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SMARTCONSTRUCTION

iMC User Guide

GENERAL EQUIPMENT & SUPPLIES, INC.

Table of Contents

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Loading Project onto Data Collector

Section 1

Version 12

Job Site Set-up: Loading Project on Data Collector

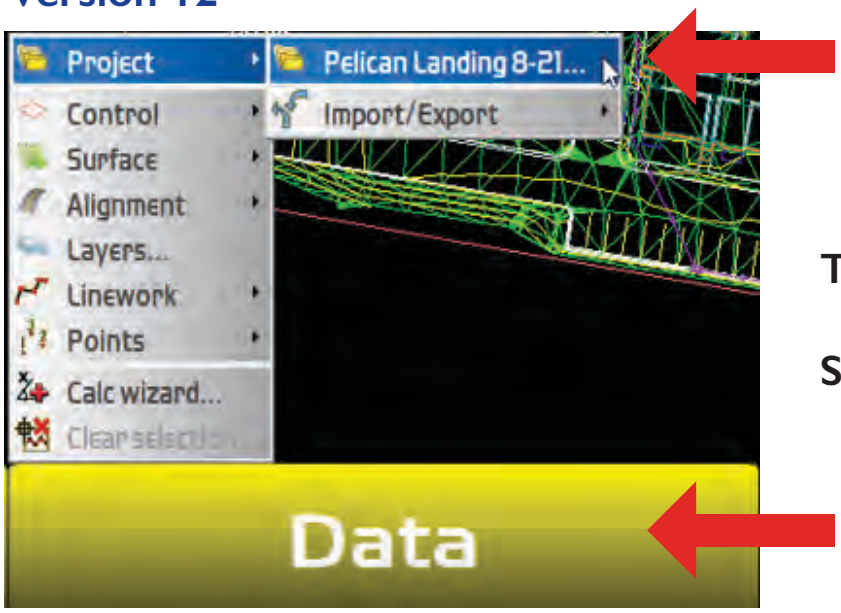
Files needed for building a machine control file:

1. **XML file:** Surface file
2. **DXF or DWG file:** Line work file
3. Is the site in US Survey Feet or International Feet?
4. List of control points: Northing, Easting, Elevation
5. PDF if available
6. Email these files to mstrehlow@genequip.com (Minimum of 2 weeks prior)

Copy TP3 file from mstrehlow@genequip.com to thumb drive.

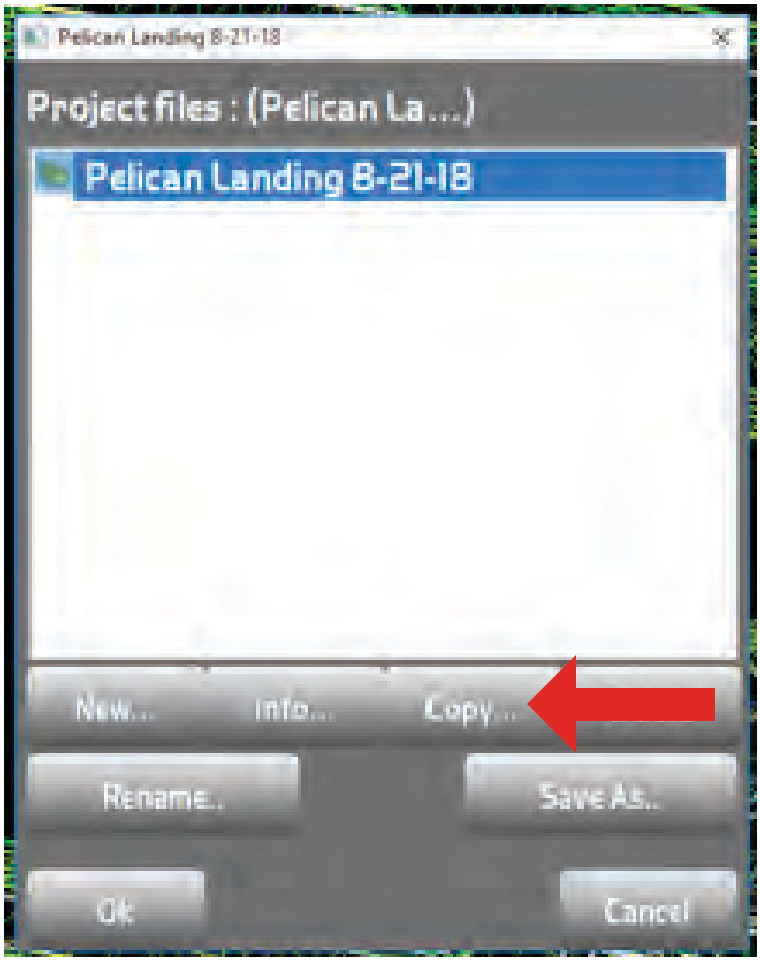
TOPCON

Version 12



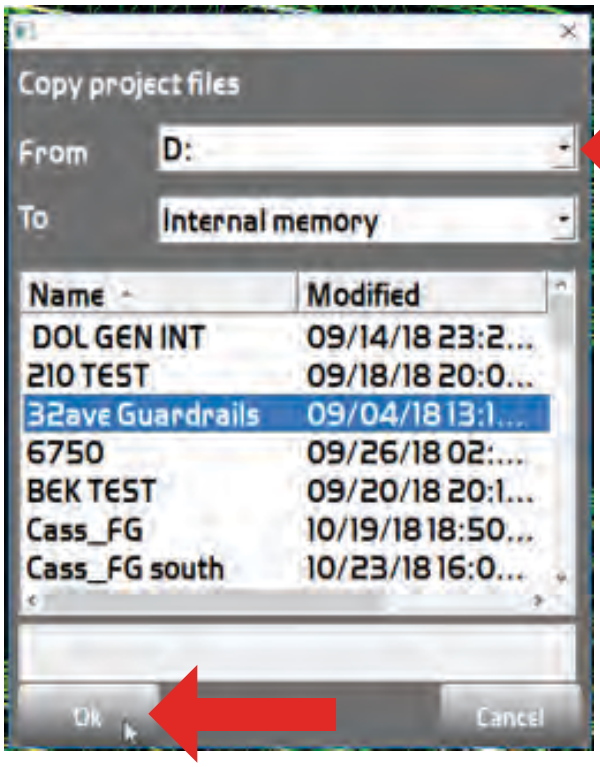
Tap **Data** then tap **Project.**

Select the current project.



Select **Copy.**

Version 12



Drop down box From Hard Disk D:

Drop down box To Internal Memory.

Find the job file you want copied and make sure it is highlighted and tap OK.

Make sure the job file you want to work on is highlighted.

Tap Ok.

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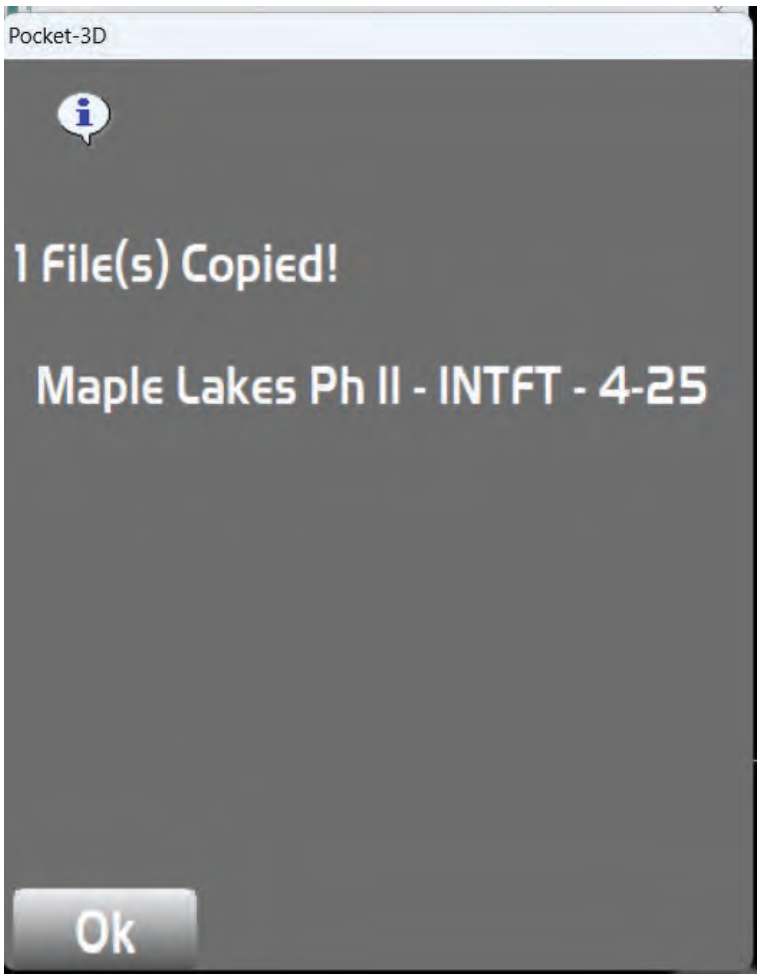

Set Job to current project.

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Starting Base and Connecting Rover to shoot control

Section 2

Version 12

What is Needed:

- Base, Rover and Data Collector
- Rover Rod set to 6.56 ft (2 Meters)
- Bi-pod legs
- T-Post
- 5/8” bolt and nut
- 2 Hose clamps

Pound in t-post near known control point and thread “Base” unit onto the bolt.

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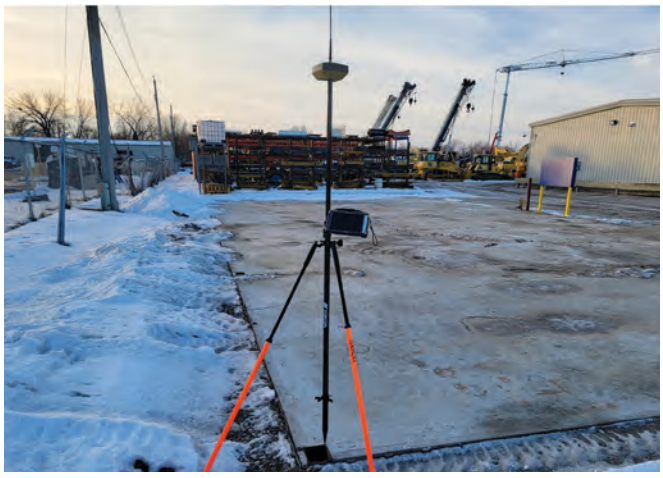


Thread the "Rover" onto your rover pole and extend to full length. (6.56 feet).

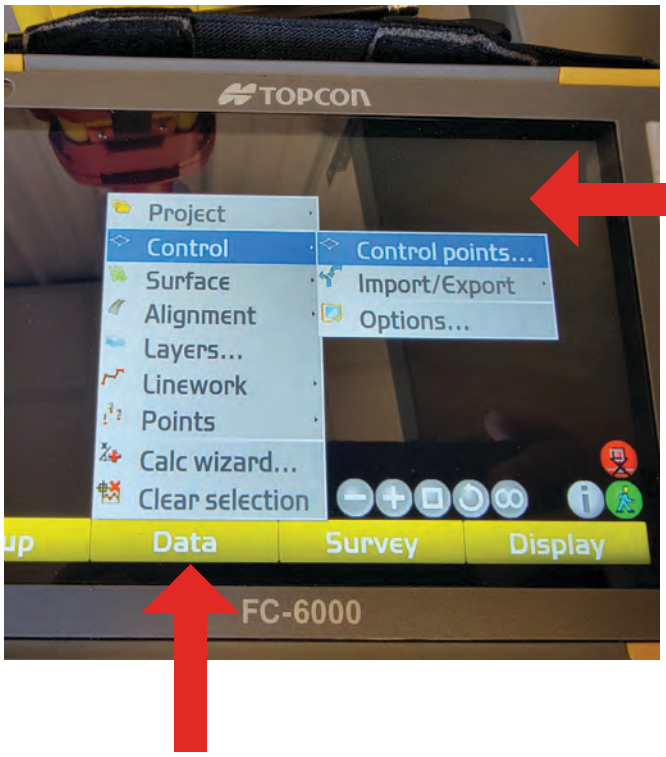
Turn both units on.

Go into data collector and add base into control points.

- Data, Control, Control Points, Add.
- Name the control point "Base" and use the full number without decimals of the Northing, Easting, and Elevation of the control point you are next to.

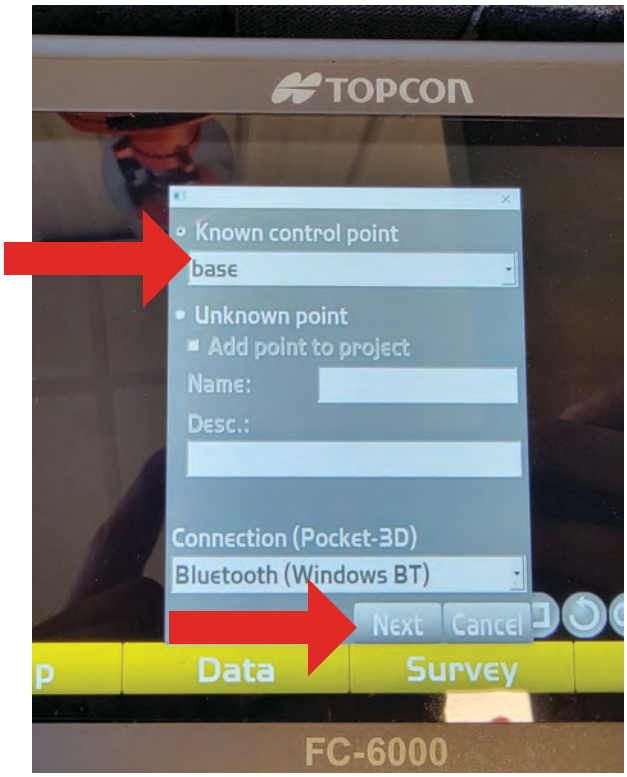
  Ex: Control point 106:
  North- 1395834.809
  East-478793.219
  Elev- 980.45

  When setting base
  North-1395834
  East-478793
  Elev-980



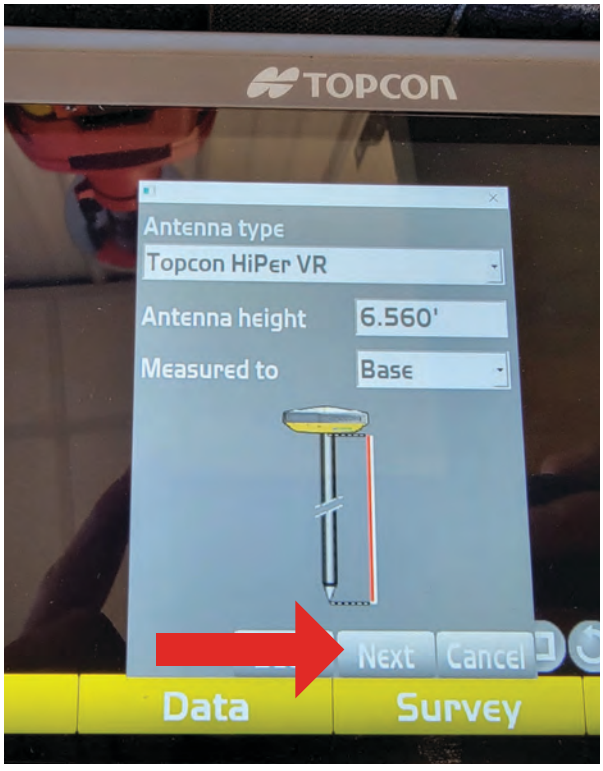
Back out to the main project screen.

Version 12



Setup, GPS Base Station

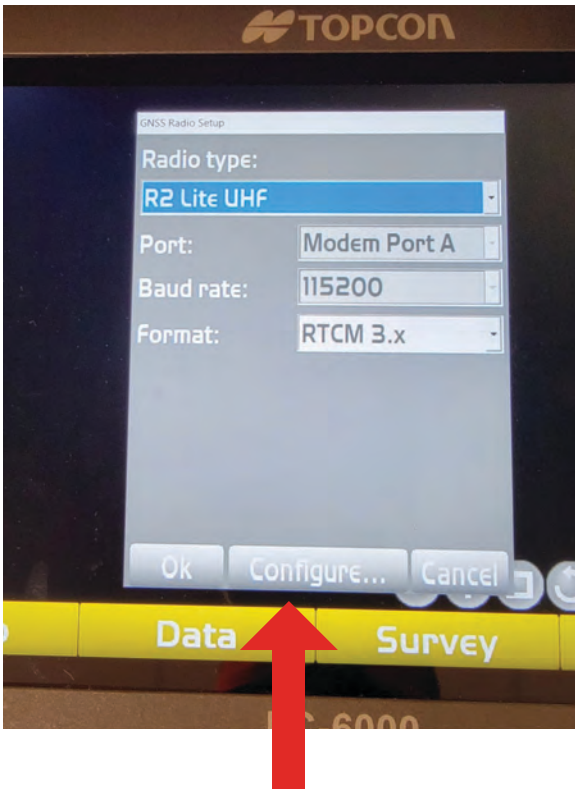
- Setup on known control point: Base
- Click **Next.**



Verify that the antenna type is the model of unit you are using.

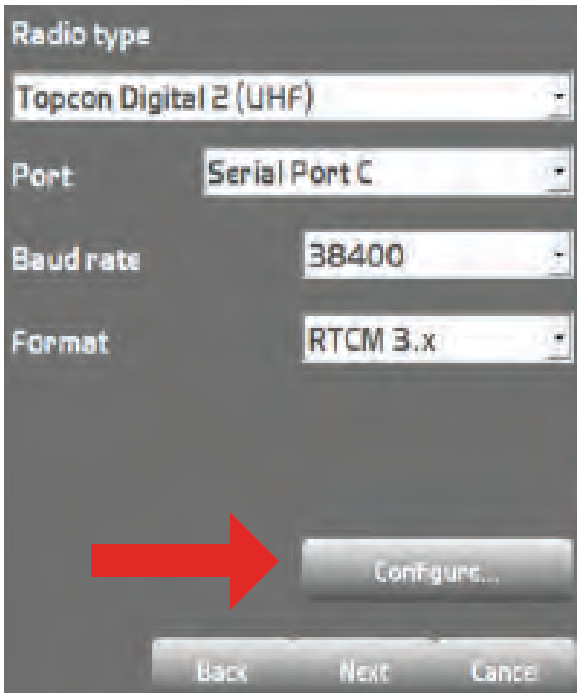
- Either HiPer-VR, GR-5, or Hiper V
- Antenna height: 6.56
- Measured to: Base
- Click **Next.**

Version 12



For Hiper VR

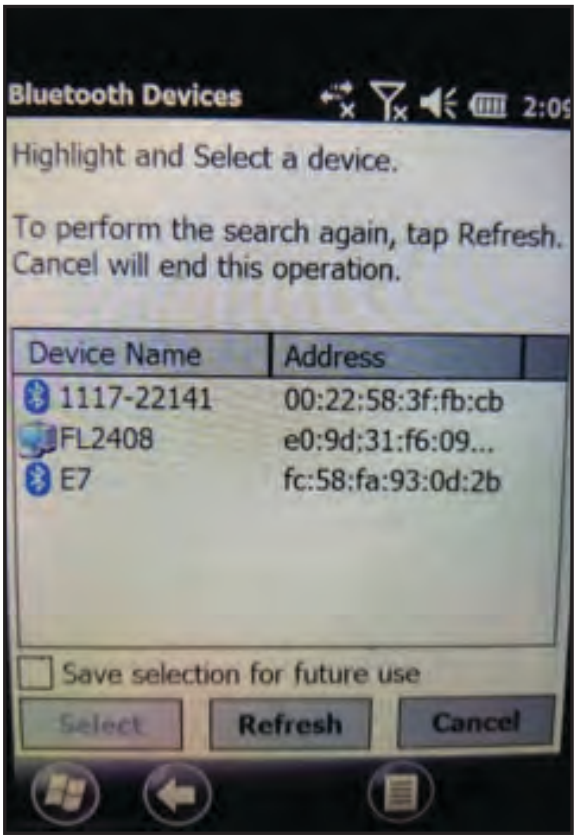
- Radio type: R2 Lite UHF
- Port: Modem Port A
- Baud Rate: 115200
- Format: RTCM 3.x
- Click Configure

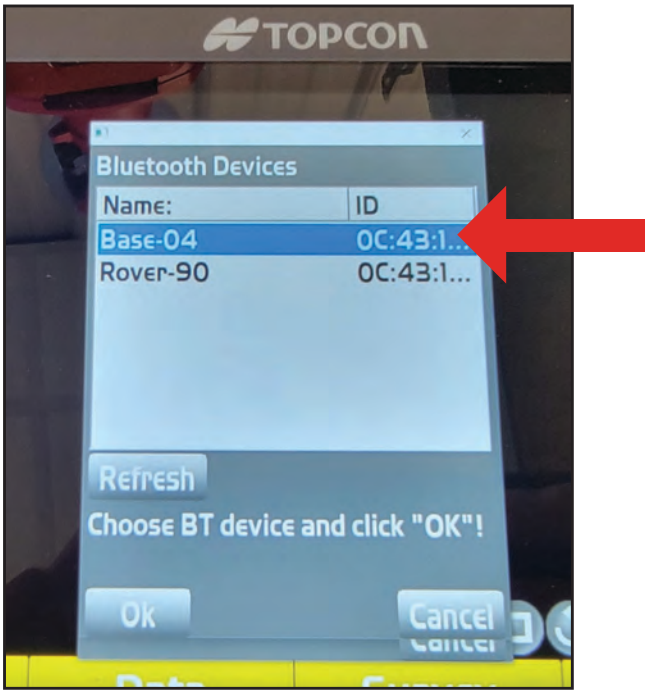


For GR-5/Hiper V

- Radio type: Topcon Digital 2 (UHF)
- Port: Serial Port C
- Baud Rate 38400
- Format: RTCM 3.x
- Click Configure

Version 12





Select the base unit that is on the t-post.

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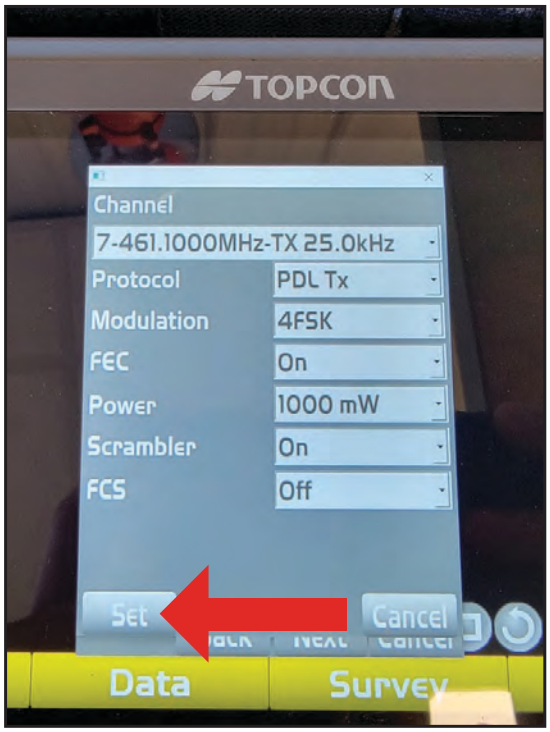
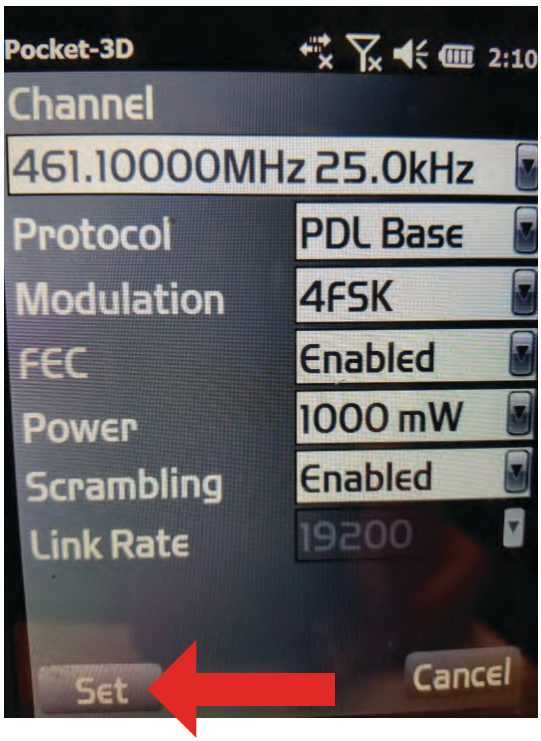


This is where you set the channel and tell the base what it will send out.

For Hiper VR

- Protocol: PDL Base/Tx
- Modulation: 4FSK
- FEC: On
- Power: 1000mW
- Scrambler: On
- FCS: Off
- Take a picture of this screen for later use
- Press Set.



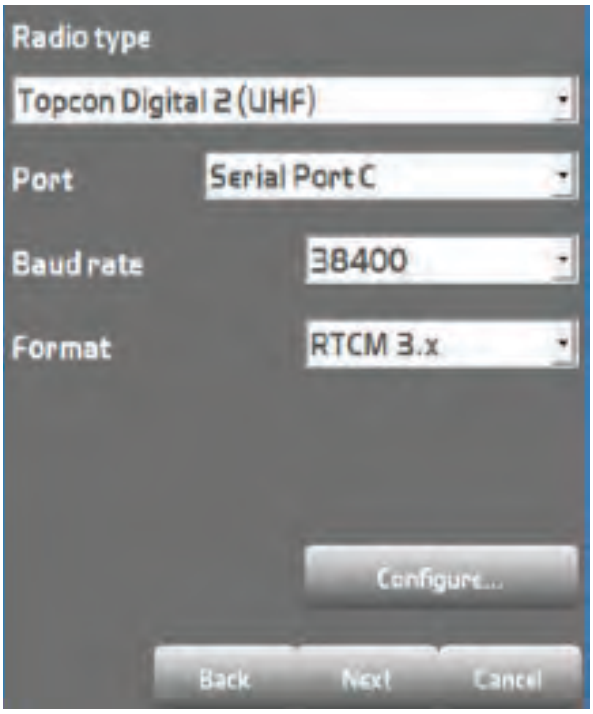
For GR-5/Hiper V

- Protocol: PDL Base
- Modulation: 4FSK
- FEC: Enabled
- Power: 1000mW
- Scrambling: Enabled
- Press Set.

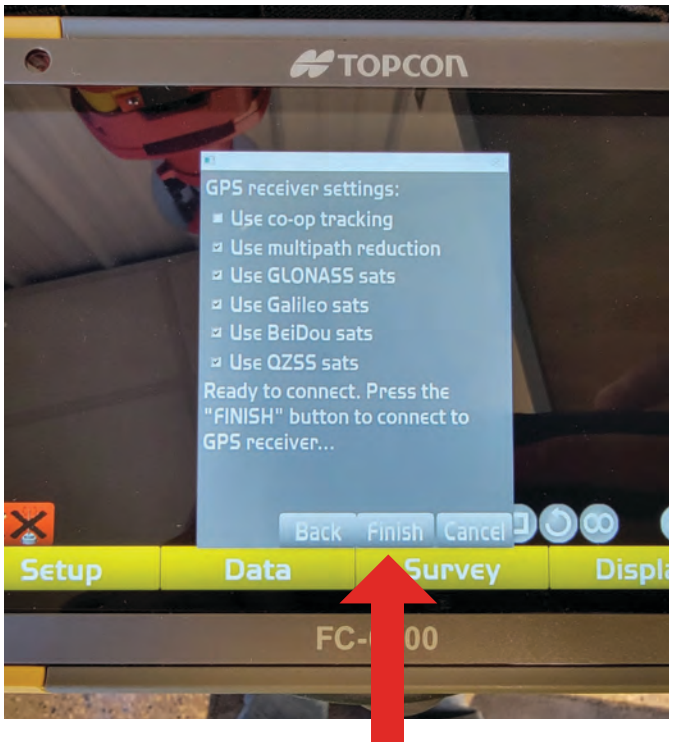
Version 12

This will bring you to the radio page again.

Press Ok/Next.



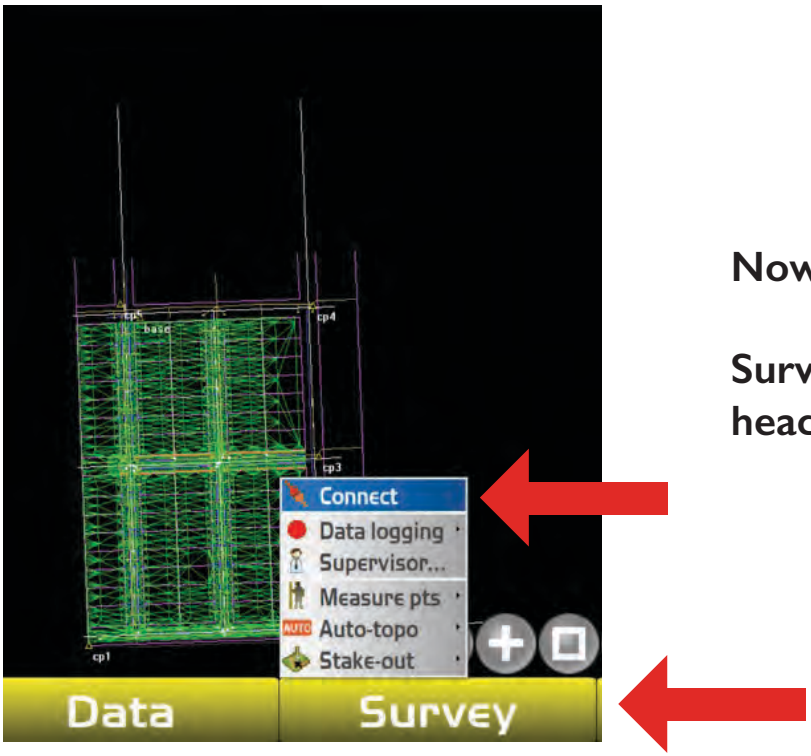
Version 12



GPS receiver settings

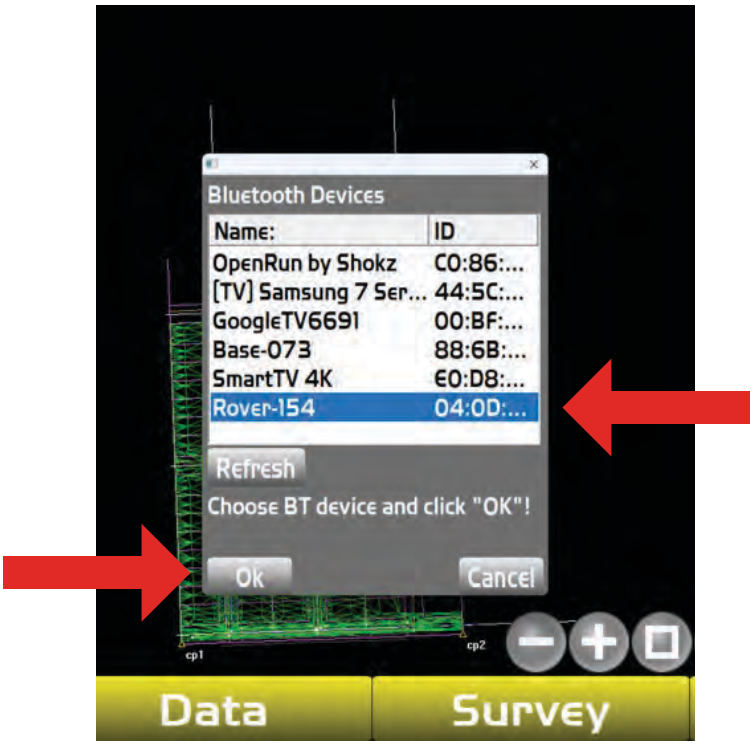
- Uncheck " Use co-op tracking"
- Check the rest of them on the list
- Click Finish
- Select the unit that is on the t-post

Version 12



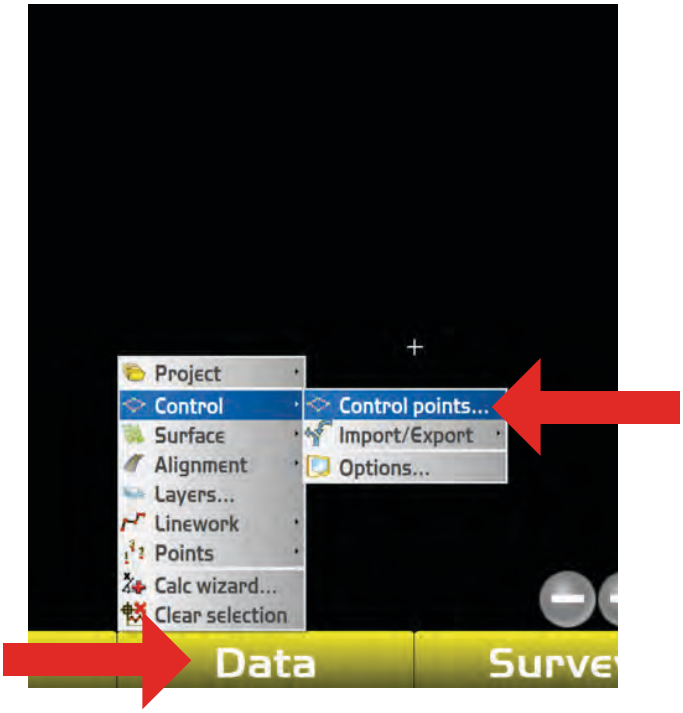
Now connect the rover.

Survey, connect, select the rover head unit.



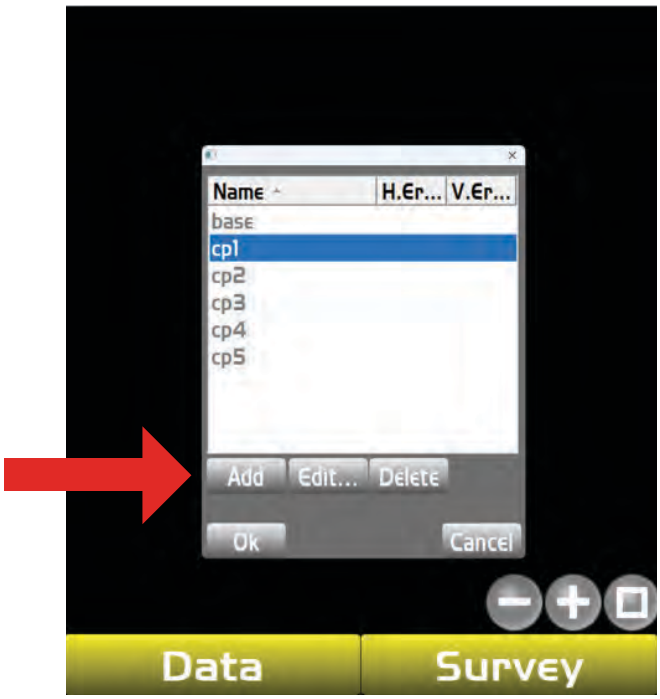
Click Ok.

Version 12



Go to each control point on site and enter the North, East, and Elevation for each control point before measuring it in.

Data, control, control point.



Click Add.

Version 12

Add the name of the control point and then add in the North, East, and Elevation of the control point.

After the N,E,E are typed in stay on this page.

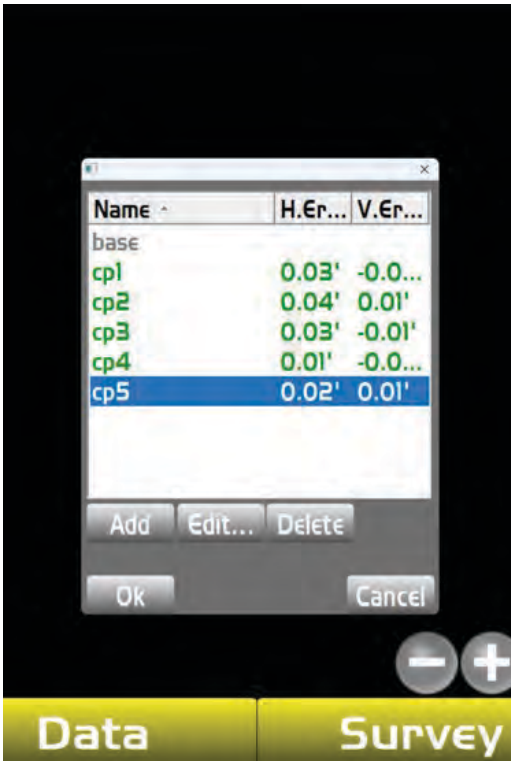
Click the GPS tab in the middle of the screen.

Click the check box next to use horizonal and vertical and then click Measure.

After it is measured click Ok.

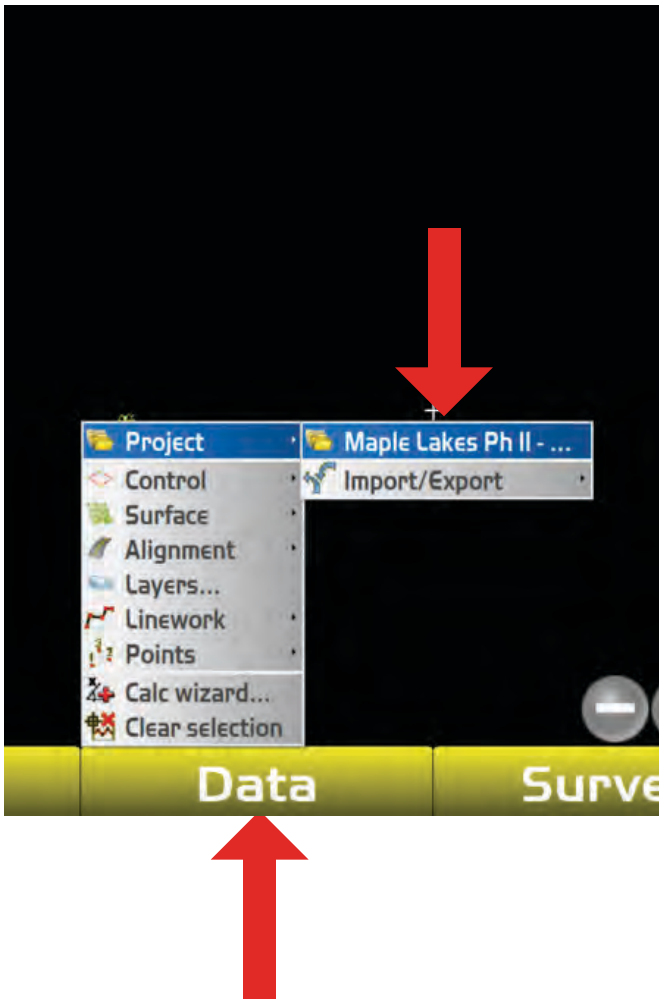
Version 12

Once you have measured your first point you will repeat the steps to measure in all the control points on the jobsite.



Once all the points are measured you will want to verify you have at least 4 green points. If there are more on-site measure all of them but you need a minimum of 4.

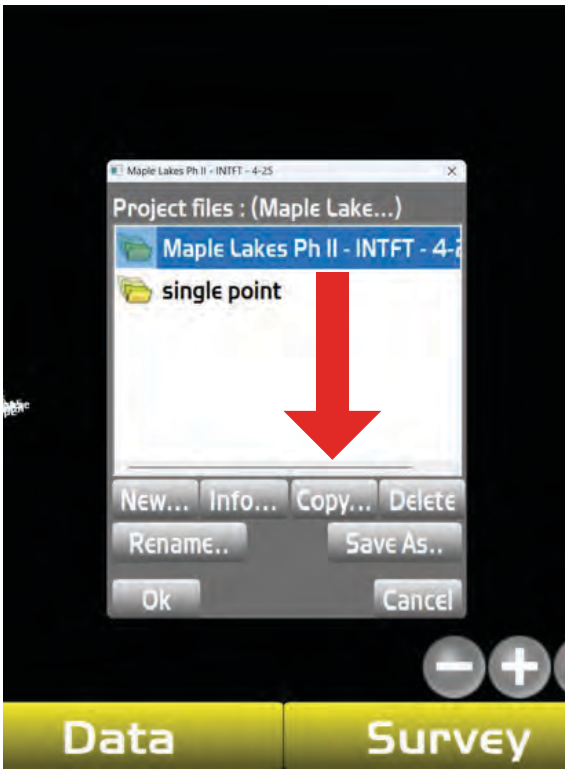
Version 12



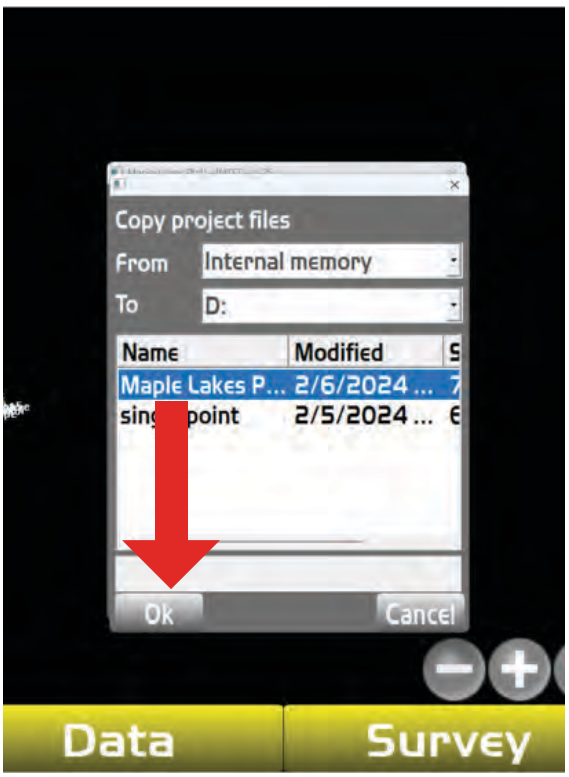
Once all of the points are measured you can copy the job onto the thumb drive and put it into the machines on site.

Data, projects, click on the current project.

Version 12



On the file list screen click copy.



Click the drop boxes to have Internal memory to D.

Highlight the project you want to copy over and then click Ok.

The file is now copied over to the thumb drive.

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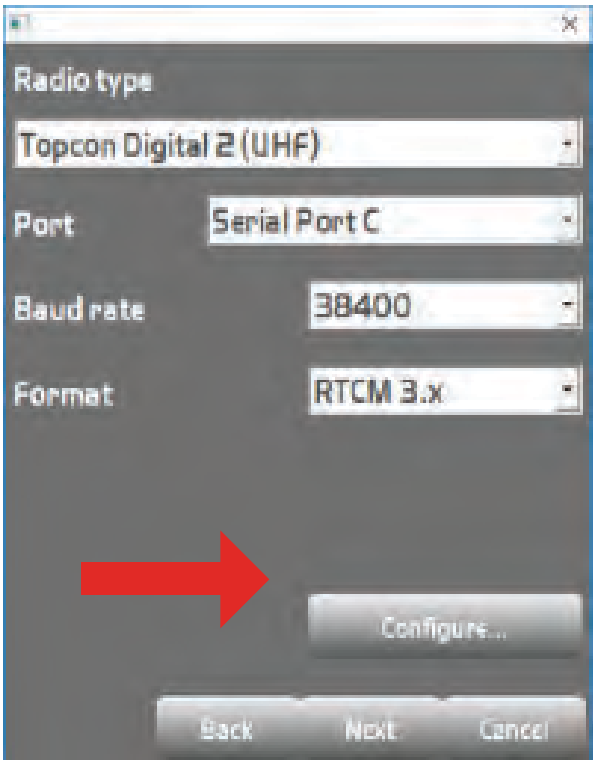
Connecting Rover to Base

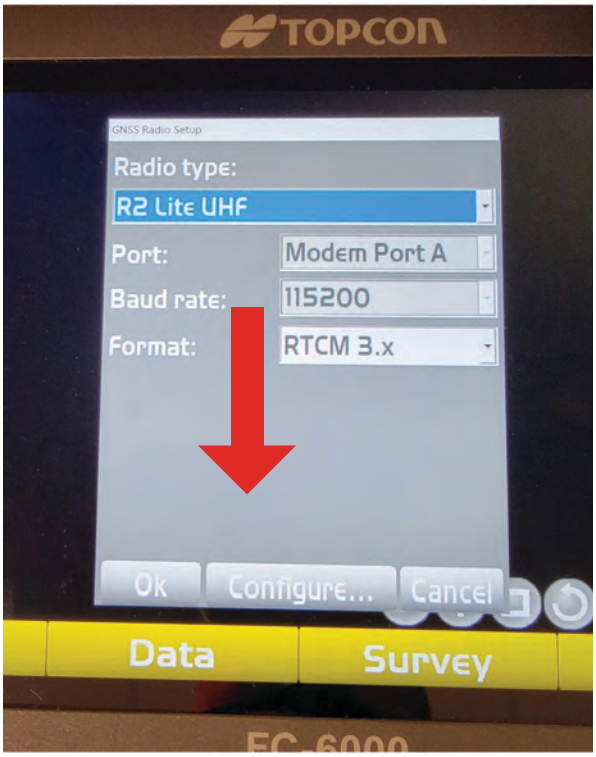
Section 3

Version 12



Setup, Radios (GR5/Hiper V)

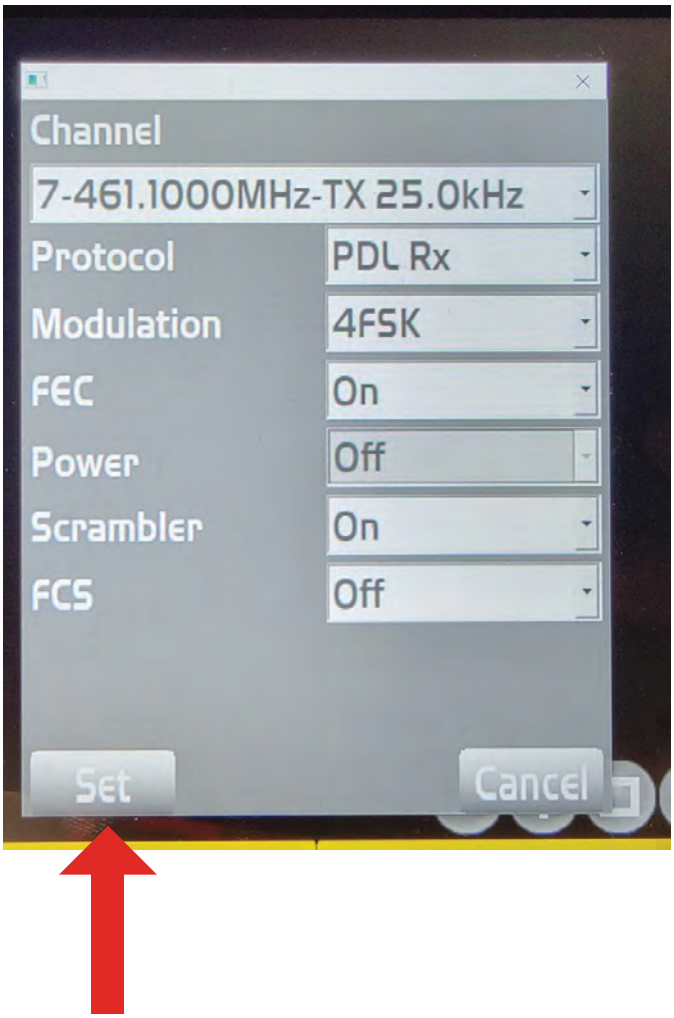
- Radio type: Topcon Digital 2 (UHF)
- Port: Serial Port C
- Baud Rate 38400
- Format: RTCM 3.x
- Click Configure
- Select the unit that is on your rover pole
- Click Select



Setup, Radios (Hiper VR)

- Radio type: R2 Lite UHF
- Port: Modem Port A
- Baud Rate 115200
- Format: RTCM 3.x
- Click Configure
- Select the unit that is on your rover pole
- Click Select

Version 12



Match the channel on this page to the channel you set the base on (Reference picture you took).

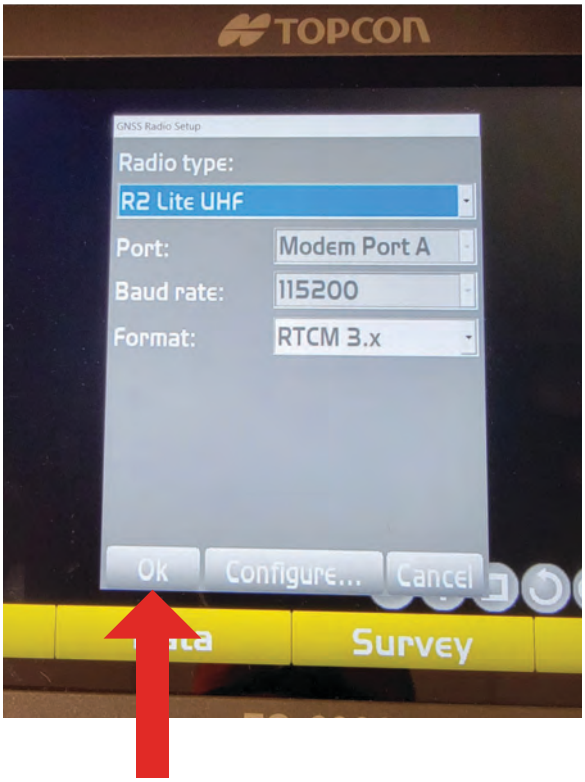
GR-5/Hiper V

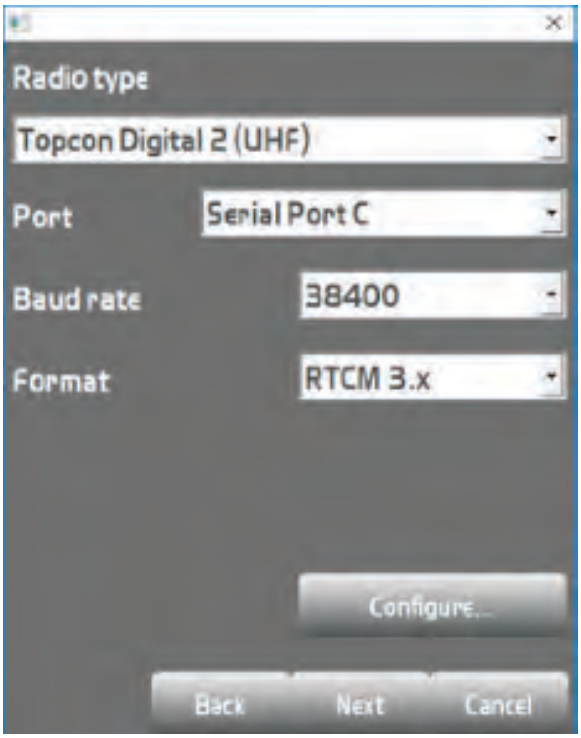
- **Protocol: PDL Rover**
- **Modulation: 4FSK**
- **FEC: Enabled**
- **Power: 1000mW**
- **Scrambling: Enabled**
- **Link rate: grayed out**
- **Click Set**

Hiper VR

- **Protocol: PDL Rx**
- **Modulation: 4FSK**
- **FEC: ON**
- **Power: Grayed out**
- **Scrambler: ON**
- **FCS: OFF**

Version 12

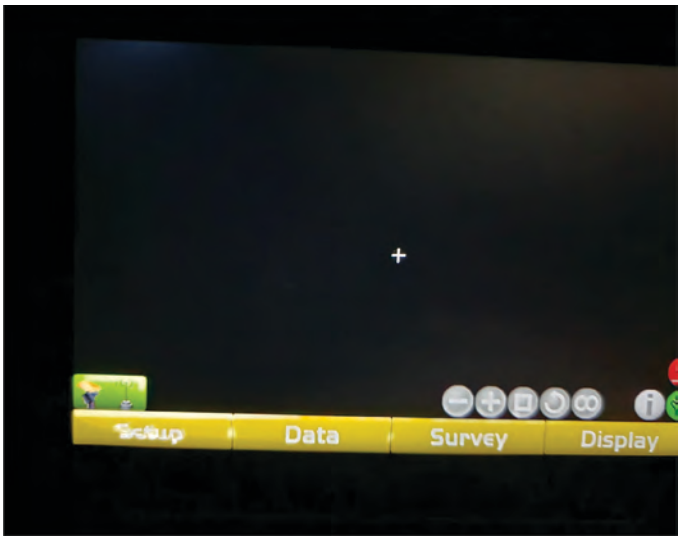




This brings you back to the radio page.

Click Ok.

Version 12



You will go green if the channels and the settings match on the "Configure" screens for both the base and rover.

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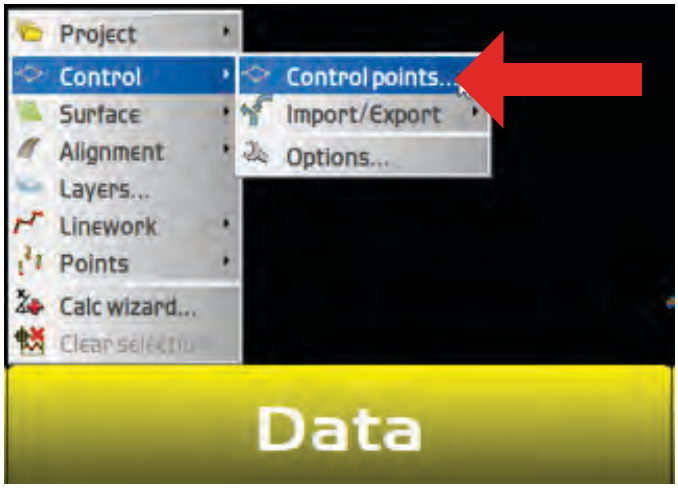
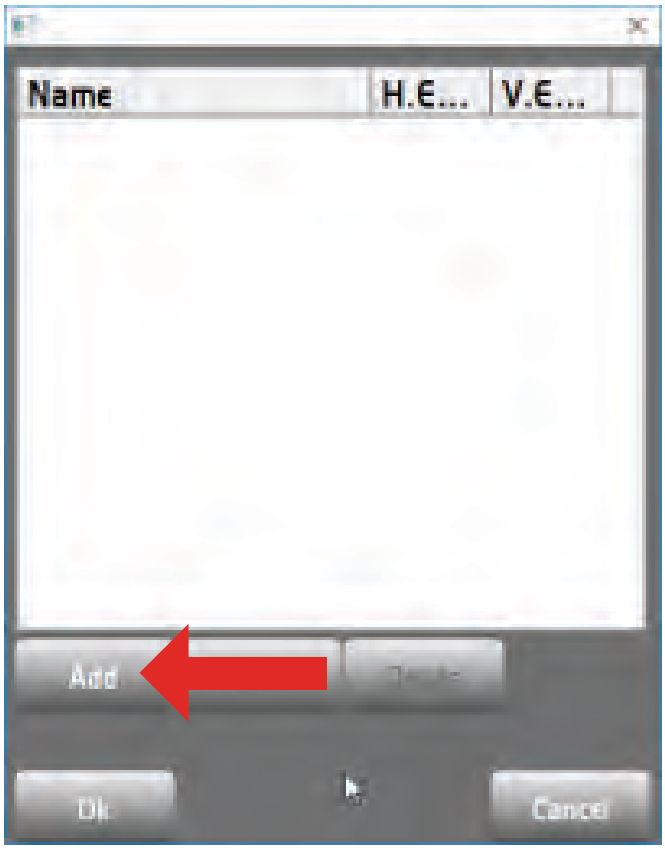
Localize Job Site

Section 4

Version 12

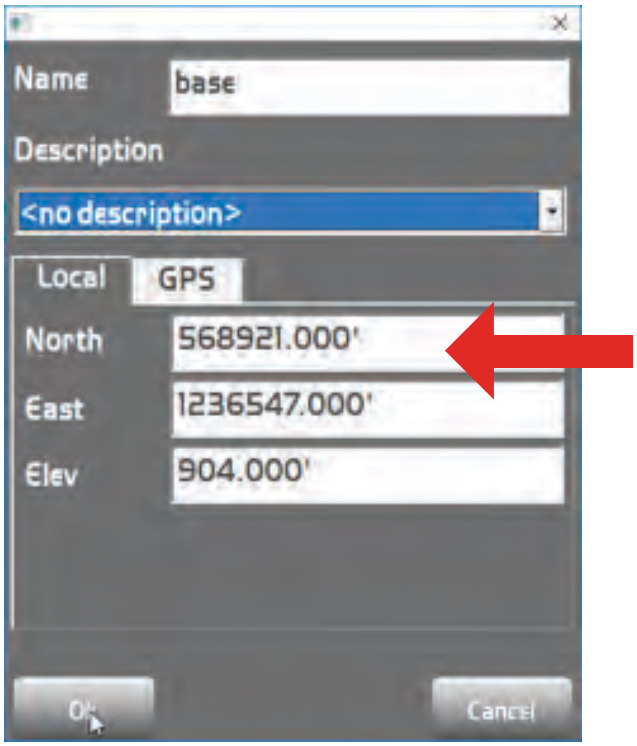


Each jobsite needs to be localized with control. Best practice is to surround the job site with a minimum of 4 points. Tap Data, tap Control, then Control Points.



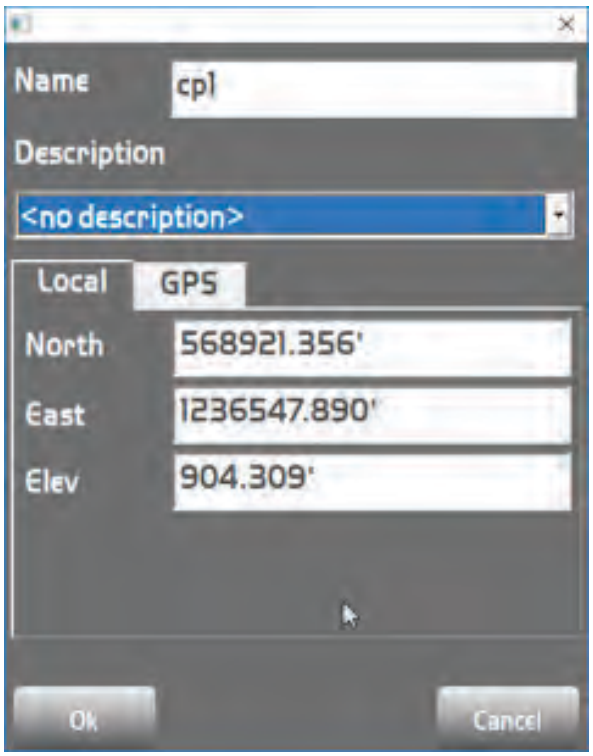
Tap Add.

Version 12



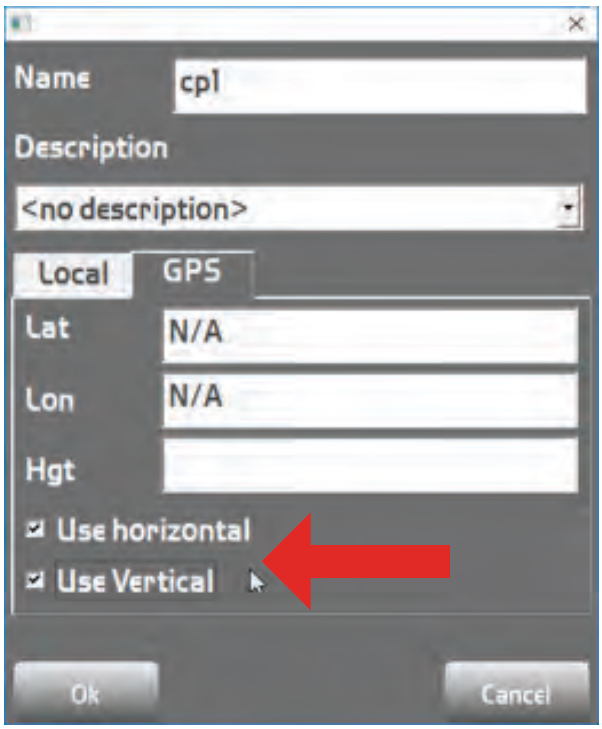
Base needs to be the first control point. Enter a value for North, East and Elevation.*

*Best practice is to set-up next to a control point and enter the control point value without the decimal point.



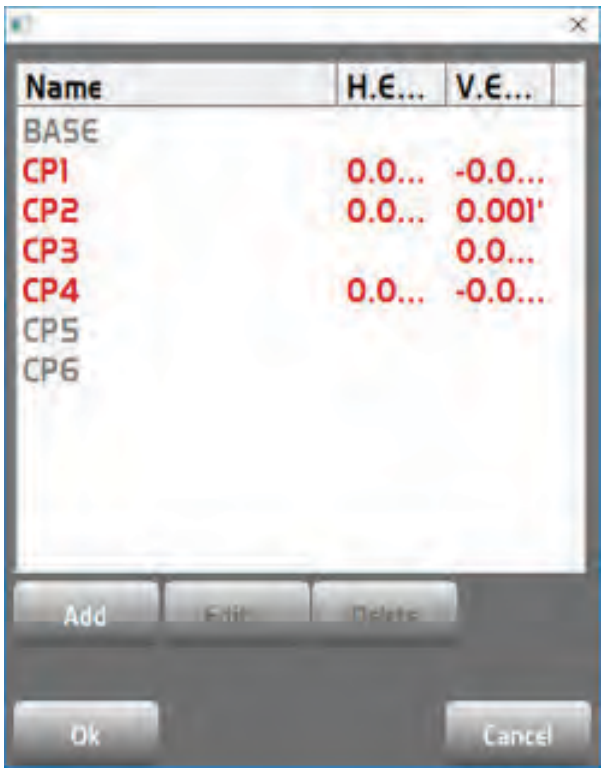
Add next point and title point as titled by engineer or lathe. Enter the North, East, and Elevation from engineer or what is written down on the lathe. After values are entered select the GPS tab.

Version 12



Position your rover over the Control Point. Check the boxes next to Use Horizontal and Use Vertical.

Tap Measure. Repeat these steps for the remaining points.



In the Control Point list page verify that your controls are green. If they are red select the control point and hit edit. Verify that the number you entered matches the numbers from the engineer or what is written on the lathe. Uncheck Use Horizontal or Use Vertical one at a time. Starting with the point that has the largest error until points are listed in green.

NOTE: Once completed, it is a good practice to stake out to a control point to verify accuracy.

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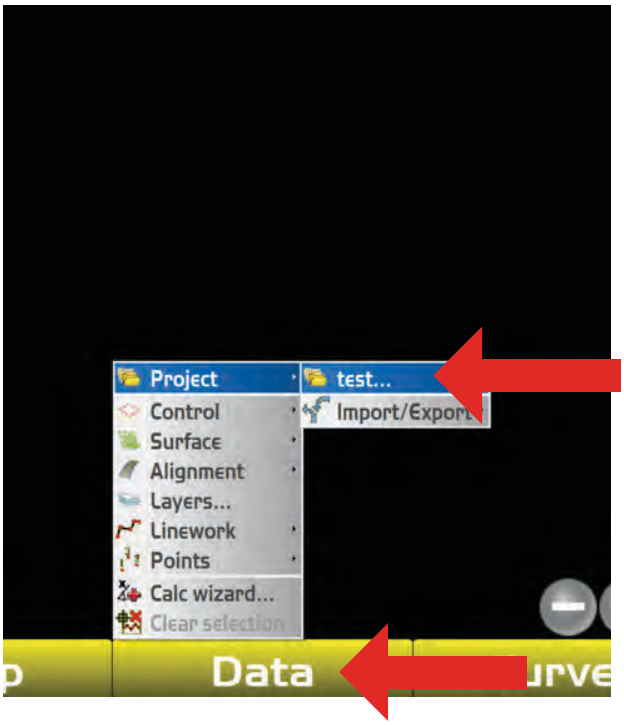
Single Point Localization

Section 5

Version 12

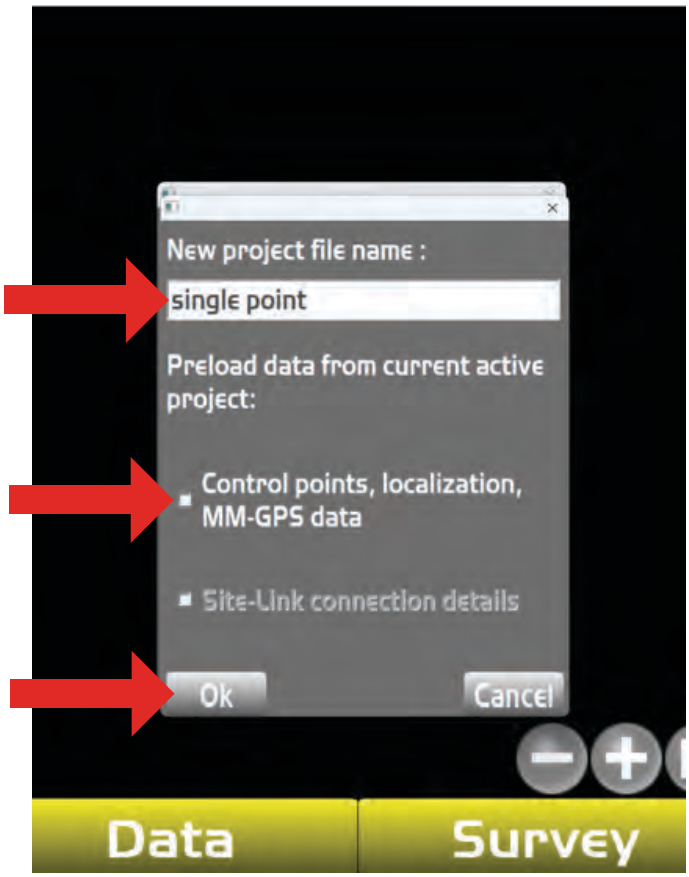


To start a new project for a single point localization tap data, project, and then select the top box. (This will be the current project or may say "none").

This will bring you to the list of projects in the data collector.

Next click New.

Version 12

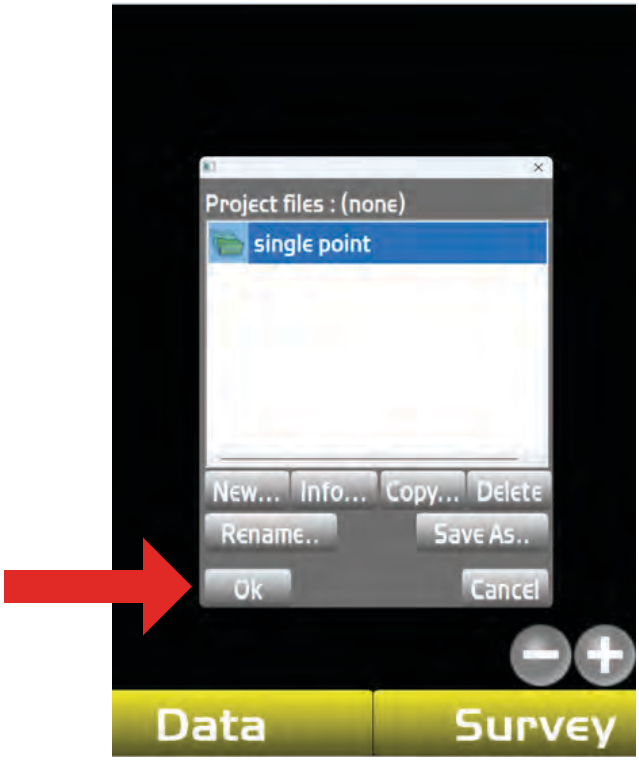


Click on the New project file name box and title your project.

Once you name it you will want to make sure to uncheck the box next to "Control points, localization, MM-GPS data."

Tap Ok.

Version 12



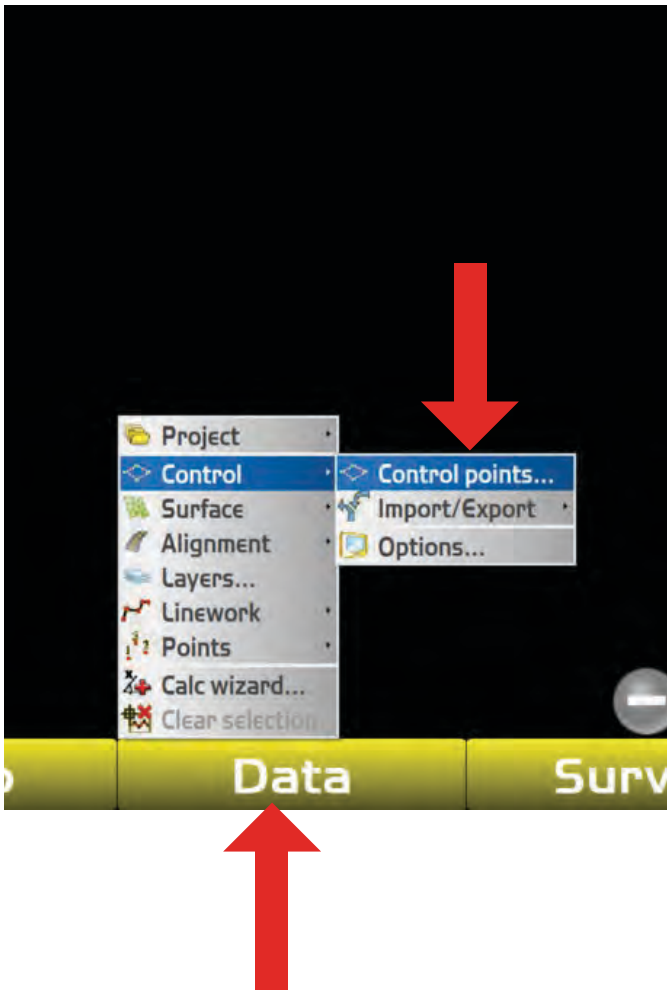
This will bring you back to the list of projects that are in the data collector.

Next highlight the project that you created and click Ok.

It will then ask if you want to set the project as the current project.

Click Yes.

Version 12



This will bring you back out to the main screen.

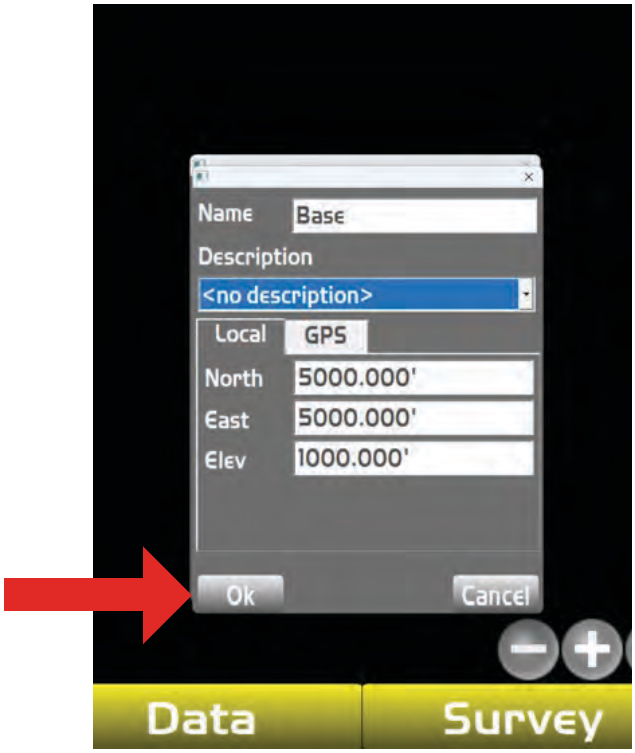
Now that the project is created you will need to add the base point and one control point.

Click on data, control, and then control points.

Version 12

This should bring up a blank screen with no control points entered yet.

Click Add.

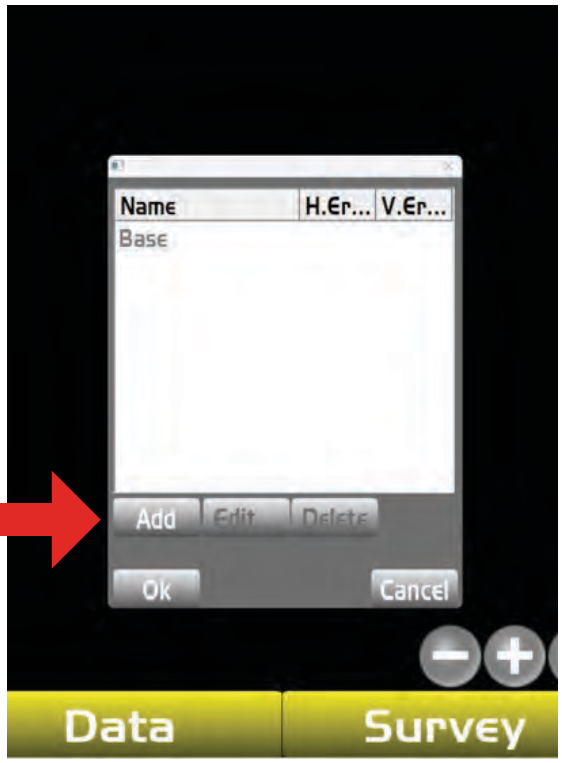


Name your first point "Base" and then set the local coordinates to:

North: 5000
East: 5000
Elevation: 1000

Then click Ok.

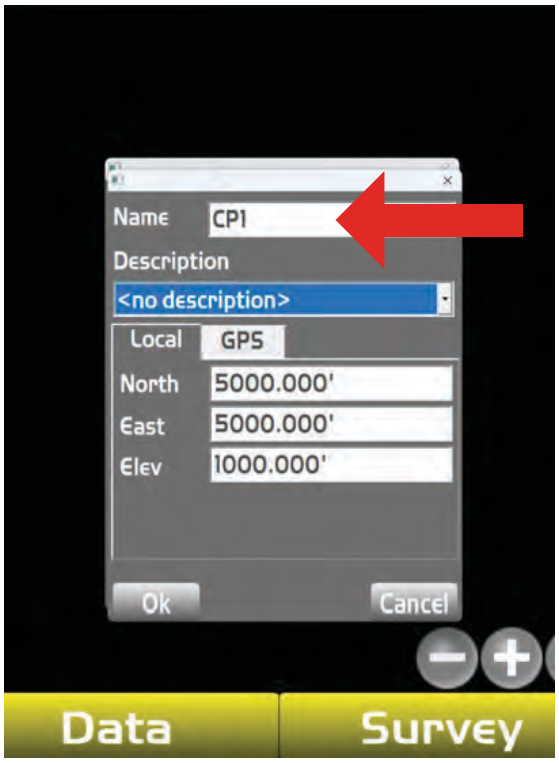
Version 12



"Base" will now show up on the control point list.

Next you will add a control point named "CP1."

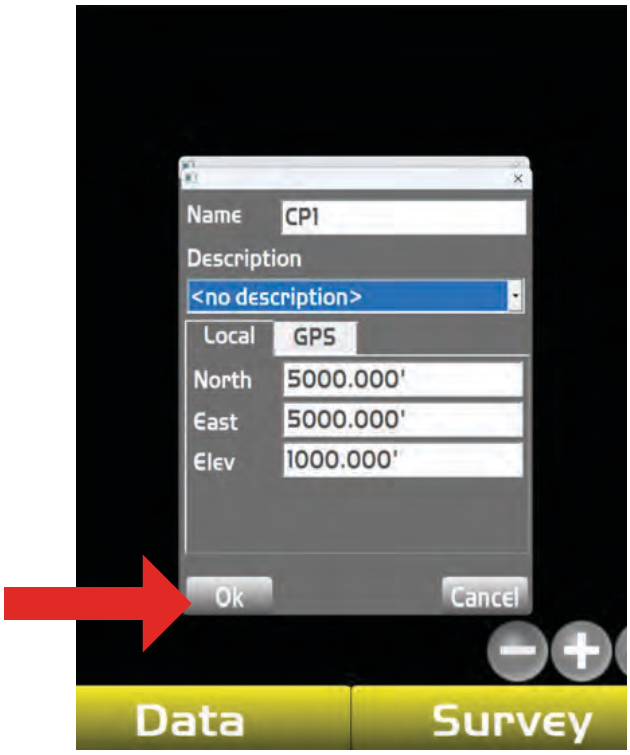
Click Add.



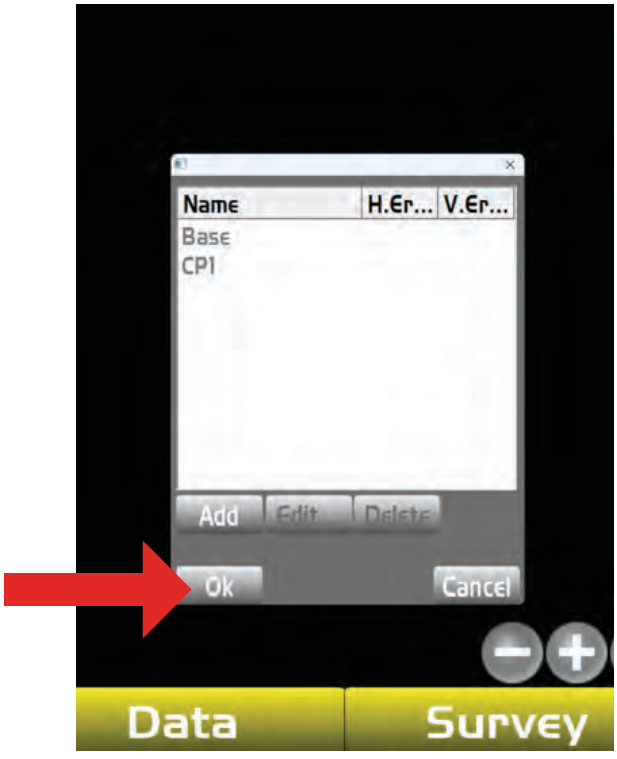
Title the point "CP1" and set the local coordinates to:

North: 5000
East: 5000
Elevation: 1000

Version 12



Then click Ok to get back to the control point list.



Click Ok again to go back to the main project screen.

Version 12

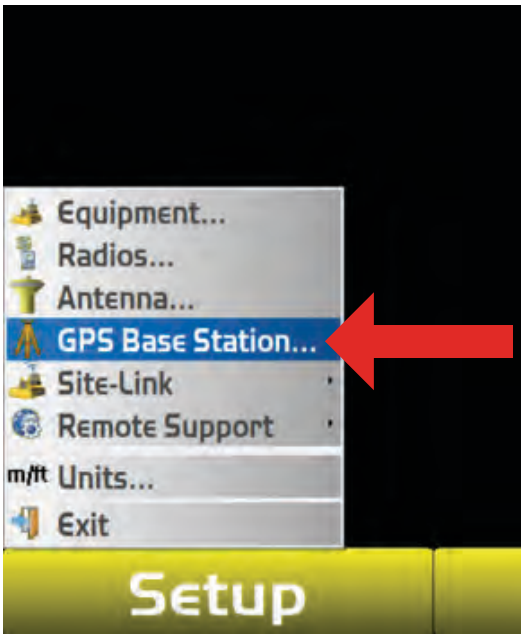
What is needed:

- **Base, Rover, and data collector**
- **Rover rod set to 6.56 ft (2 Meters)**
- **T-post or sturdy tripod**
- **5/8” bolt and nut**
- **2 hose clamps**

Now you will need to either pound in a t-post or set up a tripod to run the base on. If you plan to be on this job for a prolonged period of time it is best to use a t-post to make sure that the base location does not move as you will have to start over if the base location is moved or wiped out.

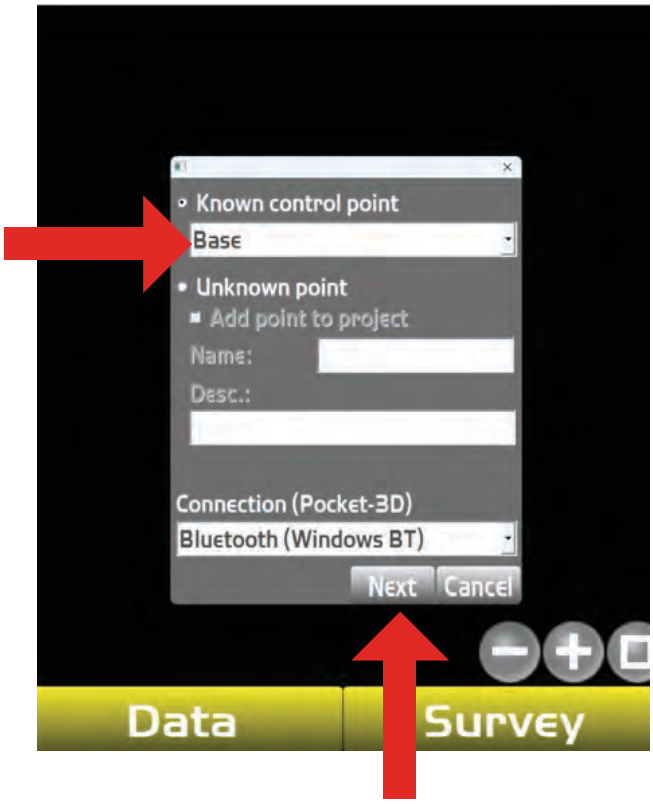
Once your base post/tripod is setup, thread the “base” head unit onto the bolt and power the head unit on.

Version 12



Next thread the "Rover" head unit onto the rover rod and power the head unit on.

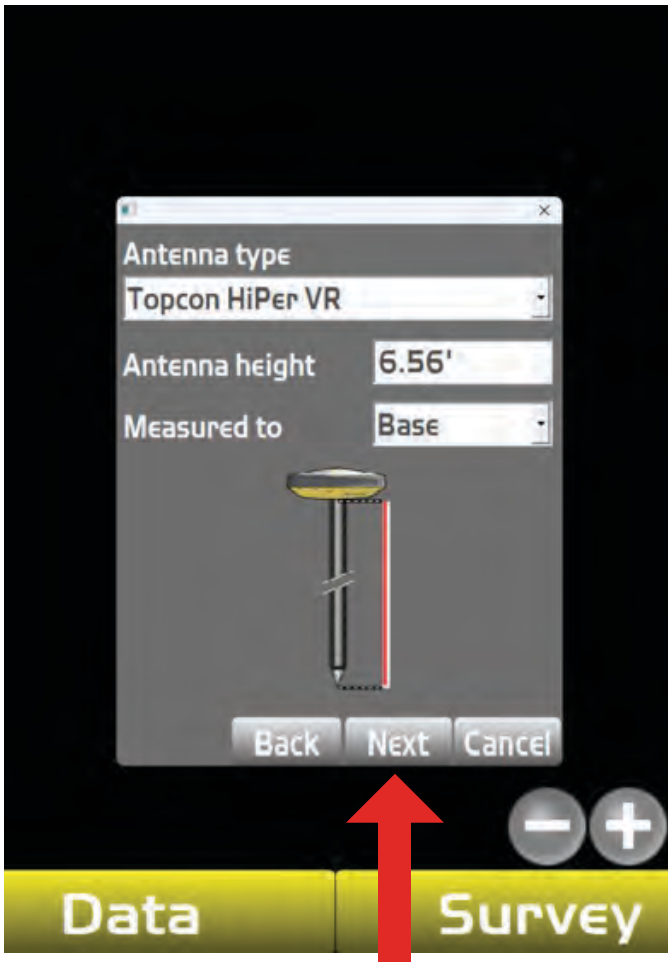
Now go back to the data collector and go into setup, GPS Base Station.



Setup on known control point "base" in the first drop down box.

Click next.

Version 12



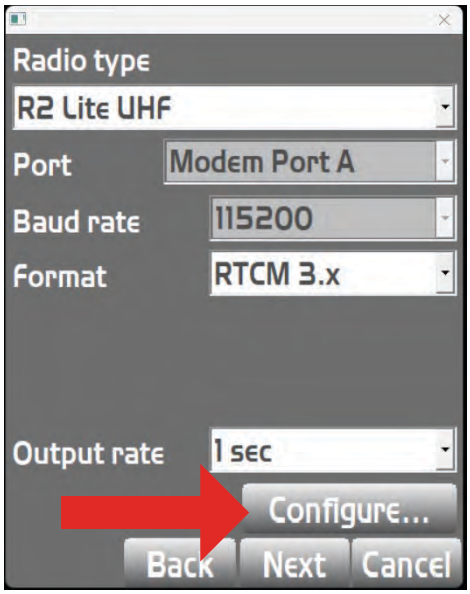
Verify that the antenna type is the model of head unit you are using: either HiPer-VR, GR-5, or Hiper V.

Antenna height: 6.56'.

Measured to: Base.

Click next.

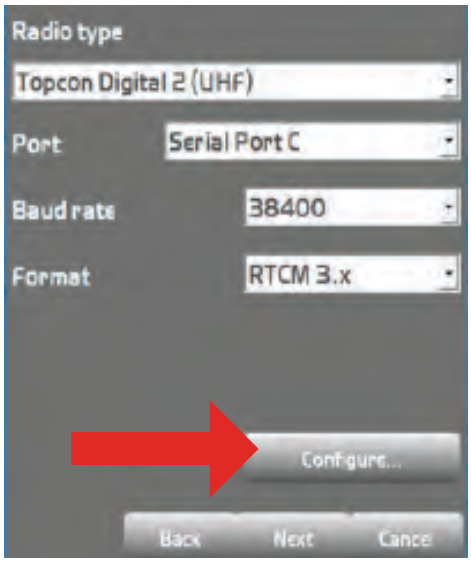
Version 12



This next screen is the radio type, the settings will be different for each head unit so verify which model you use and then match it to the corresponding settings below.

For Hiper VR

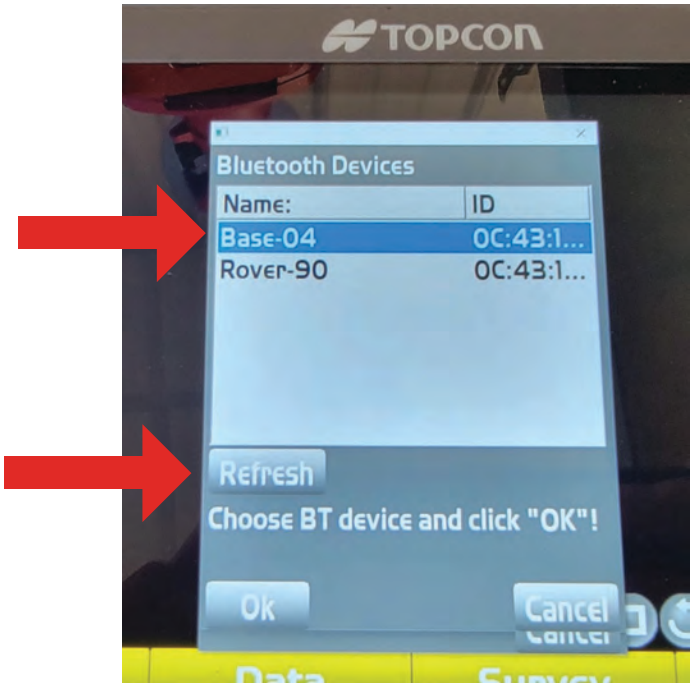
- Radio type: R2 Lite UHF
- Port: Modem Port A
- Baud Rate: 115200
- Format: RTCM 3.x
- Click Configure



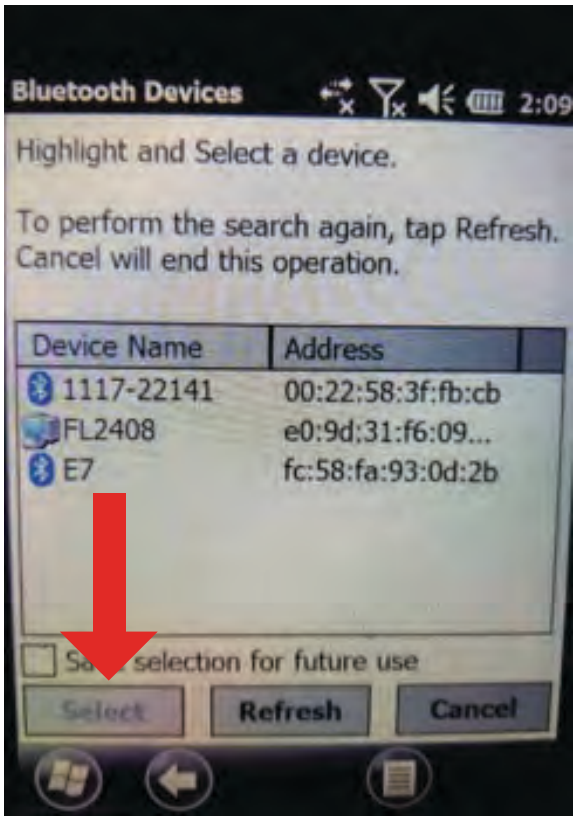
For GR-5/Hiper V

- Radio type: Topcon Digital 2 (UHF)
- Port: Serial Port C
- Baud Rate: 38400
- Format: RTCM 3.x
- Click Configure

Version 12



It will then prompt you to select a Bluetooth device. You will select the device name of the "base" unit. If you do not see this as an option, click refresh to update the current Bluetooth devices.



When the device you are looking for populates, select it and the click Ok or Select. This will depend on what model of data collector you are using.

Version 12

When it pulls up the channel page you will want to look at the channel and select the channel you desire to run off of. You will match the rover and your machines to this channel.

The settings below the channel will be as follows for the different head unit models.

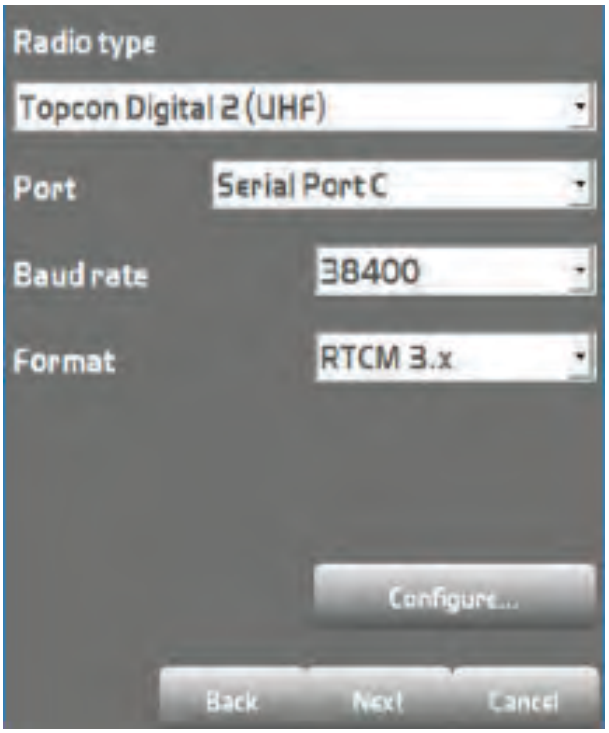
For Hiper VR

- Protocol: PDL Base/Tx
- Modulation: 4FSK
- FEC: On
- Power: 1000mW
- Scrambler: On
- FCS: Off
- Take a picture of this screen for later use
- Press Set

For GR-5/Hiper V

- Protocol: PDL Base
- Modulation: 4FSK
- FEC: Enabled
- Power: 1000mW
- Scrambling: Enabled
- Take a picture of this screen for later use
- Press Set

Version 12



This will then bring you back to the radio page.

Press Ok.

Version 12

The next page will be "GPS Receiver Settings."

Uncheck "Use co-op tracking."

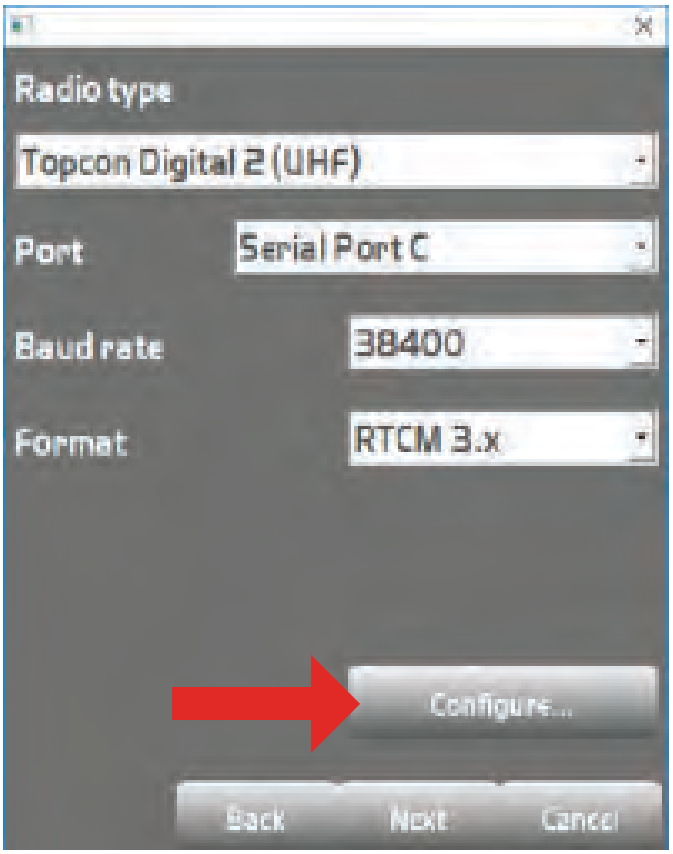
Check the rest of them on the list.

Click Finish.

Select the bluetooth unit that is on the t-post (same base unit).

Click Ok.

Version 12

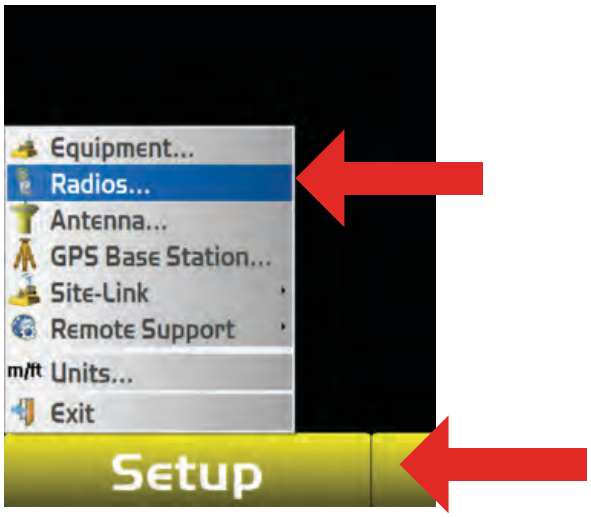


Next you will connect your rover up to the base.

Setup, Radios (GR5/Hiper V)

- **Radio type: Topcon Digital 2 (UHF)**
- **Port: Serial Port C**
- **Baud Rate: 38400**
- **Format: RTCM 3.x**
- **Click Configure**
- **Select the unit that is on your rover pole**
- **Click Select**

Version 12

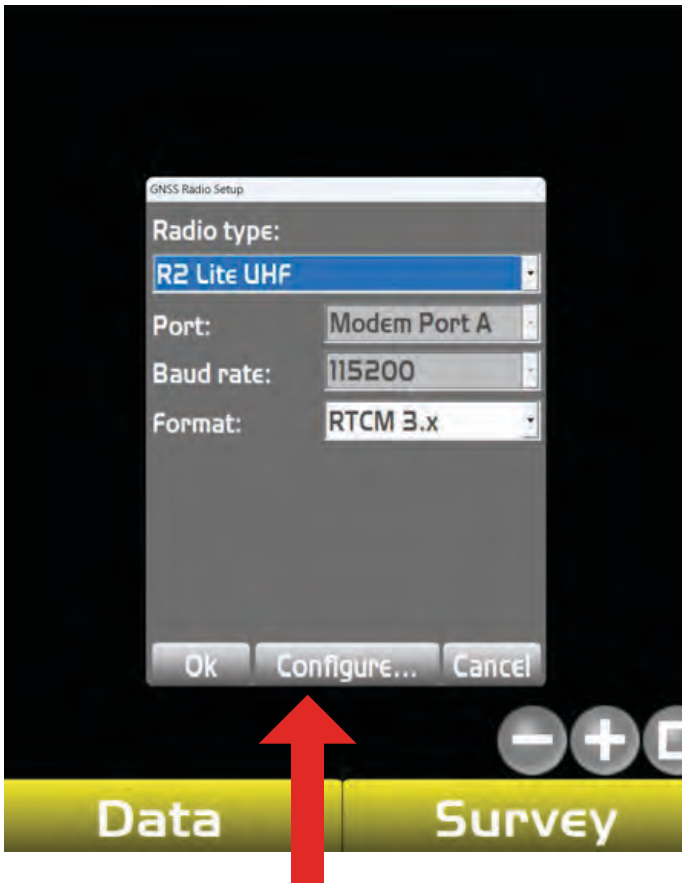


Setup, Radios (Hiper VR)

- **Radio type: R2 Lite UHF**
- **Port: Modem Port A**
- **Baud Rate: 115200**
- **Format: RTCM 3.x**

Click Configure.

Select the unit that is on your rover pole.



Click Select.

Version 12

Match the channel on this page to the channel you set the base on (Reference picture you took).

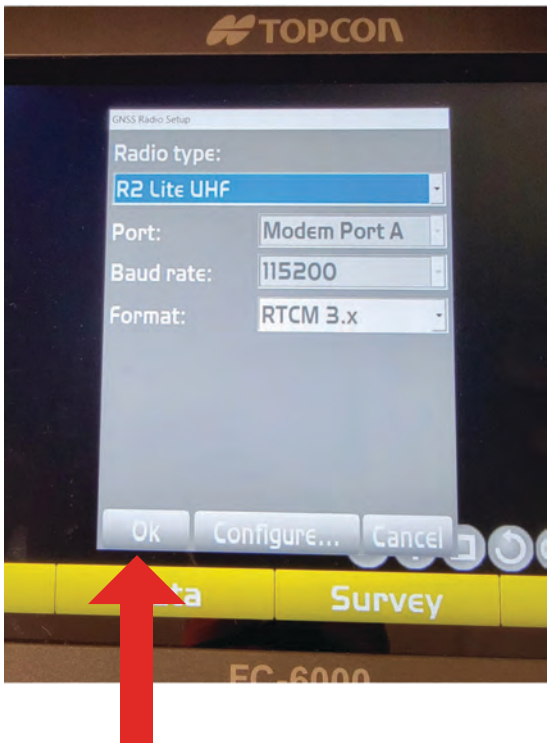
GR-5/Hiper V

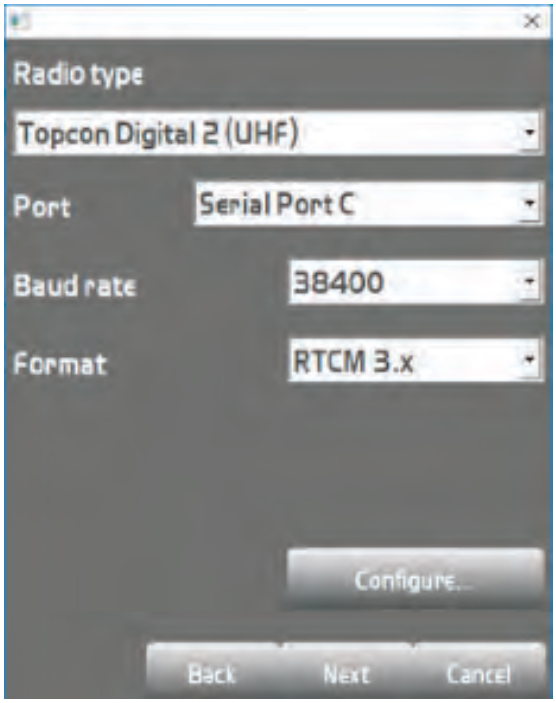
- **Protocol: PDL Rover**
- **Modulation: 4FSK**
- **FEC: Enabled**
- **Power: 1000mW**
- **Scrambling: Enabled**
- **Link rate: grayed out**
- **Click Set**

Hiper VR

- **Protocol: PDL Rx**
- **Modulation: 4FSK**
- **FEC: ON**
- **Power: Grayed out**
- **Scrambler: ON**
- **FCS: OFF**

Version 12

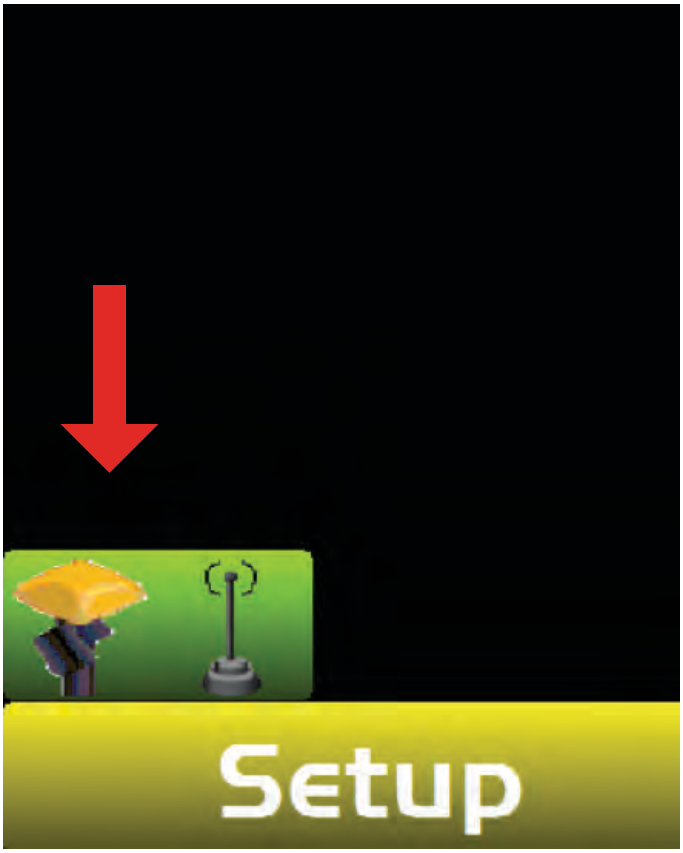




This will then bring you back to the radio page.

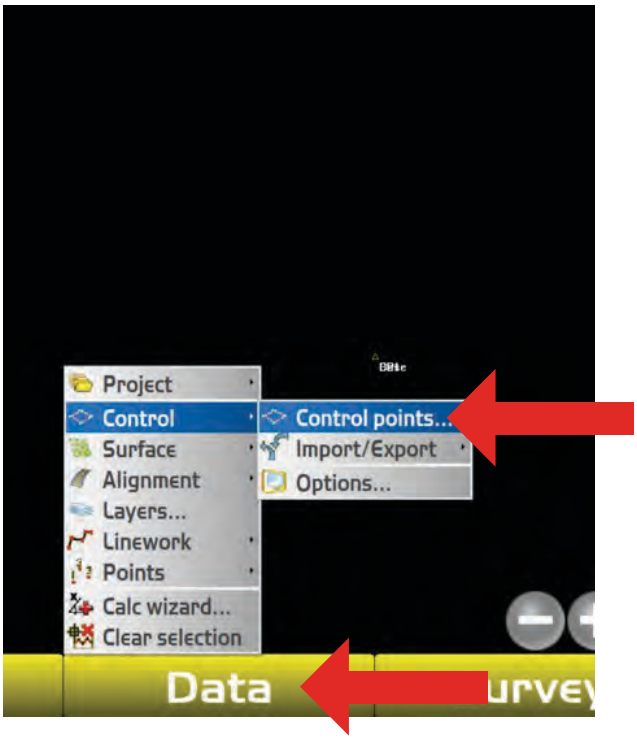
Click Ok.

Version 12



This will bring you back to the main screen and the bottom left box should turn green.

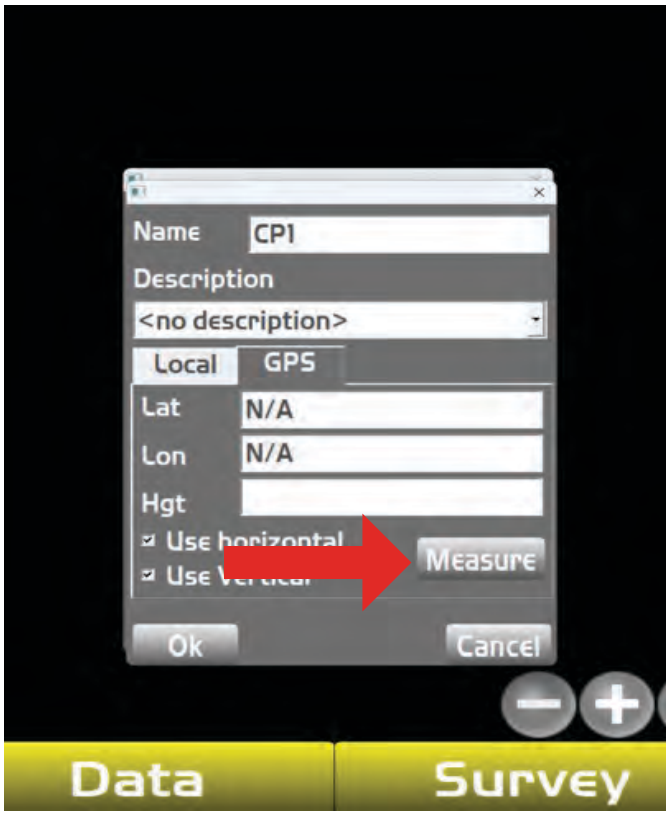
Version 12



Now that it is green and connected you will go into Data, Control, Control Points.

Select CP1 and when it is highlighted click edit.

Version 12



Then click the tab in the middle of the screen.

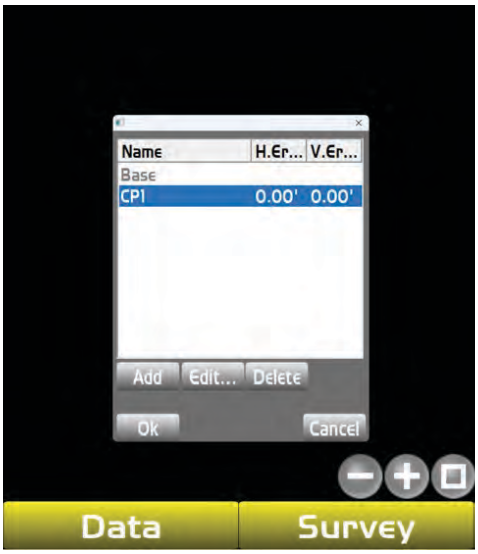
Plumb your rover rod up on the point that you want to be your 100/1000 mark.

Check both boxes next to "Use Horizontal" and "Use Vertical" and click Measure.

Version 12

Once it has measured the Lat, Lon, and Height will be populated which shows that the point measured.

Click Ok.



Now you will have Base and CP1 on your list and there should be 0.00 next to the CP1.

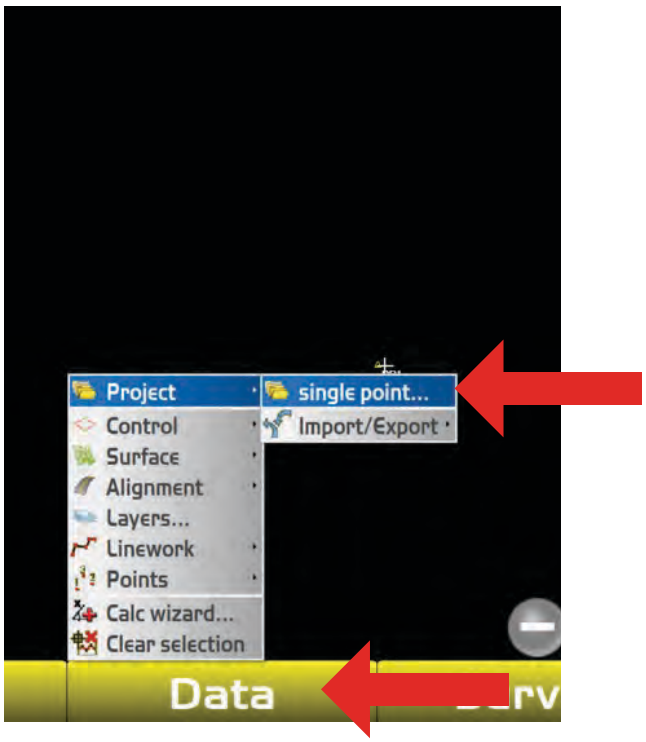
This is the bare minimum that needs to be done for machine control/gps to work.

Copy this project file on to a thumb drive and then load into your machine.

The elevations that you are reading are not "real world" elevations. They are relative to your base and control point.

Use single point for small simple jobs NOT engineered files.

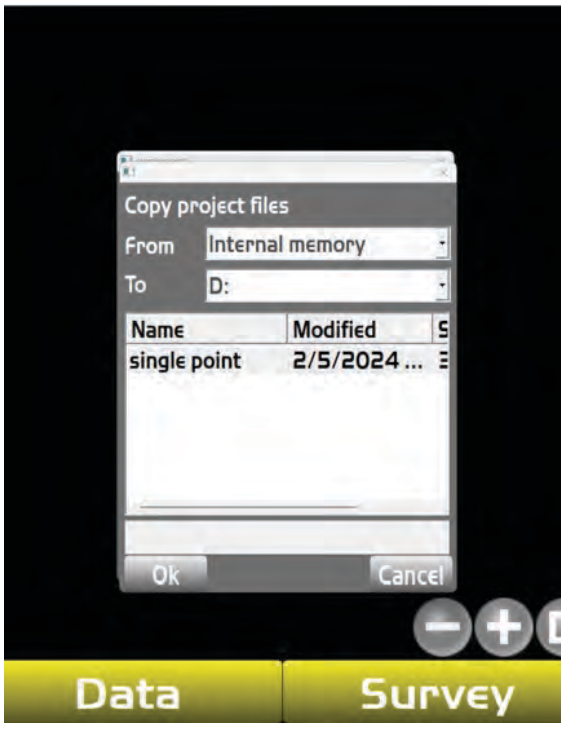
Version 12



To copy the job file to your thumb drive you will go into Data, Project, click on the current project.

Plug the thumb drive into the data collector.

Click Copy.



Select the file you want to copy and then verify the drop down boxes up top are "From internal memory" To "Hard disk or D."

Then click Copy.

The file is now on the thumb drive and can be transferred to your machine.

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Create Surfaces in Data Collector

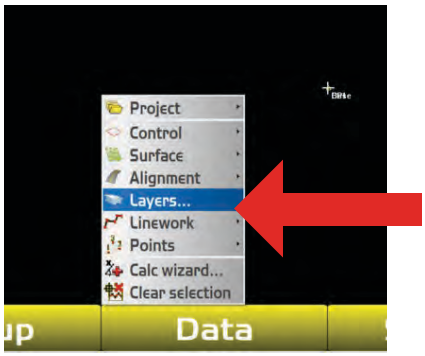
Section 6

Version 12

You will need to have a single point localization or an engineered file setup to measure points for this type of surface.

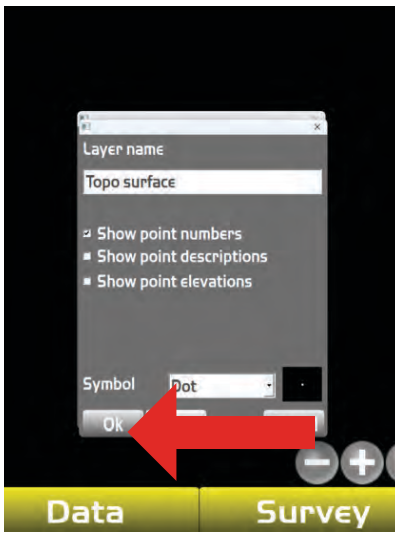
You can create a surface from points (Topo Shots) that you take with your rover. The more points that you shoot will make the surface be more accurate. When you shoot your topo shots you will want to create a new layer to put all these shots on to keep them separate from other info in the file.

Version 12



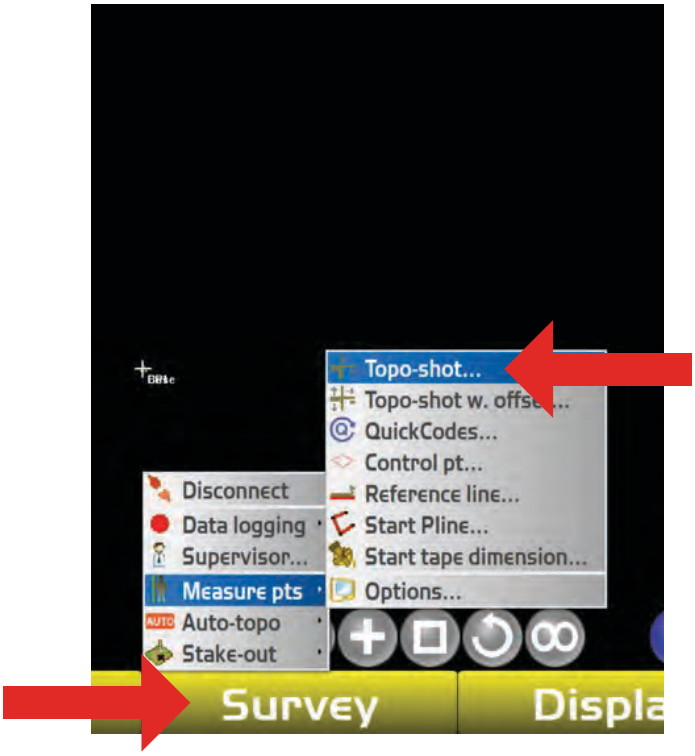
First you will create a new layer in the file. Go into data, layers and click New.

You will title the layer and then click the check boxes to have the desired info showing for each point. (I recommend either having none checked or maybe elevation if desired).



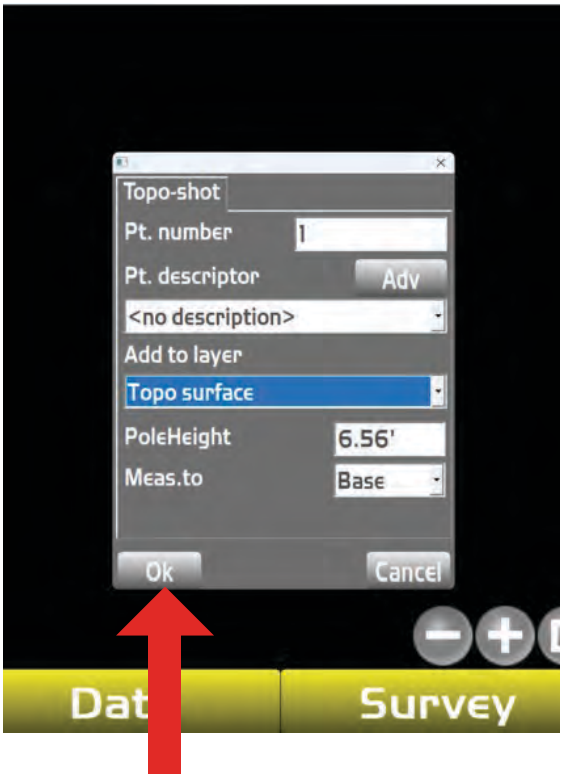
Click Ok.

Version 12



Next you will start measuring points. You are able to go in and adjust point elevations if you want to change different high and low points to get the desired surface.

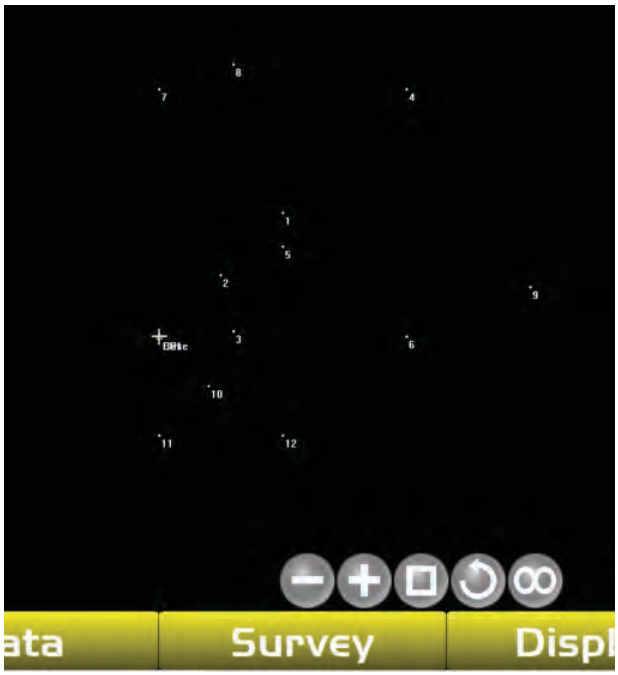
To measure points you will go into survey, measure points, topo shot.



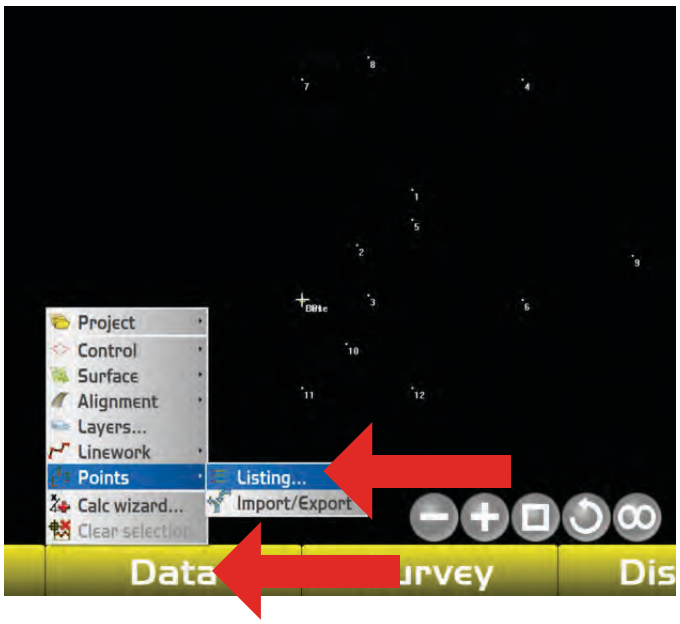
It will have which point number it is and then below select the "add to layer" dropdown box and select the layer you had created.

Plumb up your rover rod and make sure it is fully extended and then click Ok to measure in the point.

Version 12



Repeat the process of measuring the points to get the desired surface covered.



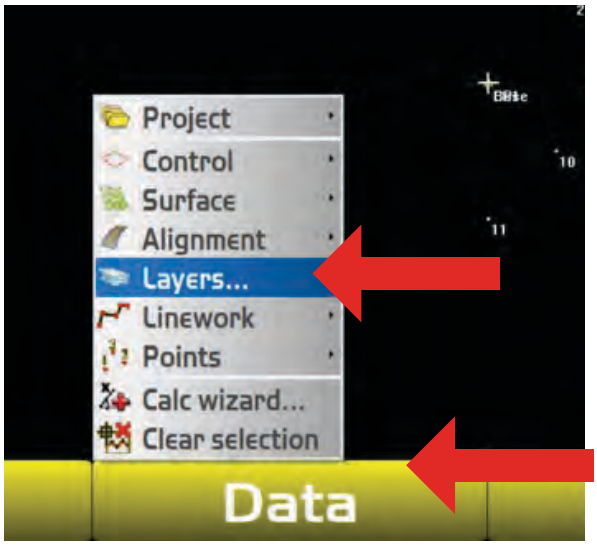
To adjust point elevations you can go into data, points, listing.

Version 12

In the point list select the desired point to adjust and then click edit.

Adjust the elevation as desired and then click Ok to save it.

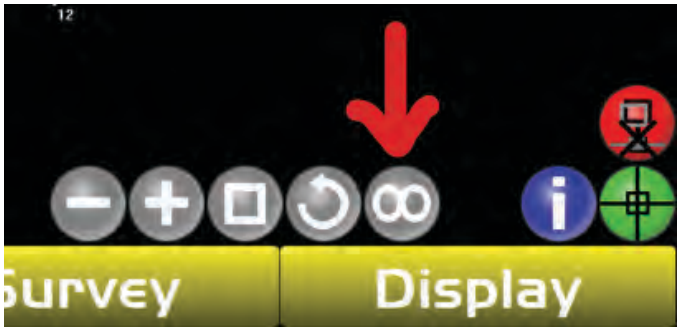
Version 12



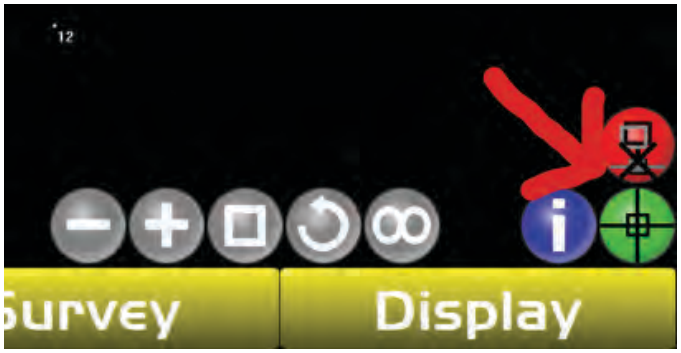
Once all points are measured in make sure that the only layer active is the layer you created. Go into data, layers.

Uncheck all of the layers except the one you just created.

Version 12



Click the zoom extents (∞ button) to put all of the points on your screen.



On the bottom right you will see a green circle, make sure it is on the crosshair selection tool.

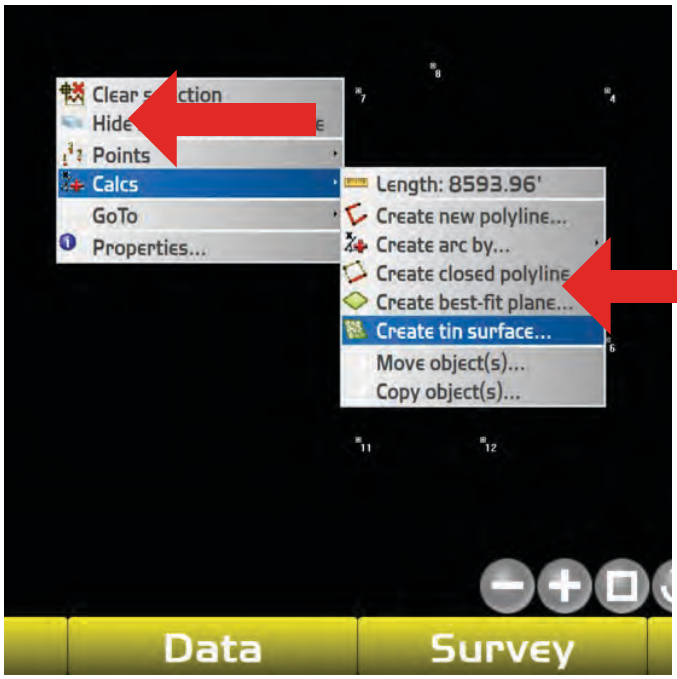
Version 12

Press on the top corner and drag a box to encompass all of the points inside the box and then release to select the points.

When selected the points will each be highlighted with a little ring around each point.

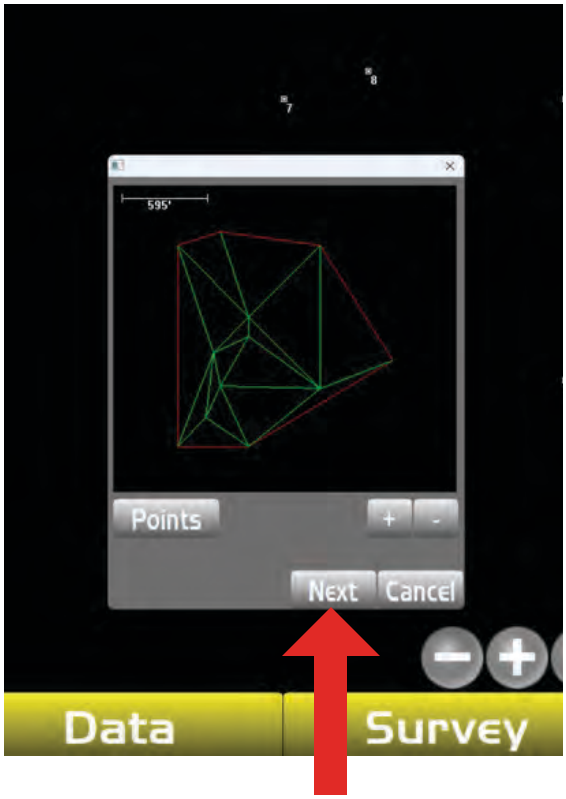
After they are selected press and hold for a second on the screen and then release to pull up the popup options.

Version 12



Click on calcs, create tin surface.

Version 12

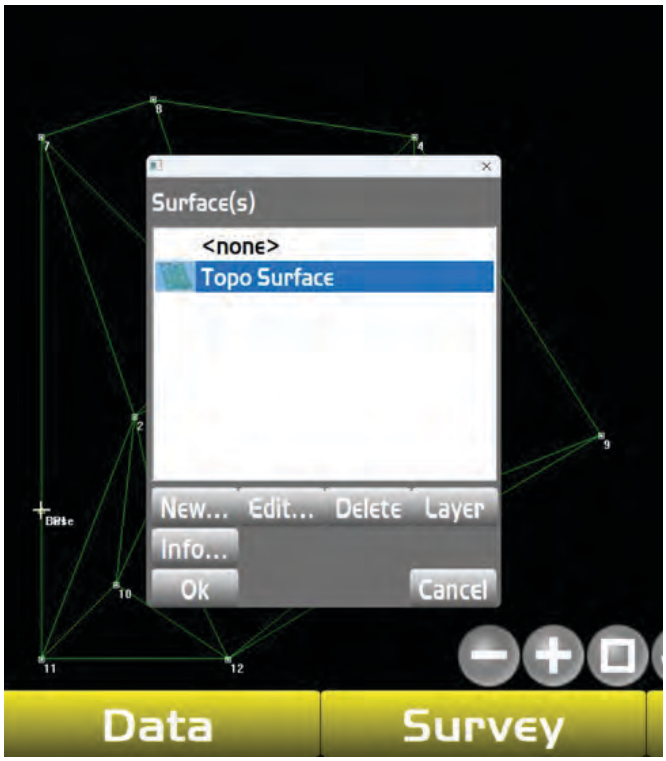


You will then see how the surface looks and you can click **Next.**

Title the surface what you want and if you desire to make it the active surface check the box "set as current surface" and click **Finish.**

You will now see the surface you created in the surface list.

Version 12



You will now see the surface you created in the surface list.

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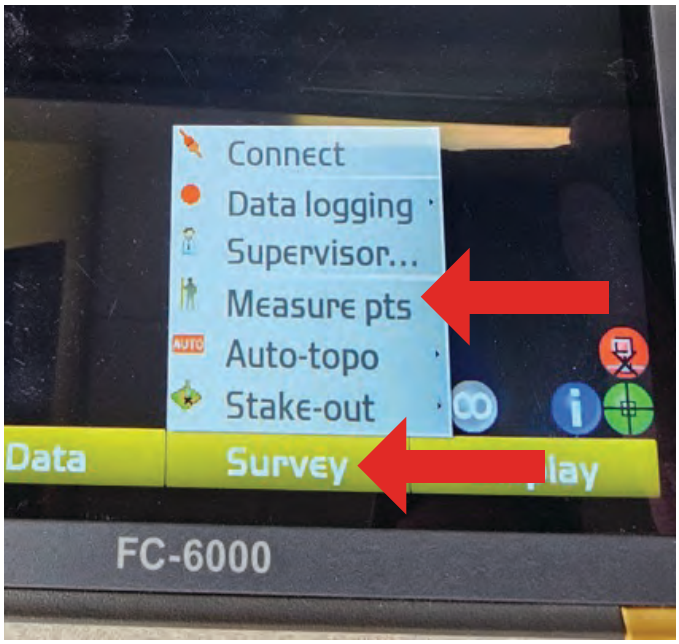
Creating a Ditch on the Data Collector

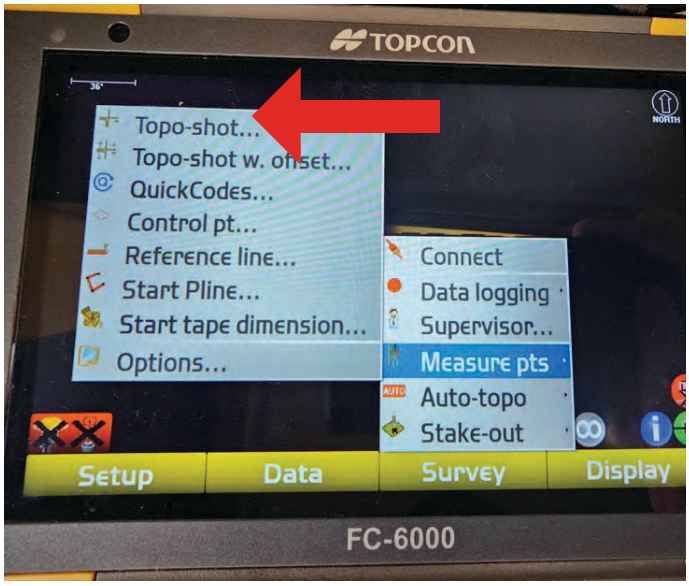
Section 7

Version 12



Follow these steps after you have created a new project and completed your single point localization.

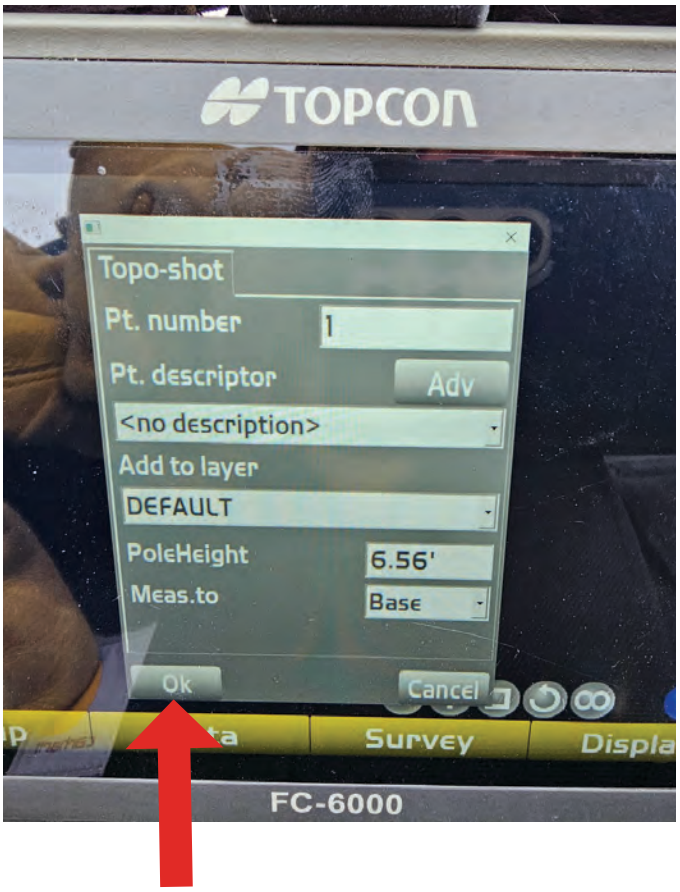
Note: this will only work for straight ditches and it is best to use your culverts as centerline.



Cick on Survey.
Then click Measure pts.

Select Topo-shot.

Version 12



Before measuring in the first point you can add a description to the point, and change what layer the point is on.

Make sure your rover is over the point you want to measure and plumb. Click Ok.

Repeat this step for all points(if stretch has more than 2 culverts breakup stretch going 2 culverts at a time).

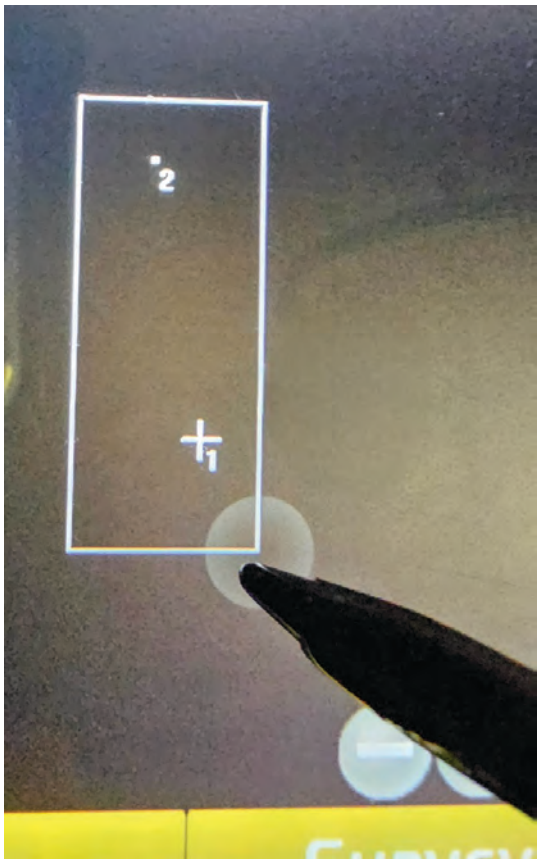
Repeat this step for end point.

Version 12

Once your start and end points are measured in, they will be displayed on the screen like this.

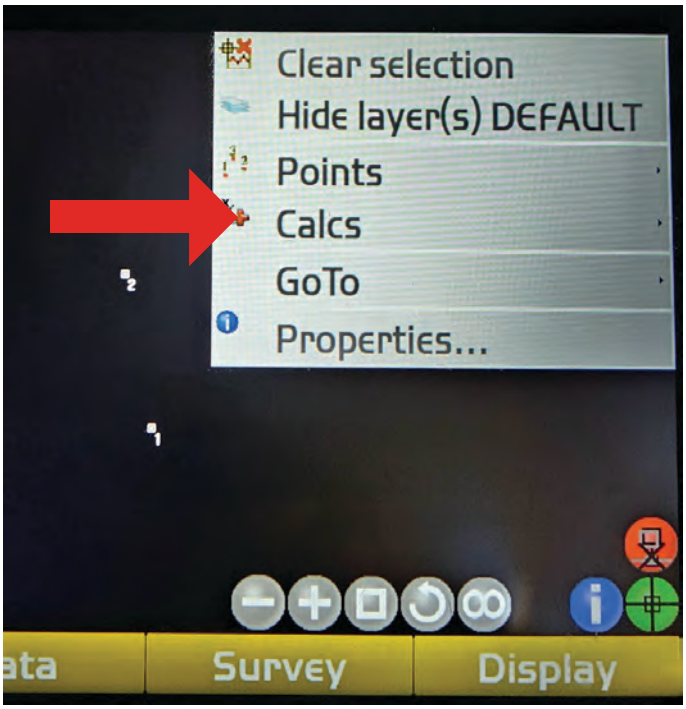
Version 12

Switch the icon on the bottom right of the screen to the target icon by tapping it.



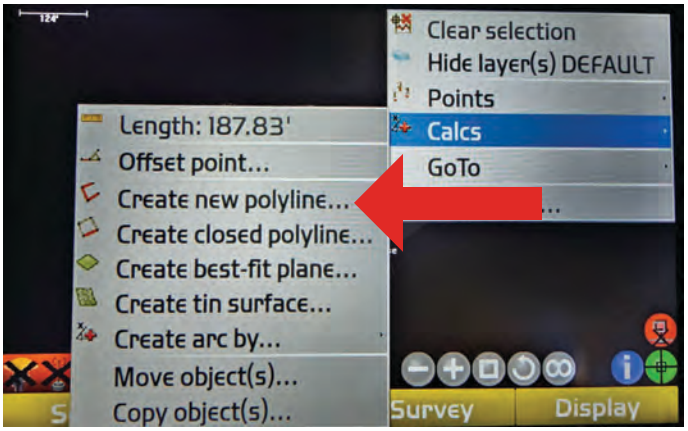
Press and drag your finger or stylus across the screen to form a box. Use this box to highlight your points.

Version 12



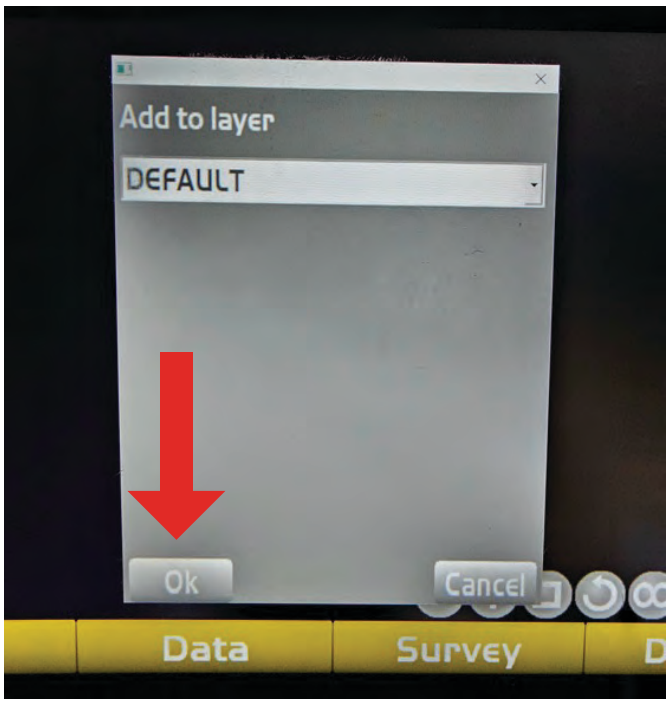
Press and hold on the screen for 1 second. A menu will pop up.

Click on Calcs.

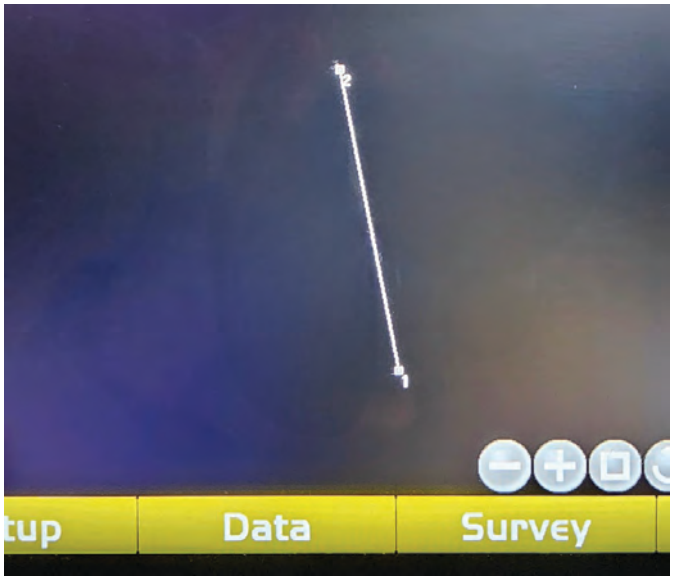


Tap on Create new polyline.

Version 12



Add to the same layer you took your topo shots on. Click Ok.

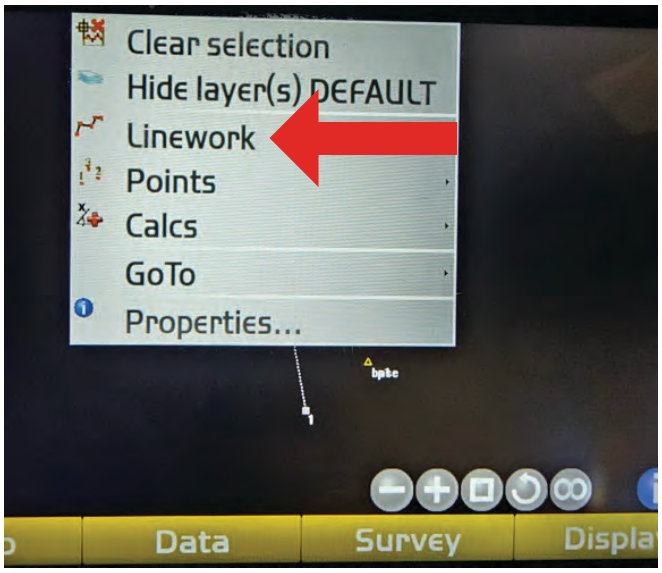


Now you will have a line between your two topo shots.

Next, press and hold screen for 1 second for menu to pop up and select Clear selection.

Version 12

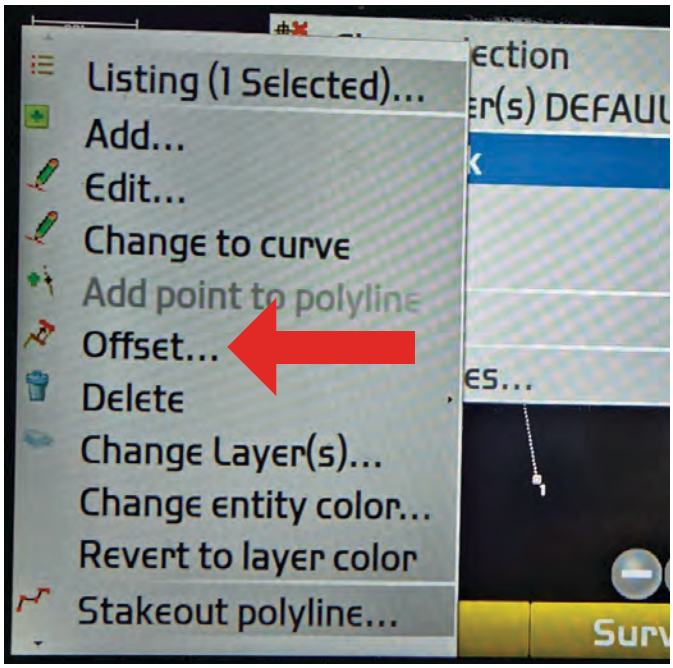
Click on the line between the points to highlight it.



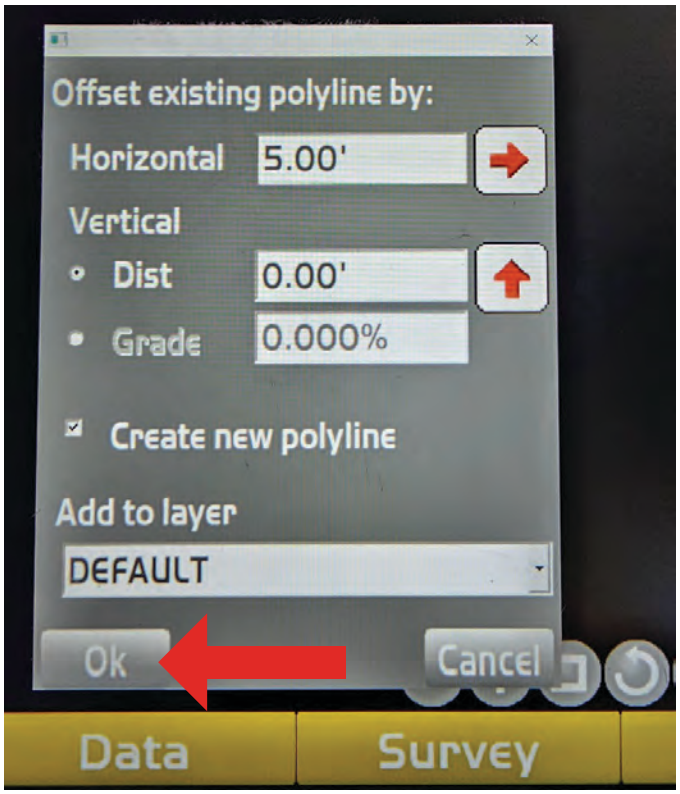
Select Linework.

Press and hold screen for 1 second to bring up menu.

Version 12



Select **Offset**. Here is where you can copy/shift your line horizontally and vertically. The direction you are shifting is relative to your initial points.

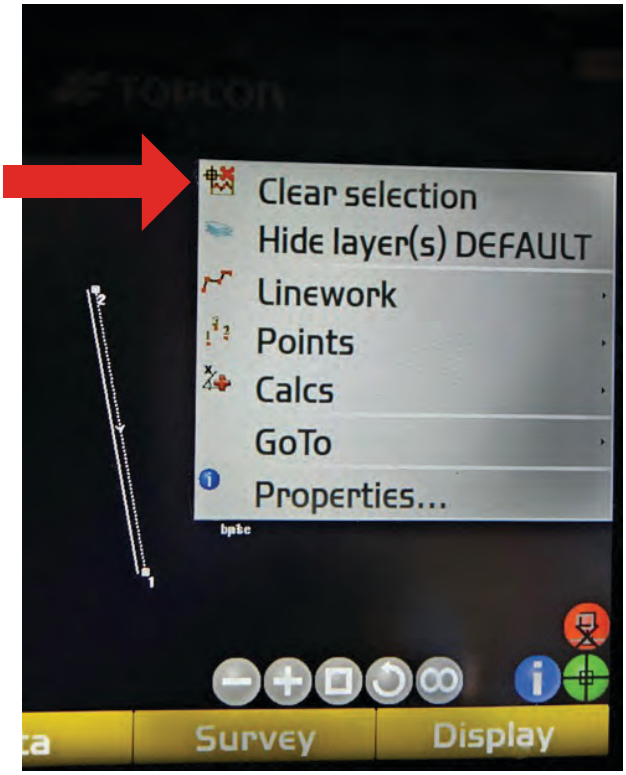


Make sure "create new polyline" is checked and click **Ok.**

If you are creating a ditch bottom you will shift a line to each side half the desired width. Example-10 foot wide bottom(one line to left 5ft) and (one line to right 5 ft) of original line. Click on the arrow to select which side you would like.

Version 12

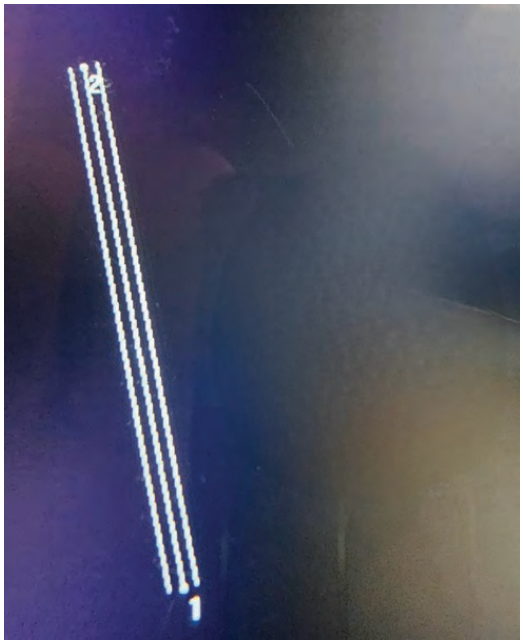
Your new line will appear on the screen next to the original line. You can identify the original line as the one with the points.



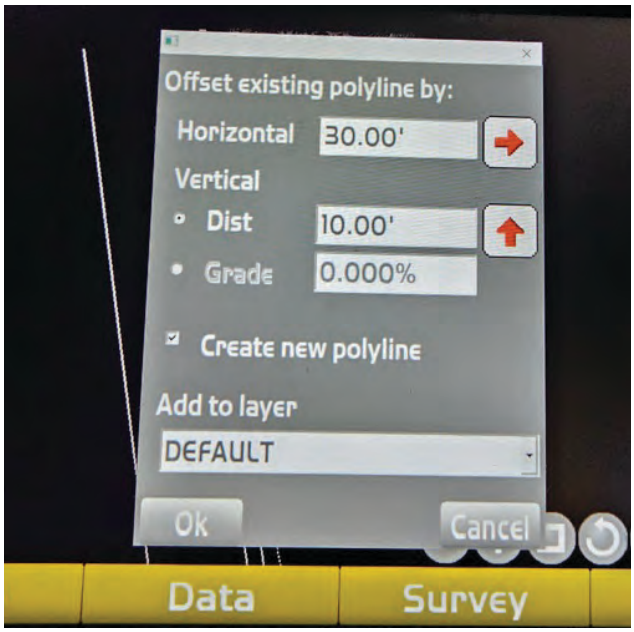
Press and hold 1 second to bring up menu. Select clear selection.

Select your centerline and repeat process for the other side.

Version 12



Example of both sides of centerline complete.



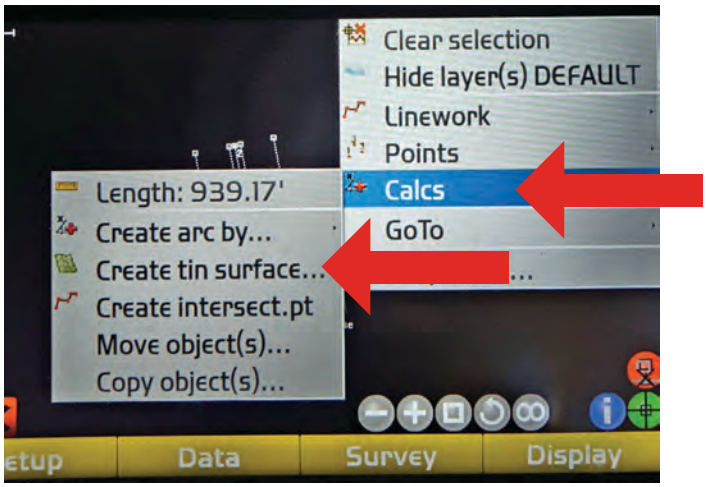
To create slopes you have to move left or right and change your vertical. Select the line (edge of ditch) you want to copy.

You can set a percent or distance

Repeat these steps for both sides of the ditch.

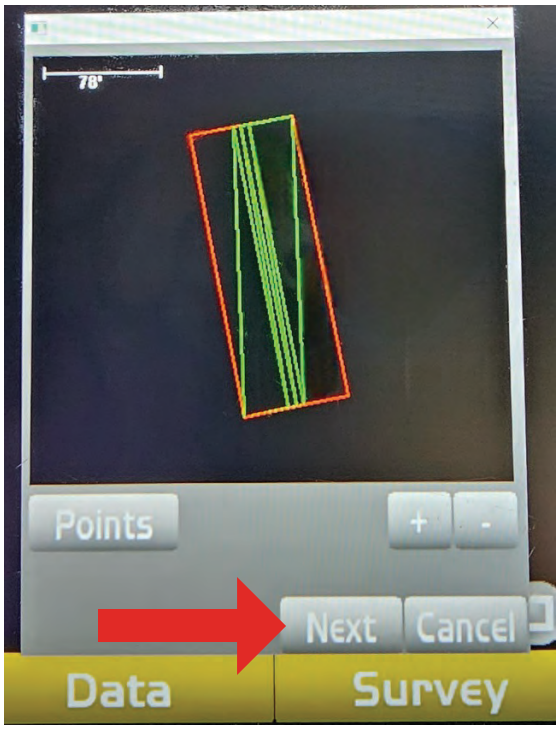
Version 12

Once the ditch bottom and side slopes are entered you should see something similar to picture. Highlight all of the lines you have created.

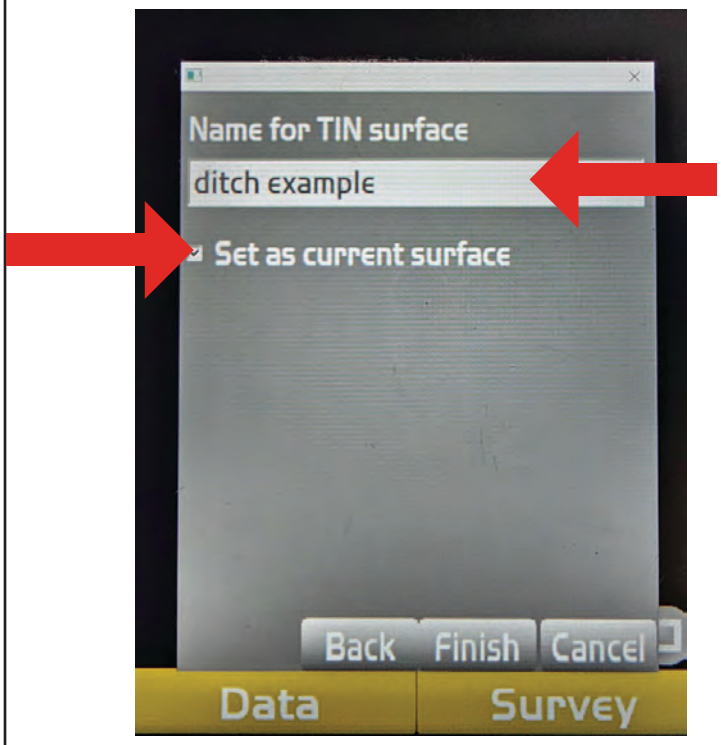


Press and hold screen for 1 second for menu to pop up. Select Calcs and then Create tin surface.

Version 12

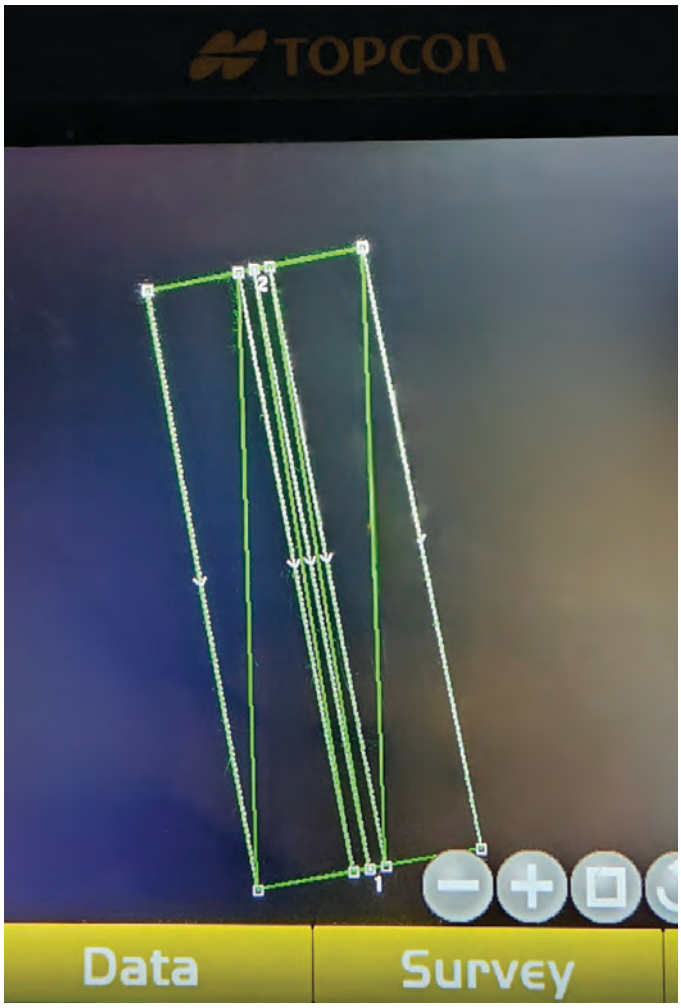


Select **next.**



Title the surface and set as current surface.

Version 12



You now have a surface and line work.

Press and hold screen for 1 second to bring up menu. Select clear selection.

You now can copy this file and put it into your machine.

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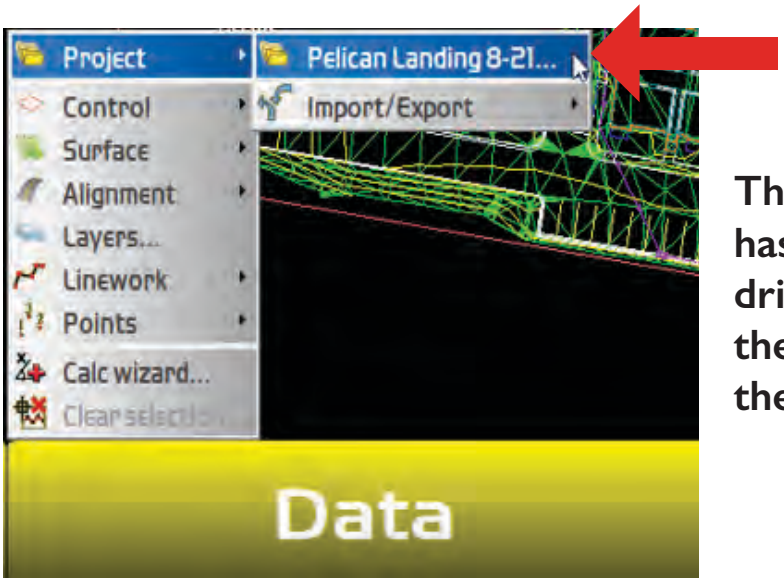
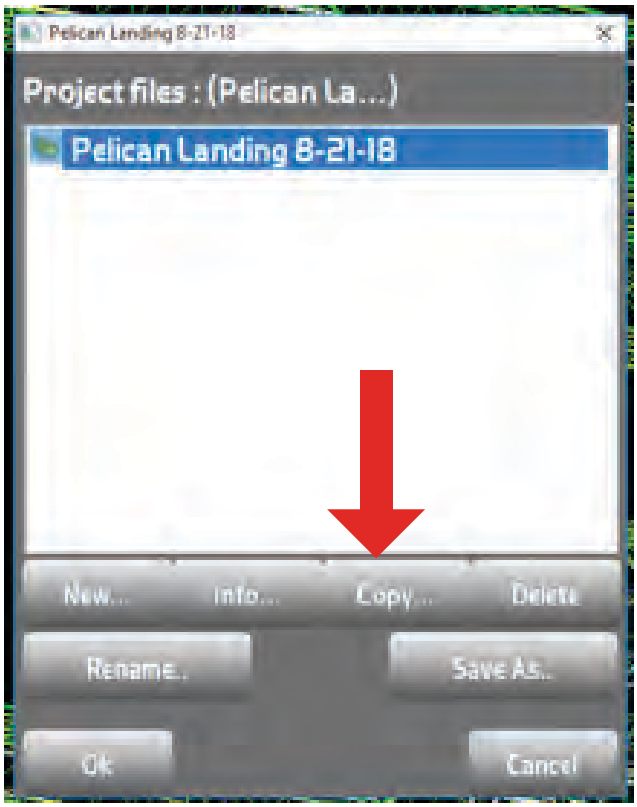
Completing Job Site Set-Up

Section 8

Version 12

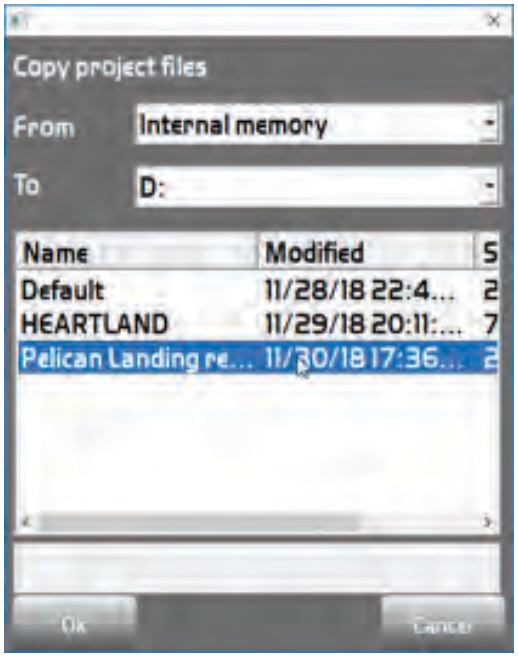


This is to be done after the site has been localized. Insert thumb drive into Data Collector. Tap the Data tab, Project, then select the current project.

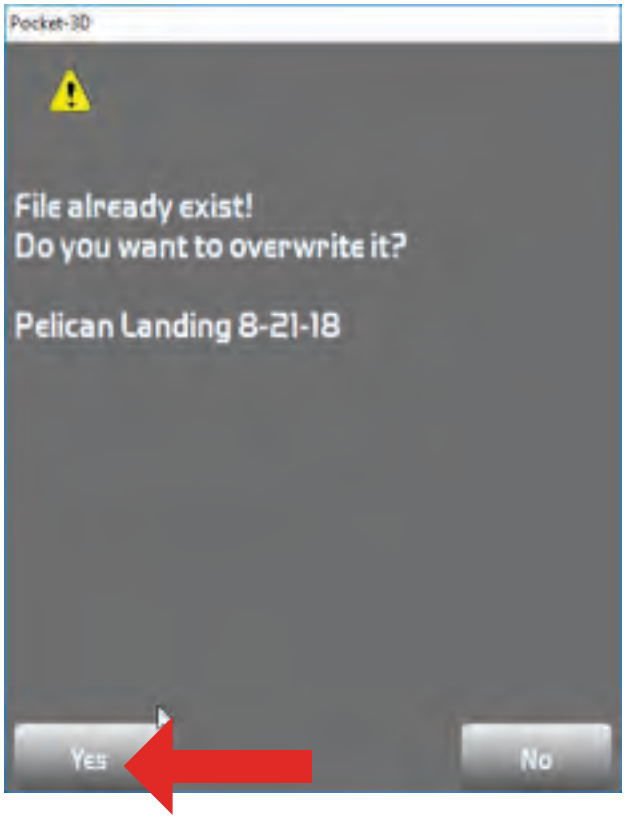


Highlight job file you want to copy.Tap the Copy tab.

Version 12



To copy file to thumb drive select from dropdown menus:
From: Internal memory
To: D:



This alert will display when copying back onto the thumb drive. Select Yes.

GENERAL EQUIPMENT & SUPPLIES, INC.

Loading Project onto Data Collector

Section 9

Version 15

Job Site Set-up: Loading Project on Data Collector

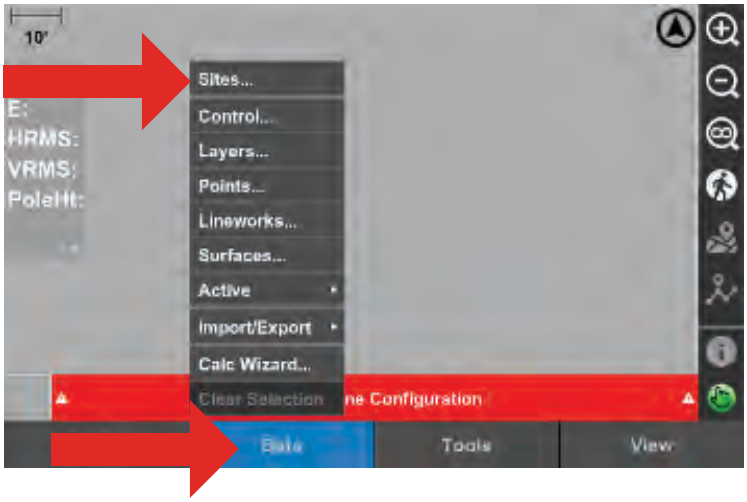
Files needed for building a machine control file:

1. **XML file:** Surface file
2. **DXF or DWG file:** Line work file
3. Is the site in US Survey Feet or International Feet?
4. List of control points: Northing, Easting, Elevation
5. PDF if available
6. Email these files to mstrehlow@genequip.com (Minimum of 2 weeks prior)

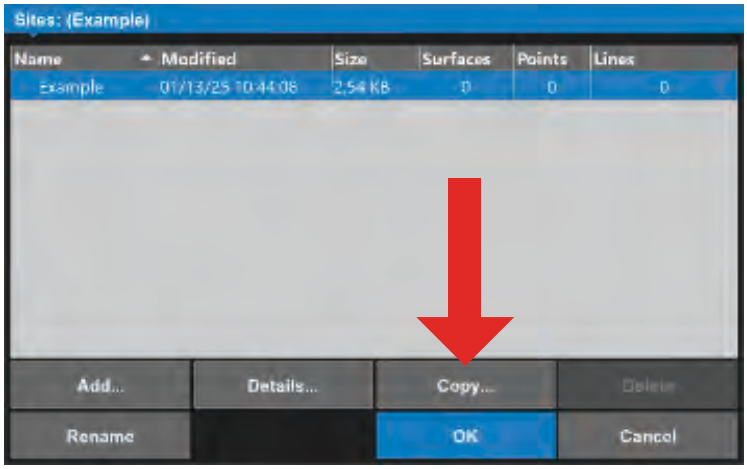
Copy TP3 file from mstrehlow@genequip.com to thumb drive.

TOPCON

Version 15

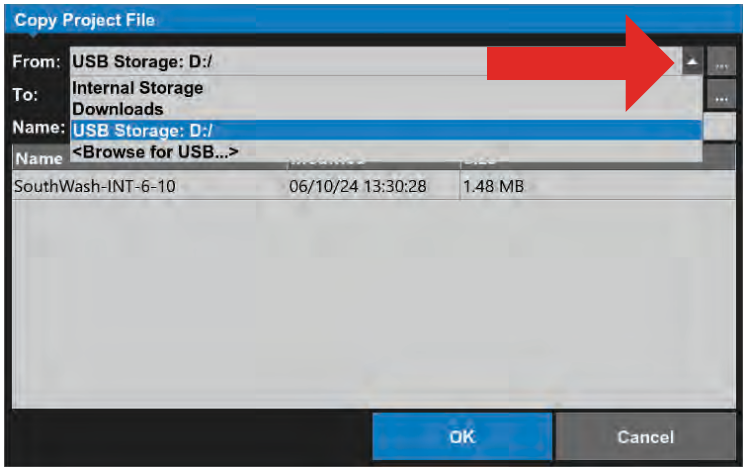


Tap Data then tap Sites.



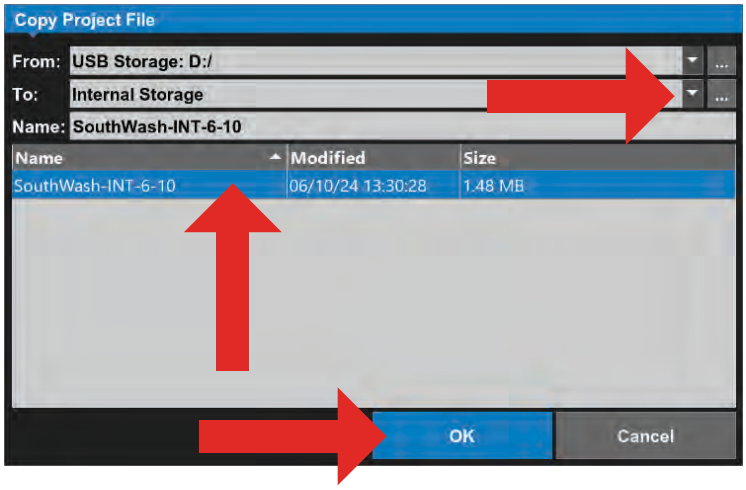
Select Copy.

Version 15



Drop down box

From-USB Storage D:



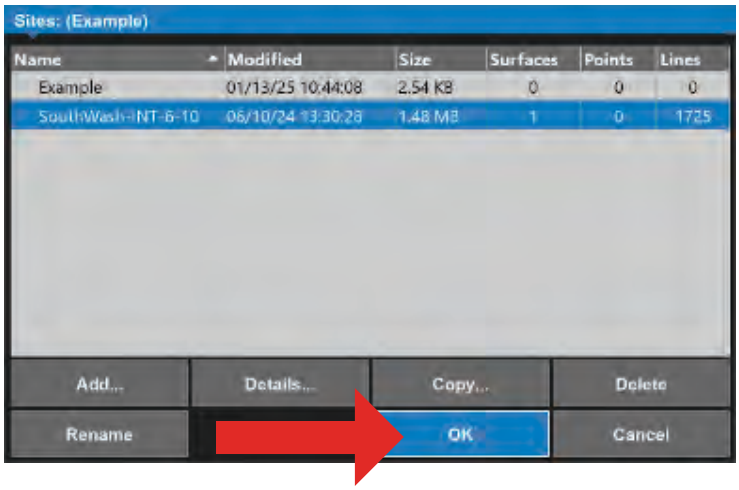
Drop down box

To-Internal Storage.

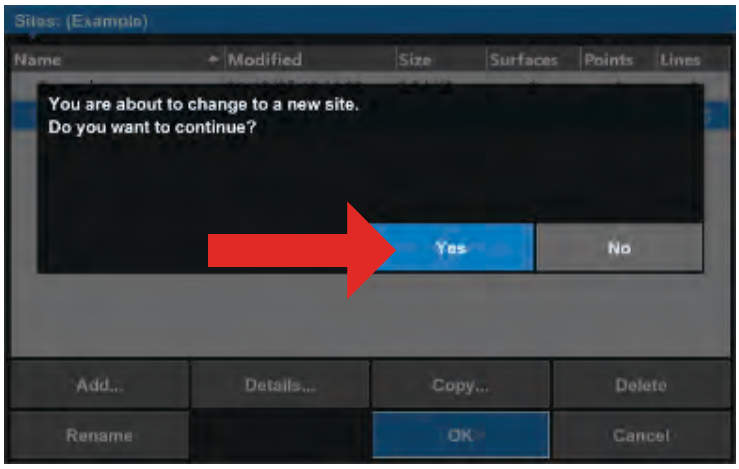
Highlight the project file you want copied.

Make sure project file is highlighted in blue and then tap OK.

Version 15



After project file is copied to Data Collector it will appear in the Sites list. To set project file as current file highlight the file and tap OK.



After tapping OK it will prompt you again. Tap Yes.

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Starting Base and Connecting Rover to shoot control

Section 10

Version 15

What is Needed:

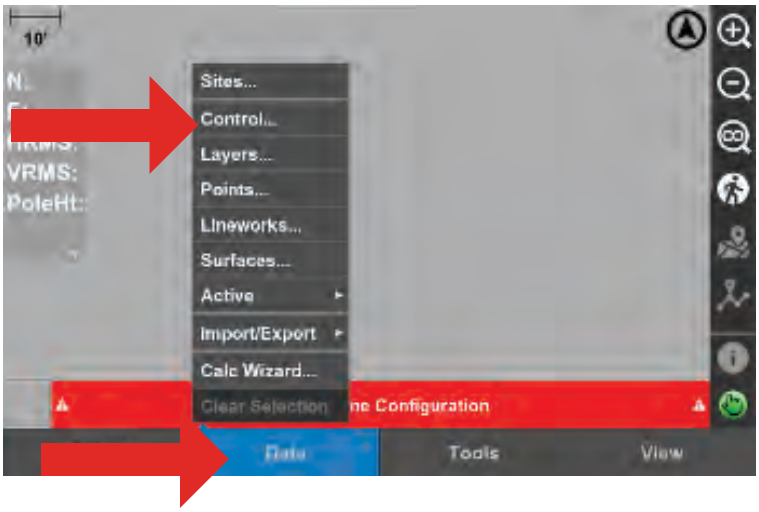
- Base, Rover and Data Collector
- Rover Rod set to 6.56 ft (2 Meters)
- Bi-pod legs
- T-Post
- 5/8” bolt and nut
- 2 Hose clamps

Pound in t-post near known control point and thread “base” unit onto 5/8” bolt.

Version 15

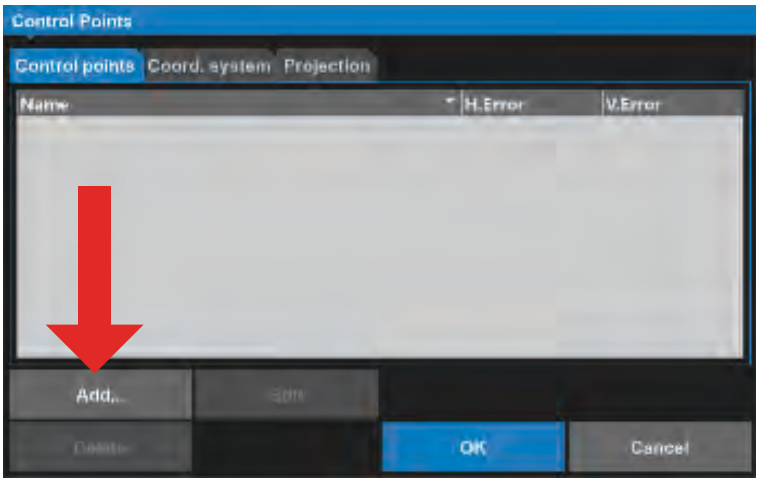
Thread the "Rover" onto your rover pole and extend to full length(6.56ft). Turn both the base and rover units on.

Version 15



Go into data collector and add base into control points.

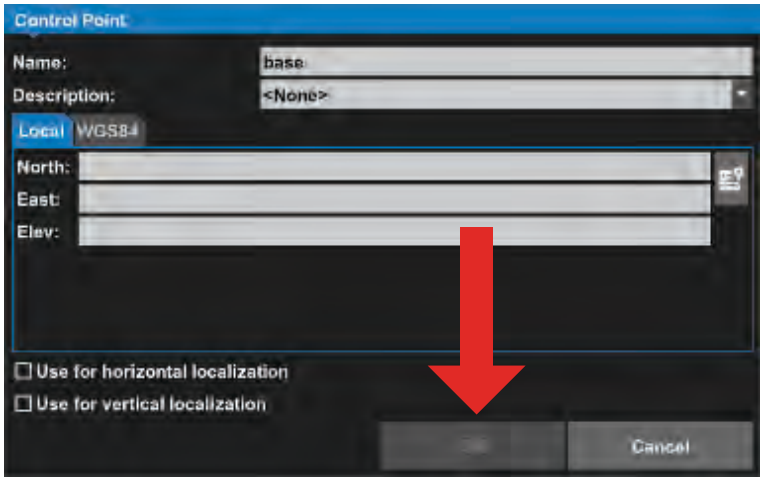
- Data → Control



Control points list will populate.

- Click add
- Name control point base

Version 15



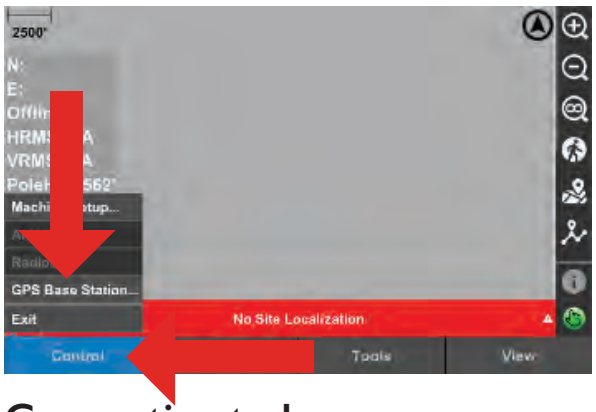
When filling in Northing, Easting, and Elevation use the full number without decimals of the control point you are next to.

Example: Control point 106
- **North—1395834.809**
- **East—478793.219**
- **Elev—980.45**

When setting base
- **North—1395834**
- **East—478793**
- **Elev—980**

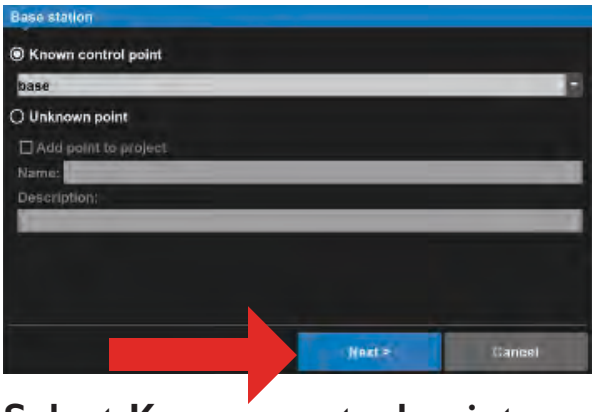
After coordinates are entered click OK and back out to main project screen.

Version 15

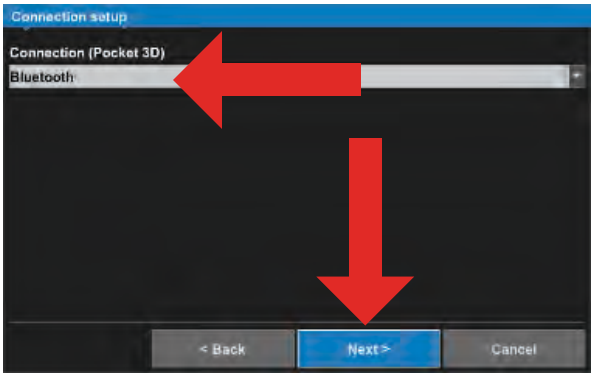


Connecting to base

- Tap Control → GPS Base Station



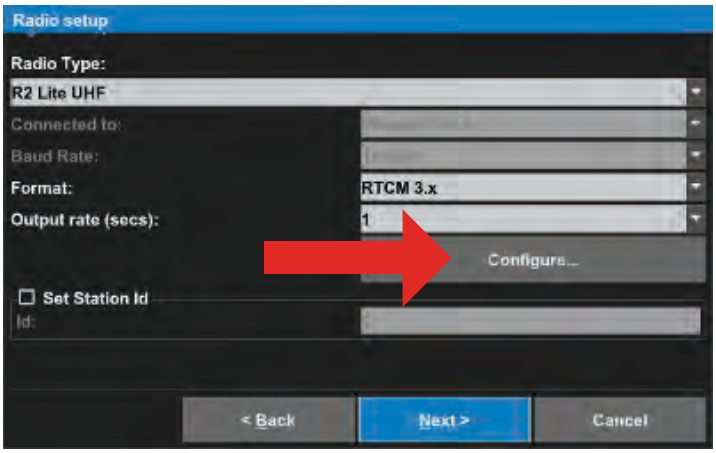
Select Known control point and then hit next



Connection is set to Bluetooth. Tap Next.

Verify that the antenna type is the model of unit that you are using, that the antenna height is 6.56 ft, that it's measured to base. Then hit Next.

Version 15

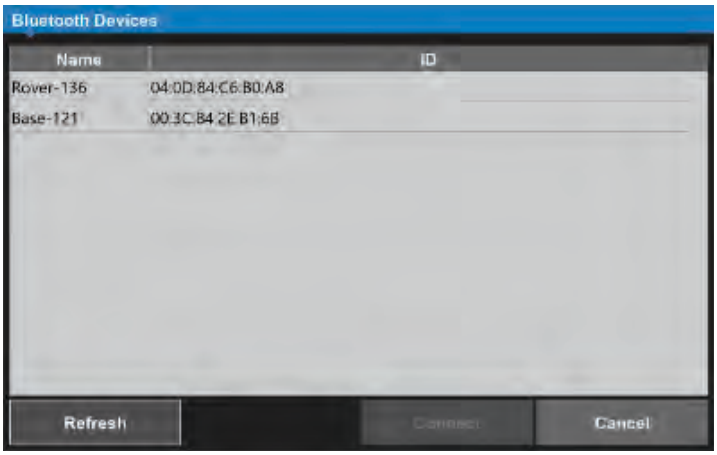


This is where you set the channel and tell the base what it will send out.

- Hiper VR
- Radio Type: R2 Lite UHF
- Connected to : Modem

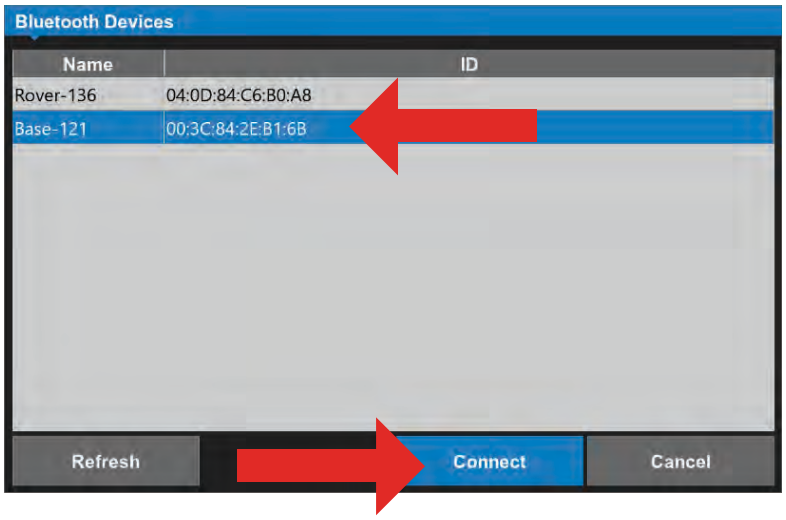
Port A

- Baud Rate: 115200
- Format: RTCM 3.x
- Output rate: 1

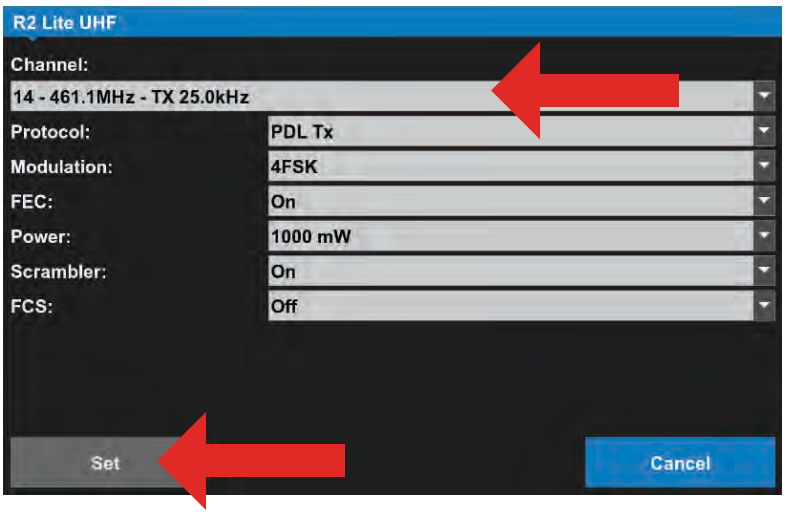


Tap Configure. Bluetooth Devices page will populate devices. If no devices show tap refresh.

Version 15



Select Base and tap Connect.

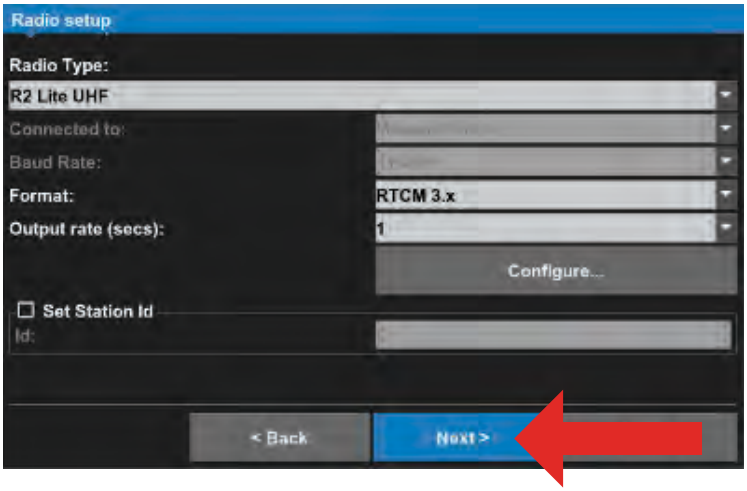


Select the channel you want to use.

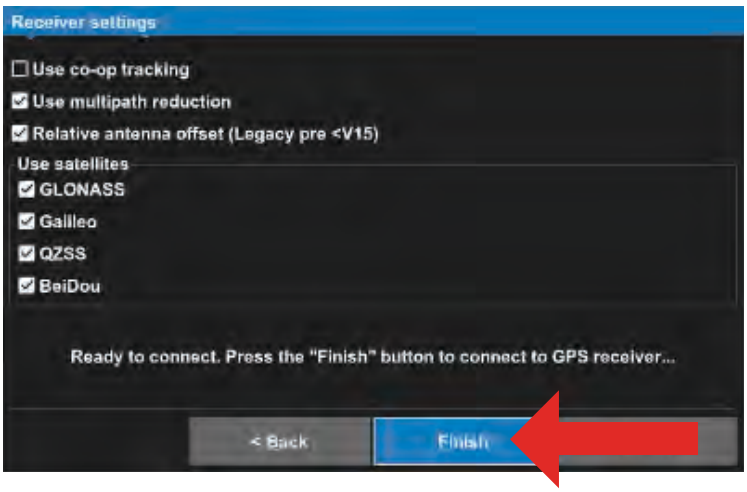
- Hiper VR settings
- Protocol: PDL Tx
- Modulation: 4FSK
- FEC: On
- Power: 1000mW
- Scrambler: On
- FCS: Off

After settings are selected tap Set.

Version 15



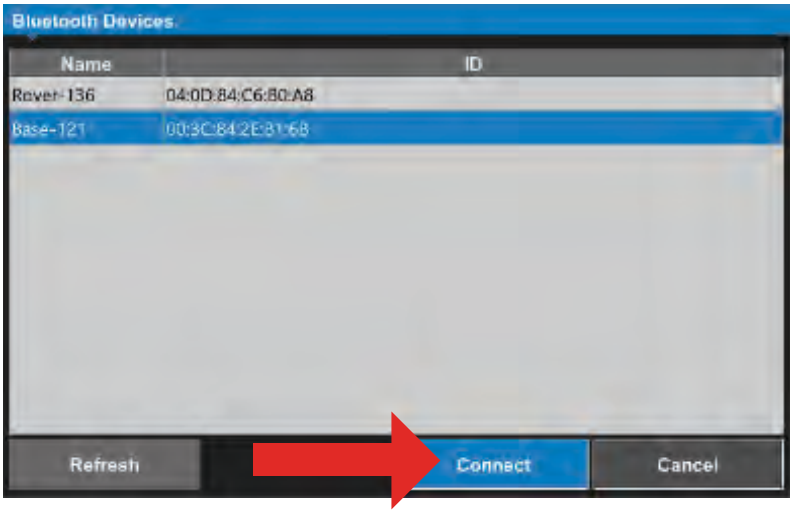
You will be brought back to the setup page. Tap **Next.**



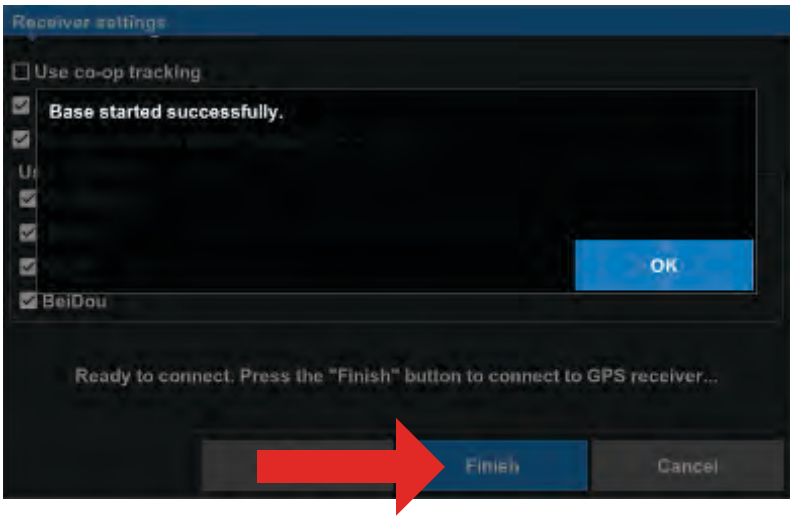
Receiver Settings

- **Uncheck co-op tracking**
- **Check the rest of the items on list**
- **Tap Finish.**

Version 15



You will be brought back to the setup page. Tap **Next.**



Receiver Settings

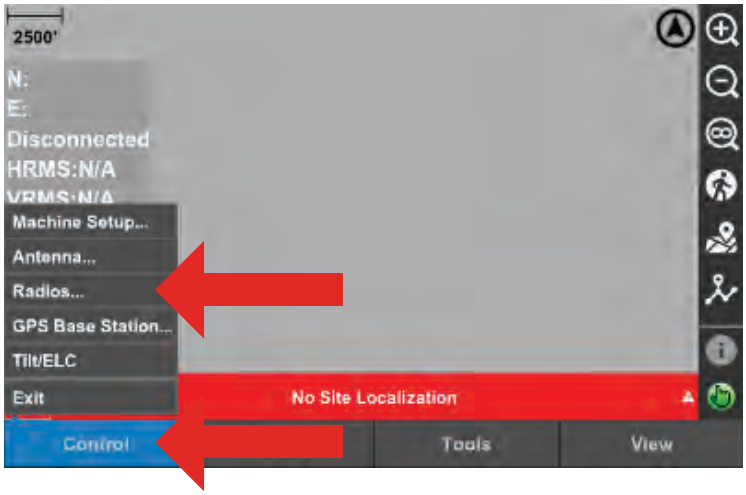
- Uncheck co-op tracking
- Check the rest of the items on list
- Tap **Finish.**

GENERAL EQUIPMENT & SUPPLIES, INC.

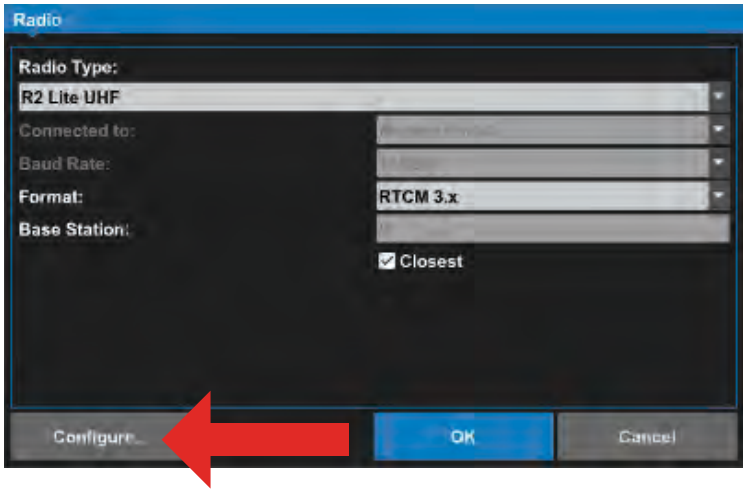
Connecting Rover to Base

Section 11

Version 15



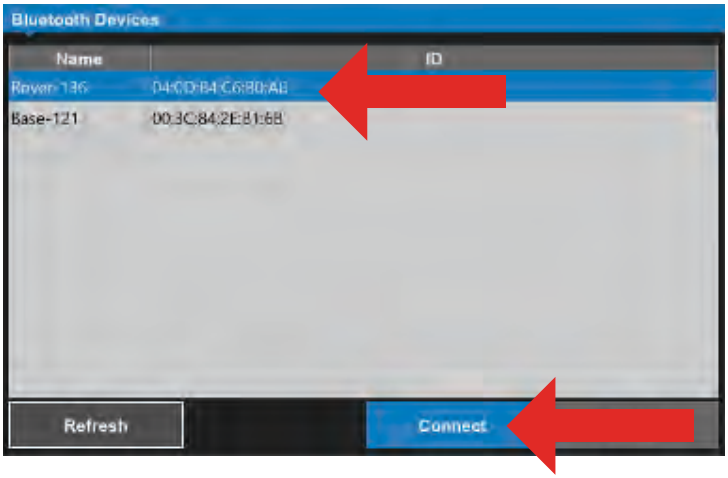
Select Control and then Radios.



- Radio Type: R2 Lite UHF
- Connected to: Modem Port A
- Baud Rate: 115200
- Format: RTCM 3.x
- Base Station: 0-Closest check marked

Tap Configure.

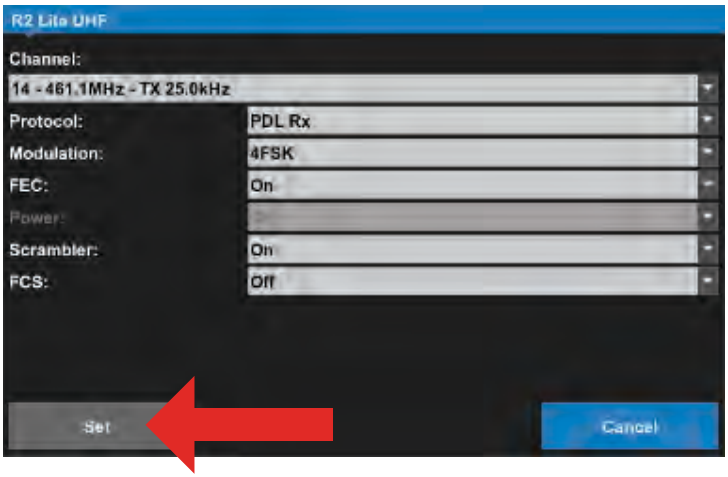
Version 15



On Bluetooth Devices select Rover. If rover doesn't show up click refresh.

Tap **Connect.**

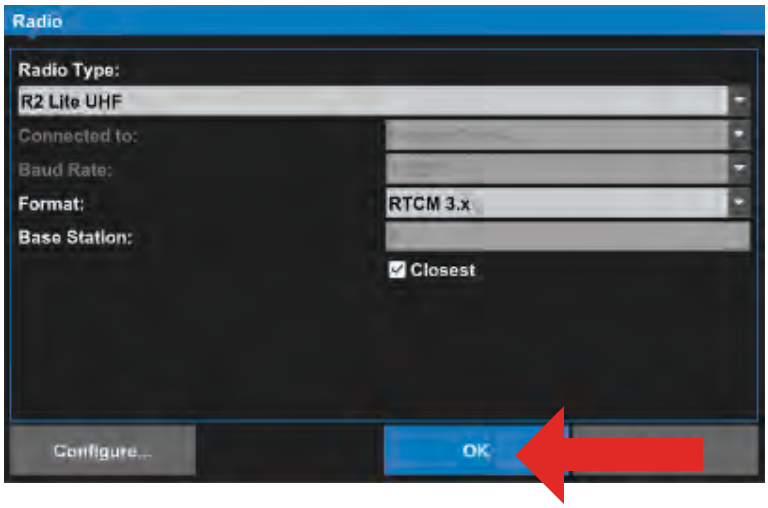
Match the channel selection to the channel you selected for your base unit.



- Hiper VR settings
- Protocol: PDL Rx
- Modulation: 4FSK
- FEC: On
- Power: Off
- Scrambler: On
- FCS: Off

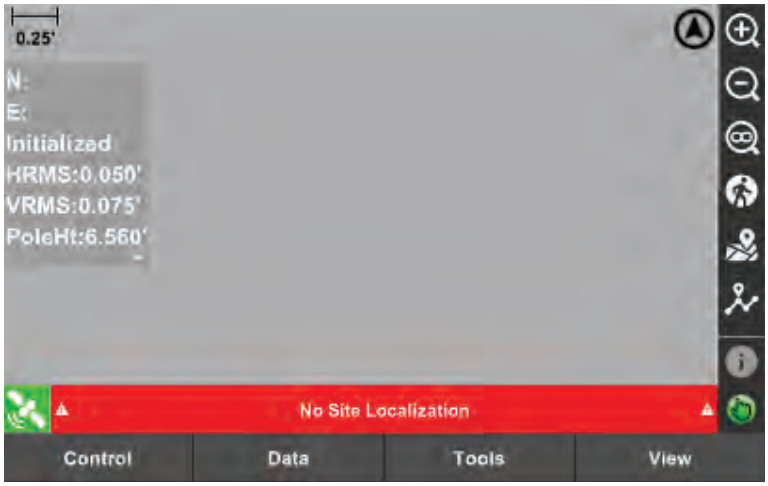
Tap **Set.**

Version 15



You will be brought back to the Radio page.

Tap OK.



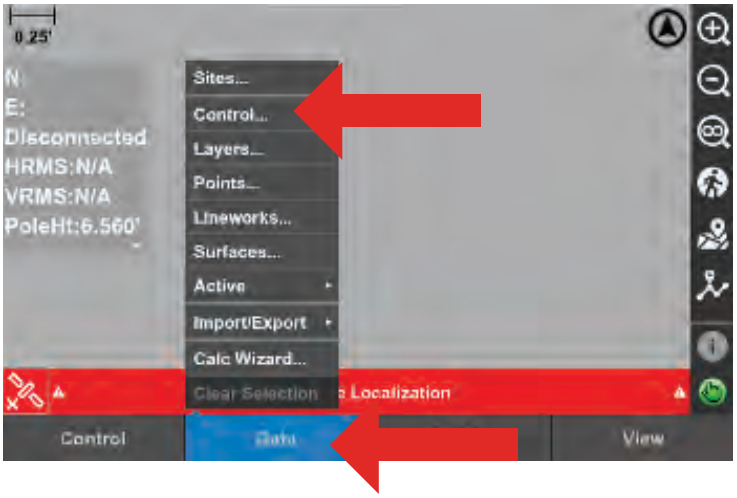
The satellite icon on bottom left of screen will go green if your settings and channels match when setting up base and rover.

GENERAL EQUIPMENT & SUPPLIES, INC.

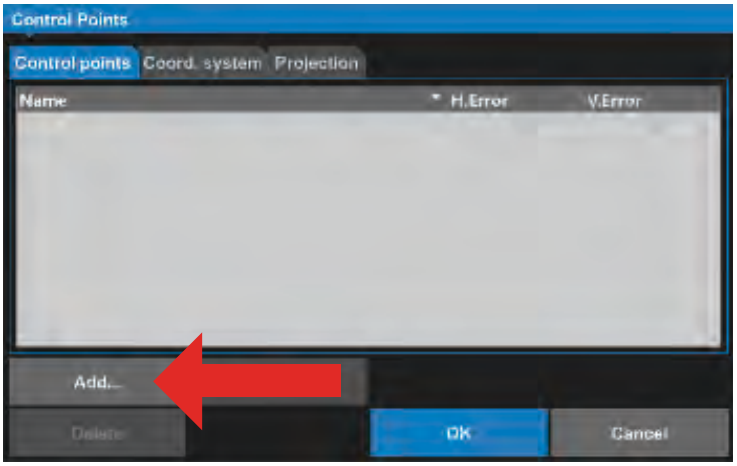
Localize Job Site

Section 12

Version 15

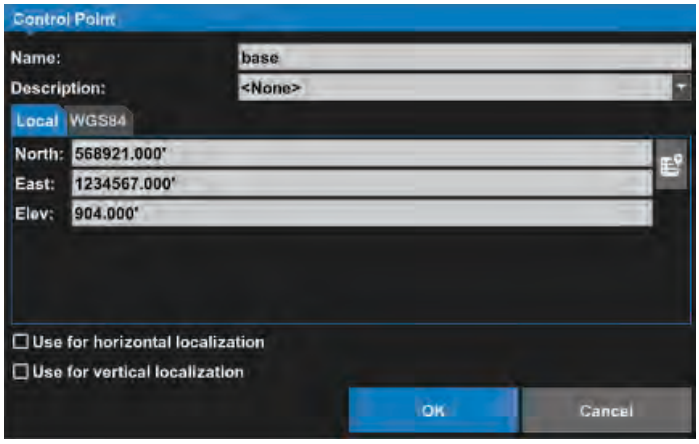


Each jobsite needs to be localized with control. Best practice is to surround the jobsite with a minimum of 4 points. Tap Data, and then control.



Tap add.

Version 15

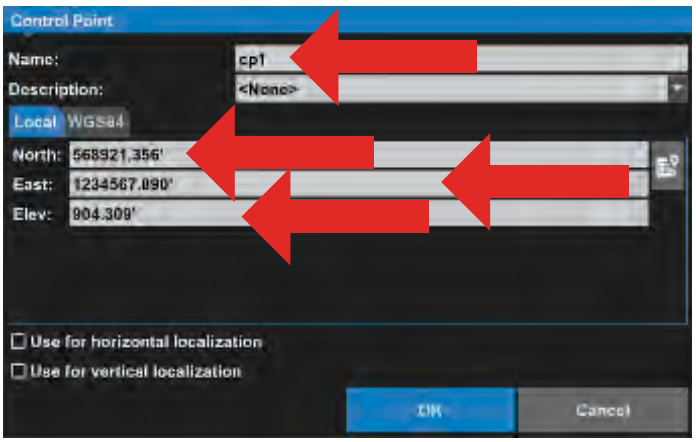


Base needs to be the first control point. Enter a value for North, East, and Elevation.

Best practice is to set up next to a control point and enter the control point value without the decimal point.

Tap OK.

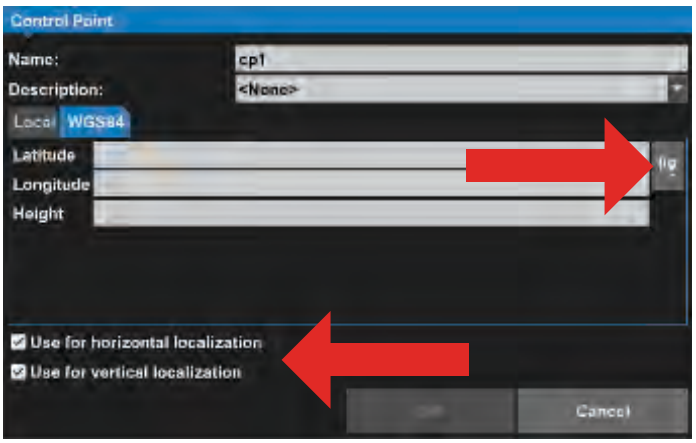
Version 15



Add next point and title point as titled by engineer or lathe.

Enter the North, East, and Elevation from engineer or what is written down on lathe.

After the values are entered select the WGS84 tab. Position your rover over the Control point.

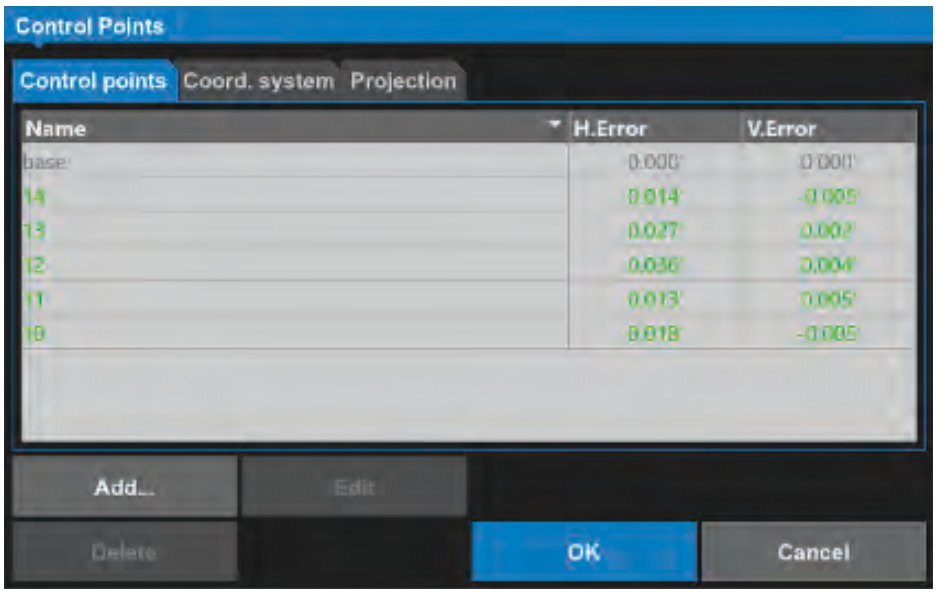


Check the boxes next to (Use for horizontal localization) and (Use for vertical localization)

After everything is set press the measure tab to the right of the Latitude and Longitude boxes.

After your point has been measured repeat the steps for the remaining points.

Version 15



In the control point list page verify that your controls are green. If they are red select the control point and hit edit.

Verify that the number you entered matches the numbers from the engineer or what is written on the lathe.

Uncheck Use horizontal localization or Use vertical localization one at a time. Start with the point that has the largest error until points are listed green.

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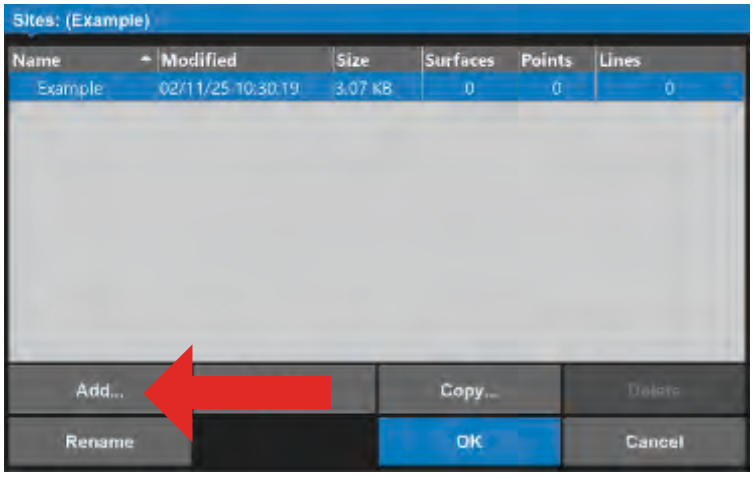
Single Point Localization

Section 13

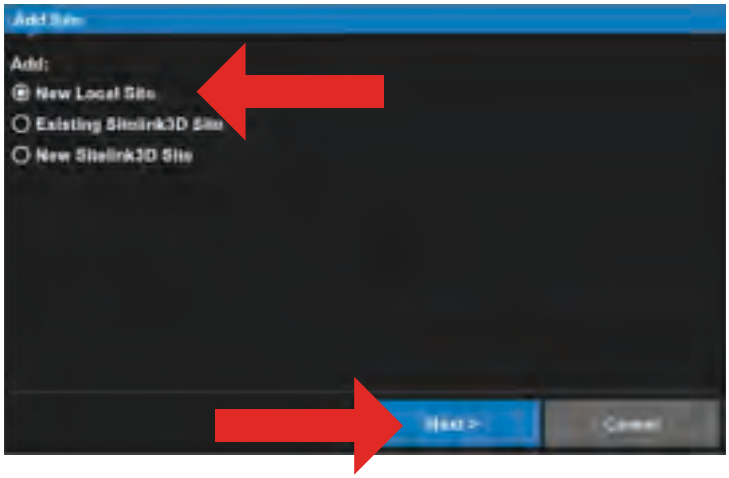
Version 15

To start a new project for a single point localization tap Data and then Sites.

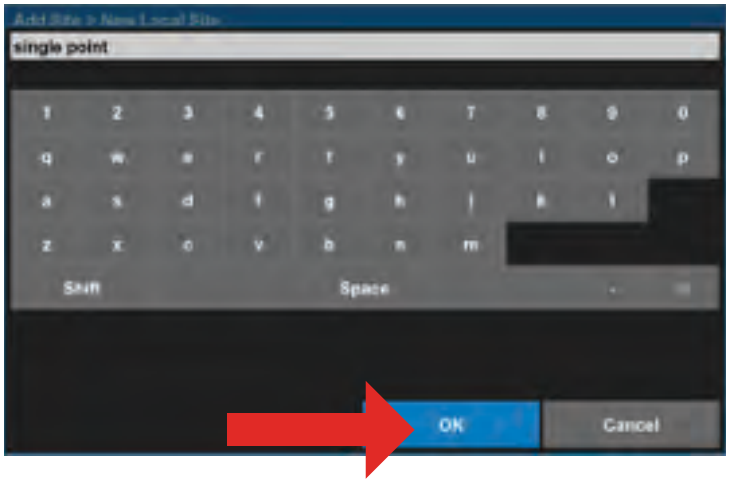


A list of all the projects in your data collector will populate. Tap Add.

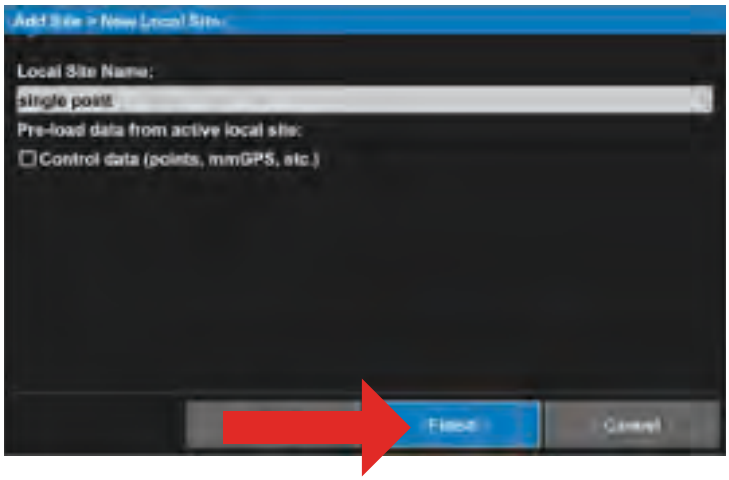
Version 15



Select **New Local Site.**
Tap **Next.**

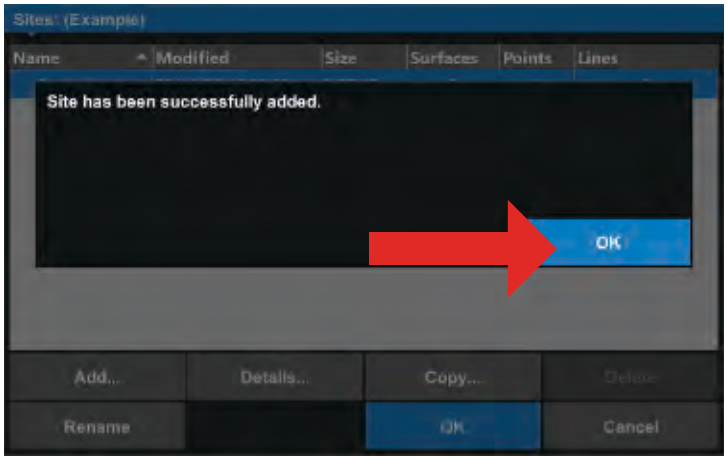


Title your new project.
Tap **OK.**

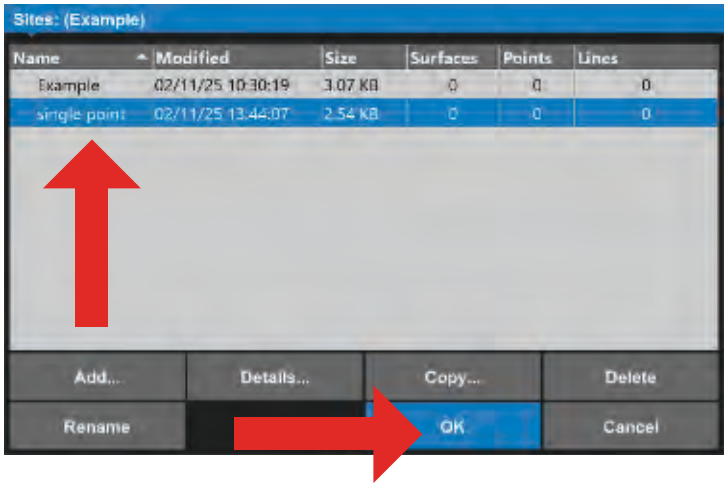


After naming your project make sure Control data is unchecked. Tap **Finish.**

Version 15

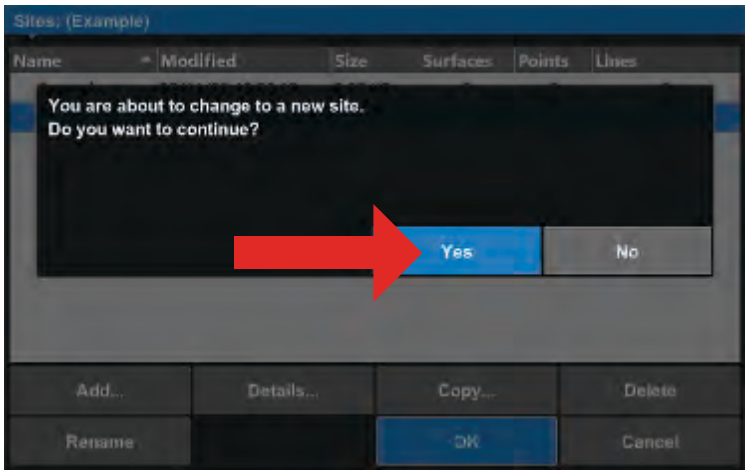


Tap **OK.**

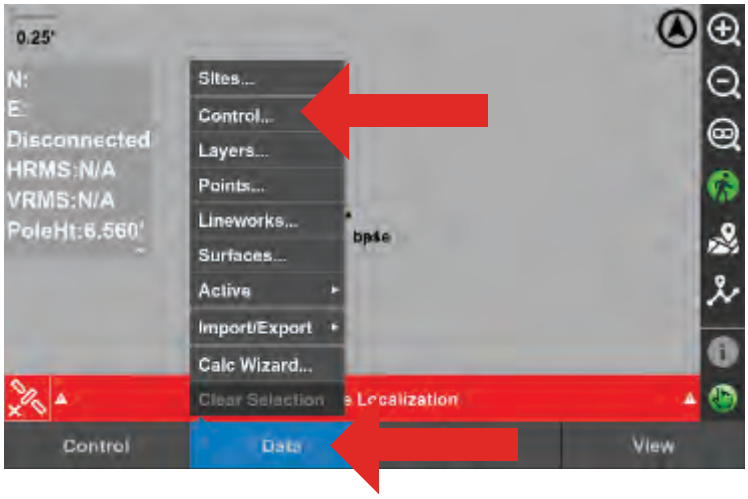


Highlight/select your new project and tap OK.

Version 15



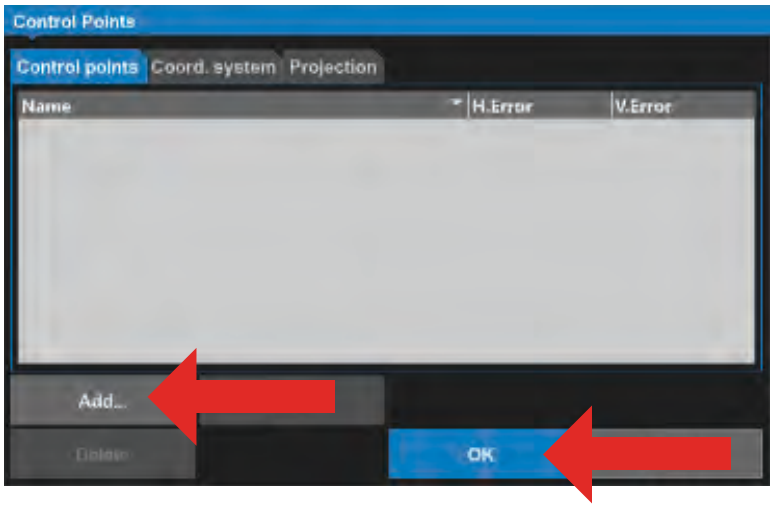
After selecting project and hitting OK it will prompt you again. Select Yes.



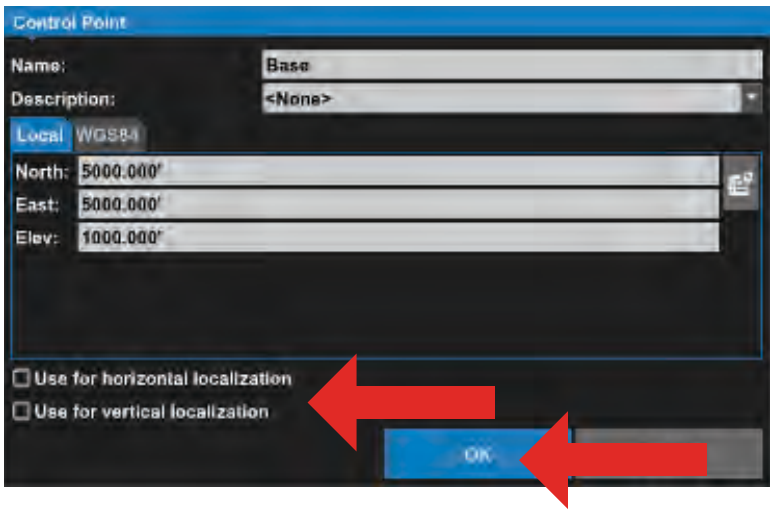
Now that the project is created you will need to add a location for the base plus one control point.

Click Data and then Control.

Version 15



On the Control Points screen you will select **Add.**

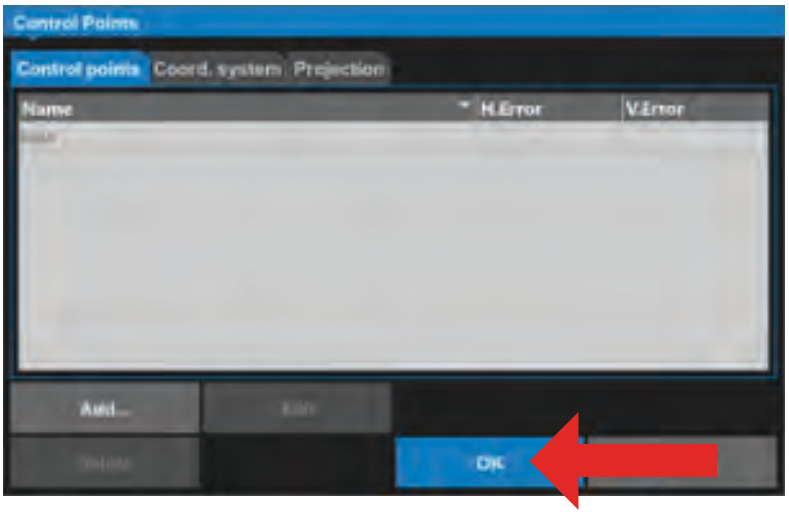


Name your first point "Base" and then set the local coordinates to:

- North: 5000
- East: 5000
- Elevation: 1000

Then click **OK.**

Version 15



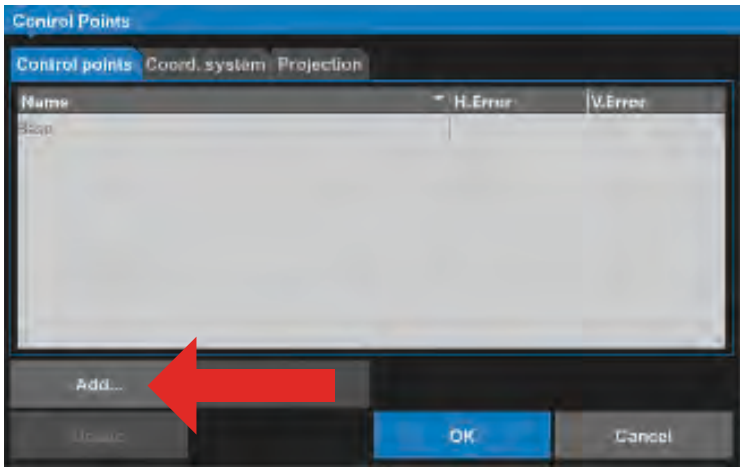
Base location is now added. Tap OK to get back to main screen.

Version 15

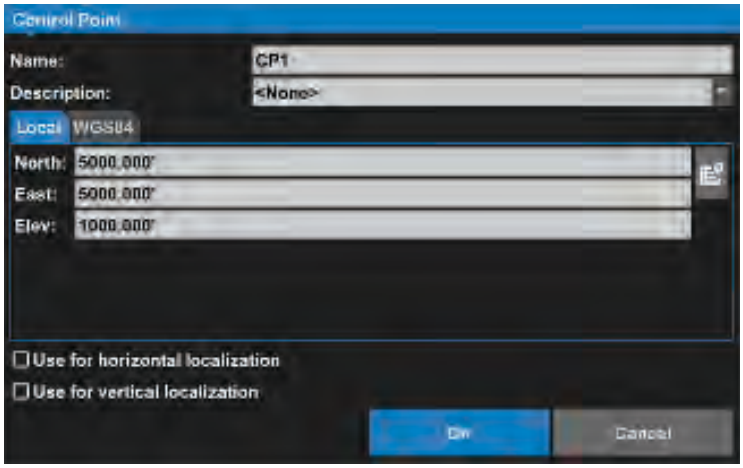
Start your base and connect to your rover. These steps can be found in section 2 and 3 of this guide.

Once you go green and have good connection go to Data and tap Control.

Version 15



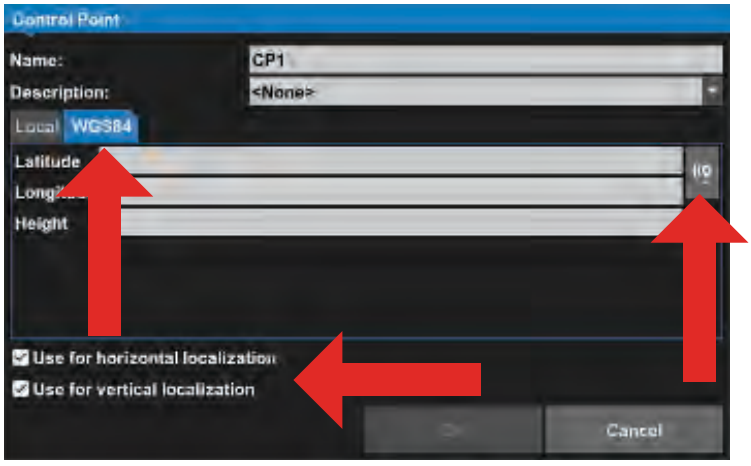
Tap Add and title this point CP1.



Give CP1 the same coordinates as your base.

- North: 5000
- East: 5000
- Elevation: 1000

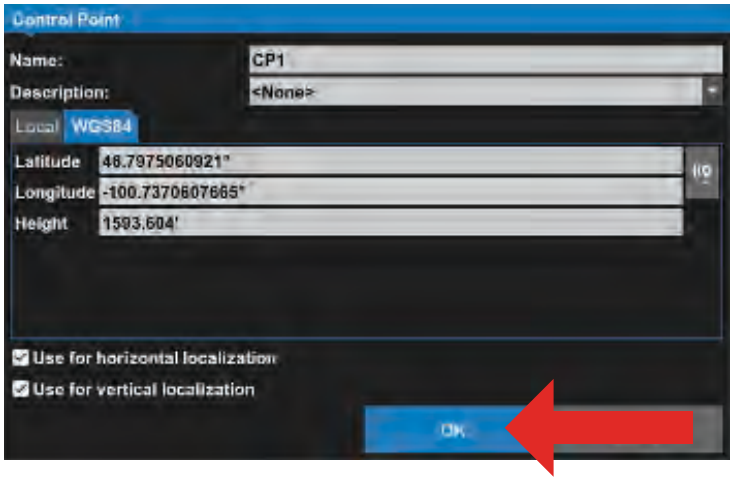
Version 15



After entering your coordinates select the WGS84 tab to the right of Local.

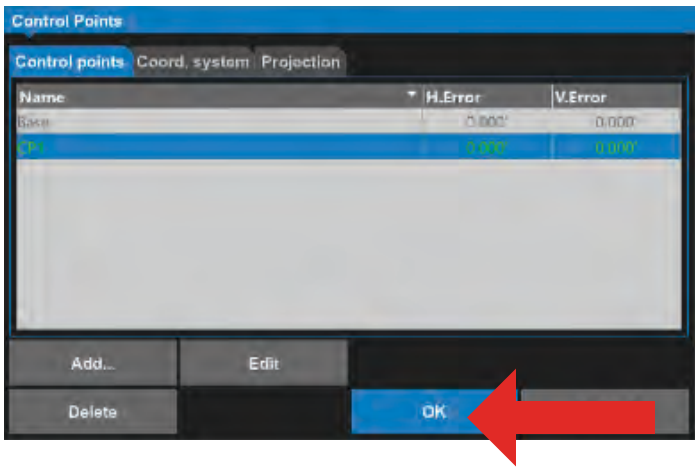
Check both horizontal and vertical localization.

Then tap the measure icon.



Once it is done with its measurements Lat, Lon, and Height will be populated. Tap OK.

Version 15



Now you should have Base and CP1 in the control point list.

Tap OK to get back to project screen.

This is the bare minimum that needs to be completed for machine control/gps to work.

Copy this project file onto a thumb drive and then load into your machine.

The elevations that you are reading are not "real world" elevations. They are relative to your base and control point.

Use single point for small simple jobs not engineered ones.

GENERAL
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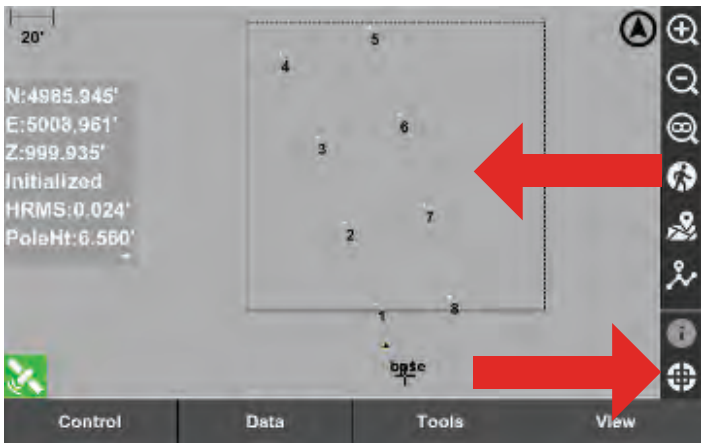
Create Surfaces in Data Collector

Section 14

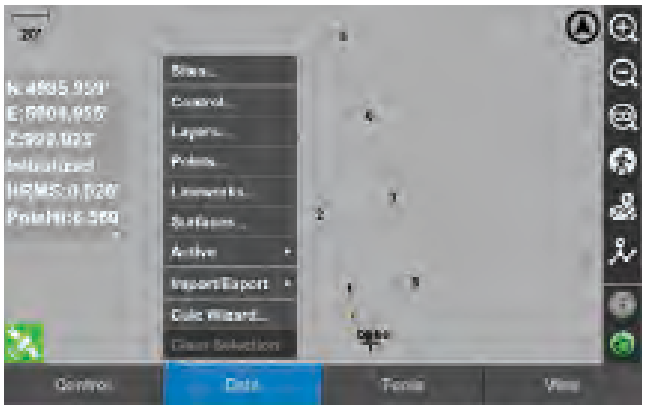
Version 15

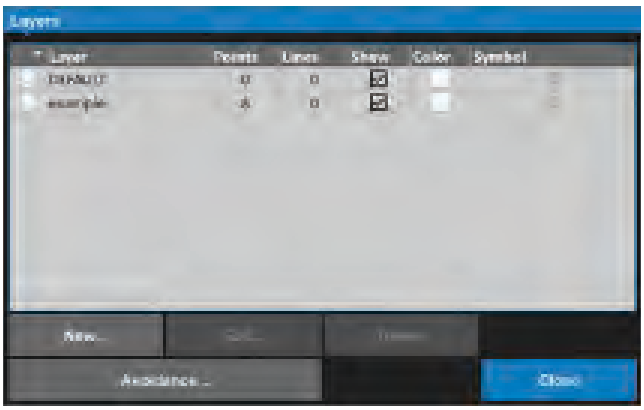


You can create a surface from points(Topo shot) that you take. The more points the more accurate the surface will be. Make sure when taking your point measurements that you keep them all in the same layer.

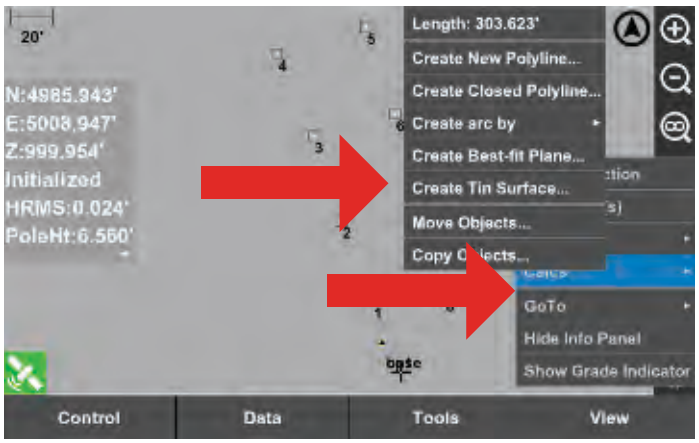
Once you have all of your points measured they will need to be the only visible points on the screen. You can do this by selecting the layer you took all of your topo shots on.

Use the selecting tool to draw a box around the points that you want to include in your surface.

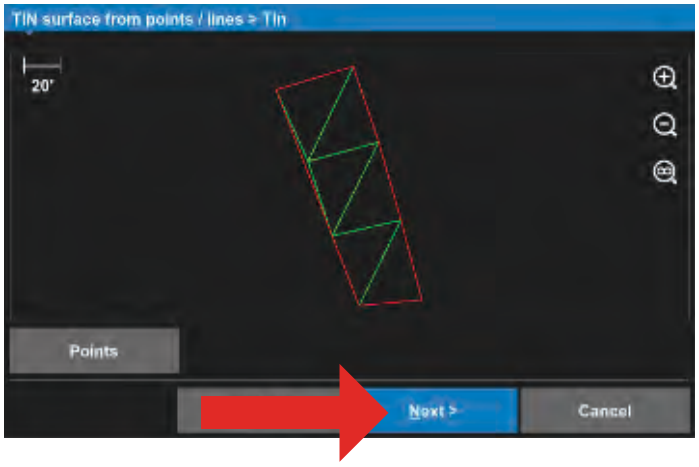




Version 15

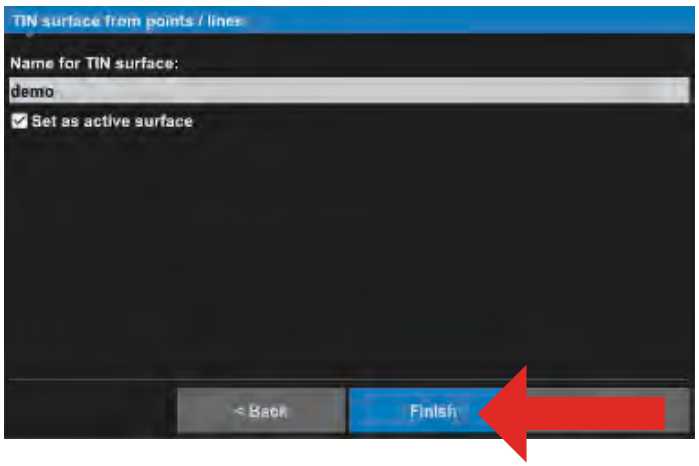


After points are selected press and hold on screen with finger or stylus to bring up pop up menu. Select Calcs, then Create Tin Surface.



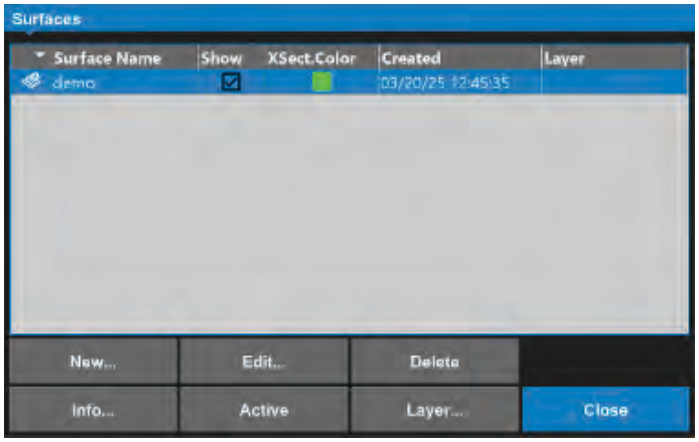
You will see what your new surface will look like. Select Next.

Version 15



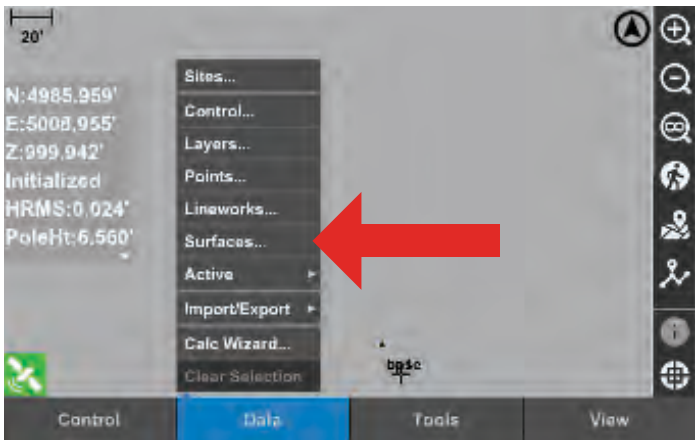
A→B Plane Surface

Title your surface. If you want this surface to be your current active surface check the box (Set as active surface). Select Finish.



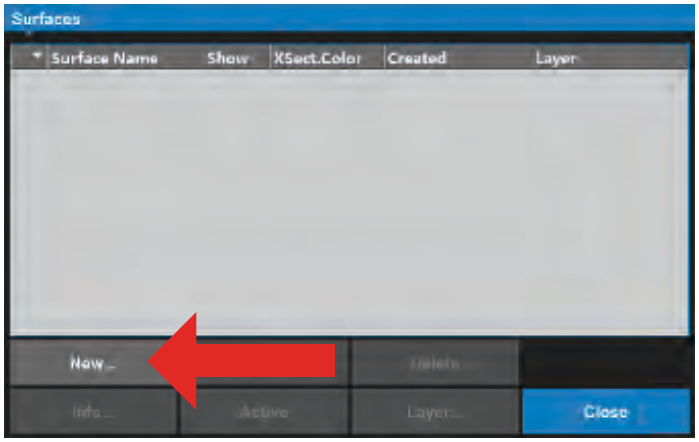
You will find your new surface has been added to your list of surfaces.

Version 15



A→B Plane Surface

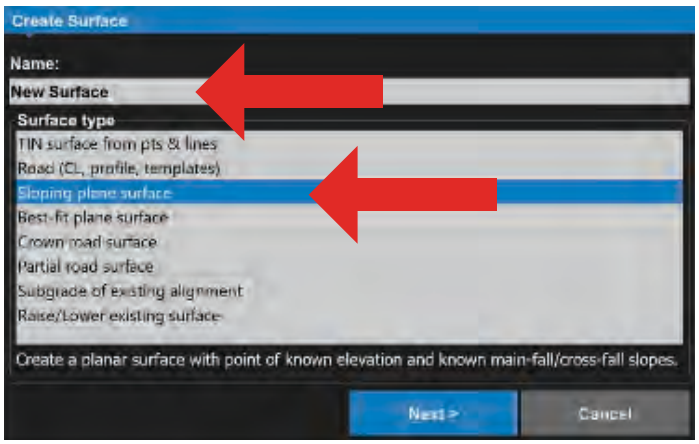
You must have a base set up and localized or single point localization set with the rover connected.



From the main project screen go to the surfaces screen.
Data→Surfaces

On the surfaces list click New.

Version 15

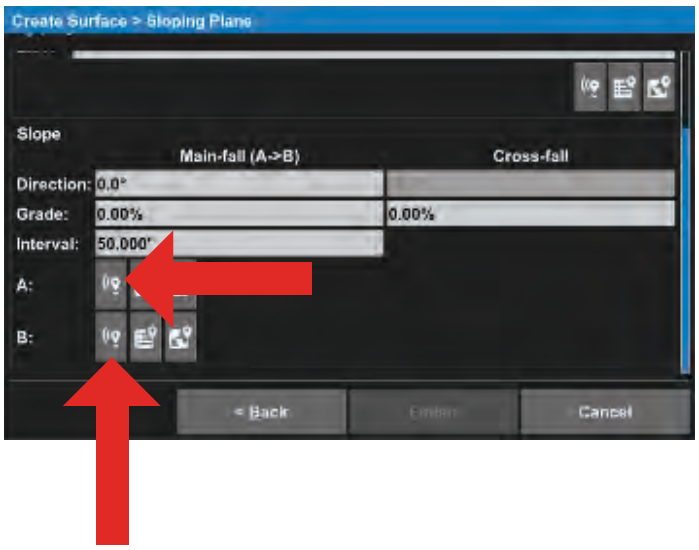


A→B Plane Surface

Name your surface and select surface type Sloping plane surface.

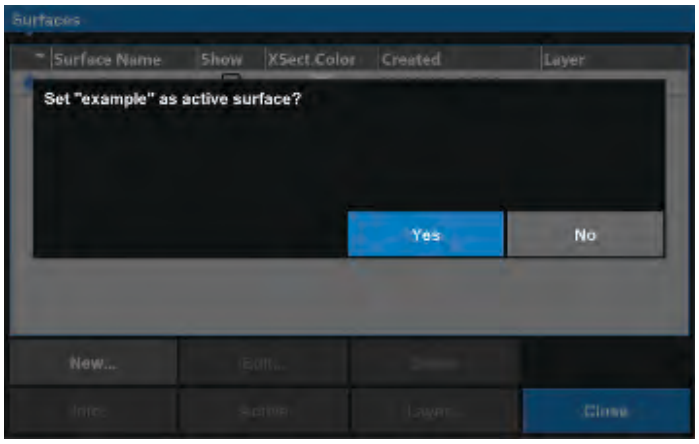
Select **Next.**

Version 15



A→B Plane Surface

Plumb the rover on the starting point(A) where you want the surface to start from. Tap the measure button for letter A. Once the measurement is taken stay on the current screen and move to the end point of the slope. When your rover is plumbed up over end point tap the measure button for letter B.



After the end point of your surface is measured finish out and you will be prompted to set the slope you just measured to be the active surface. If selected no, it will just be saved in the surfaces page.

You can now load this surface into the machine.

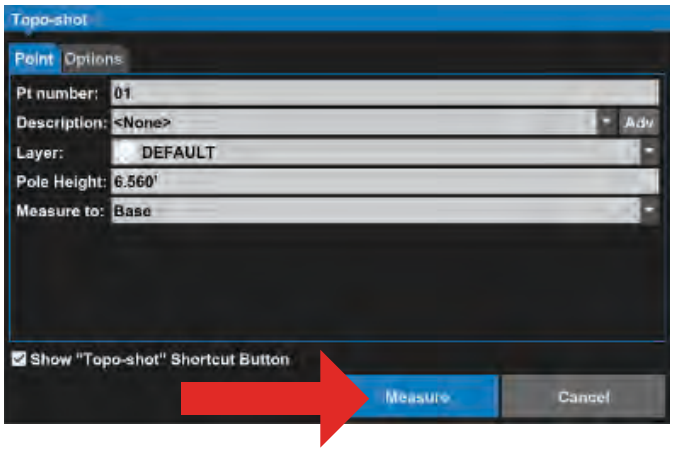
GENERAL EQUIPMENT & SUPPLIES, INC.

Creating a Ditch on the Data Collector

Section 15

Version 15

Follow these steps after you have created a new project and completed your localization. Note: this will only work for straight ditches and it is best to use your culverts as centerline. From the project screen click on tools→Measure Topo→Topo-shot

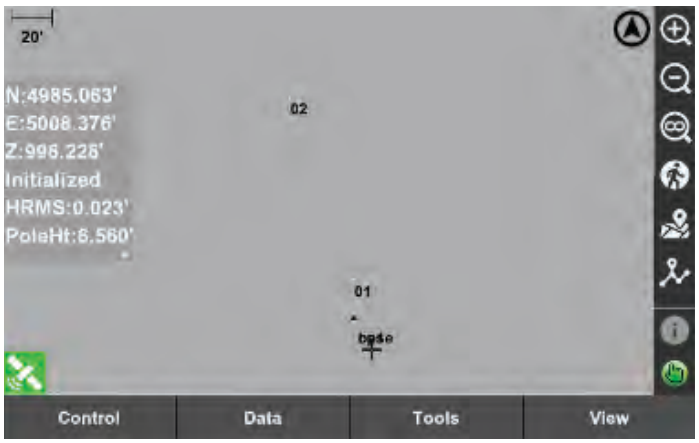


Before measuring in the first point you can add a description to the point and change what layer it is added to.

Plumb your rover over the starting point you want to measure and tap Measure.

Perform this step for all of your points.

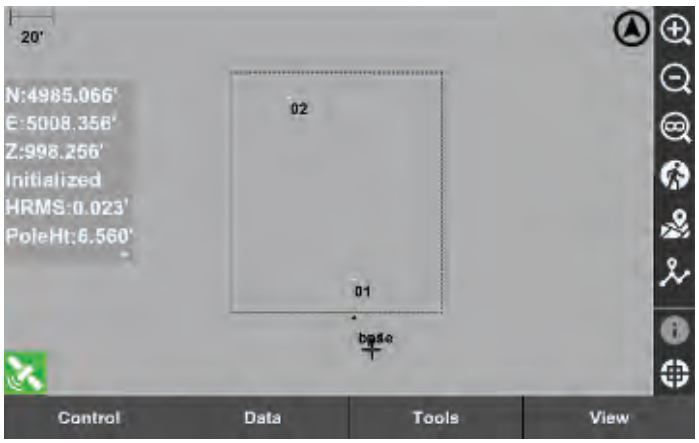
Version 15



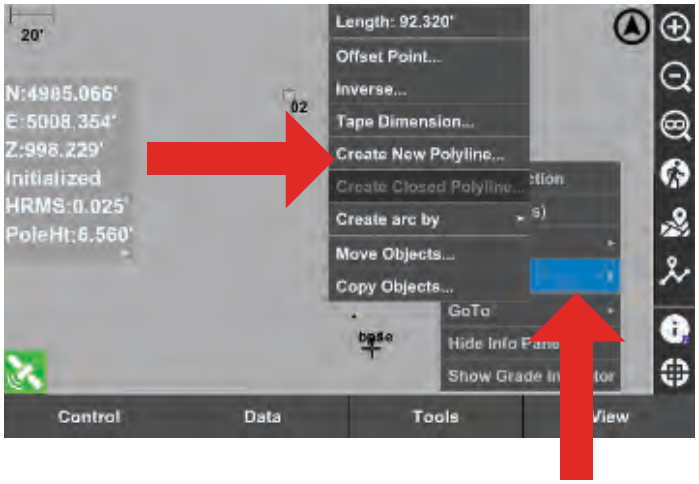
Once your start and end points are measured in, they will be displayed on the screen like this.

Make sure the icon on the bottom right of the screen is the crosshairs icon. You can change it by just tapping the icon.

Version 15

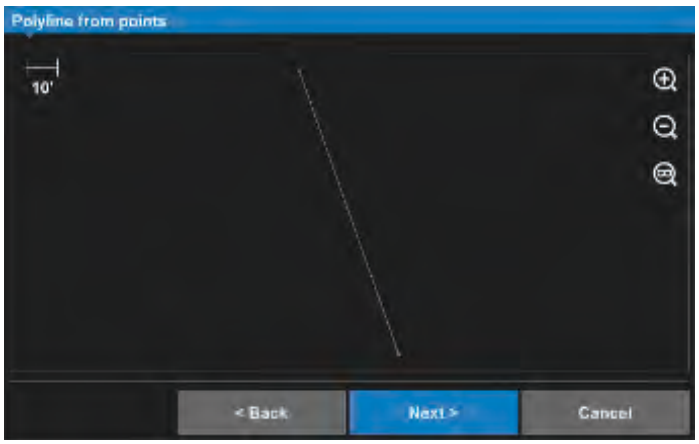


Press and drag your finger(stylus) across the screen and draw a box around your points. This will highlight your points.

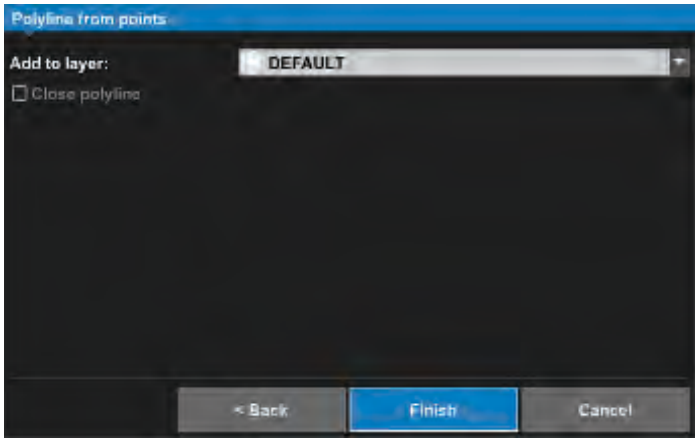


Press and hold on the screen and a menu will pop up. Select Calcs, and then Create New Polyline.

Version 15



It will display the polyline you are creating. Click **Next.**



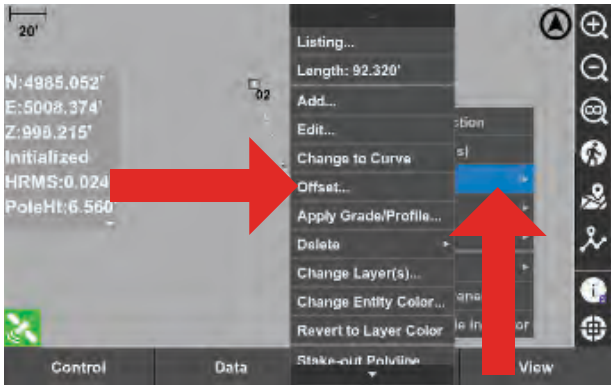
Add to the same layer you took your topo shots on. Click **Finish.**

Version 15

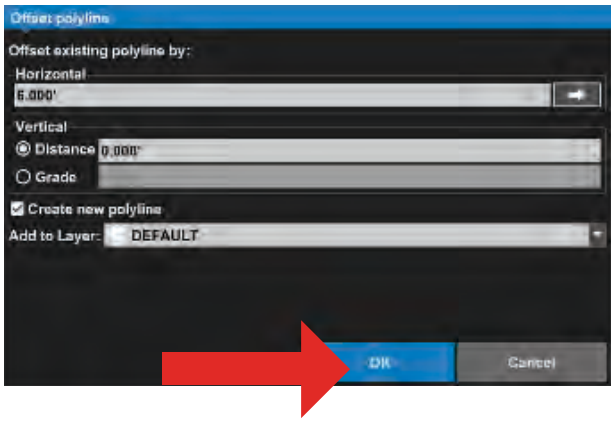
Now you will have a line between your two topo shots.

Click on the line between the points to highlight it.

Version 15

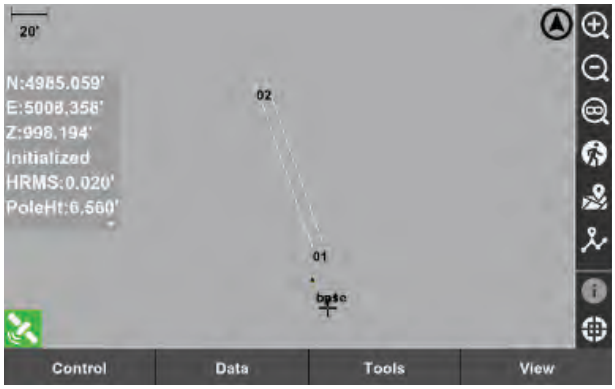


Press and hold on the screen to bring up pop up menu.
Select Linework→Offset



Here is where you can copy/ shift your line horizontally and vertically. The direction you are shifting is relative to your initial points.

Make sure Create new polyline is checked and click OK.



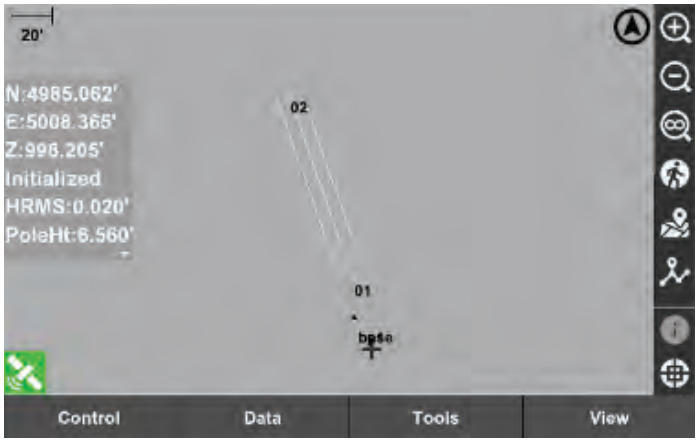
Your new line will appear on the screen next to your original line. You can identify the original line as the one with the points.

- Press and hold to bring up menu
- Clear selection

Version 15

Select your centerline and repeat the same steps to create the other side of your ditch bottom.

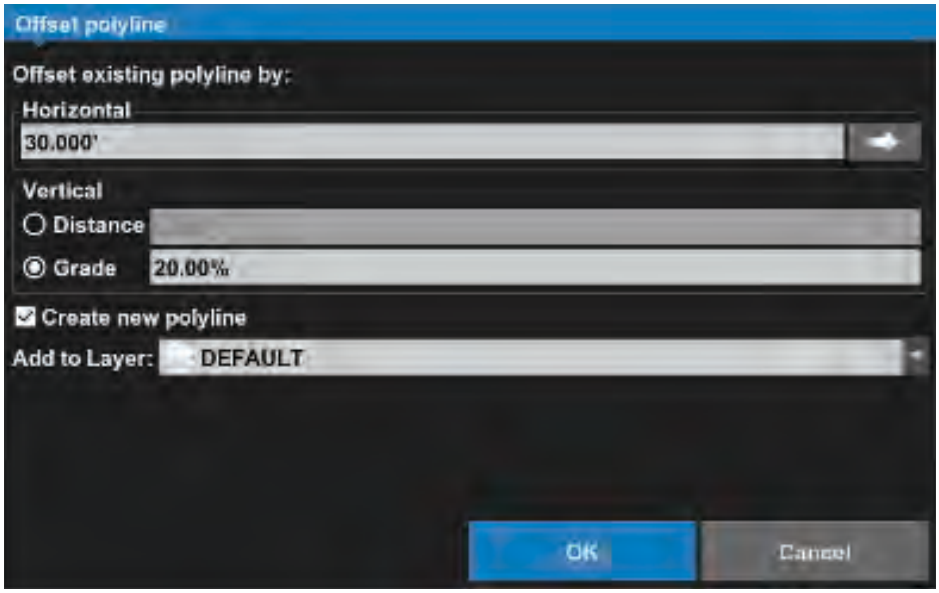
Make sure to select the opposite side of your centerline to create the other side of your ditch bottom.



After creating both sides of your ditch bottom press and hold to bring up menu and select clear selection.

This will display the bottom of your ditch.

Version 15



To create the slopes of your ditch you will have to select your outside line of your ditch bottom(select one side at a time)

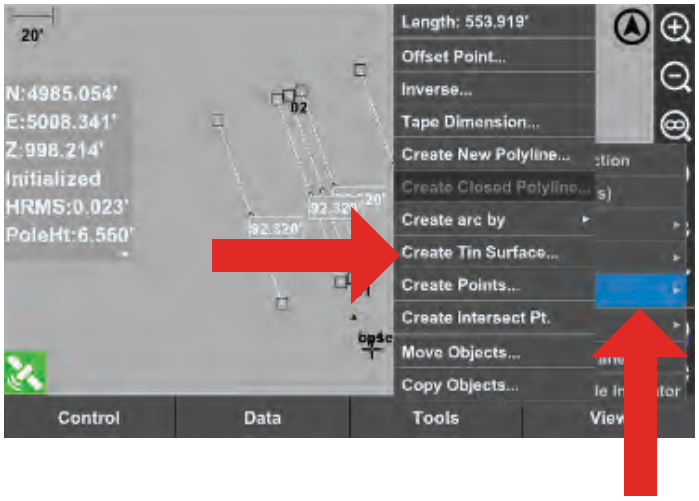
Use the same steps listed previously in this section.

Select how wide your slope will be and then you can either use distance or a percentage for your slope.

Repeat the steps for both sides of the ditch.

Version 15

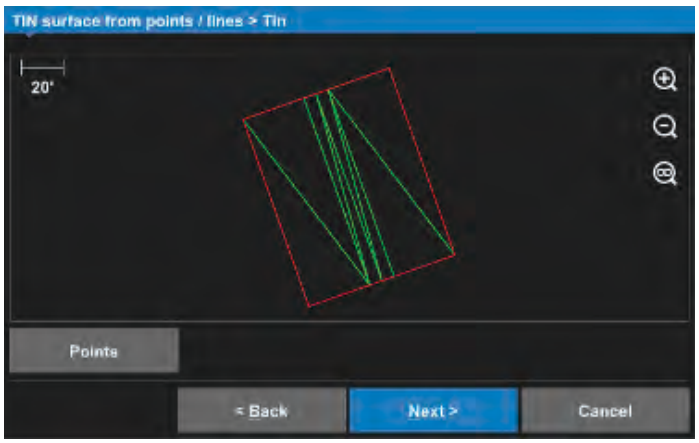
Once the ditch bottom and side slopes are entered you will see something similar as the left picture.



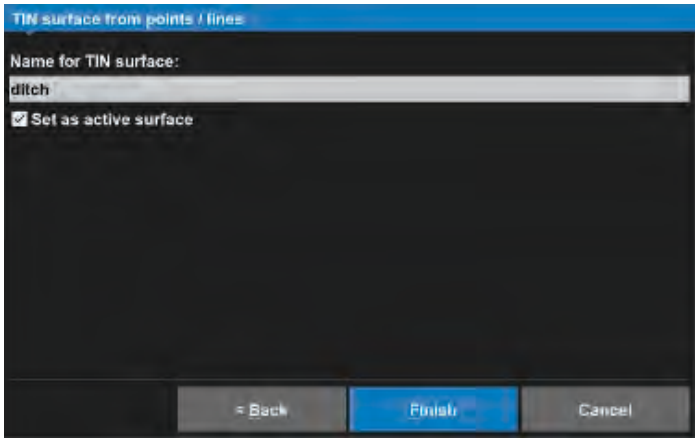
Make sure all of your lines are selected and press and hold screen to bring up menu.

- Select:
  Calcs → Create Tin Surface

Version 15

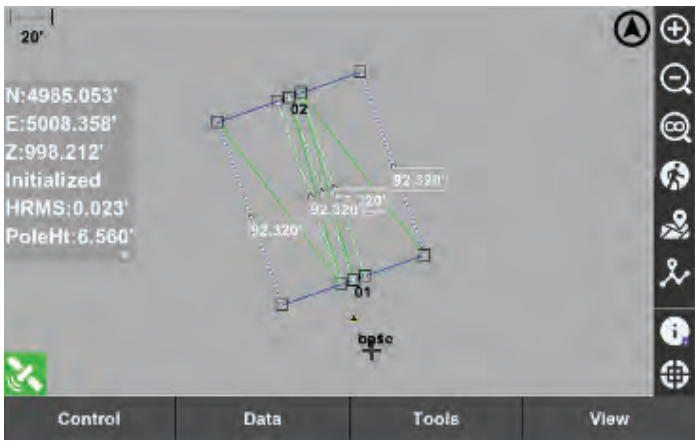


Select **Next.**



Title your surface and set as current surface (check box). Click **Finish.**

Version 15



You now have a surface and linework.

Press and hold screen to bring up menu and then select clear selection.

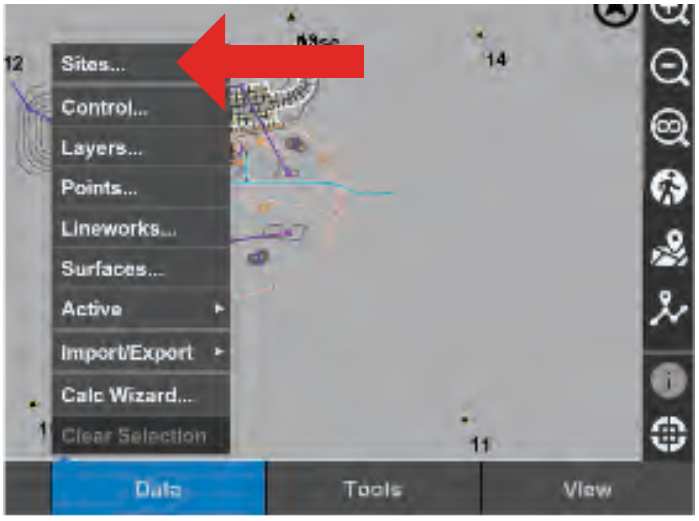
You can now copy this file and put it into your machine.

GENERAL EQUIPMENT & SUPPLIES, INC.

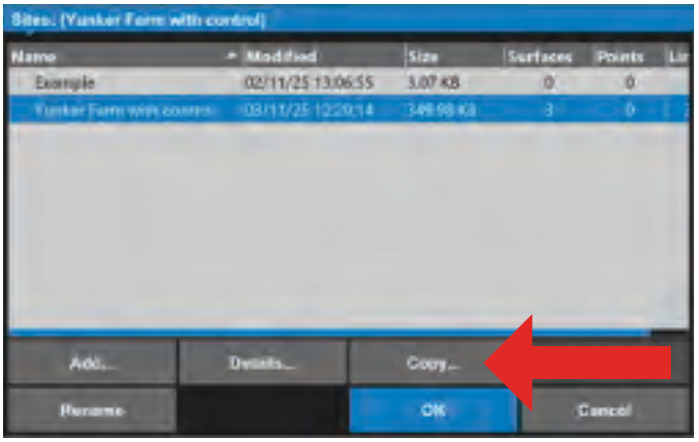
Completing Job Site Set-Up

Section 16

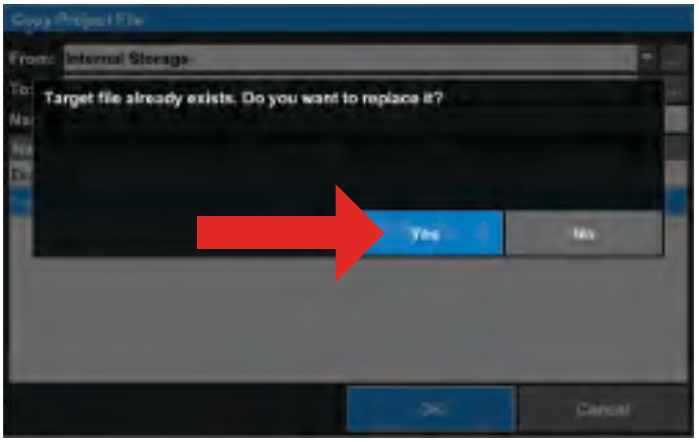
Version 15



This is to be done after the site has been localized. Insert thumb drive into Data Collector. Tap Data→Sites



Tap Copy.



This alert will display when copying back onto the thumb drive. Select Yes.

After saving file, verify accuracy using rover with some form of a benchmark (manhole,curb,etc).

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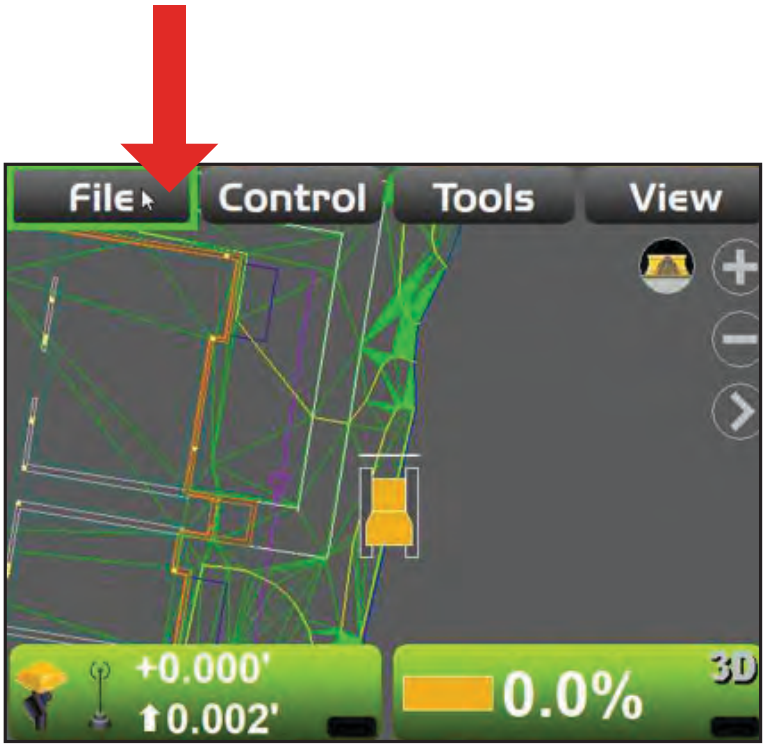
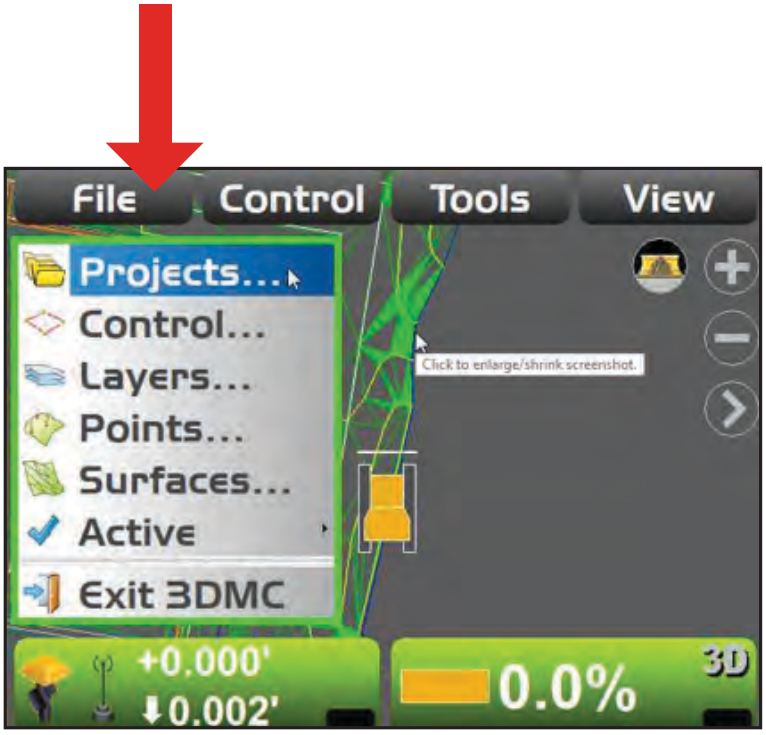
Loading New Project in Dozer

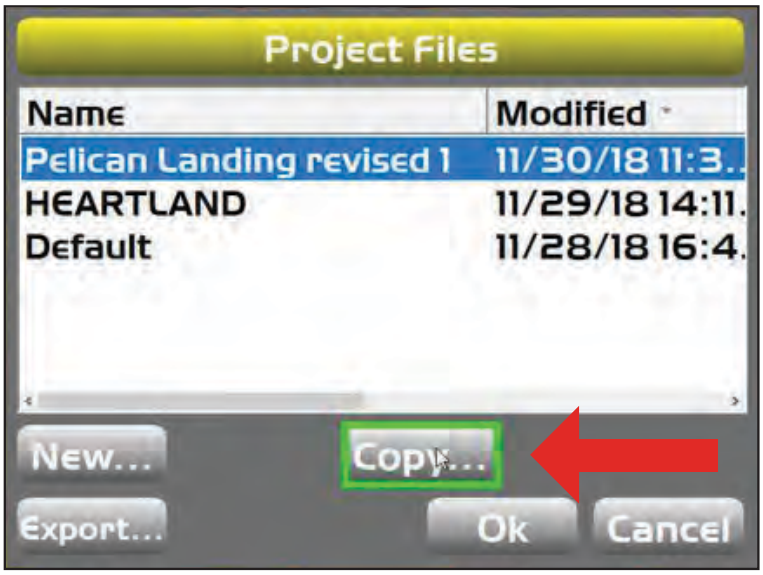
Section 17



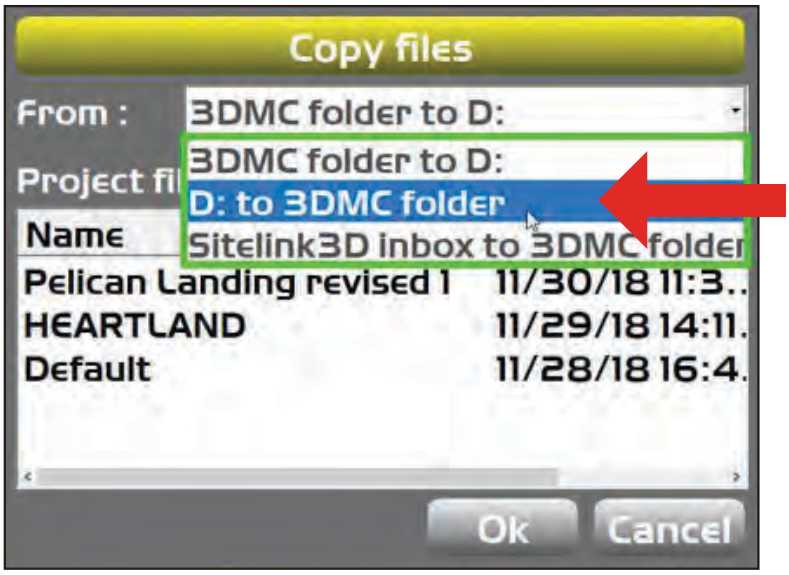
Insert the thumb drive into the machine. Tap your menu button to bring up the menu. Tap **File.**



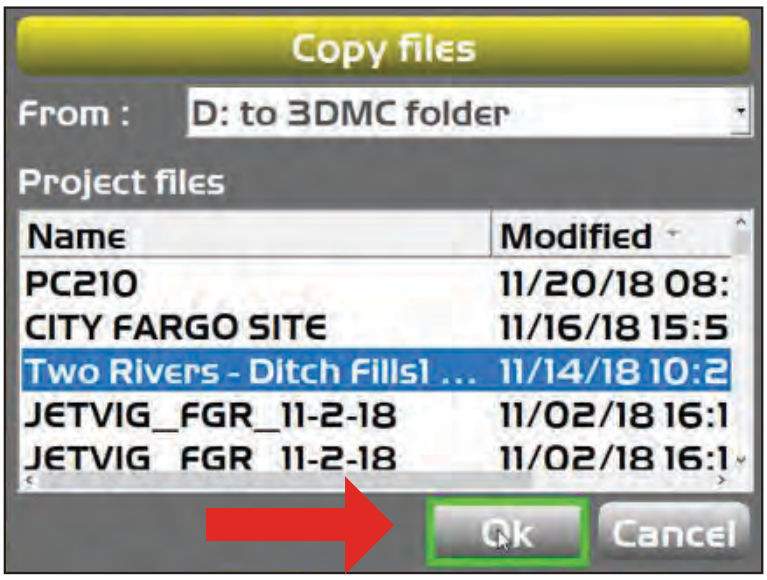
Under the file tab select **Projects.**



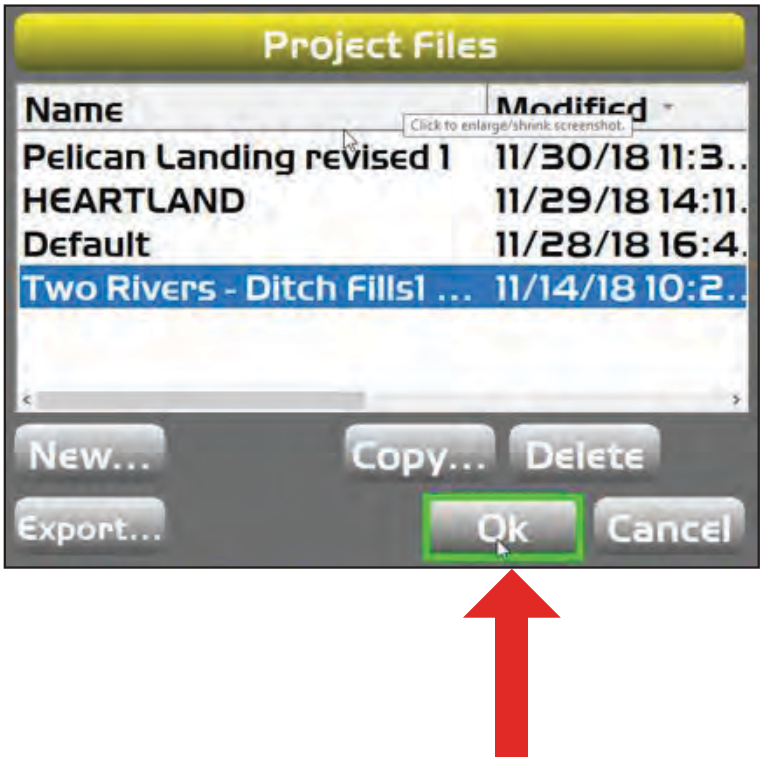
Select your project then click Copy.



In the From drop down box switch to D: to 3DMC folder.



Select the file that is on your thumb drive that you wish to copy over, tap Ok.



After the file is successfully copied over you will see a list of all the project files that are in the machine. Highlight the job file you want to use and tap Ok.

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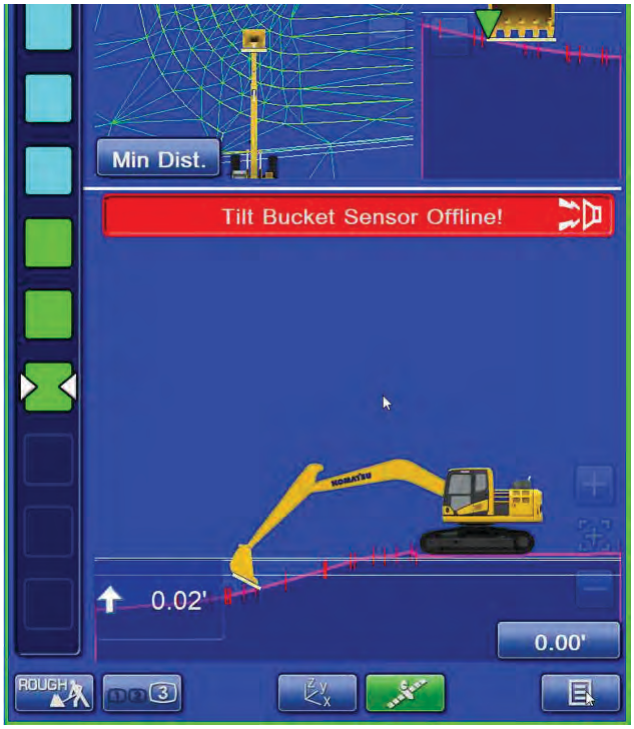
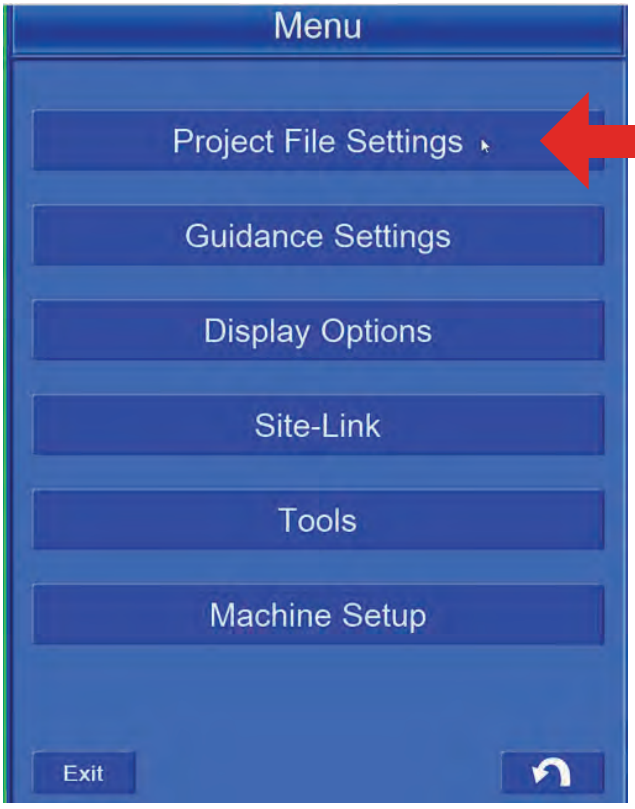
Loading New Project in Excavator

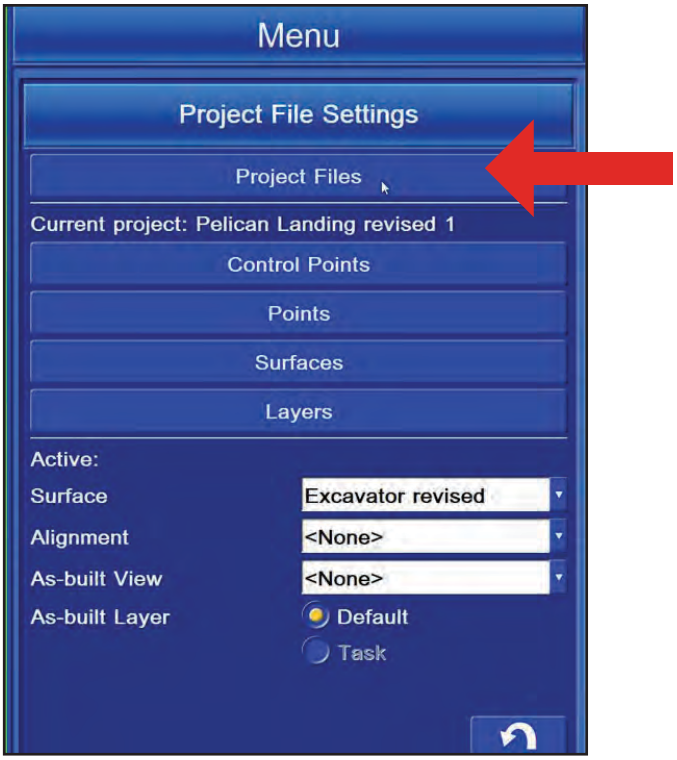
Section 18



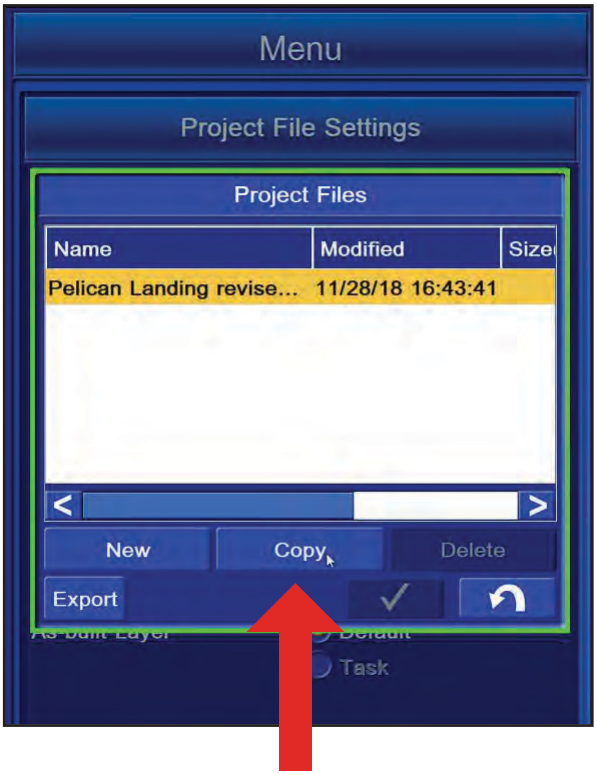
Insert thumb drive into monitor. Tap on the menu button on the bottom right corner of the page.



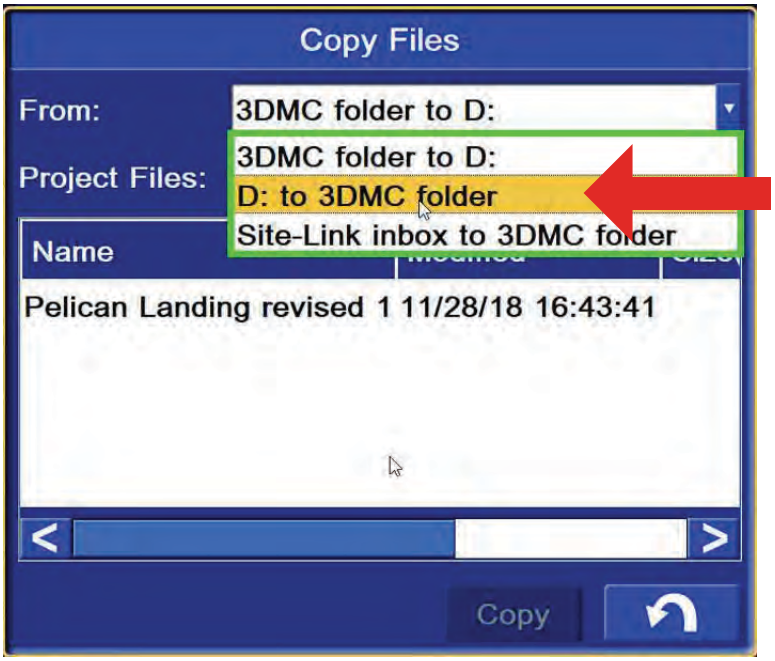
In the menu select **Project File Settings.**



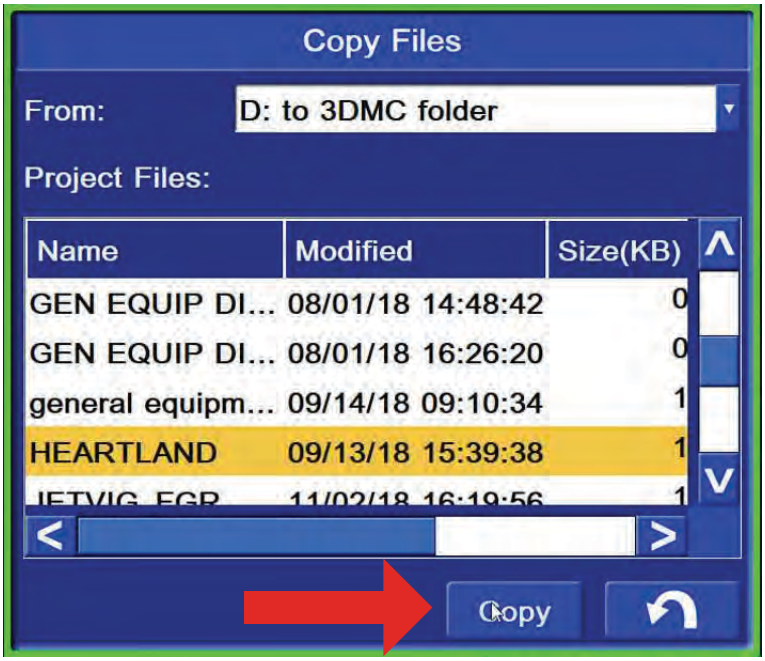
In Project File Settings select **Project Files.**



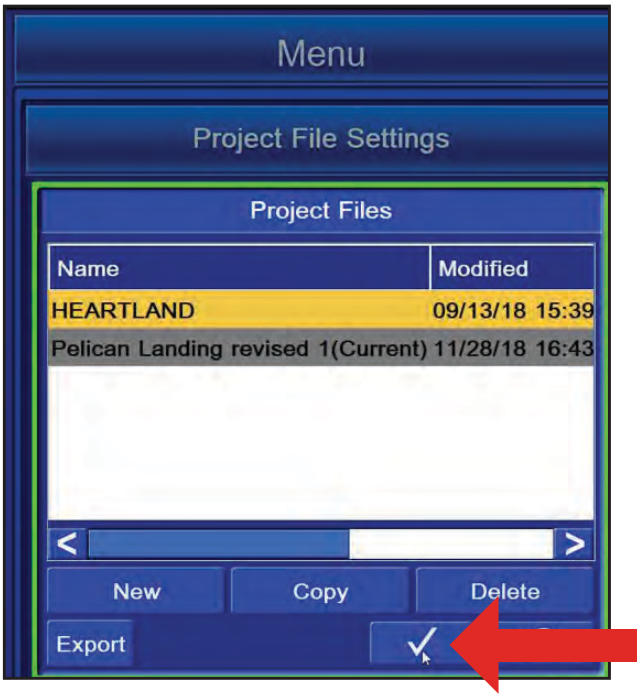
In the Project Files page, you will see all the projects that are currently loaded in the machine. To add a new project, select **Copy.**



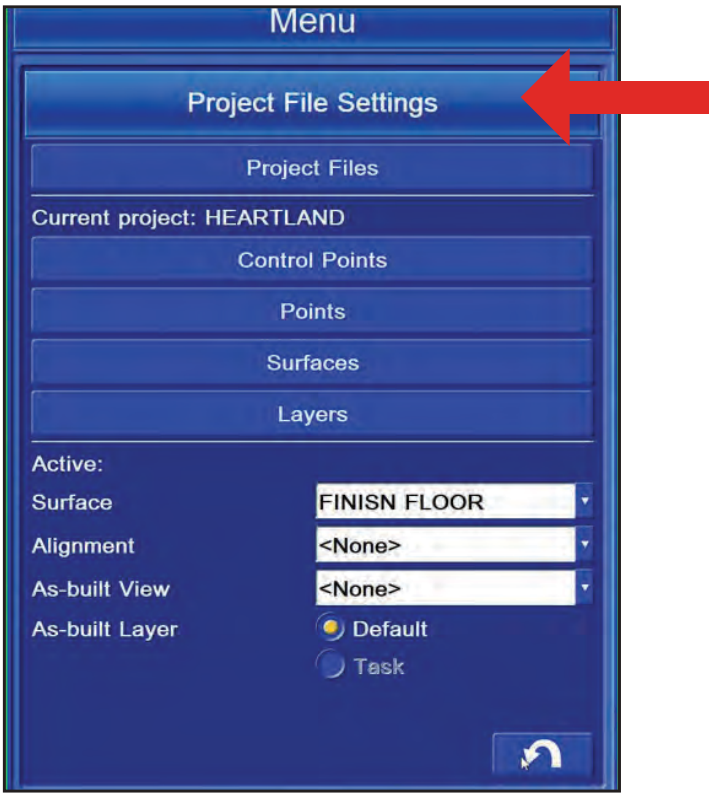
You will need to change the From drop down box to read D: to 3DMC folder. This will give you the list of files on the thumb drive.



Select the file on the thumb drive that you would like to copy over to the machine. Make sure the file is highlighted and hit Copy.



After the file has copied over you will need to select the Job File. Make sure it is highlighted and tap the Check Mark.



Here you can see under Project Files that the current file of the machine will be running. Also, on this page, you can see a list of your surfaces associated with that file.

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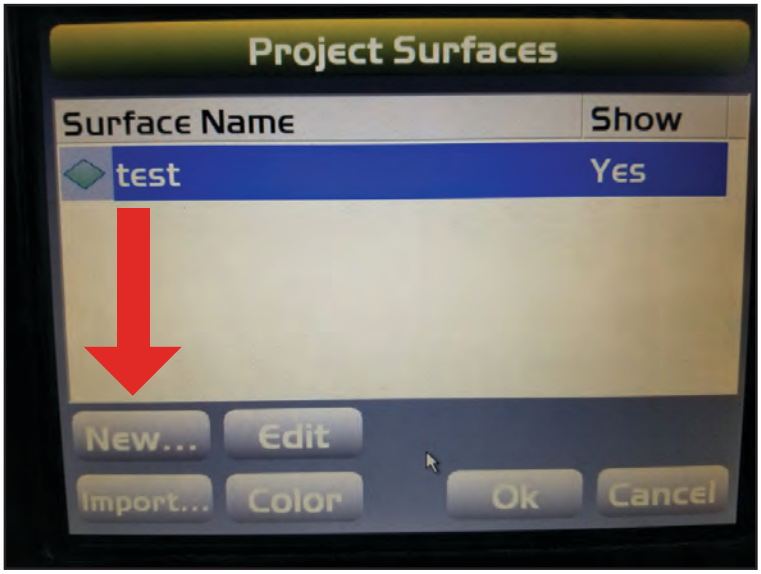
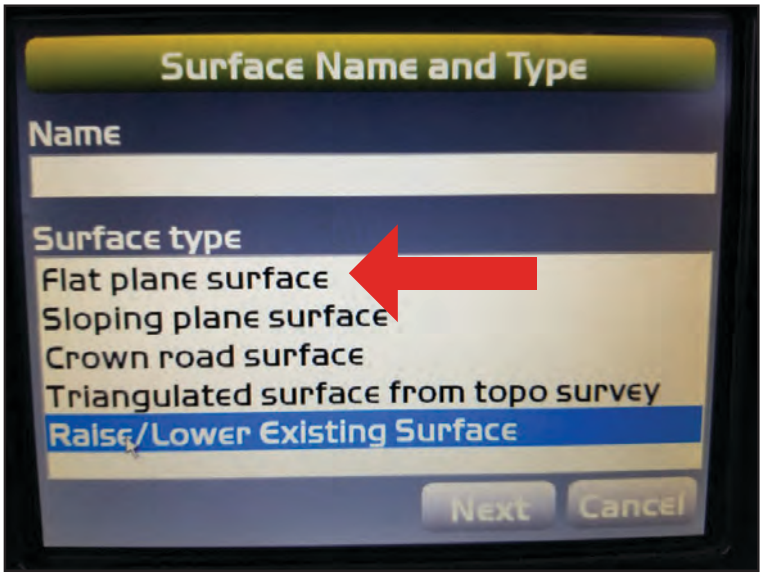
Dozer Flat

Section 19

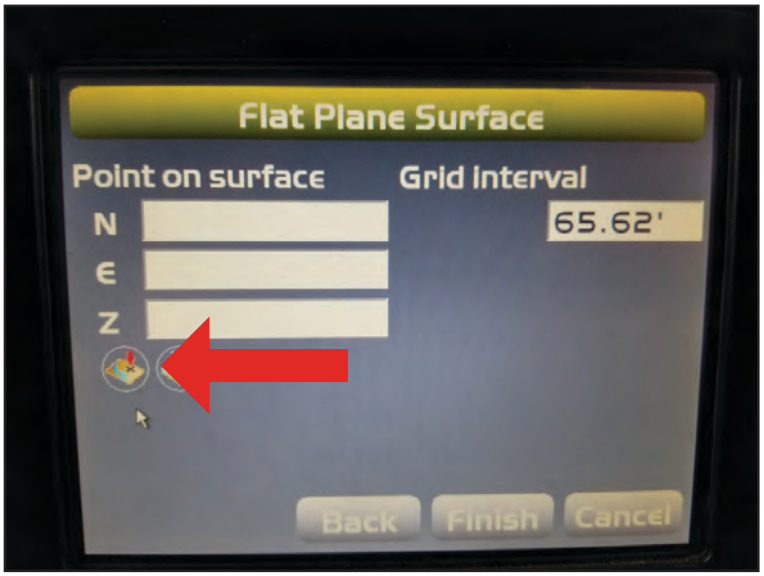
To create a new surface, click **File, Surfaces.**



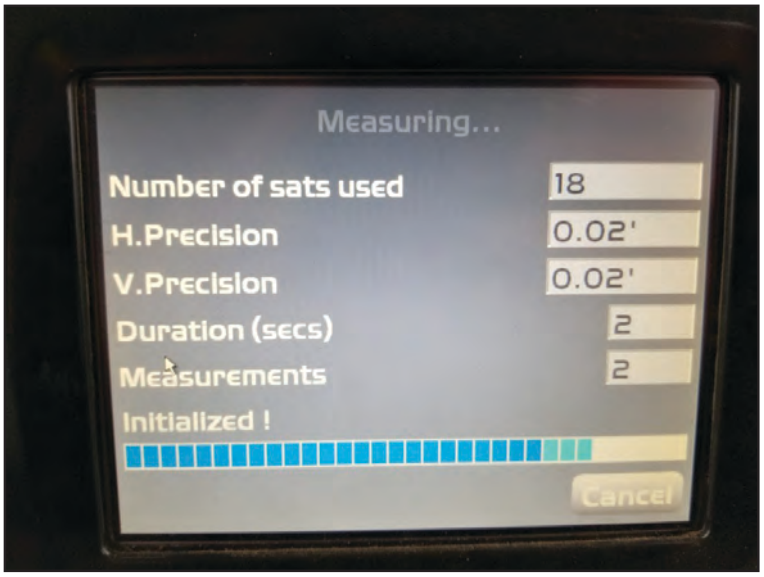
In the surfaces folder you will see a list of all the surfaces in your project, select **New.**



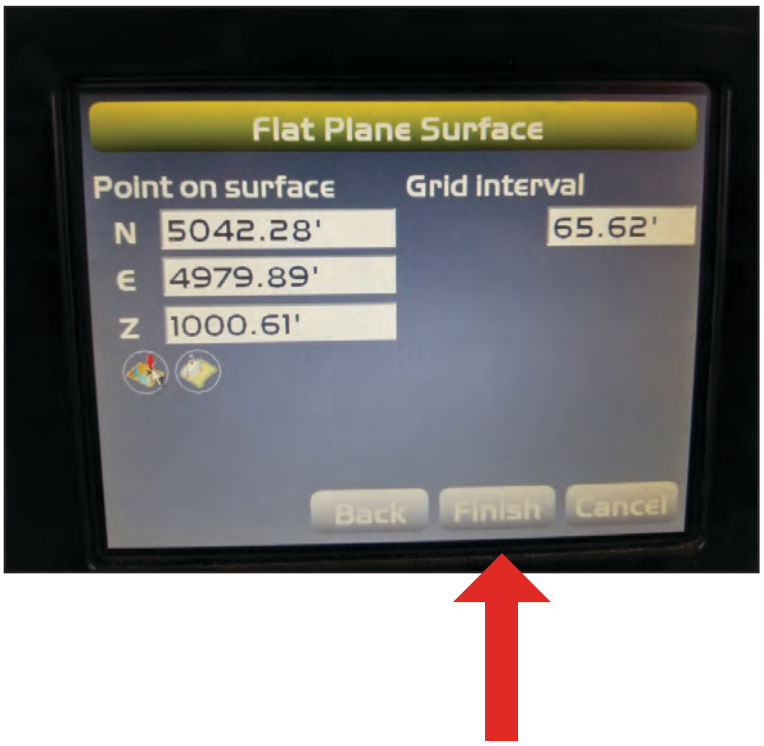
On this page you can title the surface you wish to create. Select Flat plane surface.



Select the Measure Here option.

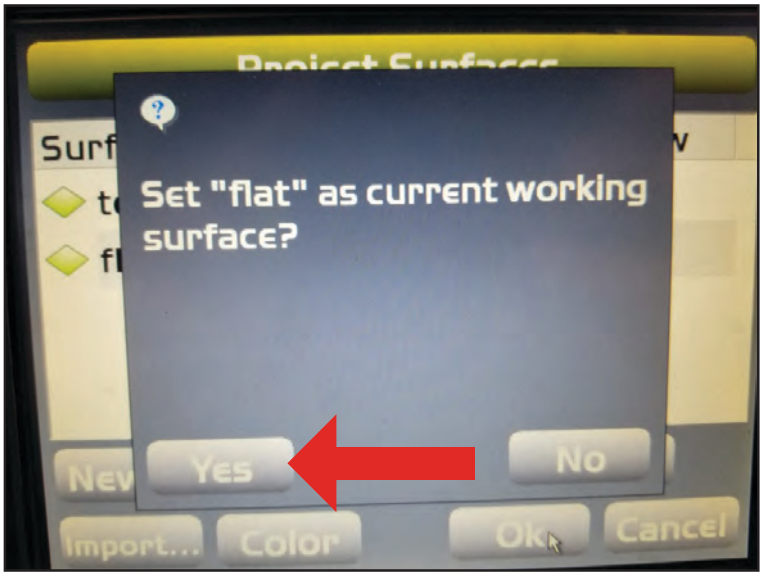


Do not move the machine while the machine is taking its measurements.



Once the machine has taken the measurement the boxes will populate with data. Select **Finish.**

Now your new surface will appear with all other surfaces in your project file. Highlight your new surface file and select Ok.



The machine will ask if you want to set the surface as your working surface. Select Yes.

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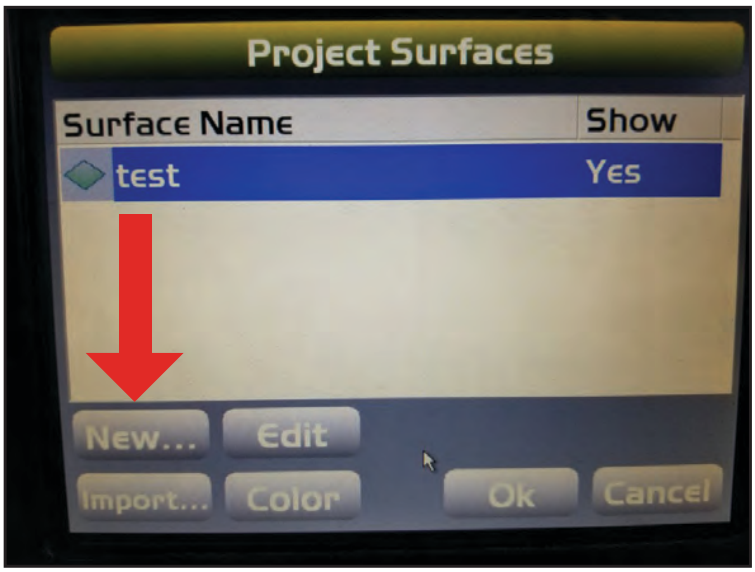
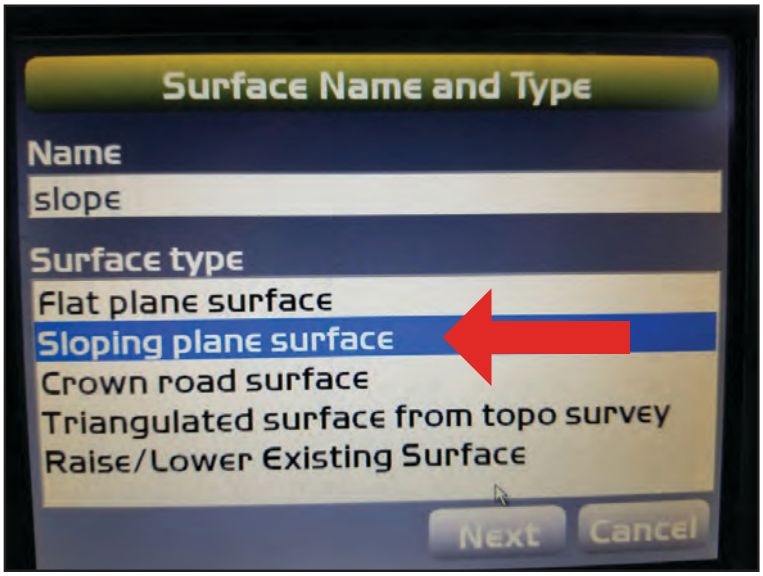
Dozer Slope

Section 20

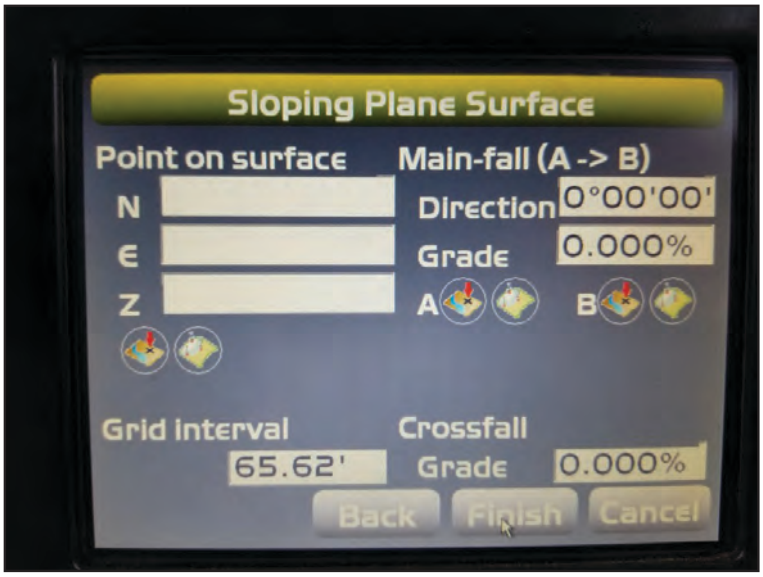
To create a new surface click File, Surfaces.



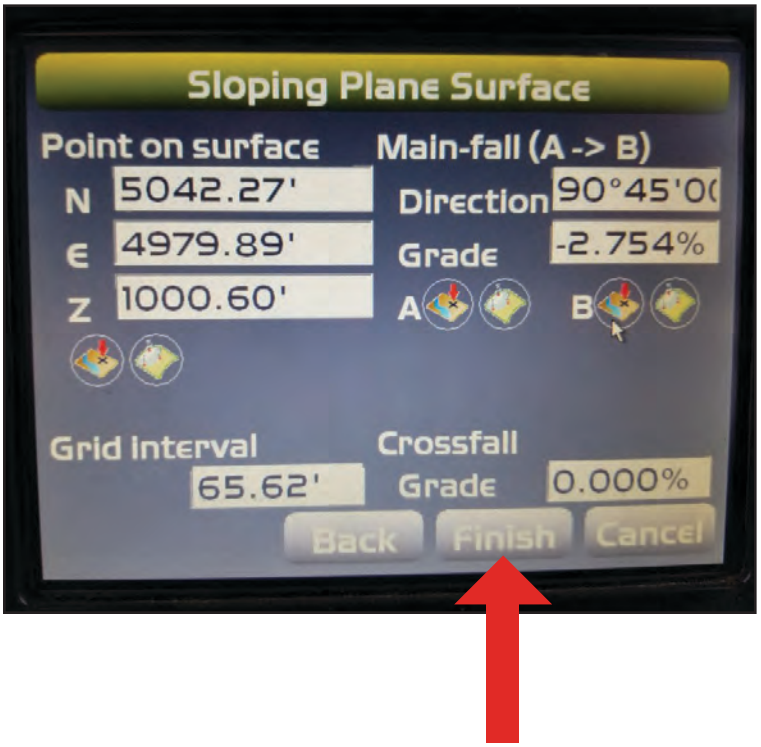
In the surface folder you will see a list of all the surfaces in your project, select New.



On this page you can title the surface you want to create. Select Sloping plane surface.



First make sure you are facing the direction you want the slope to travel. Select the A measure here tab. Wait for the machine to make its measurements. Now travel the machine in the direction that you want the slope to go (travel a few feet). Stop and tap the B measure here tab.



Now that all the fields are populated. You can edit them just tap in the box and change the value. Select Finish when completed.

Make sure to highlight the surface you want to work on and select Ok to set as the current working surface.

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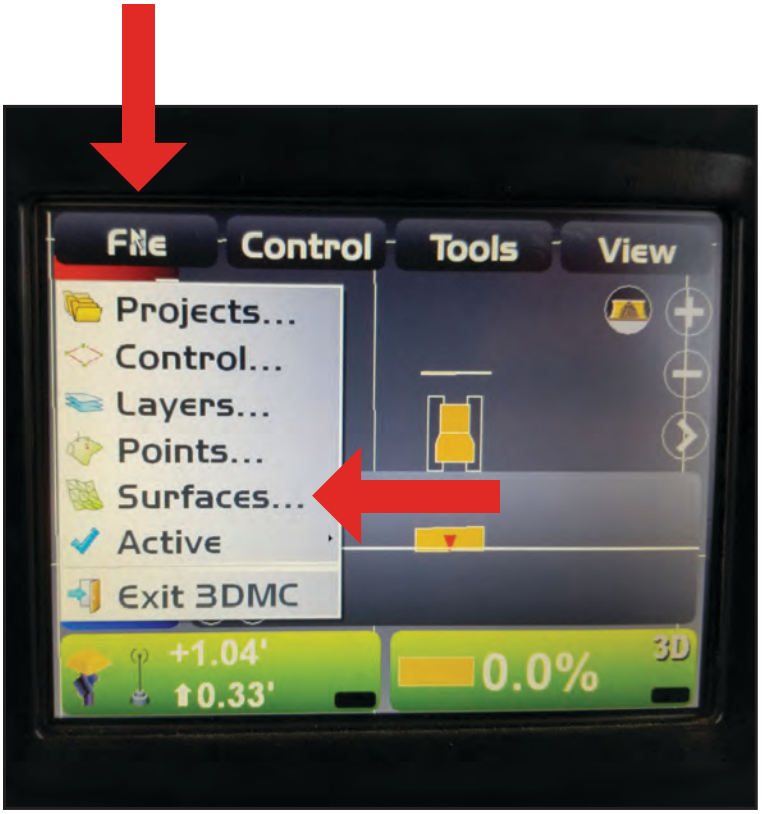
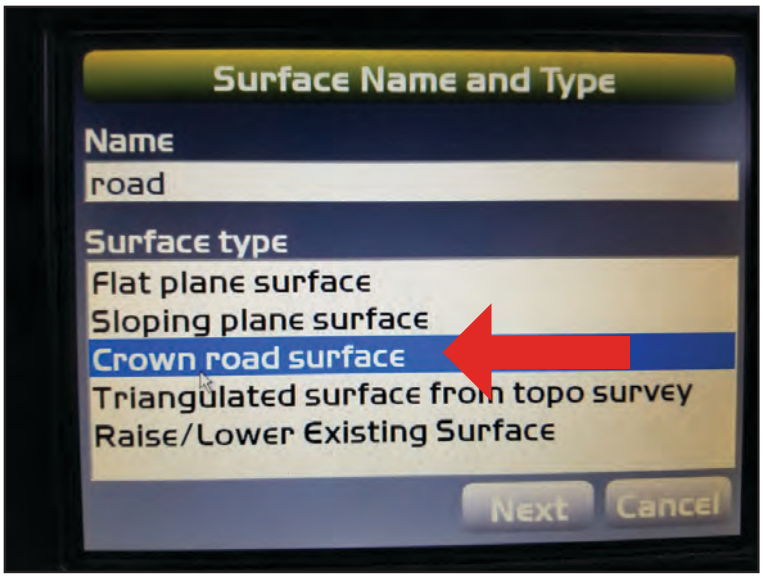
Dozer Road

Section 21

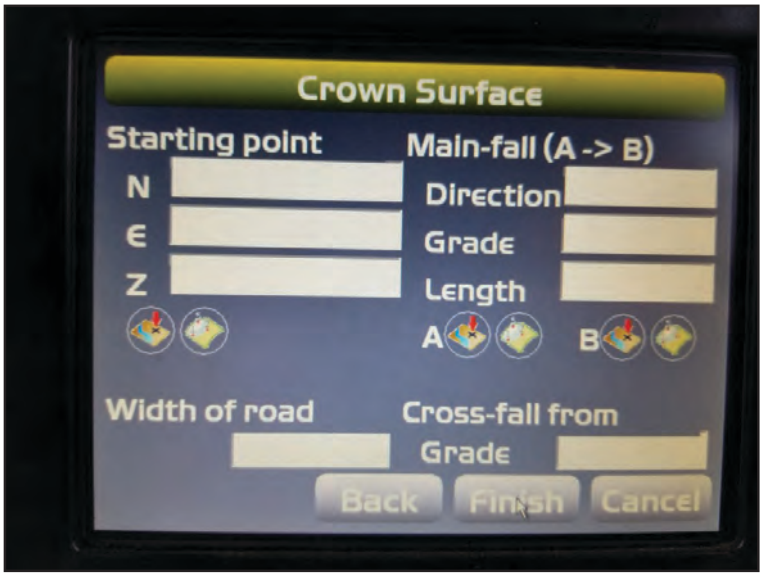


To create a new surface. Click File, Surfaces.

In the surfaces folder you will see a list of all the surfaces in your project. Select New.

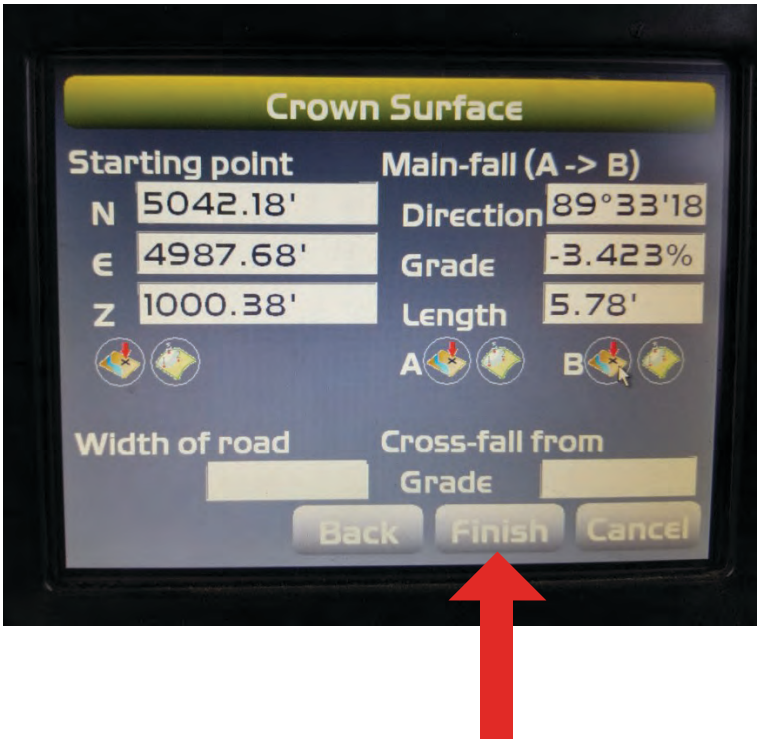


On this page you can title the surface you wish to create. Select Crown road surface.

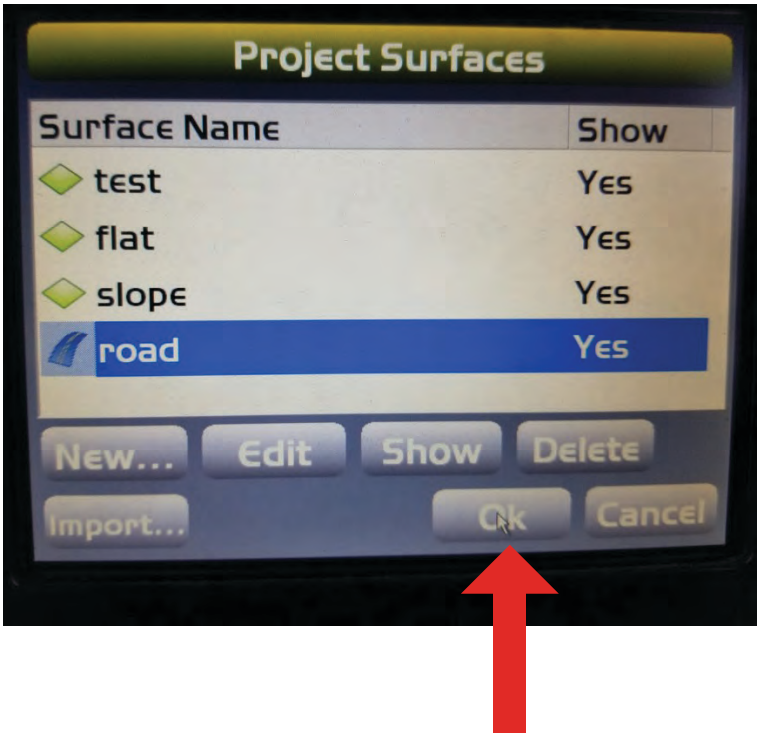


Just like the sloping plane the easiest form for measuring is the 2 points. Start by selecting point A measure here tab. Now move the machine in the direction you want the road to go. Put the blade on the ground and tap B measure here tab.

**This surface is the length measured from A to B.*



Once the fields are populated they can be edited. You will need to enter the width of the road and cross fall. Cross fall can be positive or negative. Positives will be a crowned road surface and negative will be a V-Ditch. Select Finish after you have edited all the fields.



Highlight the surface that you want to use and select Ok.

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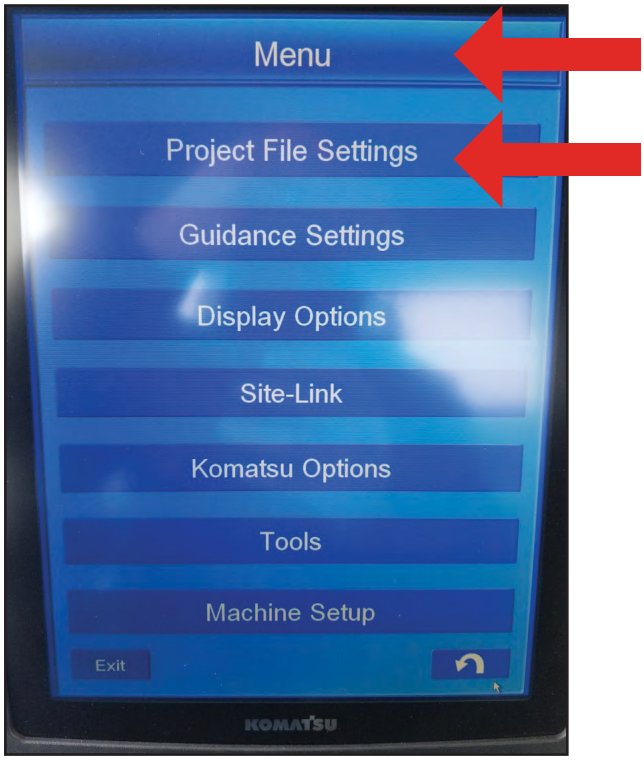
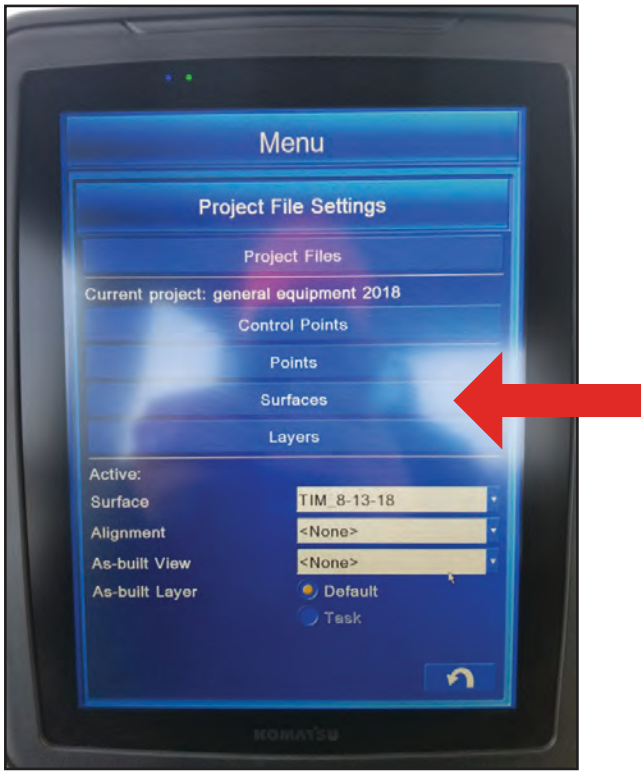
Excavator Flat

Section 22

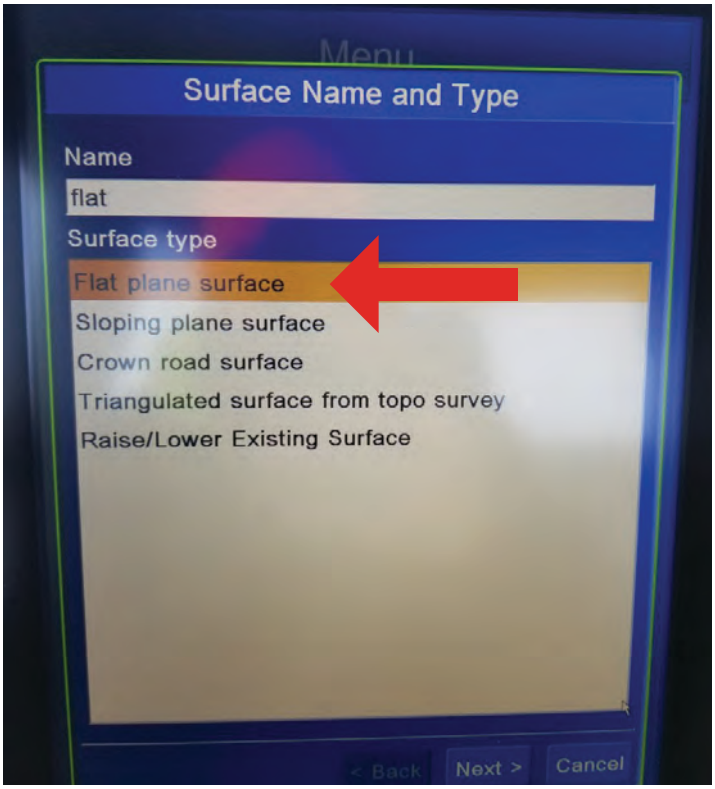


To make any surface you need to get to the Menu page. Here you will select Project File Settings.



In Project File setting you can see what job you are working on and a list of the current surfaces. To create a new surface tap on Surfaces.

On this page you can edit or create new surfaces. Select New.



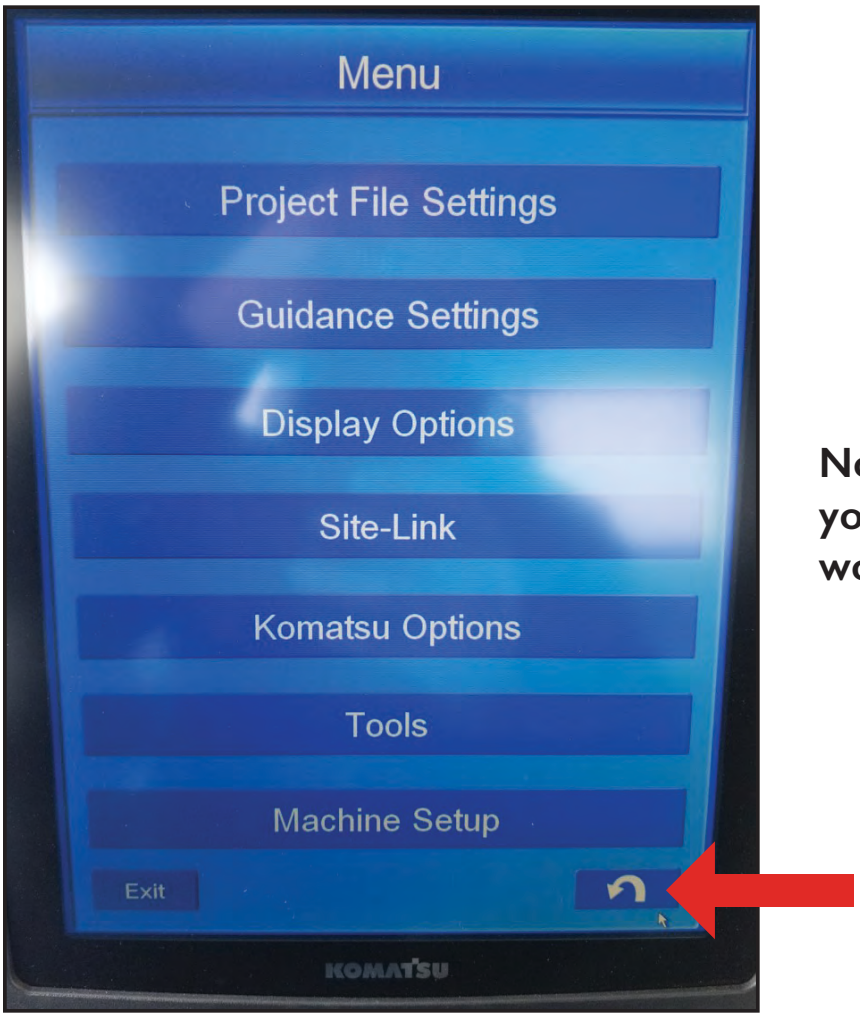
Here you will need to title your new surface and select Flat plane surface as the surface.

Place your bucket at the elevation/point you would like to measure. Tap on Measure Point.

When you select measure point the machine will ask where on the bucket cutting edge do you want to take the measurement from. Select one.

Once all the boxes have populated select **Finish.**

Select the check mark to set this surface as your current surface.



Now hit the back button until you get back to the main working screen.

GENERAL
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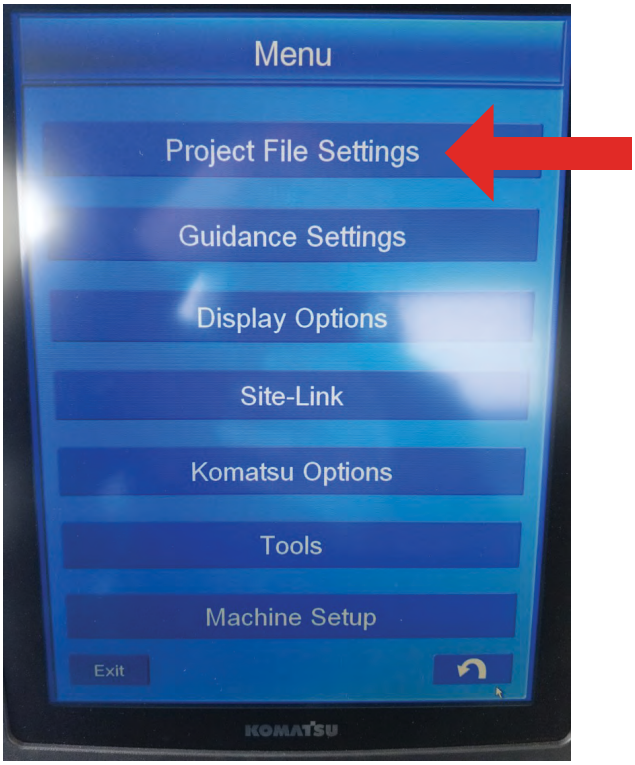
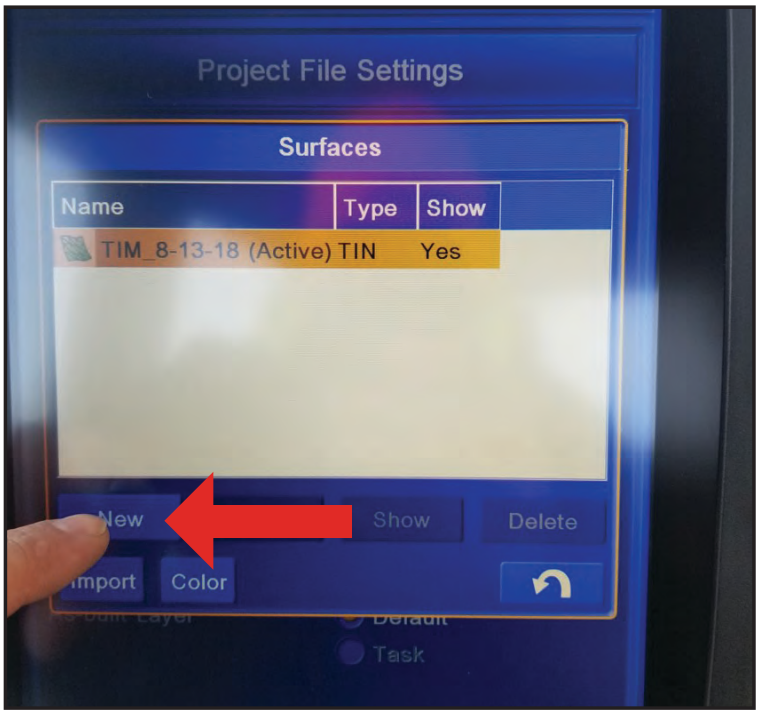
Excavator Slope

Section 23

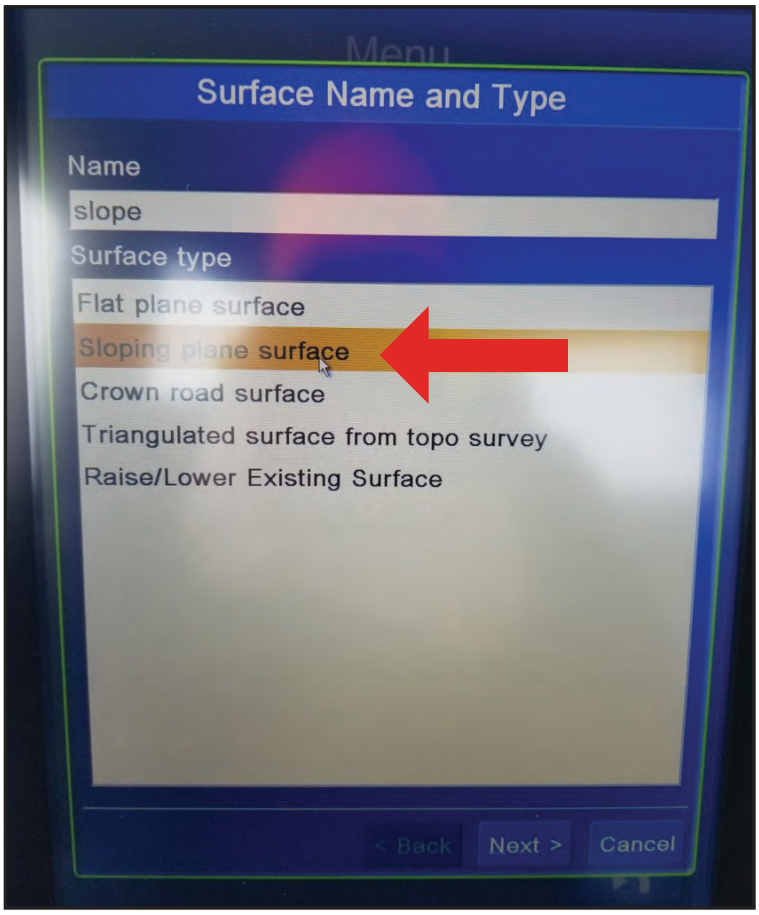


To make any surface you need to get to the Menu page. Here you will select **Project File Settings.**

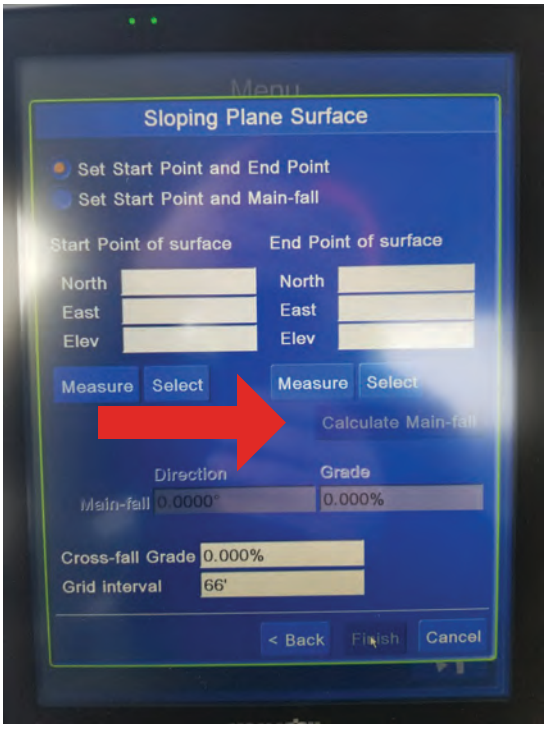
In Project File Settings you can see what job you are working on and a list of current surfaces. To create a new surface tap on **Surfaces.**



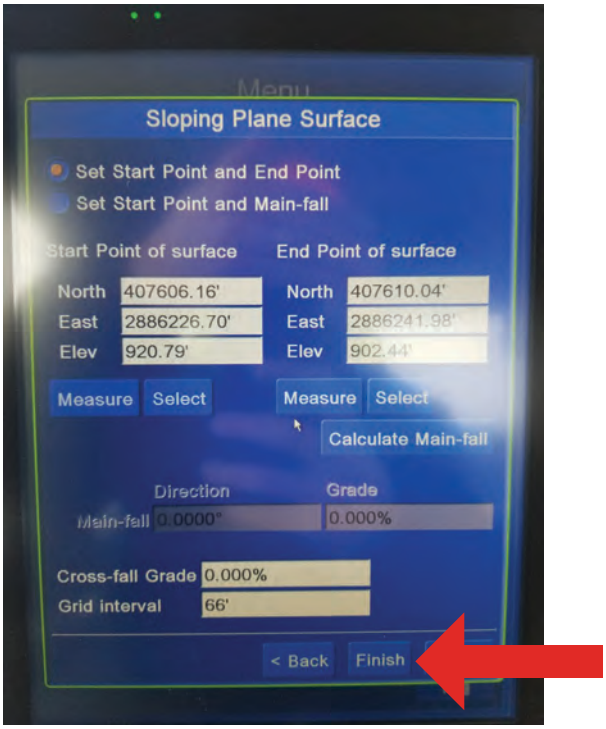
On this page you can edit or create new surfaces. Select New.



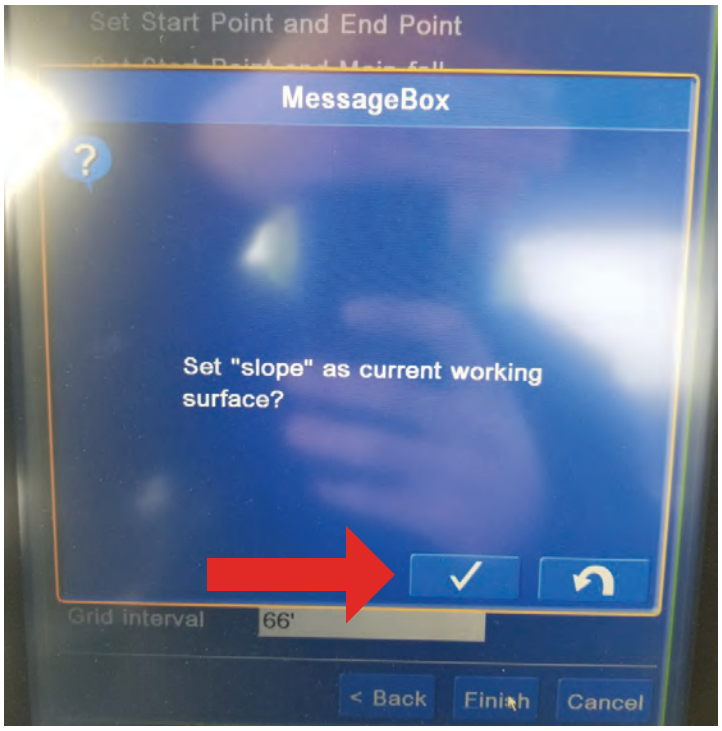
Here you will need to title your new surface and select Sloping plane surface as the surface.



When creating a sloping plane the easiest method is the 2 point measurement. For this method you will place the bucket at the top of the slope (starting point) select measure. Then move your bucket to the bottom of the slope (end point) select measure. Then calculate to get the grade.



Select **Finish**.



Select the check mark to set as the current working surface.

Now tap the back button until you reach the main working screen.

GENERAL
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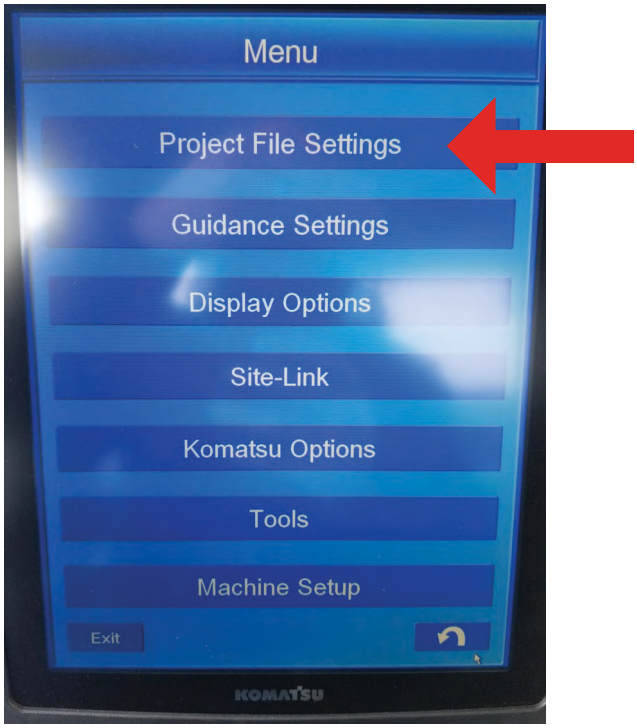
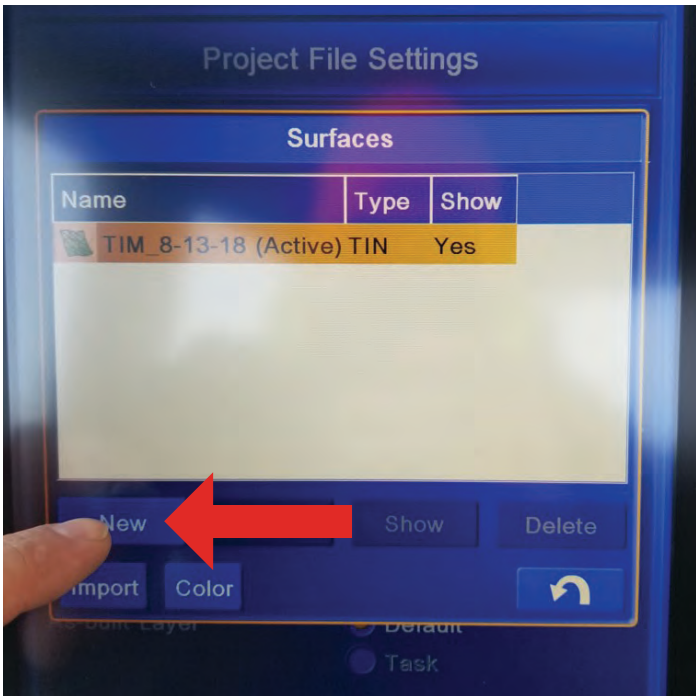
Excavator Crown

Section 24

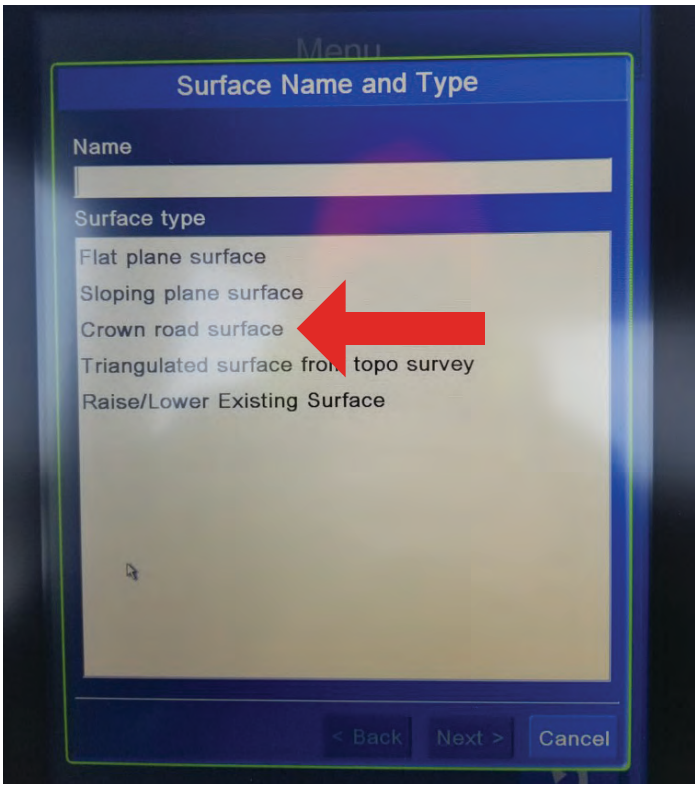


To make any surface you need to get to the menu page. Here you will select **Project File Settings.**

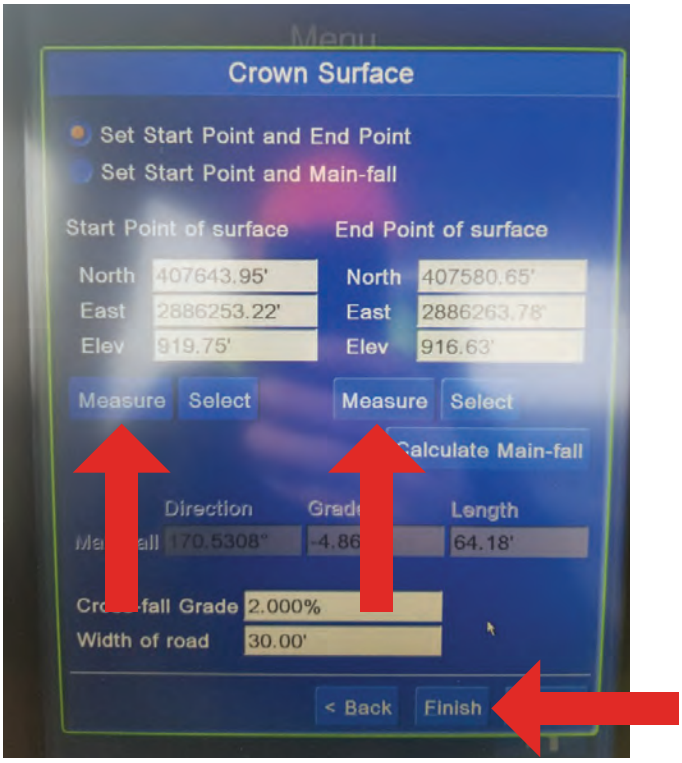
In Project File Settings you can see what job you are working on and a list of the current surfaces. To create a new surface tap on **Surfaces.**



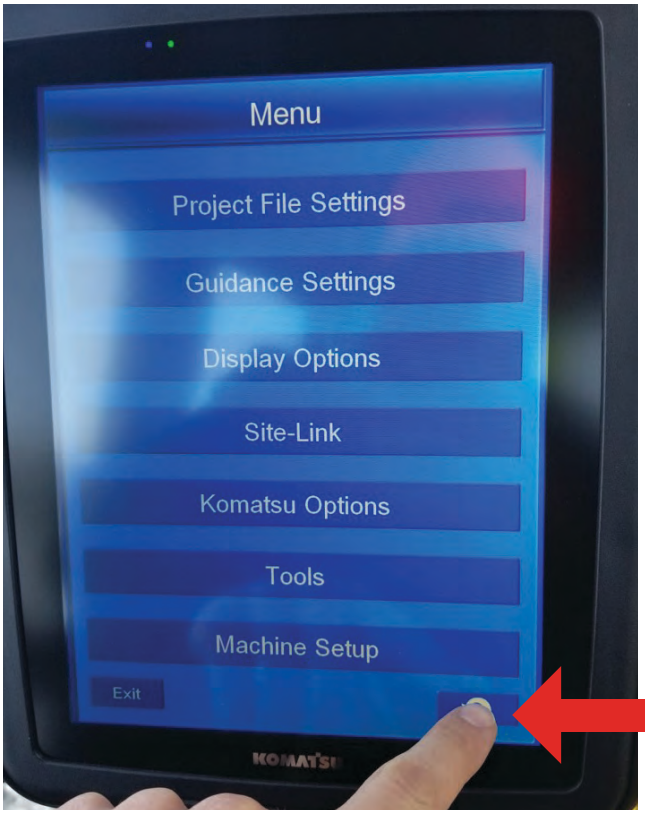
On this page you can edit or create new surfaces. Select New.



Here you will need to title your new surface and select Crown road surface as the surface.



Just like slopping plane you will need to measure a starting point and an end. To do this place the bucket on the surface at the spot you would like to start select **Measure.** Then move to the end and place the bucket on the ground and select **Measure.** A positive cross fall is a crowned road. A negative cross fall is a V-Ditch. Width of road is a shoulder to shoulder measurement. Select **Finish.**



Tap on the back button until you reach the main working screen.

GENERAL
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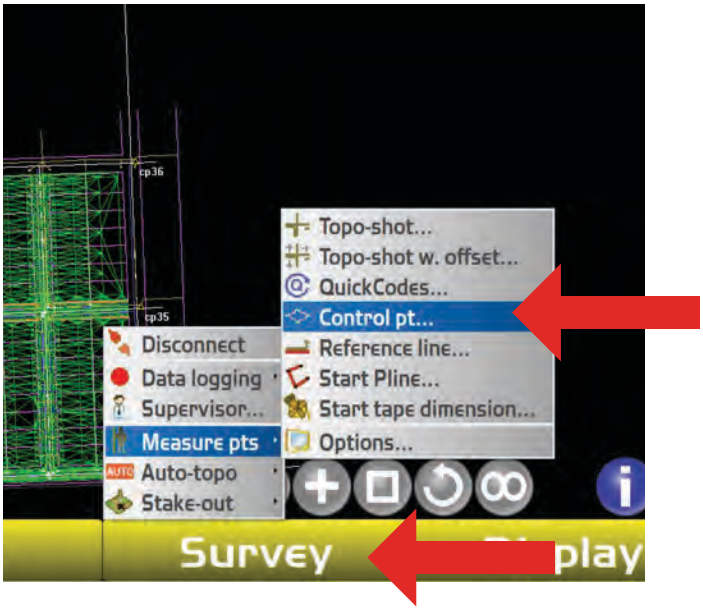
Moving a Base Station

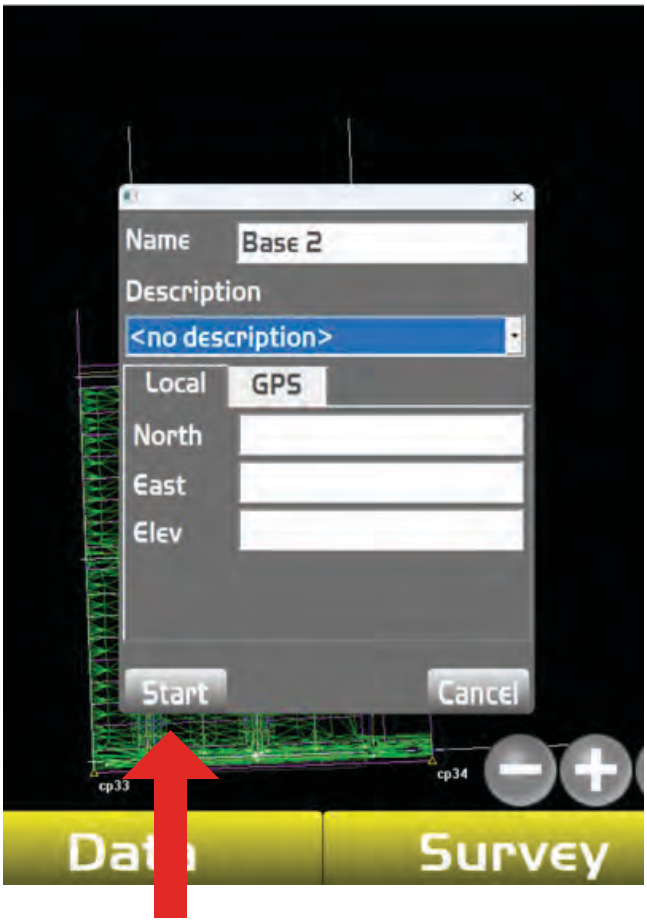
Section 25

In the instance the base pole has not been hit or removed but the customer needs to move it to a new location from their original spot.



If you desire to move your base post to a new location on the jobsite and your original base post is still up, you will use your rover to measure a new base post in.

With the base on the original t-post, you will start your base and connect the rover.

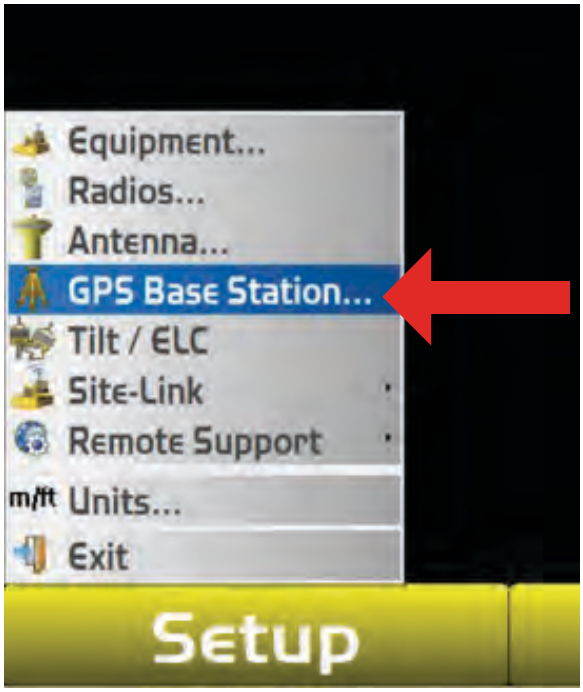


Next pound in a new t-post at the new base location and thread the rover onto this post.

Now you will measure in the new location. Survey, measure points, control point.

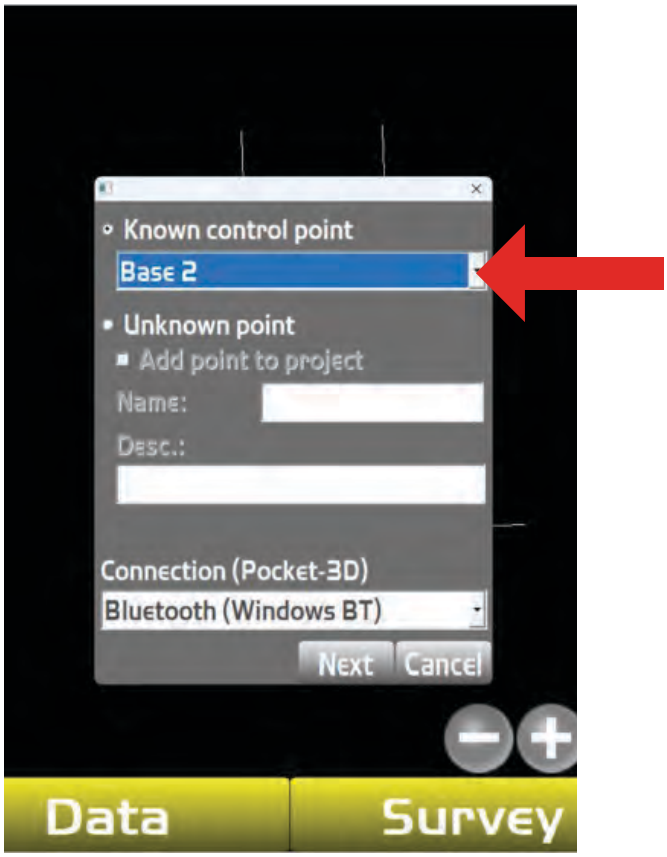
Name the point "Base 2" or something so you know the which base point is which.

Once you have named the point, click Start.

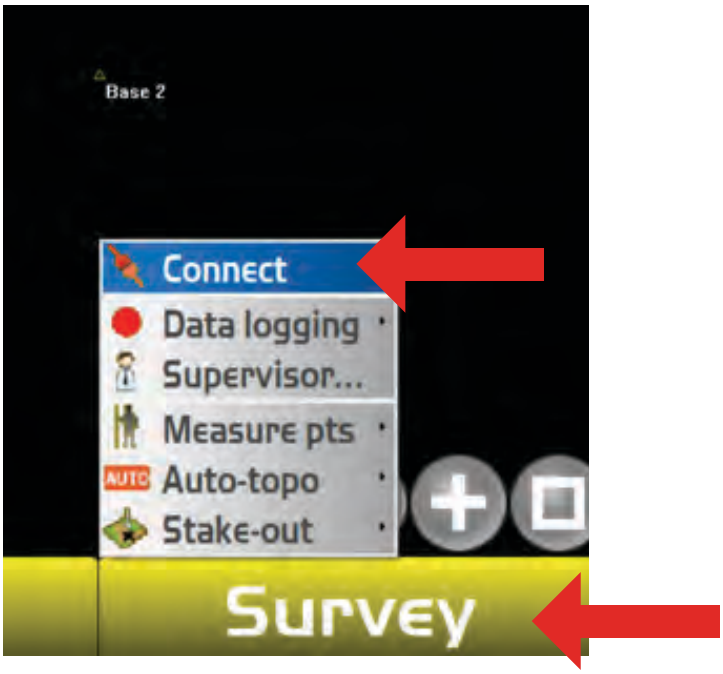


Once the point has measured you will click out to the main project screen.

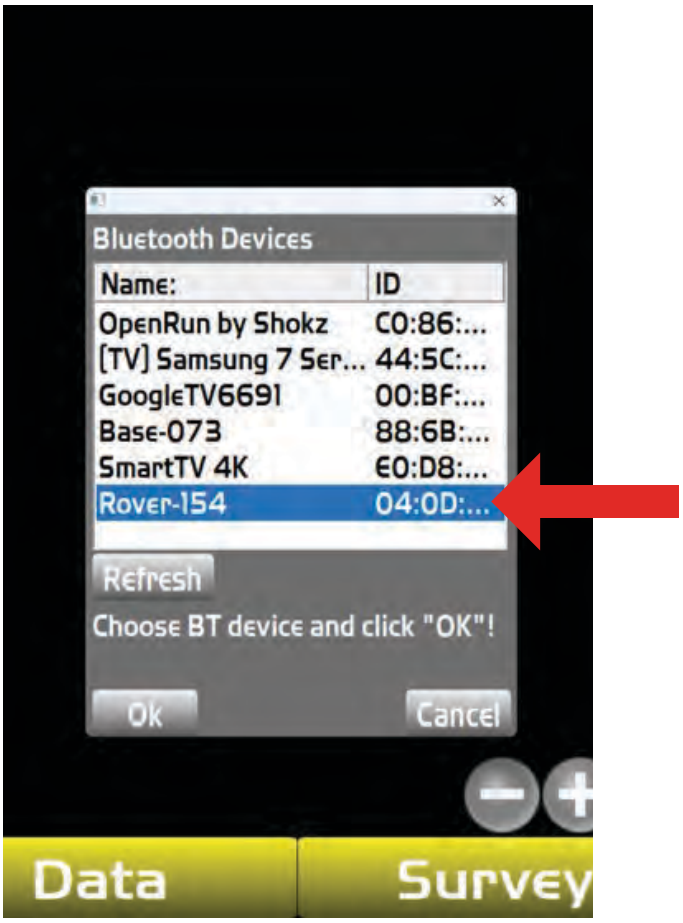
Now you will power both head units down and put your base onto the new t-post and the rover onto your rover rod.



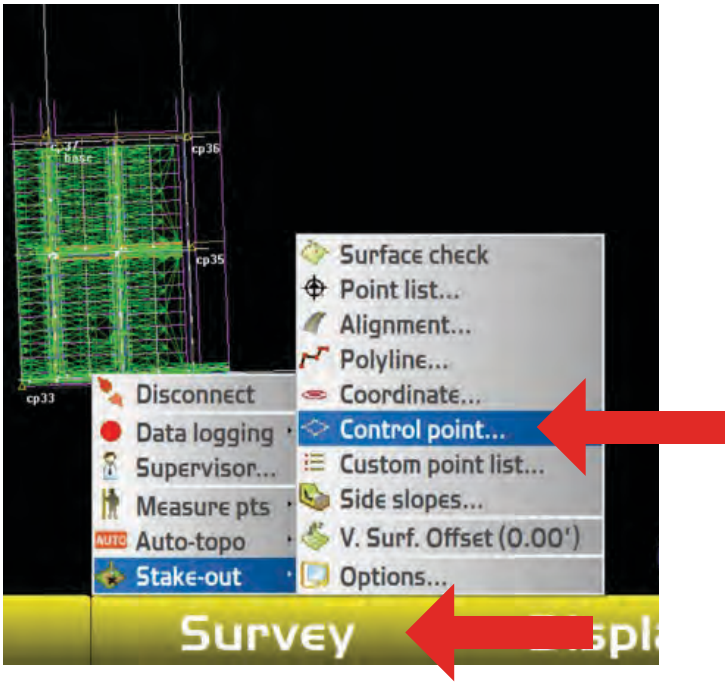
Now start your base on the new base location “Base 2”.



Once the base is started connect the rover up.



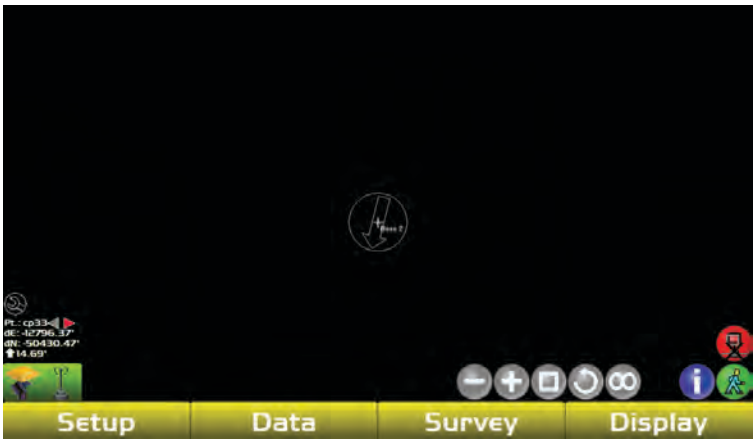
Select survey, connect, select your rover.



After you have connected the rover it is good practice to stake out to a control point to verify the job did not shift.

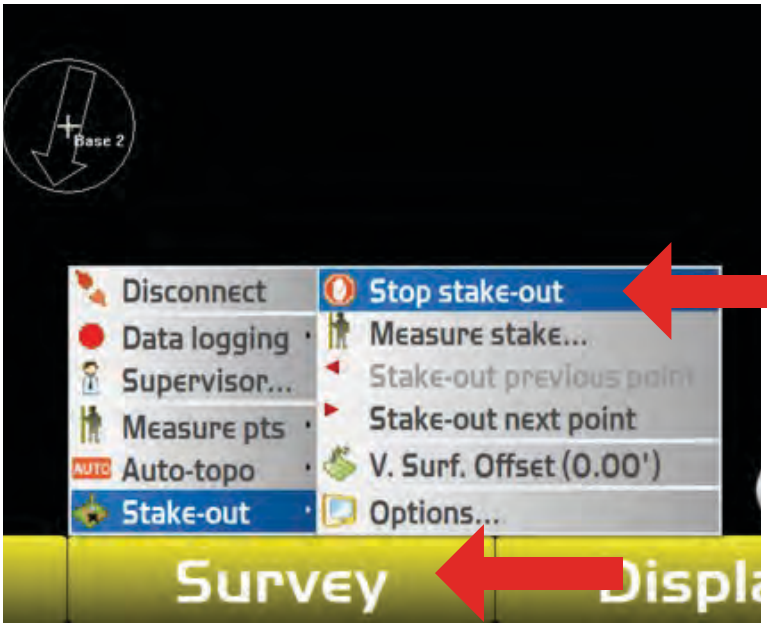
Go into survey, stake out, control point.

Select which control point you want to check and click Ok.



When checking the control point you will see how close you are to the control point on the bottom left above the green box.

As long as the control point is in the original spot, and you reset your base correctly it should match up under a tenth to the rover.



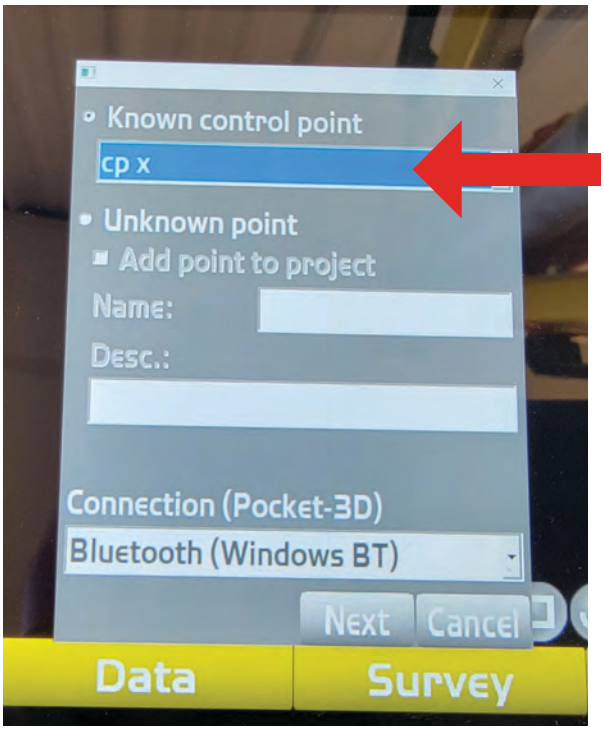
When you are done staking out you will stop the stakeout. Survey, stake out, stop stake out

Resetting base location after pole has been moved/hit

Thread "Base" unit onto the rover rod and extend it to the full length.

Go to the nearest control point and plumb the rover rod and base unit over said control point.

Power “Base” unit on.

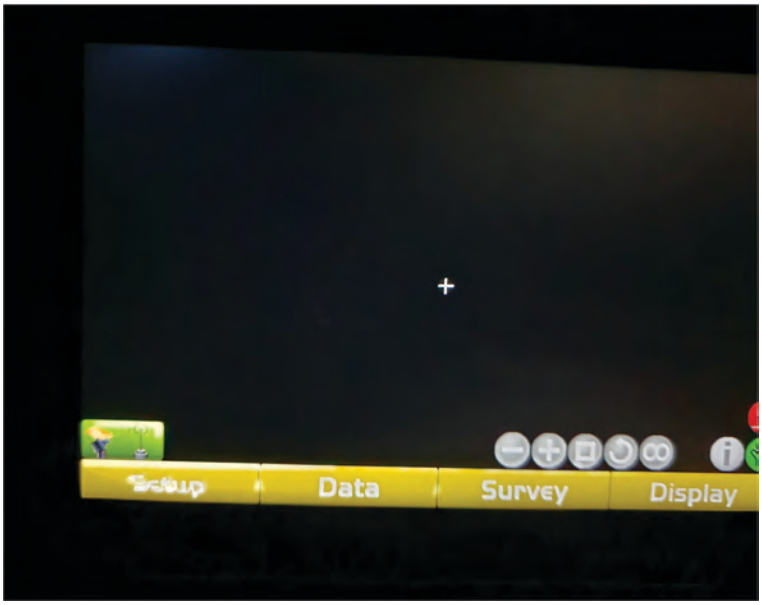


Setup GPS Base Station over known control point “x” and make sure base height is set to 6.56 on the setup screen.

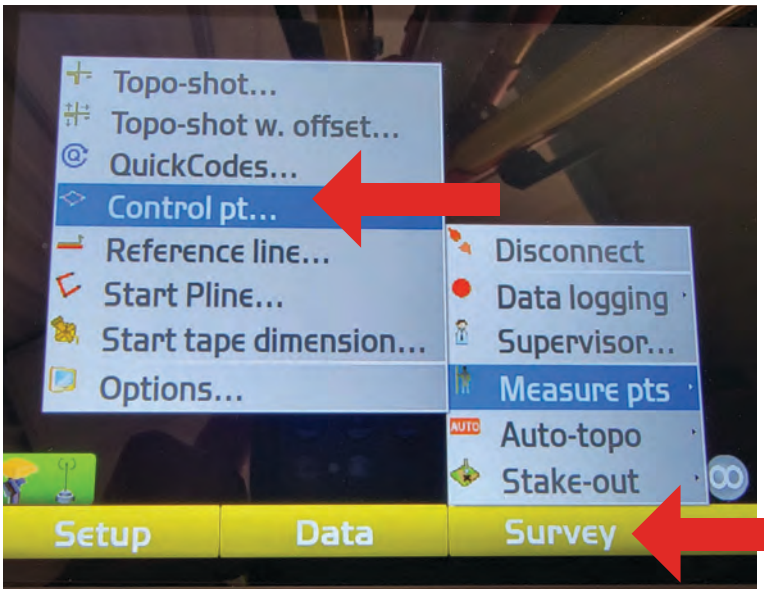
New Base Location

Pound in new t-post in desired location.

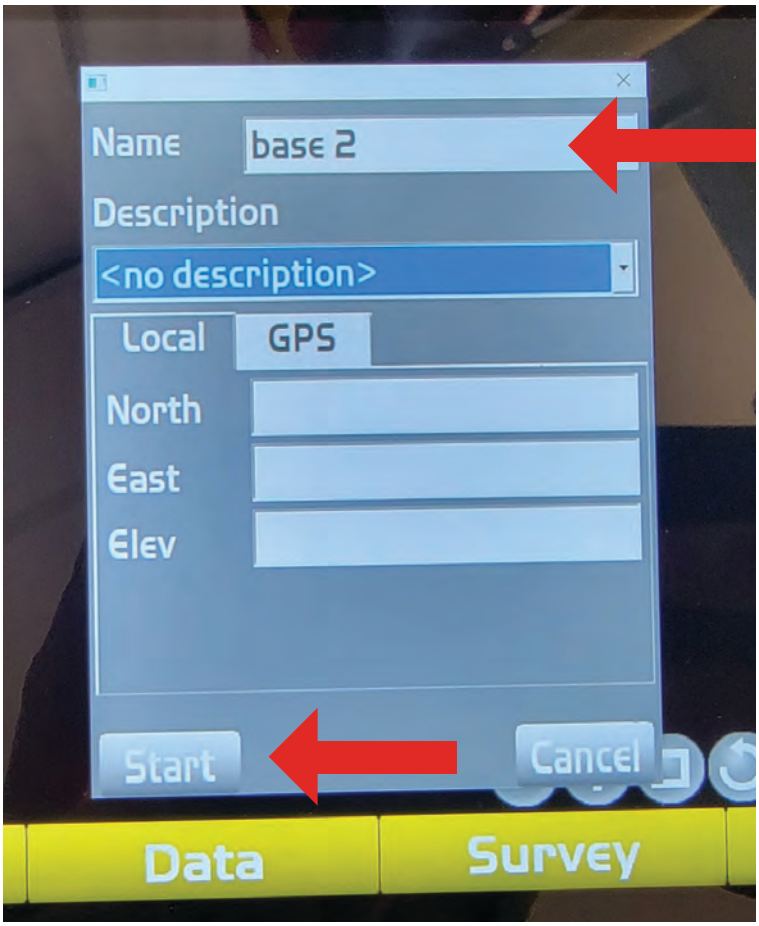
Thread “Rover” unit onto t-post and power on.



Connect the rover to the base and make sure it initializes and goes green in the bottom left of the data collector screen.



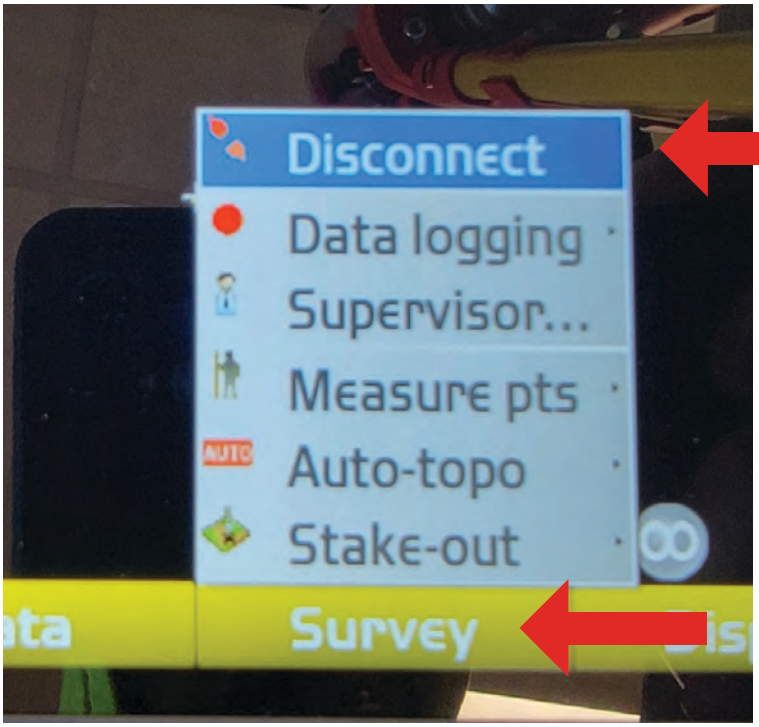
Measure in new base position. Click survey, Measure points, Control points.



Name this point "Base 2."

Push Start.

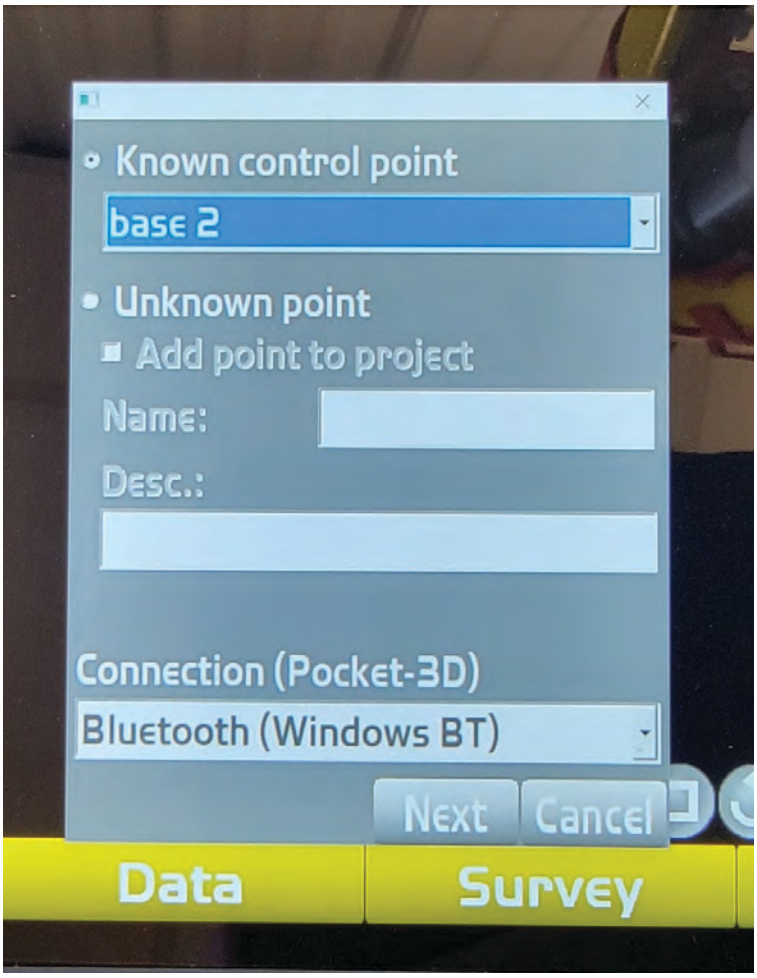
This will add "Base 2" to the control point list.



Disconnect the rover from the base (Survey, Disconnect).

Turn both units off.

Thread "Base" onto the new t-post and power the base on.



Setup base station on known control point "Base 2" and connect rover.

Stake out to control points to verify accuracy.

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Changing Units in Data Collector and Machines

Section 26

Before localizing a jobsite you will want to verify that the data collector is in the correct units.

You will also want to make sure the machines on site are all on the correct units as it can cause a shift in the positioning.

It is always a good idea to verify units whenever you move equipment or the base and rover to a new job to minimize the chance of causing issues.

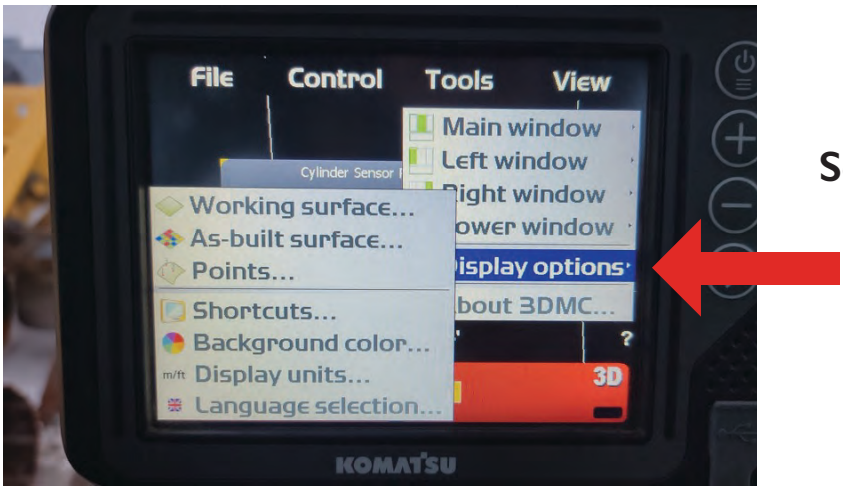
To start, click setup, units.

Verify correct measurement units.

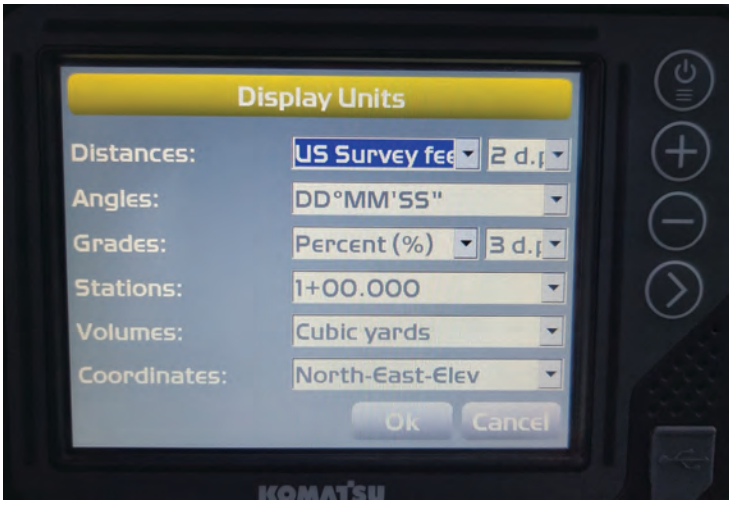
Dozer

Click the power button to get the menu bar to appear.

Press View.

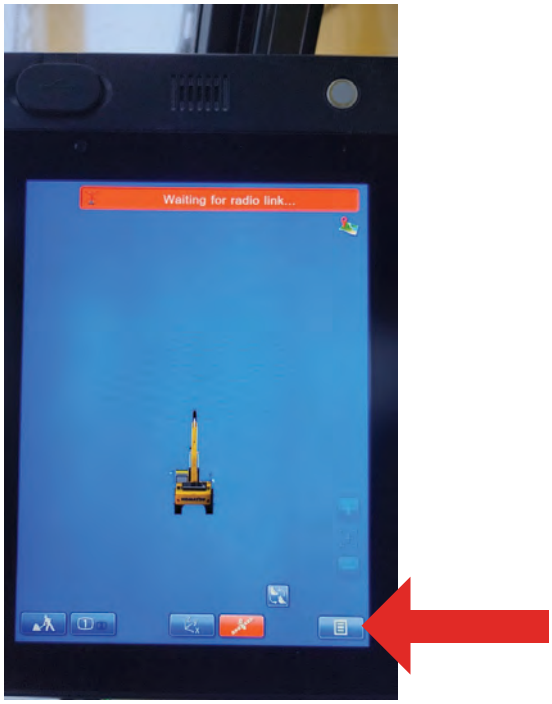


Select Display Options.

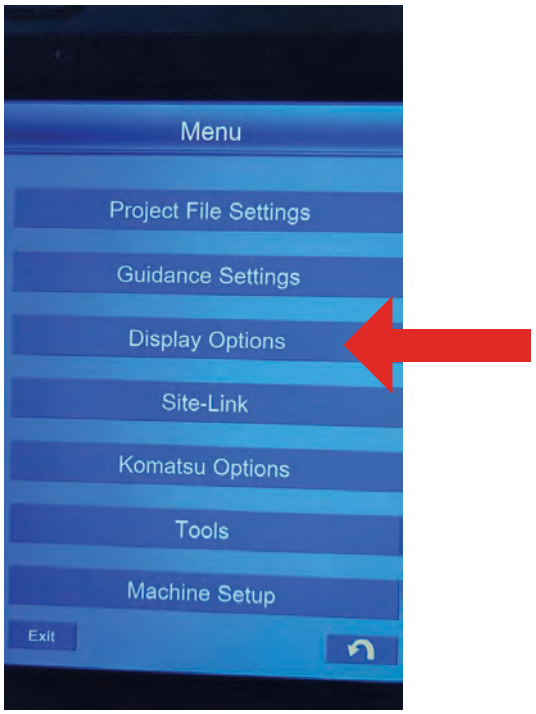


Adjust the units to the correct units for the jobsite.

Excavator



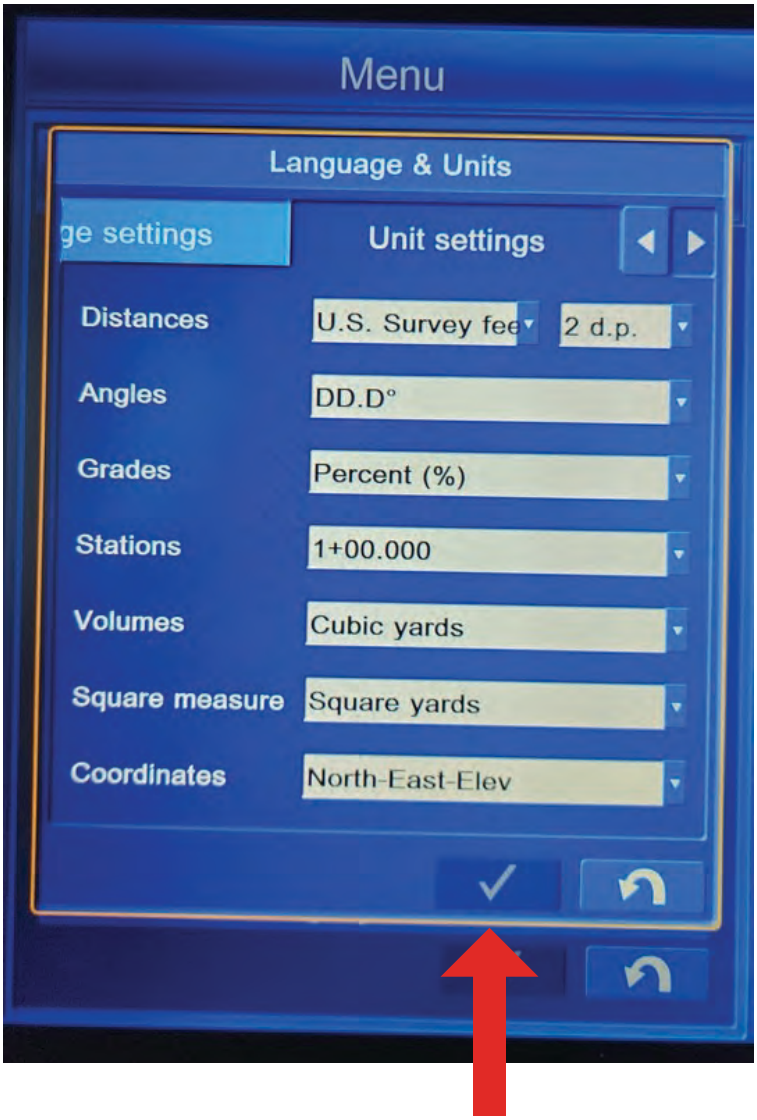
Click the bottom right corner menu button to pull up the menu options.



Click Display Options.

Select Language and Units.

Click Units on the top display bar.



Select the correct units and click the check mark to save the settings.

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Common Issues and Troubleshooting Tips

Section 27

Machine or rover will not go green/initialize

- Verify base unit is powered on and is not blinking red. When the base blinks red it will not send a good signal.
- Go through base setup and verify all settings are correct. (see section 2)
- Go through radio tab and match settings and channel to base. (see section 2)

Jobsite is vertically or horizontally off

- If the job is roughly 6.56 feet vertically off, make sure your base height is consistent from when the job was originally localized. (See section 2)
- Verify you are connected to the correct base by checking distance to base and making sure it is your base. (Rover- click the bottom left green/red box, “info” tab, distance to base) (Machine- click the bottom cut/fill box, GPS info, “position” tab, distance to base)
- Check to see if the base t-post has been hit or moved. If so, see section 14 to setup new base location.

Things to verify before changing settings in machine or on jobsite:

- Verify you are on the correct job that you are working at with the base setup and with the machine.
- Make sure the radio channels for the base and the machine/rover are matched and you are connected to your base.
- Check wear adjustments on the dozer and make sure they are current.
- Verify that the base pole was not hit or did not get moved.
- If other GPS machines are on the job, check and see if they are connected and having the same issue or if it is singled out to one machine.
    - If no other machines are on the jobsite, connect the rover and make sure everything checks in and connects with that.
- Verify machine and jobsite are on the same measurement units (U.S. survey or int. feet).