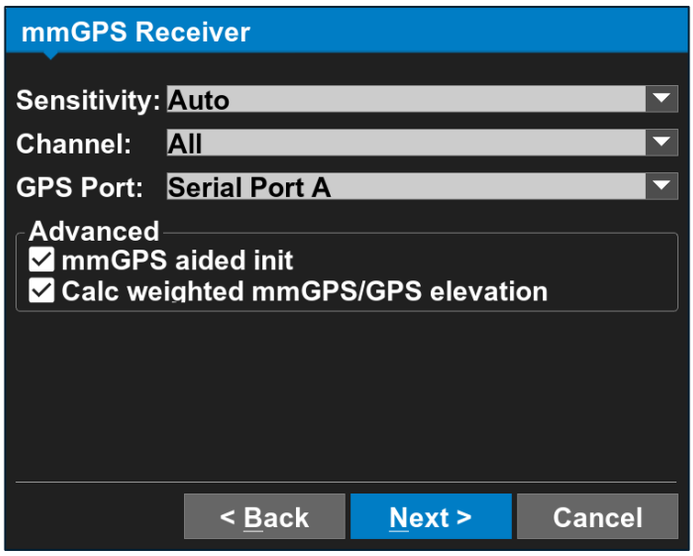


6. Select the following **mmGPS Receiver** parameters:

   - **Sensitivity –** select the sensitivity level for detecting the transmitter, usually **Auto**. Select a different setting when working at very short or very long distances, or during inclement weather that can affect laser detection.

   - **Channel –** select the channel to scan for mmGPS connection. The **'All'** selection will allow the sensor to independently select the transmitter with the smallest error rate. If setting up only one transmitter, but the job has been configured for multiple transmitters, select the individual ID of the transmitter for the sensor to detect.

   - **GPS port –** select the port used for GPS communication between receiver and sensor **(Serial Port A)**.



7. Press **Next** and then **Finish** to save the configuration file.

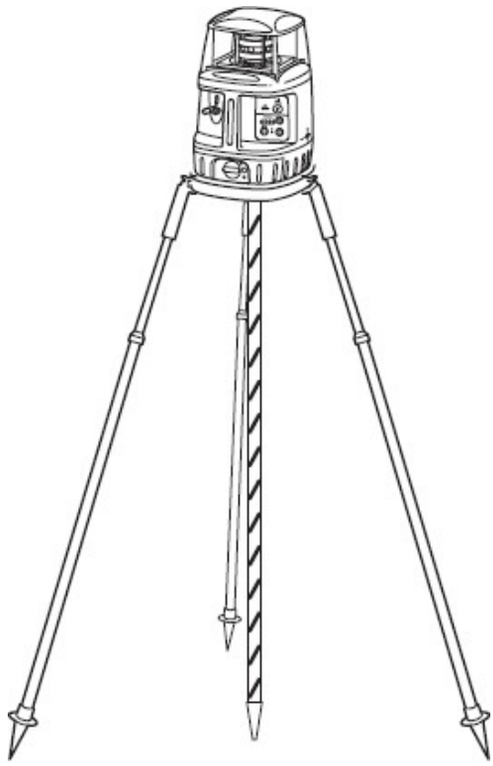
8. On the **Machine Files** configuration dialog box, select the created equipment file and press **OK** to apply the configuration file.

PZL-1 / LZ-T5

For machine control applications, the PZL-1 / LZ-T5 transmitter attaches to a 4-legged mmGPS Tripod over a surveyed point.

1. Locate a control point over which to set up the PZL-1 / LZ-T5 transmitter.

2. Attach the transmitter to the tripod



3. Turn on the transmitter's power and select a channel for the transmitter. To assign a channel to the transmitter, press the channel button until the corresponding LED lights up.

4. Connect the transmitter to Pocket-3D on the field controller. Check that a mmGPS- enabled machine configuration is loaded.

5. Select **Control > mmGPS Transmitters** to set up from one to four transmitters in Pocket-3D.

6. Select the **Transmitters** tab. Here you can add and download the calibration file from the mmGPS Transmitter.

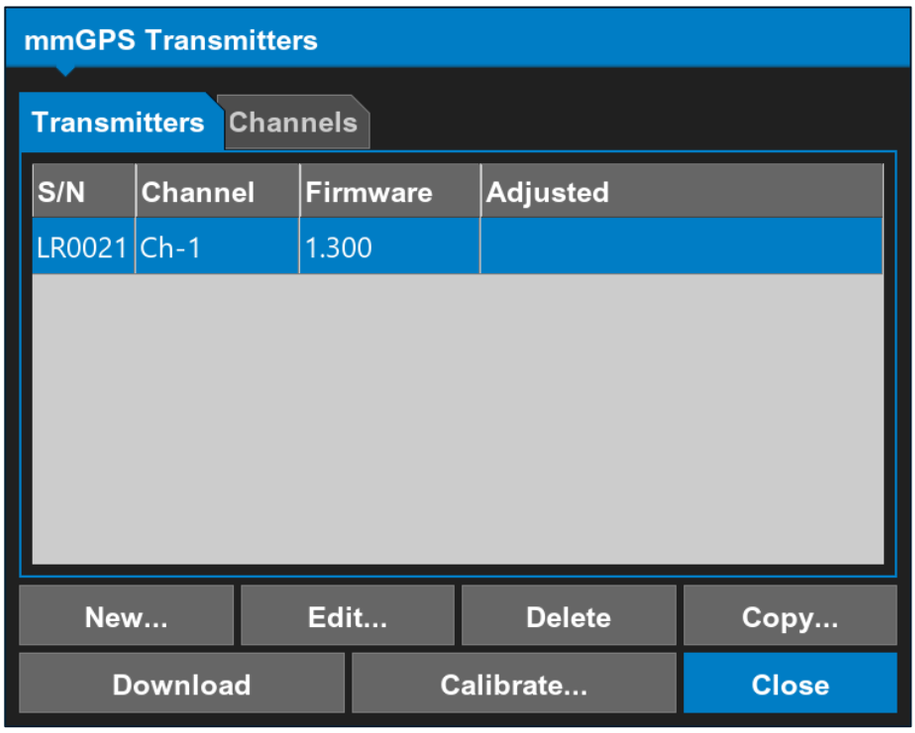
    - **New –** to add a transmitter to the project, enter a transmitter serial number or other description.

- **Download –** to load transmitter data for the first time, select **Download** to retrieve calibration data from the connected transmitter. The download is complete when the firmware version displays in the Firmware column.

- **Delete –** select a transmitter and tap **Delete**.

- **Copy –** to copy a transmitter file from another project or USB, select **Copy** and navigate through selecting the correct file location or Project name. Select **OK** once identified.

Once the Transmitters tab contains a list of transmitters, each transmitter must be setup on a unique channel. The channel button on the transmitter determines the channel that the transmitter broadcasts on.



7. Select the channel tab for the connected transmitter and set the following parameters:

    - **Transmitter S/N –** from the drop-down list, select the serial number of the connected transmitter

    - **Type –** select either **PZL-1** or **LZ-T5**

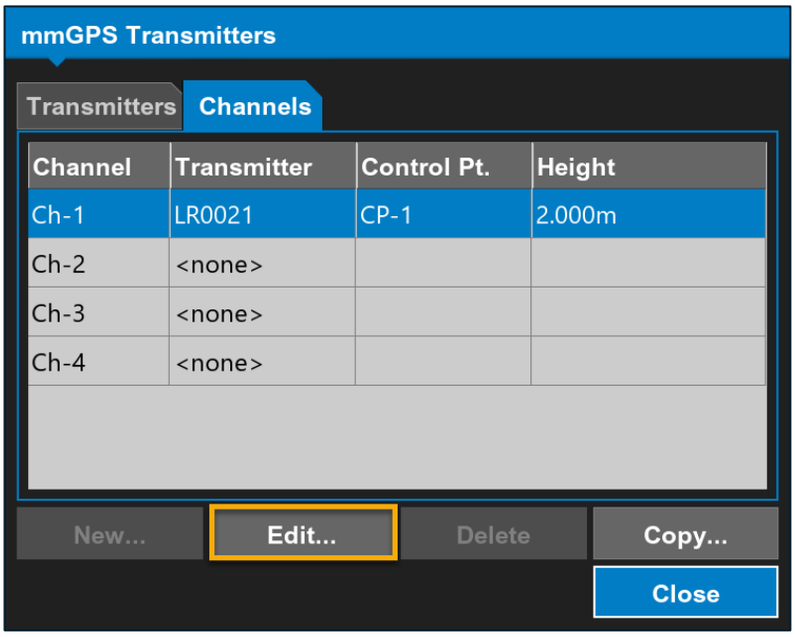
    - **Control Point –** select the control point that the transmitter is set up rover

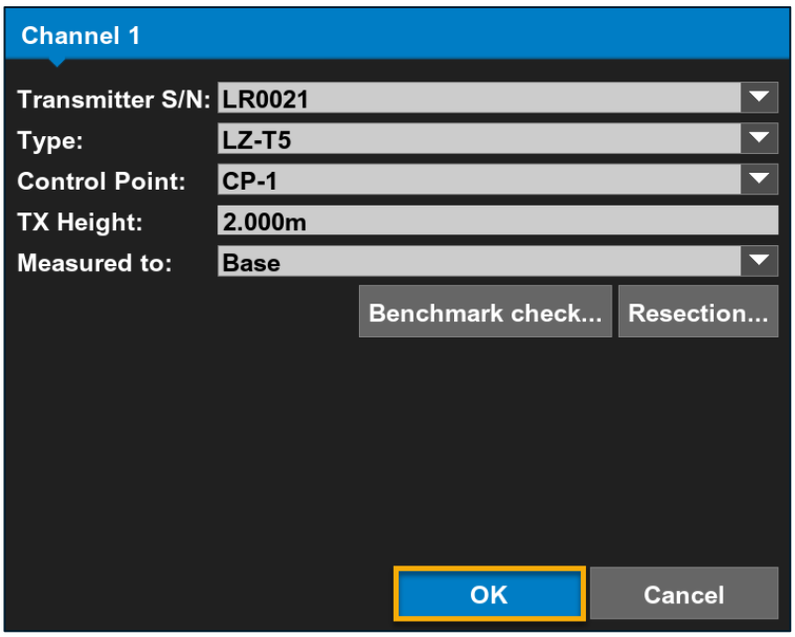
    - **TX Height –** enter the height of the transmitter (Centre pole height of the mmGPS tripod)

    - **Measured to –** select **base** as the measure to point on the transmitter tripod

8. If needed, repeat step 7 for up to three other transmitters.

9. Press **OK** when done.



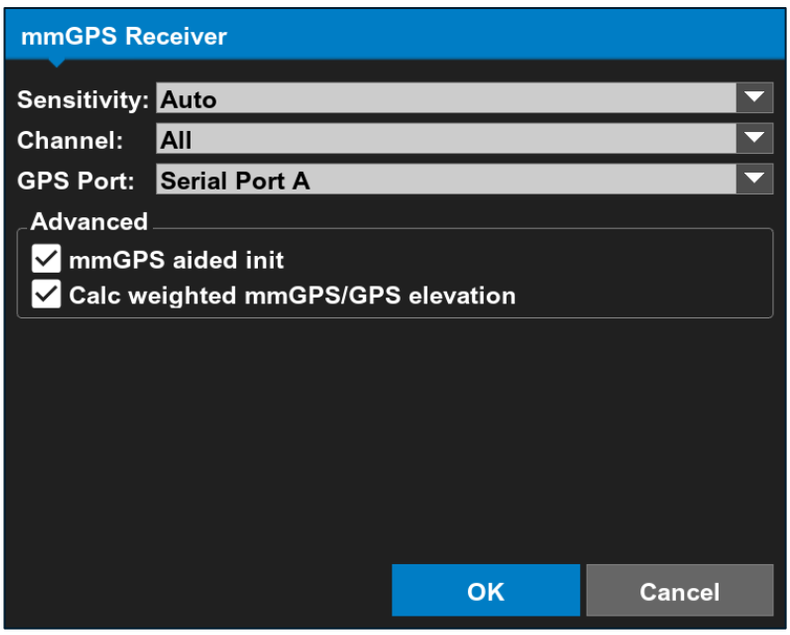


PZS-1 Sensor Receiver

For machine control applications, the PZL-1/LZ-T5 transmitter attaches to a 4-legged mmGPS Tripod over a surveyed point.

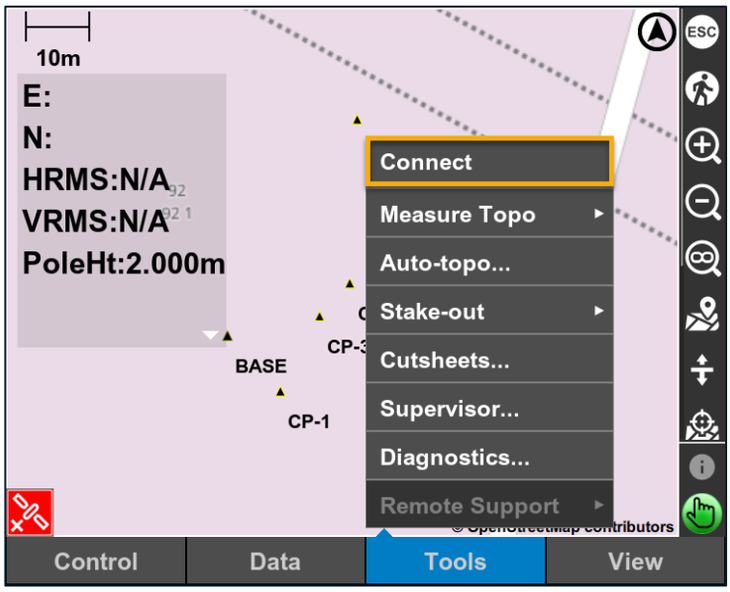
The following procedure requires a mmGPS-enabled machine configuration file to be selected in Pocket-3D.

1. Connect the GPS receiver to the 5/8” bung on the PZS-1 sensor.
2. Connect the PZS-1 to the range pole.
3. Connect the serial cable from port A of the GPS receiver to the serial port on the PZS-1 sensor.
4. Turn on the power to both the receiver and sensor.
5. In Pocket-3D, tap **Control > mmGPS Receiver**.
6. Select the following **mmGPS Receiver** parameters:
   - **Sensitivity –** select the sensitivity level for detecting the transmitter, usually Auto. Select a different setting when working at very short or very long distances, or during inclement weather that can affect laser detection.
   - **Channel –** select the **All-channel** option to scan for mmGPS connection.
   - **GPS port –** select the port used for GPS communication between receiver and sensor (**Serial Port A**).
7. Tap **OK**.



Benchmark Checking

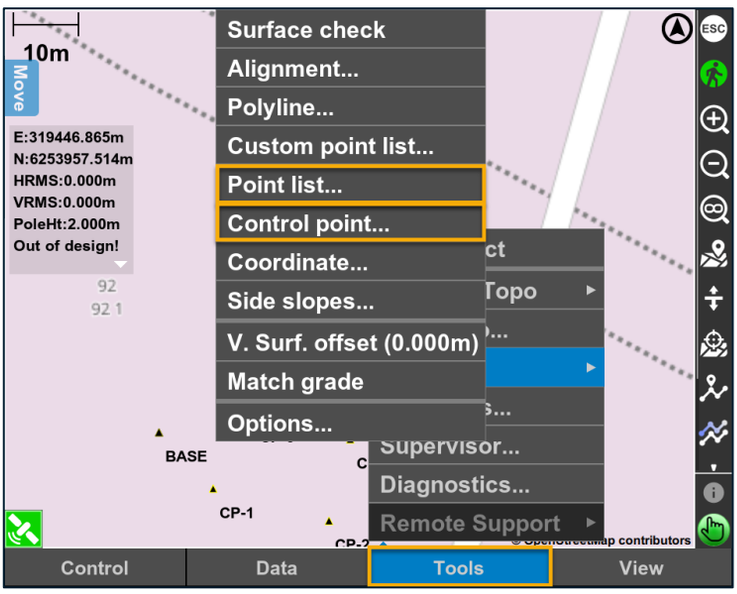
After completing the mmGPS configuration and setup through Pocket 3D, tap **Tools > Connect** to connect to the GNSS receiver on the range pole.



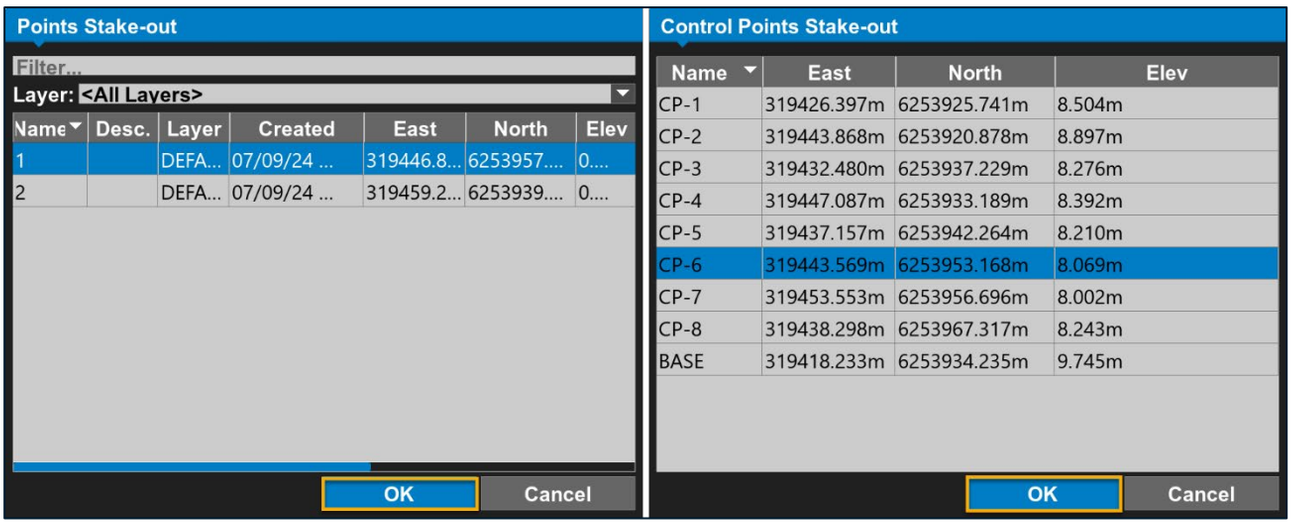
Once connected and mmGPS transmitter is picking up the PZS-1 receiver on the range pole, the final step is to bench check the system off a known point on the jobsite (physical reference point with ENZ to verify the setup is accurate ready for machine control).

To stake out a point from the project file:

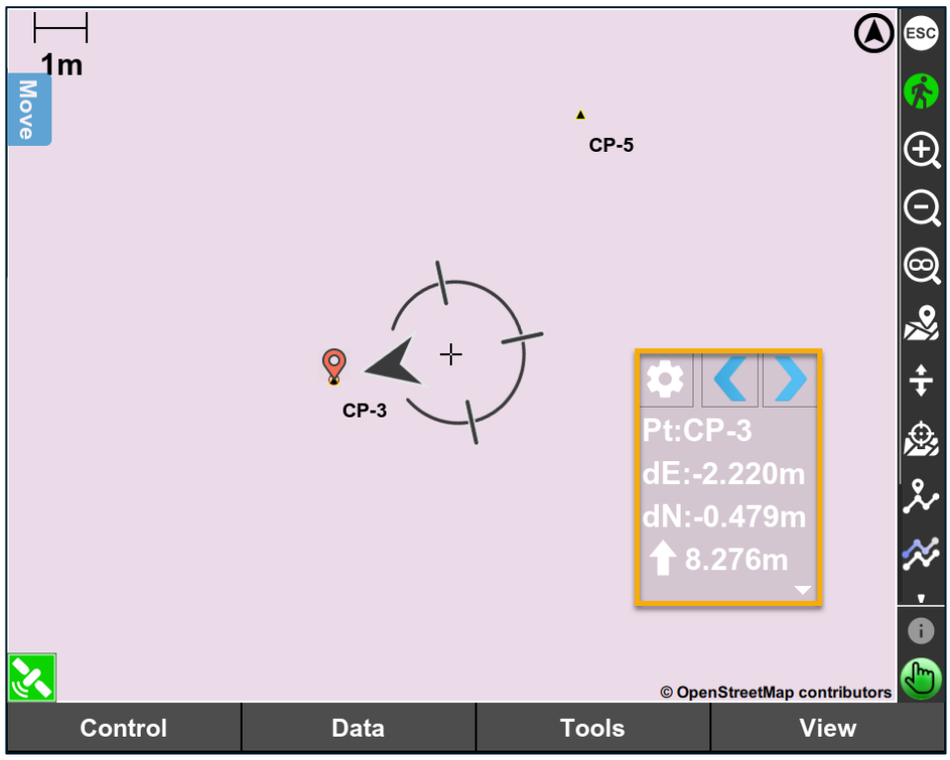
1. Tap **Tools > Stake-out > Point List** or **Control Point.** The **Stake-out** screen appears.



2. Select the desired Point or Control point for staking out. Tap **OK**.



3. The main screen appears with the difference between your current position and the exact coordinates of that point. Here you can bench and see how accurate you are to a known reference point (its always best practice to check over a few known points for verification).



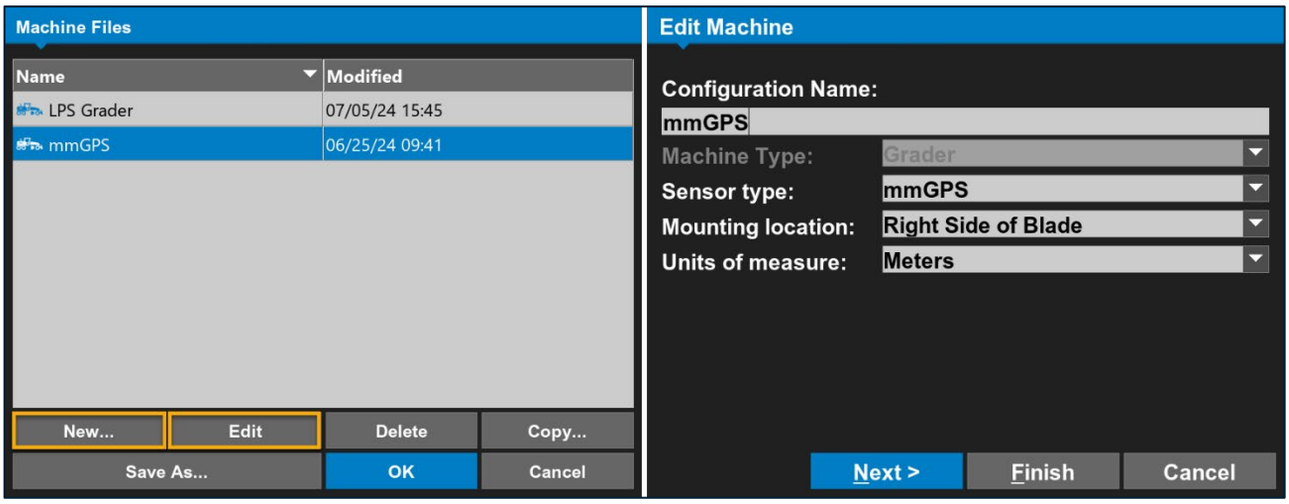
mmGPS Machine Setup with 3DMC

When setting up the machine for mmGPS, the control box and 3DMC software provides the interface for building machine files, entering PZS-MC receiver information, and selecting channels for one or more transmitters. Transmitter information, such as serial number/description, firmware and adjusted status, comes from a copied Pocket-3D control point file.

Creating a Machine Setup File

The Machine Configuration file provides vital information about the type of machine, the setup of the components on the machine, machine measurements, and radio configuration information. You must have a machine configuration file before beginning to grade.

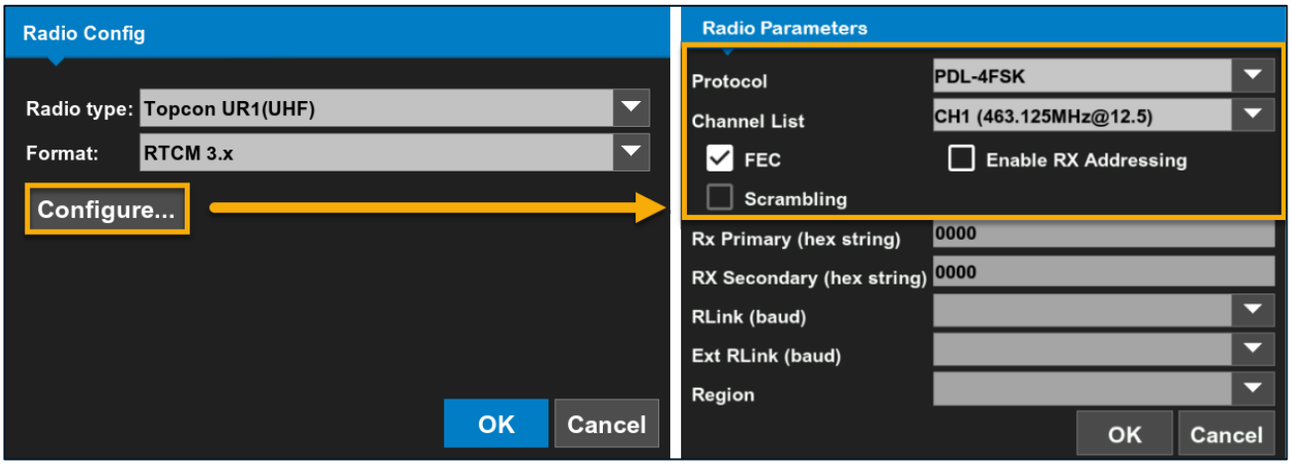
1. Select **Control > Machine setup** to display the **Machine files**.
2. Press **New** to create a new machine configuration or **Edit** to change a current configuration.
3. Enter the following information and tap **Next**:
    - **Configuration Name –** enter a name for the configuration using the pop-up keyboard
    - **Machine type –** select the type of machine (defaulted to **Grader**)
    - **Sensor Type –** for mmGPS application, select **mmGPS**
    - **Mounting Location –** select the sensor's location on the machine
    - **Units of measure –** select the unit of measure used in the project (meters)

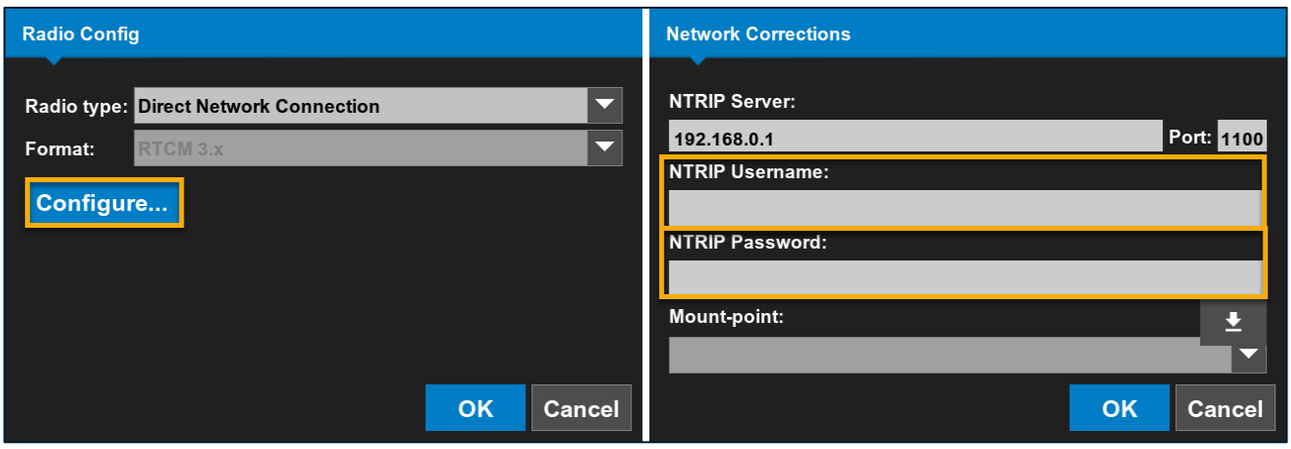


4. **Radio Config** screen appears for you to select the appropriate **Radio Type, Port** and **Format**, then select **Configure.** The **Radio Parameters** screen appears for you to select the radio configuration information and channel that matches the channel of the base station.

    Select **OK** to save settings. Change the radio type to **Direct Network Connection** to connect to a network base station. Select **Configure** and here you can add the correct **NTRIP Server,**

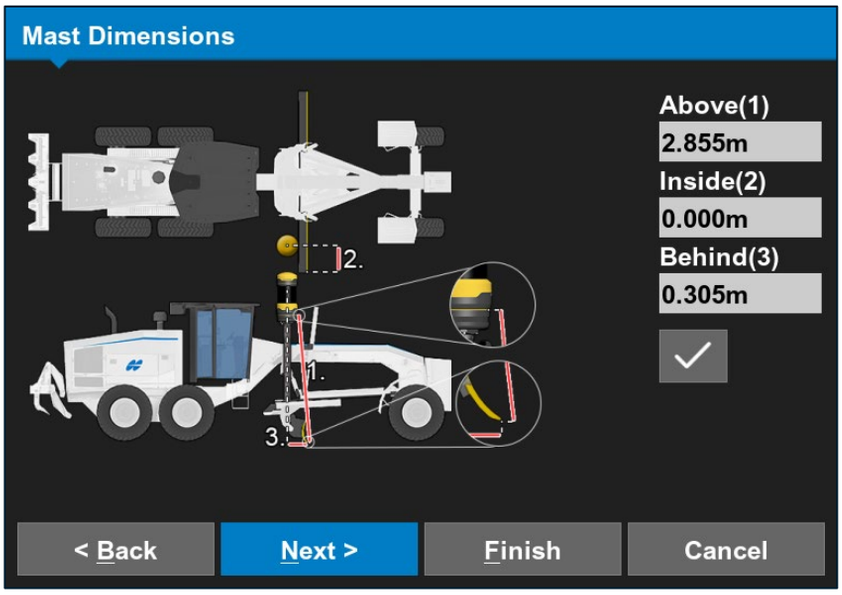
Username, Password and **Mount-Point**. Select **OK** to save settings and return back to the main screen.





5. Click next '7' times to get to the **Mast Dimensions** screen. Here you can enter the mast information for the machine setup

   - **Above –** enter the height from the bottom of the PZS-MC to the cutting edge of the blade
   - **Inside –** how far inside the vibe pole is from the edge of the blade
   - **Behind –** how far behind the vibe pole is located from the cutting edge. If the vibe pole is behind the cutting edge (as shown in the image), the measurement is a positive value, if the vibe pole is in front of the cutting edge, the measurement is a negative value



NOTE: *Incorrect measurements or data entry errors directly affect grading accuracy. Take each measurement twice.*

6. Press **Next** all the way to the end and tap **Finish**. Your machine file is now enabled for mmGPS operation.

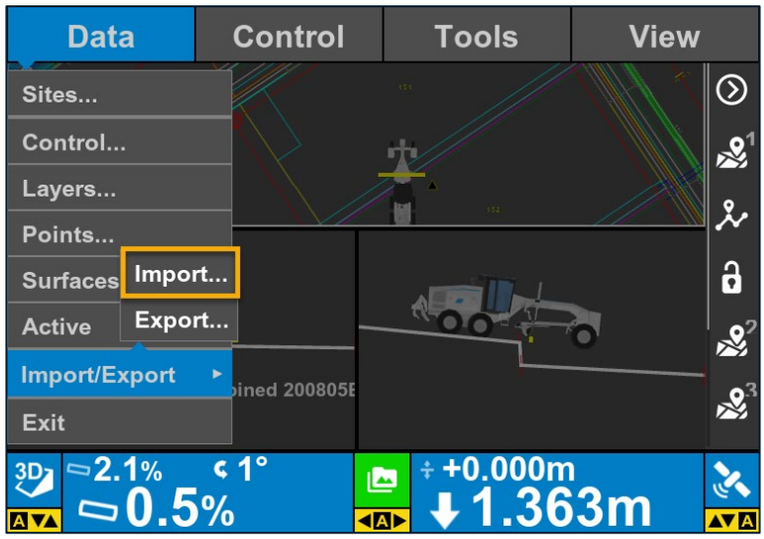
Copying the mmGPS Transmitter Calibration File (Control Point File – GC3)

For mmGPS applications, the control point file also stores transmitter information, including calibration data, setup location, and height data. This information is copied from a Pocket-3D controller to the Control Box via a USB hard drive.

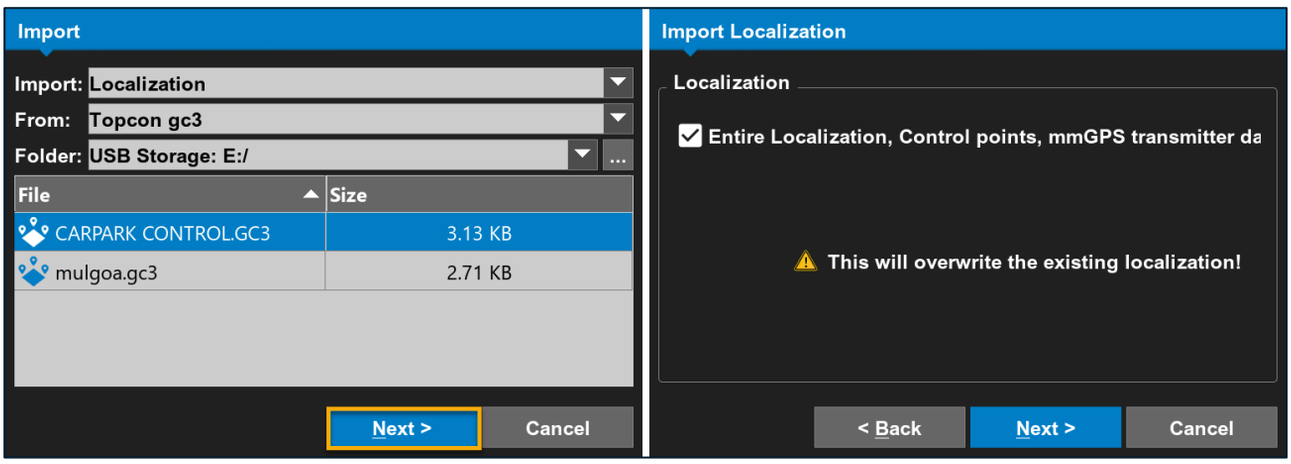
1. Save the Pocket-3D control point file (GC3) to a USB storage device.

2. Insert the USB hard drive that contains the mmGPS control point file into the USB storage device on the Control Box.

3. Select **Data > Import/Export > Import**



4. Select **Localization** in the **Import** drop-down and change the **From** field to **Topcon gc3.** From here you can select the **Folder** location of the USB Storage Device (only GC3 files will show up in the list). Select the file from the list and press **Next** to confirm the import.

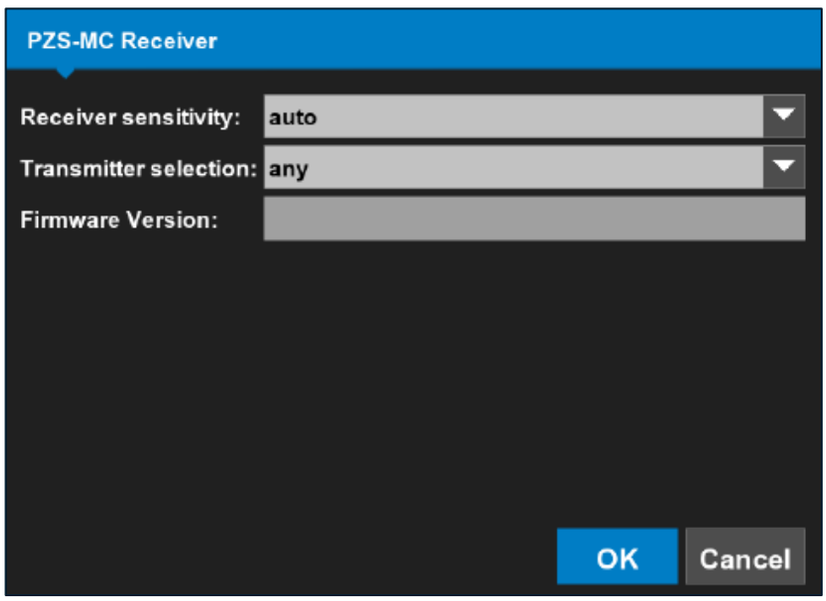


PZS-MC Receiver Setup

After mounting the PZS-MC receiver to the vibration pole, use 3DMC to configure the receiver for the machine.

1. With the blade placed on level ground, position the pole vertically, then mount the receiver on the pole.
2. Connect the GPS antenna cable and serial cable to the PZS-MC Receiver.
3. Select **Control > PZS-MC receiver** and select the following receiver parameters. Then press **OK:**

- **Receiver Sensitivity –** select the sensitivity level for detecting the transmitter, usually **Auto**. Select a different setting when working at very short or very long distances, or during inclement weather that can affect laser detection.
- **Transmitter selection –** select the channel to scan for mmGPS connection. The **Any** selection will allow the sensor to independently select the transmitter with the smallest error rate. If setting up only one transmitter, but the job has been configured for multiple transmitters, select the individual ID of the transmitter for the sensor to detect.
- The **Firmware Version** will show the firmware version of the connected PZS-MC receiver.



PZL-1 / LZ-T5 Transmitter Setup

After loading a control point file (GC3) that stores all transmitter information, including calibration data, setup location, and height data, activating the transmitters in 3DMC is the final step.

NOTE: *Changing a Control Point file will change the transmitter information.*

mmGPS Transmitters communicate with 3DMC over a designated channel. To setup the mmGPS channel on your machine, follow the following steps:

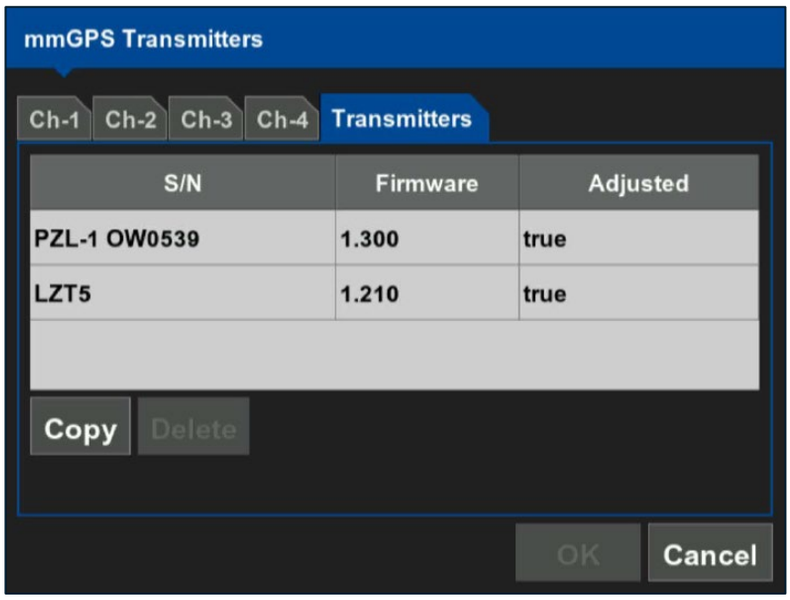
1. Go to **Control > mmGPS > Transmitters**

2. Select channel tab to change, for example, Ch-1 for channel 1.

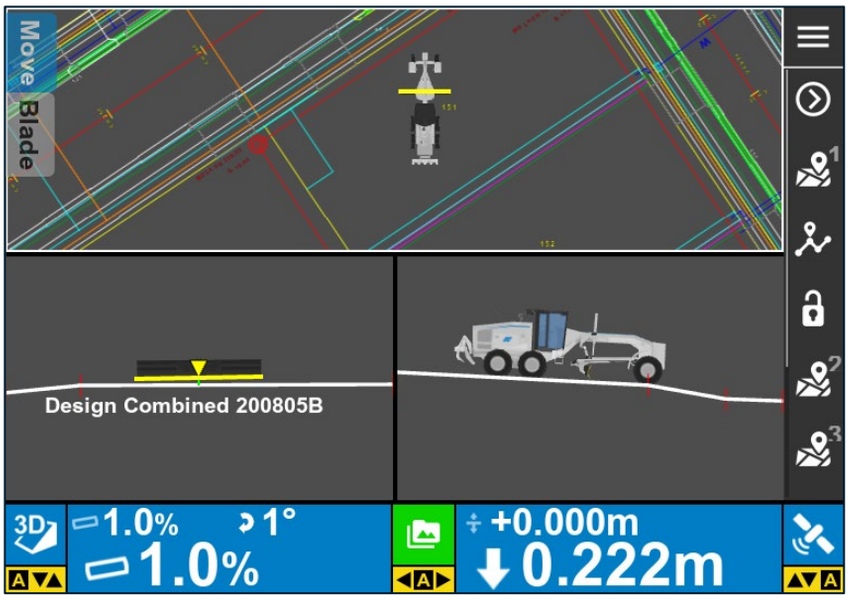
3. Select a **Control point** value to use as reference.

4. As needed change the **Measure To** properties, choices are to measure to PZL-1 or LZ-T5, and select **Base**

5. Copy mmGPS calibration by selecting the **Transmitters** tab. All Transmitter data included in the previously imported **GC3 file** will populate in this list.



Depending on how many transmitters are set up on the jobsite will determine how many channels need to be activated (Up to 4 transmitters running at the same time, all occupying their own channel).



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	

Notes

Please use the space below to add any additional personalized notes.

Notes

Please use the space below to add any additional personalized notes.

Aptella

AUTOMATION +
POSITIONING TECH