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Hemisphere®

875-0469-10

User Guide

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November 22, 2021

SiteMetrix Grade™

Machine Control & Guidance Management Software

Table of Contents

Device Compliance, License and Patents 4
Terms and Definitions 6
Chapter 1: Introduction 8
Overview 8
Product Overview 9
Key Features 10
Chapter 2: Getting Started with SiteMetrix Grade 11
Overview 11
Software Installation 12
User Interface 16
Operator Interface 19
SiteMetrix Grade Main Menu 45
Chapter 3: Working with SiteMetrix Grade Jobs 59
Overview 59
Create a Job 60
Open a Job 70
Modify a Job 71
Delete a Job 76
Job Tools 77
Field Design 79
Design a Job 84
Topo 91
Calculations 98
Manage Points 107
Check Position 109
Stake Out 112
File Tools 114
Appendix A: Troubleshooting 115
Overview 115
Troubleshooting 116

Appendix B: Technical Specifications 117
Overview 117
C631 Smart Antenna 118
HT20 Data Collector 123
Index 126
End User License Agreement 127
Warranty Notice 131

Device Compliance, License and Patents

Device Compliance

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
This device may not cause harmful interference, and
this device must accept any interference received, including interference that may cause undesired operation.

This product complies with the essential requirements and other relevant provisions of Directive 2014/53/EU. The declaration of conformity may be consulted at HTTPS://HEMISPHEREGNSS.COM/ABOUT-US/QUALITY-COMMITMENT.

E-Mark Statement: This product is not to be used for driverless/autonomous driving.

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Patents			
6111549	6876920	7400956	8000381
6397147	7142956	7429952	8018376
6469663	7162348	7437230	8085196
6501346	7277792	7460942	8102325
6539303	7292185	7689354	8138970
6549091	7292186	7808428	8140223
6711501	7373231	7835832	8174437
6744404	7388539	7885745	8184050
6865465	7400294	7948769	8190337
8214111	8217833	8265826	8271194
8307535	8311696	8334804	RE41358

Australia Patents	
2002244539	2002325645
2004320401	

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Device Compliance, License and Patents, Continued

Notice to Customers

Contact your local dealer for technical assistance. To find the authorized dealer near you:

Hemisphere GNSS, Inc
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Fax: (480) 270-5070
PRECISION@HGNSS.COM
HTTPS://WWW.HEMISPHEREGNSS.COM/

Technical Support

If you need to contact Hemisphere GNSS Technical Support:

Hemisphere GNSS, Inc.
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Hemisphere GNSS is committed to the quality and continuous improvement of our products and services. We urge you to provide Hemisphere GNSS with any feedback regarding this guide by opening a support case at the following website:
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Terms and Definitions

Introduction

The following table lists the terms and definitions used in this document.

SiteMetrix Grade terms & definitions

Term	Definition
Activation	Activation refers to a feature added through a one-time purchase. For features that require recurring fees, see Subscription.
BeiDou	BeiDou is a Chinese satellite-based navigation system.
DTM	Digital Terrain Model – the 3D grading of a job.
Ellipsoid	Ellipsoidal elevation refers to your height above the WGS84 ellipsoid.
Flat Pad	A set elevation that you grade to over the entire job site, regardless of design elevation.
Galileo	Galileo is a global navigation satellite system implemented by the European Union and European Space Agency.
Geoid	A model representing the shape of the earth, represented by mean sea level.
GLONASS	Global Orbiting Navigation Satellite System (GLONASS) is a Global Navigation Satellite System deployed and maintained by Russia.
GNSS	Global Navigation Satellite System
GPS	Global Position System
Heading	The vector created from the primary to secondary antenna. It points to the direction that the receiver is facing.
Latitude	A measure of how far north or south you are on the earth. Uses degrees, with the equator at 0 degrees and the poles at 90 degrees (north or south).

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Terms and Definitions, Continued

SiteMetrix Grade terms & definitions, continued

Term	Definition
Longitude	A measure of how far east or west you are on the earth. Uses degrees, with the prime meridian at 0 (same as +180 degrees and -180 degrees). Positive degrees are east of prime meridian and negative degrees west.
NEZ	Refers to Northing, Easting, and Elevation.
Point of Interest (POI)	The point from which the cut/fill and NEZ information is derived.
Subscription	A subscription is a feature that is enabled for a limited time. Once the end-date of the subscription has been reached, the feature will turn off until the subscription is renewed.

Chapter 1: Introduction

Overview

Introduction

This User Guide provides information on using SiteMetrix™ Grade.

Contents

Topic	See Page
Product Overview	9
Key Features	10

Product Overview

Product overview

SiteMetrix Grade is a grade checking software application developed by Hemisphere GNSS. SiteMetrix Grade features include:

- Grade checking with a GNSS rover
- Grade checking with a pickup truck
- Topos
- Creating surfaces
- Stakeouts
- Localization
- Machine calibration
- Calculating volumes
- Layer Management

SiteMetrix Grade is designed to run with the Hemisphere C631 Multi-GNSS Smart Antenna, which includes all constellations (GPS, GLONASS, BeiDou, Galileo, and QZSS), an internal dual band radio, Bluetooth, WiFi, tilt compensation, and hot-swappable batteries.

Key Features

SiteMetrix Grade key features

SiteMetrix Grade software features:

- An easy-to-use user interface
- Stakeout design points on your site
- Collects as-built features of your site
- Collects topo shots to create surfaces for volume comparisons
- Configurable to operate on a vehicle or as a manned rover
- Configures, converts, and manages files for Hemisphere GradeMetrix™
- Create pads, slopes, and ramps for use either stand-alone or for upload into GradeMetrix™ machine control systems
- Network RTK compatible
- Supports common generic file formats: DXF, DWG, and LandXML

Chapter 2: Getting Started with SiteMetrix Grade

Overview

Introduction

The information in this chapter shows you how to install SiteMetrix Grade and provides an overview of SiteMetrix Grade functions.

Contents

Topic	See Page
Software Installation	12
User Interface	16
Operator Interface	19
SiteMetrix Grade Main Menu	45

Software Installation

Operating system requirements

SiteMetrix Grade can be installed to a ruggedized field computer or an office PC.

SiteMetrix Grade is designed to run on the Windows 10 Operating System.

Files and formats used in SiteMetrix Grade

Various files are loaded into SiteMetrix Grade on the specific recommended directories on the Control Panel. Files are loaded into these directories using a couple of different methods: manually selecting files in SiteMetrix Grade from memory sticks (USB drives, thumb drives, etc.) or using Windows Explorer to copy files.

GradeMetrix can support the following files and file formats:

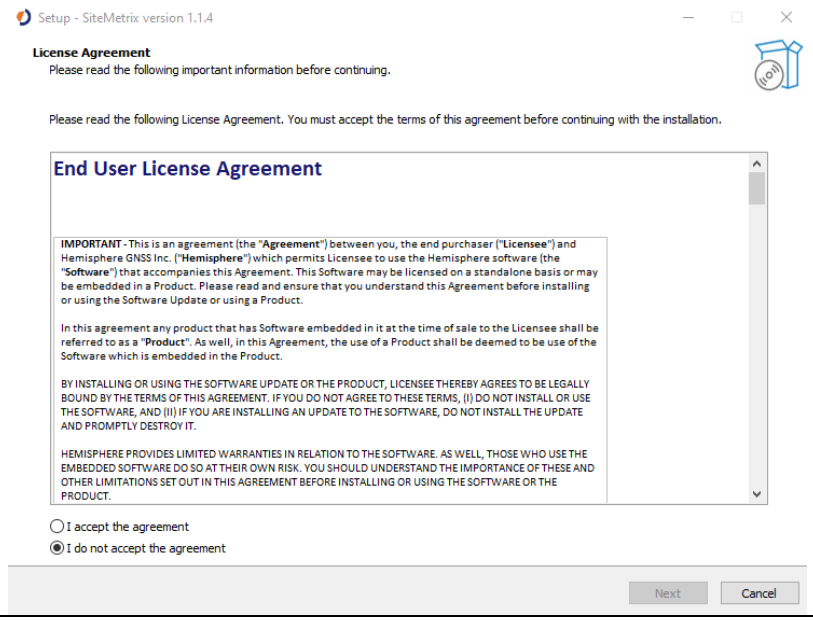
- Site Plan File: DWG, DXF, LandXML
- Surface Model File: DWG, DXF 3d face triangles or polylines, TIN, FLT, GRD, LandXML, and LandXML Grid
- Survey Topo File: TOPO
- Tin File: MESH, TIN, NTR, DXF, DWG, FLT
- Geoid File: BIN, GGF, GSF, GTX, TIF, ASC
- Localization File: LOCAL (SiteMetrix Grade), LOC (SiteMetrix), COT (SiteMetrix Survey), .CAL

Continued on next page

Software Installation, Continued

Install SiteMetrix Grade software

To install your SiteMetrix Grade software, complete the following steps:

Step	Action
1	Click the **Install** file. Select “I accept the agreement” to accept the End User License Agreement. 
2	Click **Next**.

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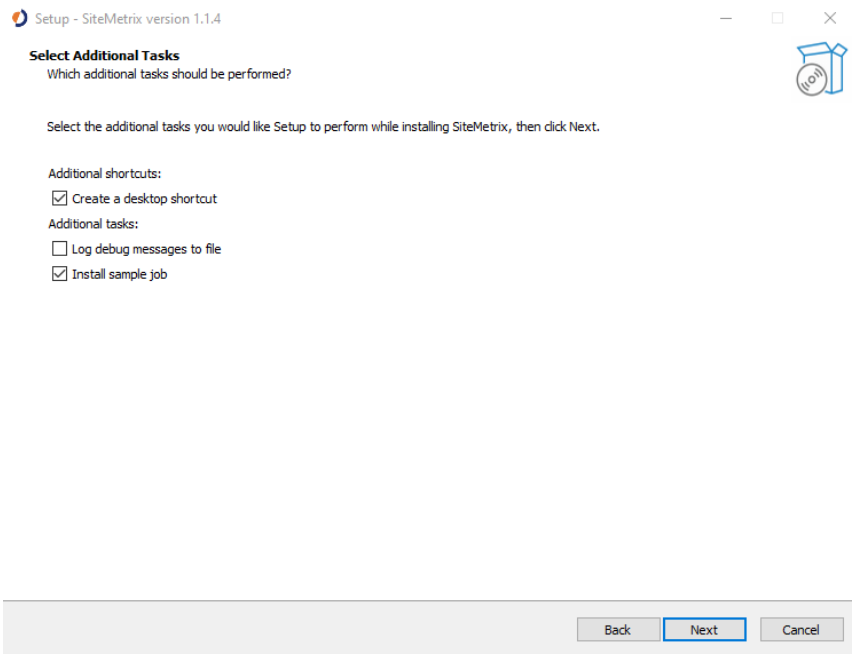
Install SiteMetrix Grade software, continued

Step	Action
3	Leave **Create a desktop shortcut** checked so that a desktop shortcut appears on your tablet. Click **Next**. 

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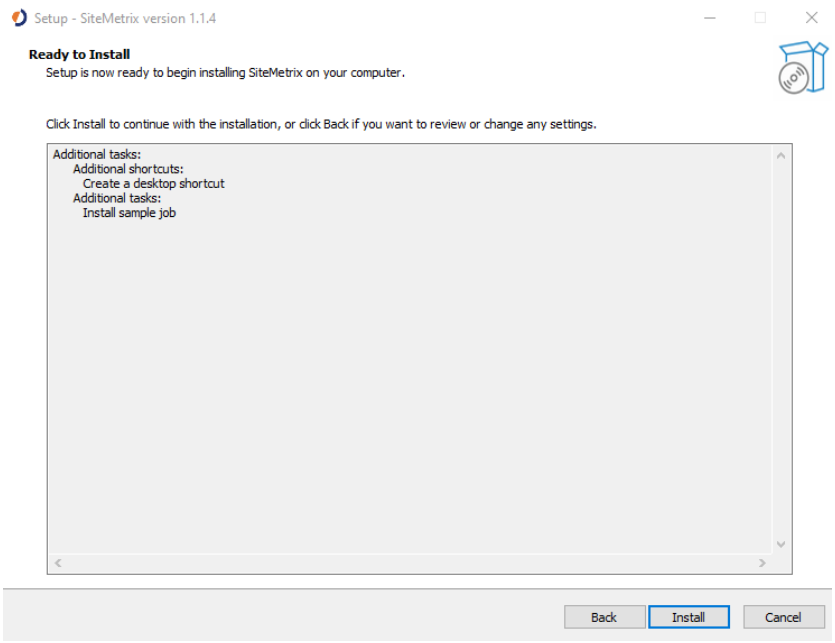
Software Installation, Continued

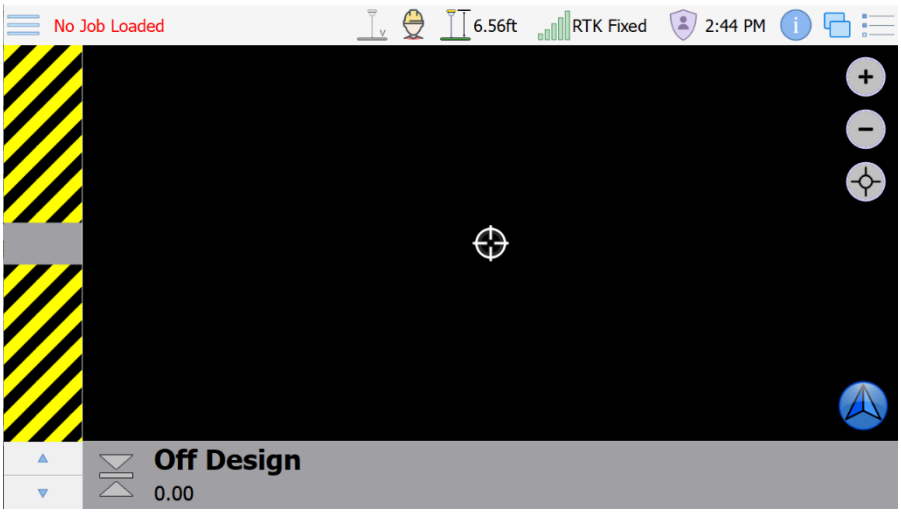
Install SiteMetrix Grade software, continued

Step	Action
4	Click **Install**. The software will begin installing. 

User Interface

User interface

The first time you open SiteMetrix Grade there are no jobs loaded and the receiver is not connected.



Setting Up Administrative Modes

SiteMetrix Grade has three access levels: **User**, **Power User**, and **Administrative Mode**. Most features within the software can be configured to only allow power users or administrators. Throughout this manual, it is assumed that when a feature is discussed, it has been unlocked.

To configure access levels, click the  button on the top-left. Then click the  icon.

Click the  icon to unlock the software. When the software is newly installed, there is not an administrative password.

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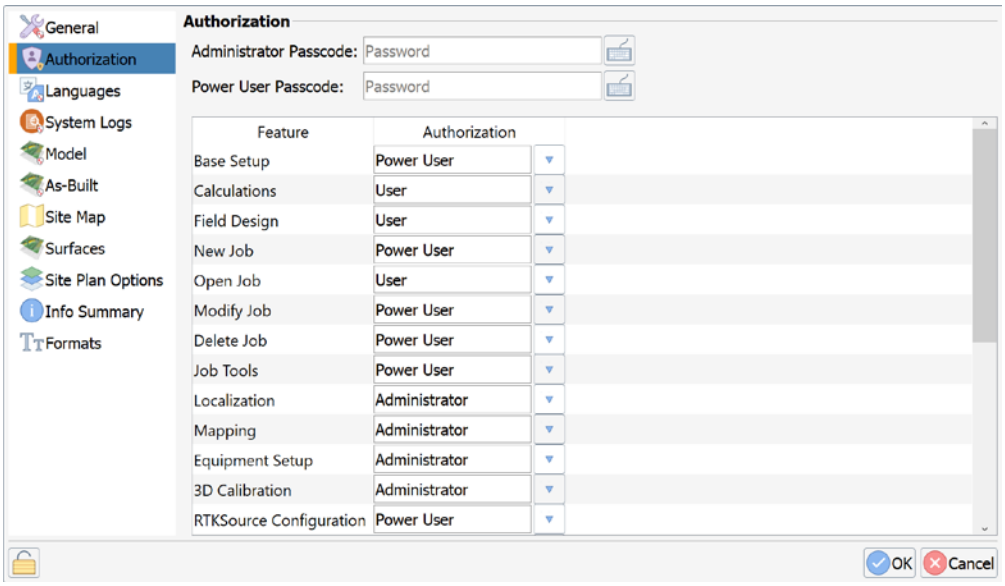
Setting Up Administrative Modes, continued

Click the **Authorization** tab.



Each setting allows for you to choose from **User**, **Power User**, and **Administrator**.

User: Access without typing in any password.
Power User: Access by typing in the Power User Passcode.
Administrator: Access by typing in the **Power User** or **Administrator Passcode**.

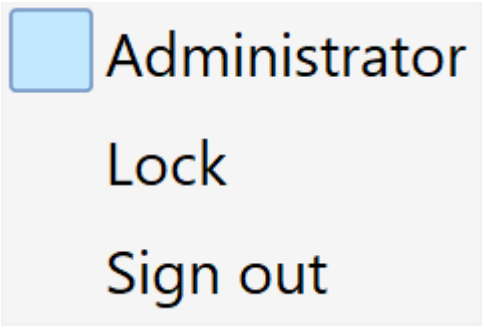
Continued on next page

Setting Up Administrative Modes, continued

Select which features should be locked down and then enter a passcode for both **Administrator** and **Power User**. Click **OK**.

After setting up the power user/administrator, click the  icon.

Click to select the **Administrator** checkbox.



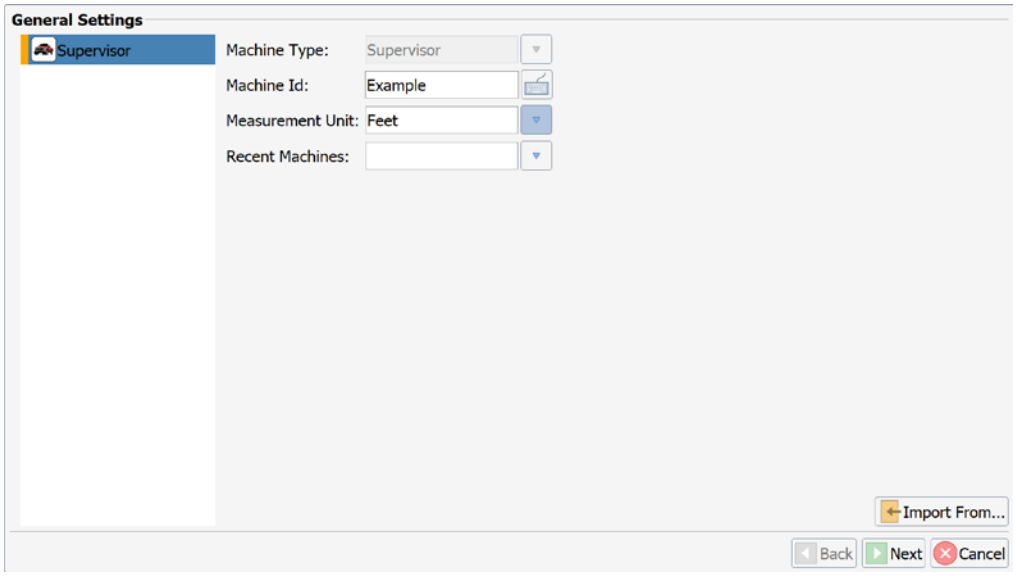
You will be prompted for a passcode. If you enter the **Power User** passcode you will be able to access the power user features. If you enter the **Administrator** passcode you can access either the power user or administrator settings.

Setting Up Rover

SiteMetrix Grade supports the use of a survey pole and truck. To configure the two, click the  icon. Select the User  and select administrator. Select the right arrow  and click the **Equipment Setup** Icon.

Click the icon pictured below.

Enter a **Machine ID**. Select a **Measurement Unit**.



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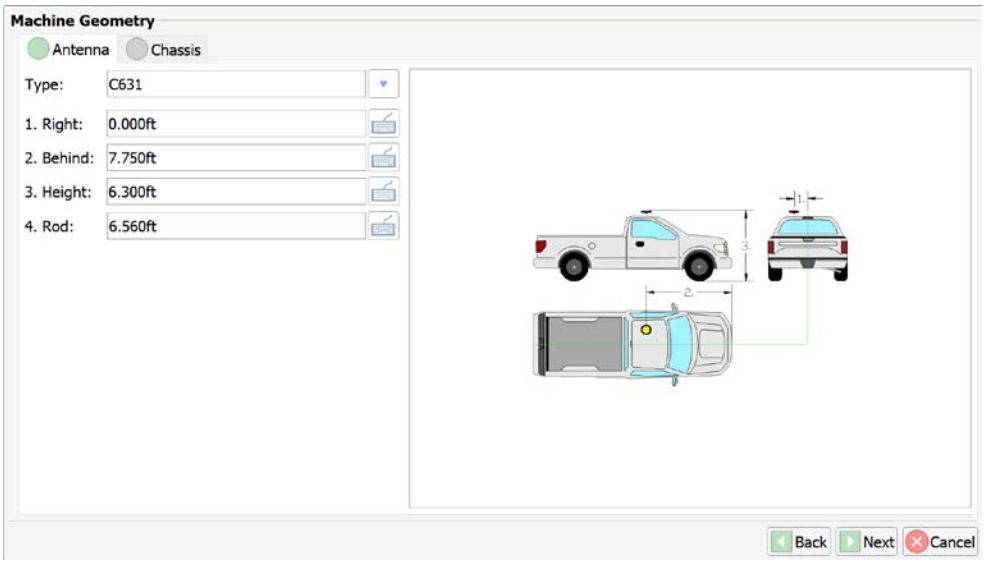
Setting Up Rover, continued

Click **Next**.



Select the antenna type (C631). You will see several measurements:

1) **Right:** The receiver is on a truck. Enter the distance to the right of centerline (negative for left of centerline).
2) **Behind:** The receiver is on a truck. Enter the distance behind the front bumper of the truck.
3) **Height:** The receiver is on a truck. Enter the distance to the ground.
4) **Rod:** The C631 is on a survey pole (not truck). Enter the pole height.

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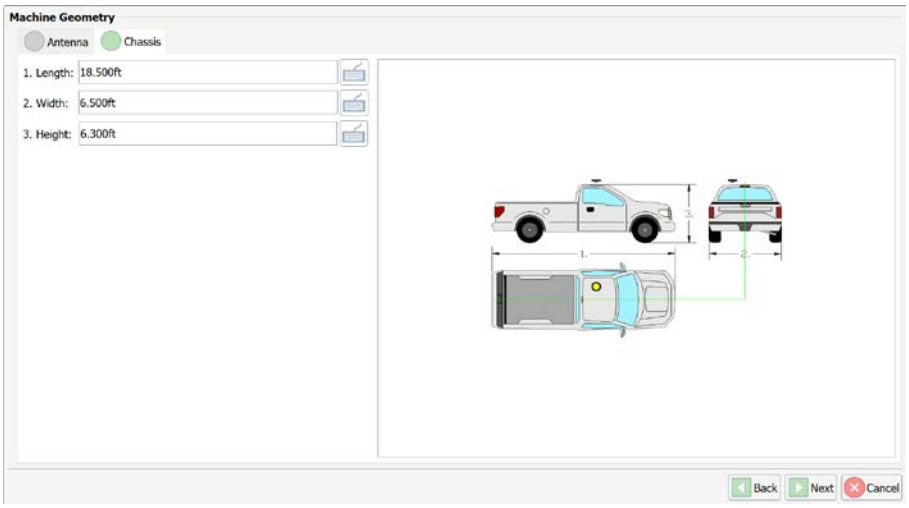
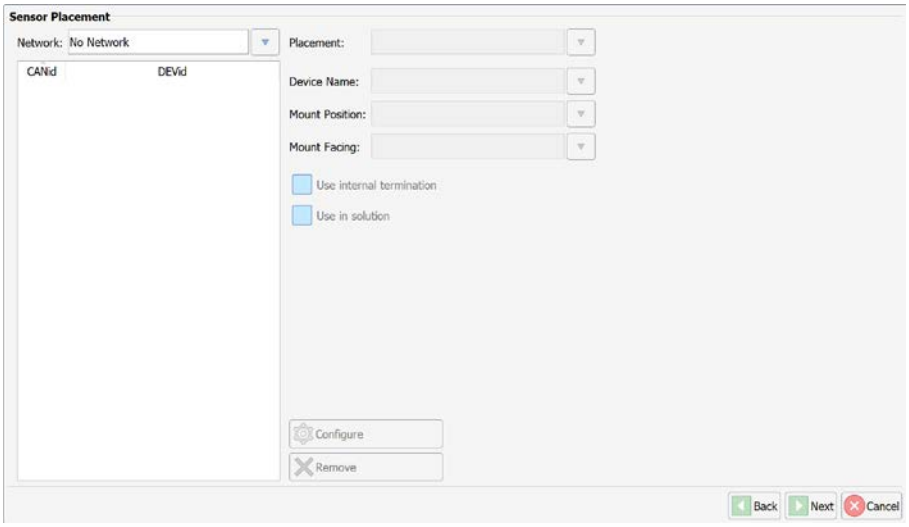
Setting Up Rover, continued

Click the **Chassis** tab.



Type in the chassis dimensions of the truck. This is only for graphics and does not affect the math.

Click **Next**. If you have a software activation for **Sensors**, you can set up your sensors here.



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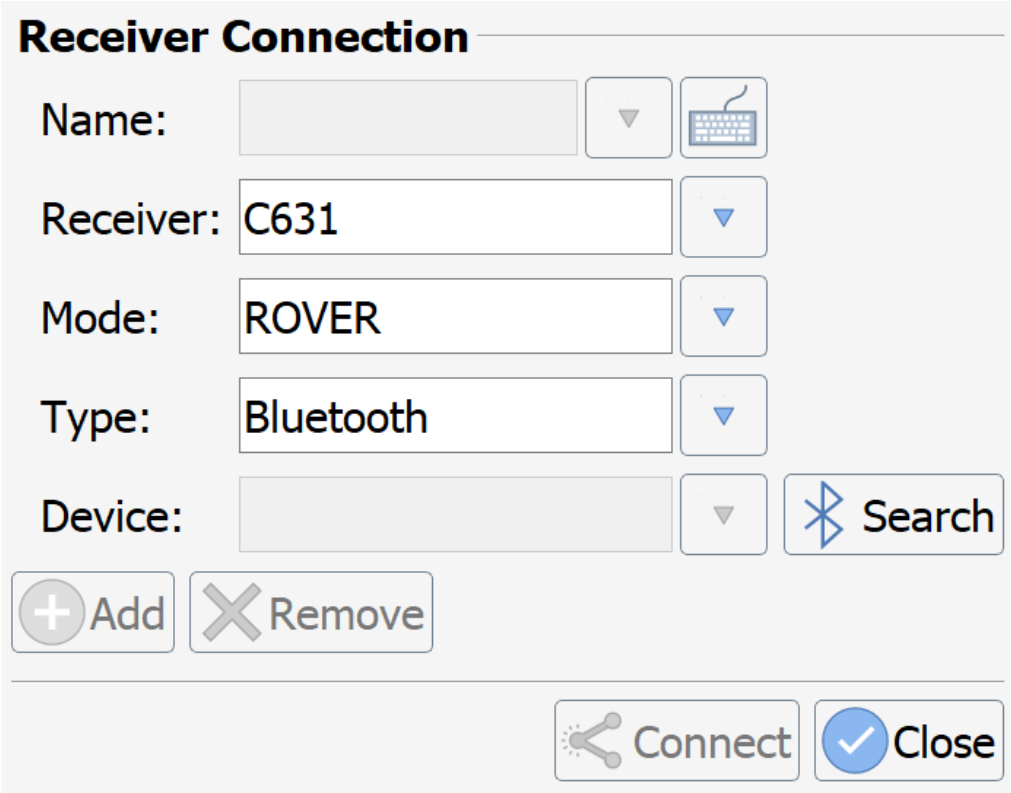
Connecting to the Receiver

Click the Bluetooth icon on the top-right.

A dialogue will appear. Click **Search** to search for Bluetooth devices.



Click **Search**. Search for the receiver. The **Bluetooth ID** is the serial number. There is no Bluetooth pin. Set **Mode** to either Rover, **Base**, or **Static**. You can optionally enter a receiver name under **Name**.

Click **Connect**.

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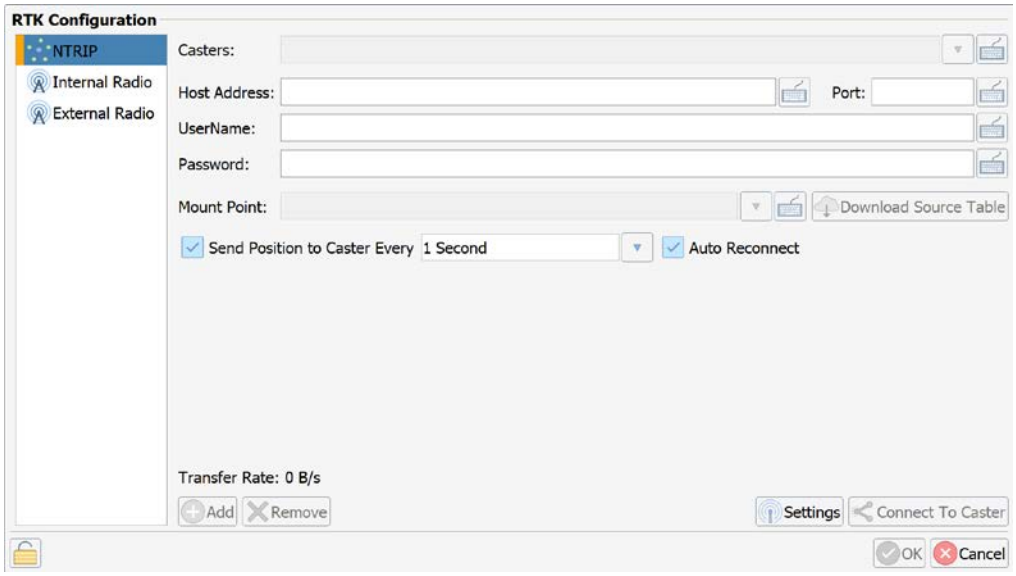
Setting up RTK Rover

After connecting to the rover, you will want to configure RTK. Go to the menu, scroll to the right, and click **RTKSource Configuration**.

SiteMetrix Grade can receive RTK over NTRIP as well as use the internal UHF radio or an external UHF radio.



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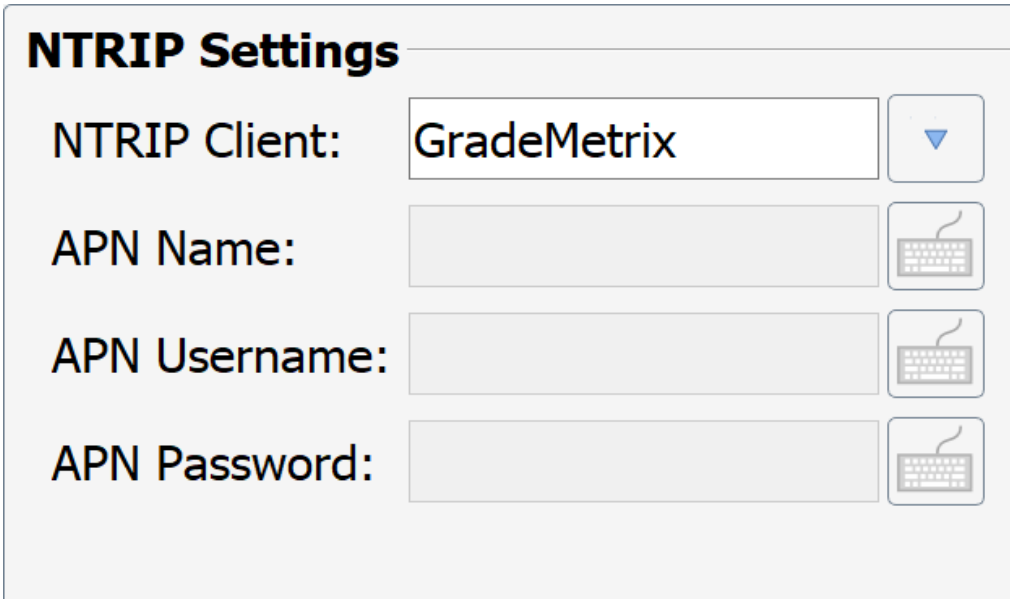
Setting up RTK Rover, continued

If using NTRIP, you can use the data collector's internet (if the data collector has an internal cellular modem or WiFi) or the C631's internal GSM modem.

To setup click **Settings**.



If NTRIP Client is set to **GradeMetrix**, the data collector's internet will be used to access the NTRIP caster and then the RTK messages will transfer back to the C631 via Bluetooth. If the NTRIP Client is set to **Receiver**, the C631's internal modem will be used. You can type in an **APN Name**, **Username**, and **Password**.

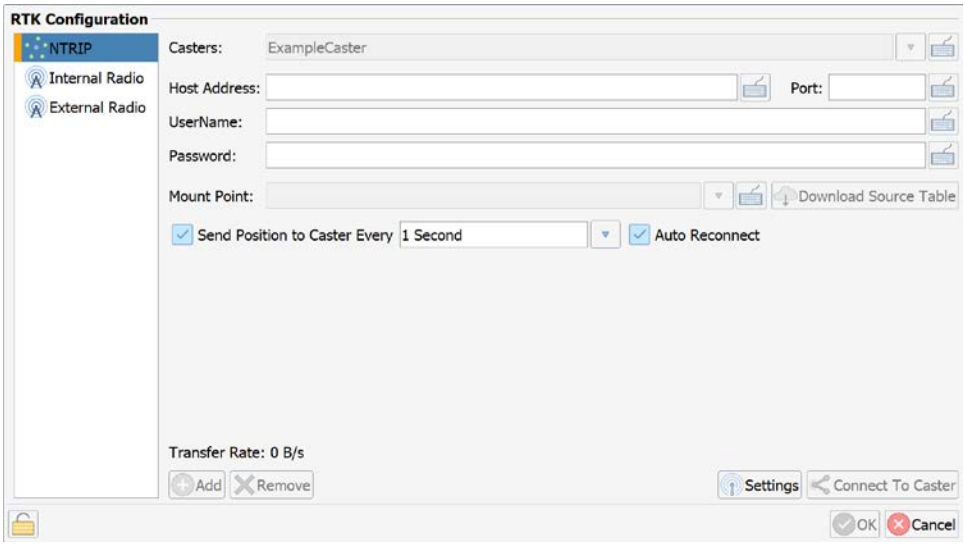
Continued on next page

Setting up RTK Rover, continued

Type in a **Caster** name. You can add multiple NTRIP casters to SiteMetrix Grade (all will be saved in a database). Type in the **IP address/DNS**, **Port**, **Username**, and **Password**.

Click **Download Source Table**. Select the correct mount point. If using a VRS network (or a nearest base station), click **Send Position To Caster Every** and select an interval for your position to be sent to the caster. Click **Auto Reconnect** to ensure the software reconnects to the NTRIP caster every time it opens up or if you lose internet and re-gain internet. Click **OK**.

After clicking **OK**, the NTRIP client will be the only source of RTK (even if the internal UHF radio is configured). If you also configure the internal UHF radio and want to switch to it, go back into **RTKSource Configure**, and click **Internal Radio**, and click **OK**.



Alternatively, you can use the Internal Radio. Click the **Internal Radio** tab. If you have the correct administrative settings, you can enter channels with **Channel Configuration**.

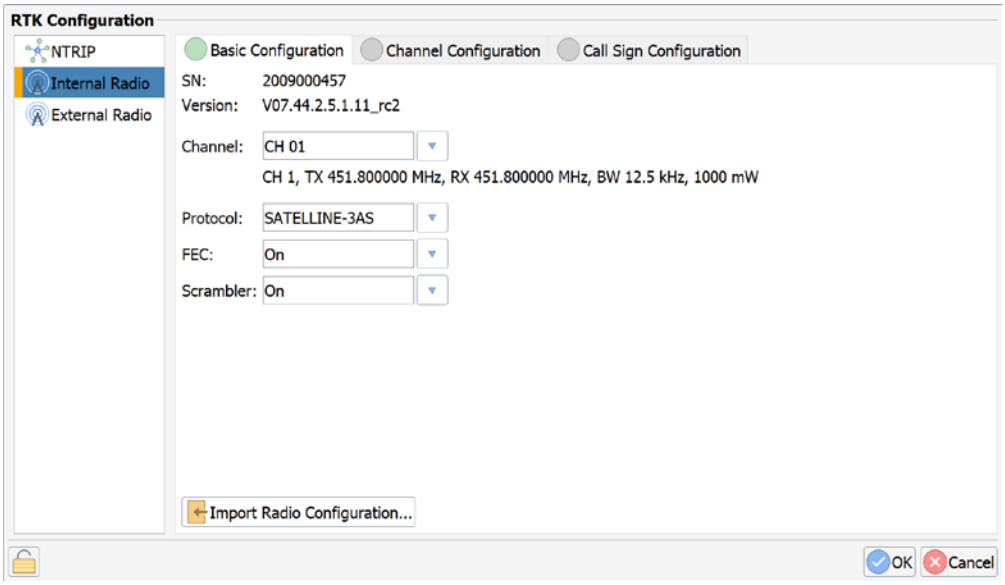
Warning: You are responsible for verifying which frequencies and bandwidths can be set up for your region.

Continued on next page

Setting up RTK Rover, continued

Select the channel, protocol, FEC (if applicable), and scrambling (if applicable).

Click **OK**. After clicking **OK**, the internal UHF radio will be your primary source of RTK. If you have configured the NTRIP client, the receiver will use the radio. If you configure the NTRIP client and want to switch, go into **RTKSource Configure**, click **NTRIP**, and click **OK**.



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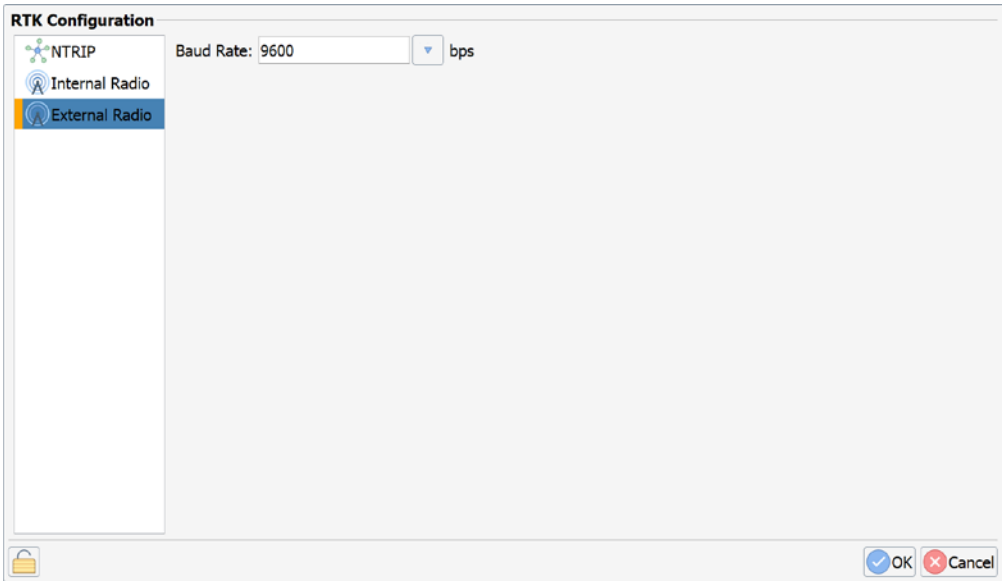
Setting up RTK Rover, continued

Finally, you can select an **External Radio**. Click the **External Radio** tab. SiteMetrix Grade does not support the configuration of an external radio, but you can set the baud rate of the serial port of the C631.

On the bottom of the C631 there are two Lemo connectors. One has 5-pins and the other has 7-pins. The 5-pin connector is for an external radio.



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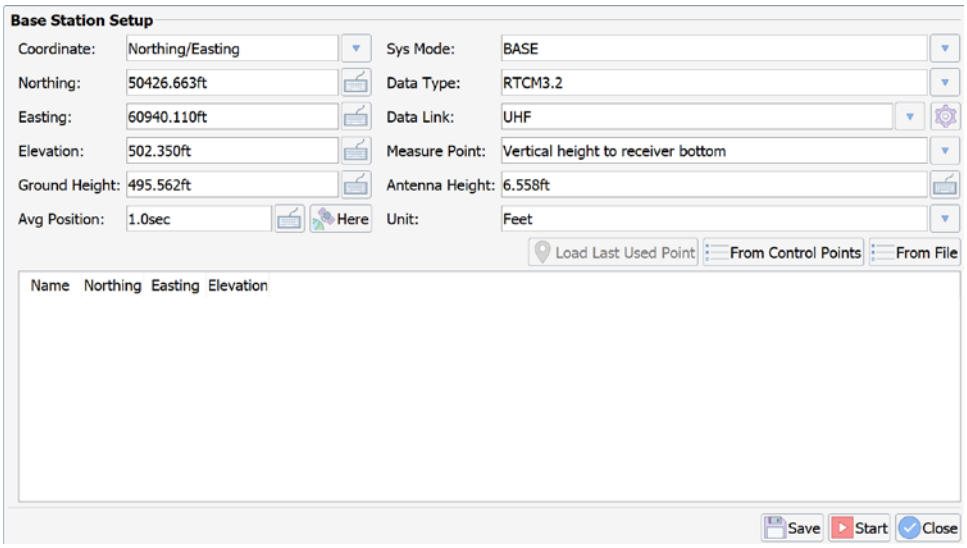
Base Station Setup

SiteMetrix Grade can be used to configure your C631 as a base station. Go into the menu (), scroll to the right (), and click **Base Setup**.

Set **Sys Mode** to **BASE**. For data type, it is suggested for most applications you use ROX or RTCM 3.2. These RTK message formats provide RTK messages for all signals/constellations. Using RTCM 3.0 limits you to GPS + GLONASS only and you will be unable to take advantage of Galileo and BeiDou.



If you have a localization file loaded, you have the option to enter in a **Northing**, **Easting**, **Elevation** (rather than **Latitude**, **Longitude**, and **Height**).

Click **From Control Points** to select a localization point or select **From File** to load from your topo file.

Continued on next page

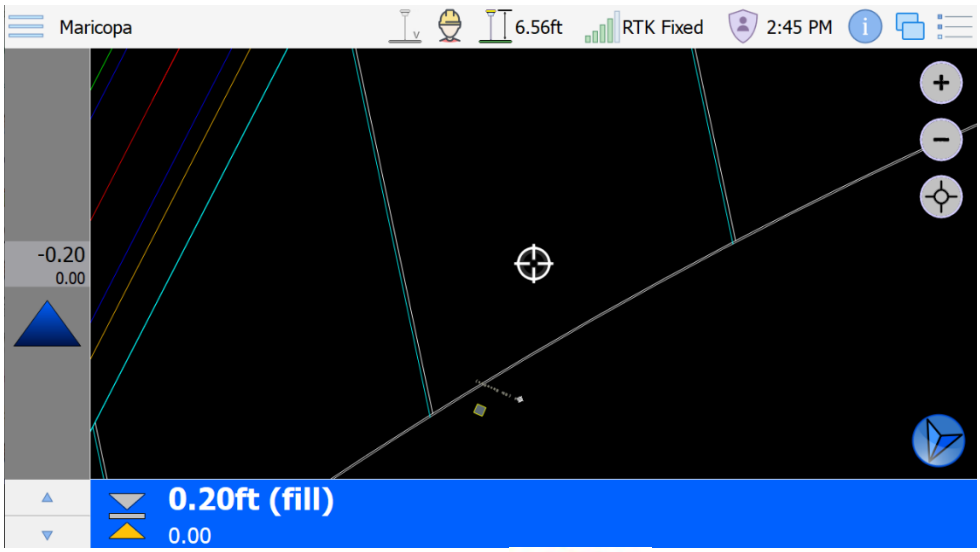
Using Rover

Data Link allows you to configure how the RTK messages will be transmitted.

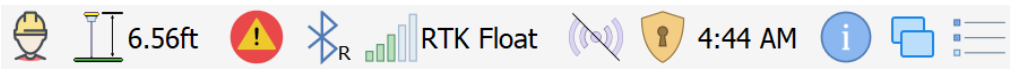
The options are:

1. **Ext (External)** – Use to output RTK from the 5-pin Lemo connector located on the bottom of the C631. Click on the gears button next to **Data Link** to set the baud rate.
2. **UHF** – Use to output RTK from the internal UHF radio. Click on the gears button next to **Data Link** to configure the radio.
3. **Network** – Use to output RTK to a TCP/IP server or NTRIP caster. Click on the gears button next to **Data Link** to configure the network settings.

On the main screen, you can see the following:



The toolbar may show an alert symbol  as shown below if there is an issue (in this case, the issue is that the GNSS receiver is RTK Float instead of RTK Fixed). Click the exclamation point to see the error.



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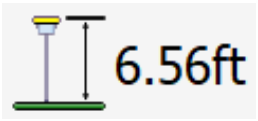
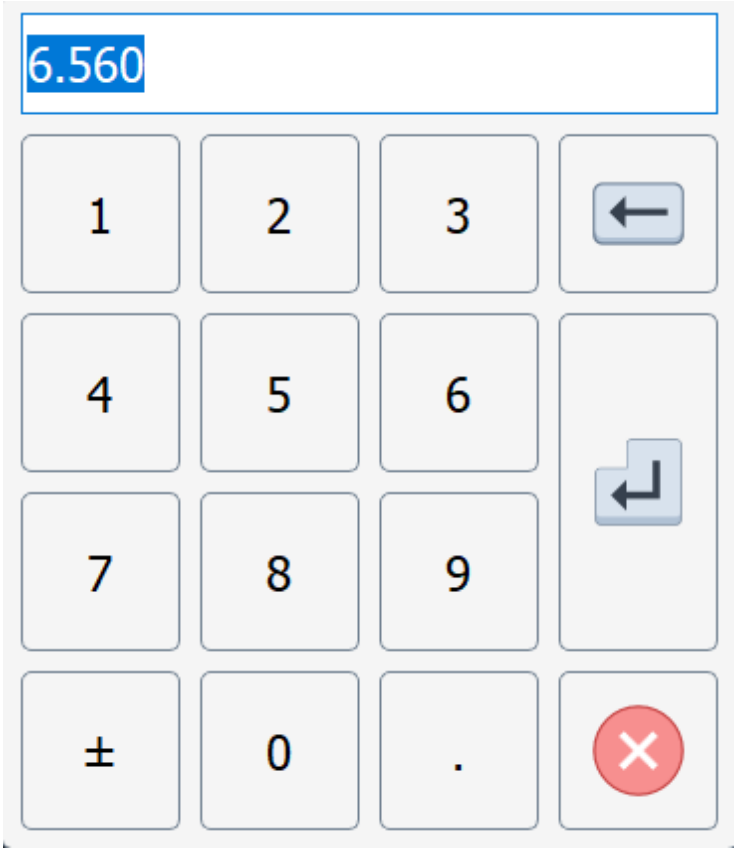
Using Rover, continued

The 

symbol shows the rover rod height (from the pointon the ground to the base of the receiver). Click on this value to change it.



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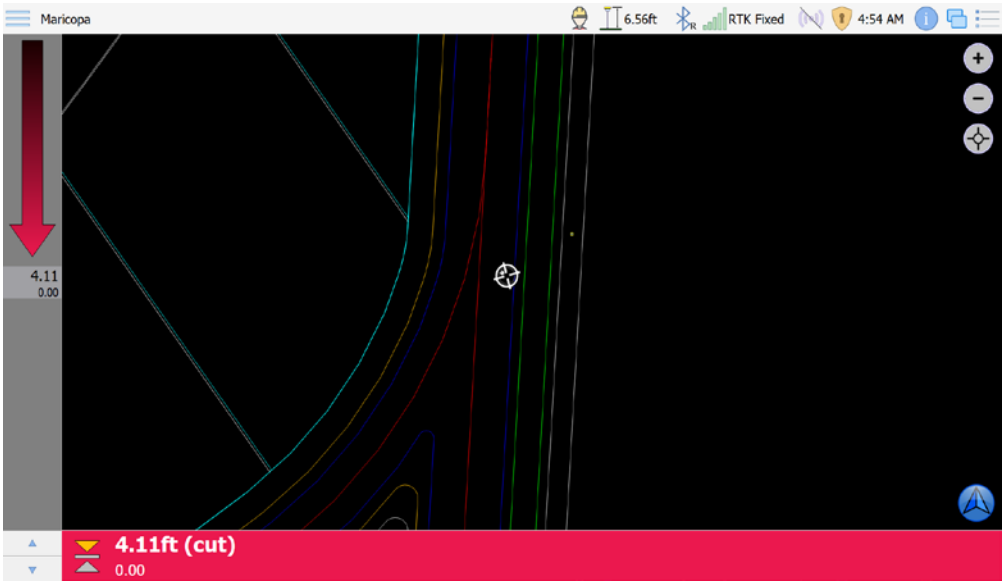
Using Rover, continued

Clicking on the  icon changes from using a survey rover to using a truck (using the antenna height of the truck entered in Equipment Setup). In the example below, a survey rover is used:



Continued on next page

Using Rover, continued

Click the person icon once more to show the truck.

Warning: Ensure you have the correct option shown, as the antenna height for a person and for a truck may be different.

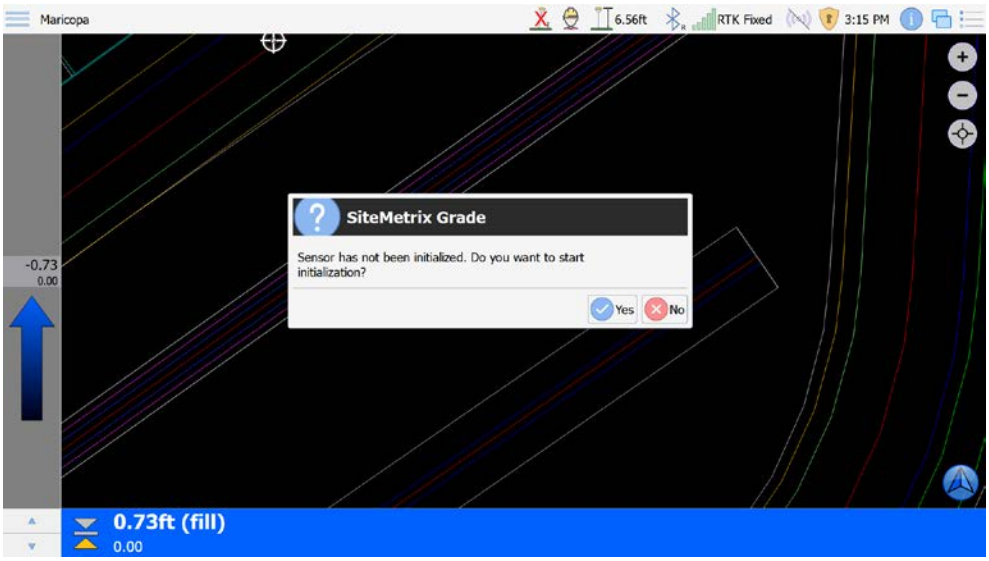
Click the  icon to return to the survey rover.

SiteMetrix Grade supports the use of tilted pole measurements. Click the  symbol in the toolbar to enter **Tilt Compensation Mode** (this does not work when using a truck). The image tilts, indicating tilt compensation mode is turned on. 

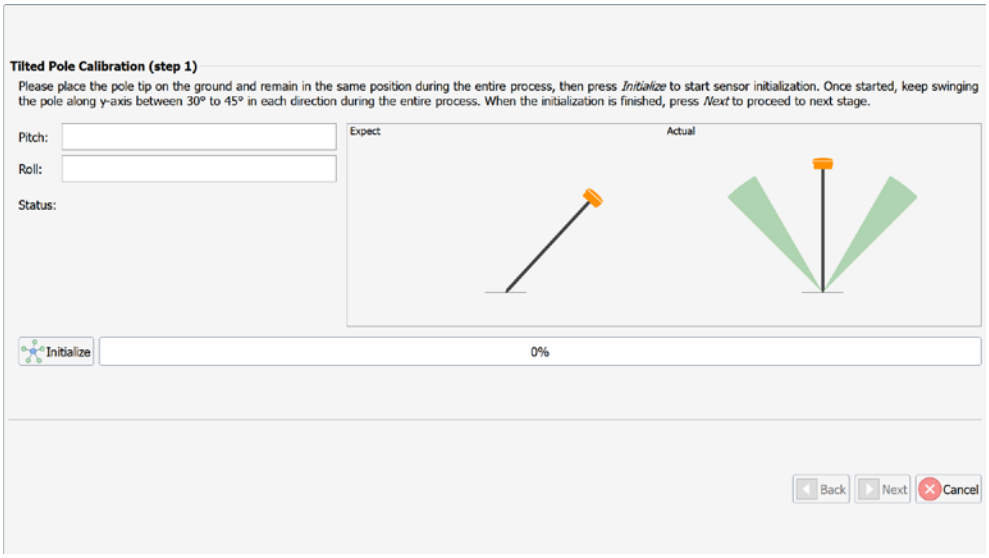
Continued on next page

Using Rover, continued

Tilted Pole Measurements use an internal Inertial Measurement Unit (IMU) that requires motion of an RTK Fixed receiver to intialize. The C631 must be RTK Fixed to use this feature. If the IMU needs to be initalized, a message prompts you to initialize the receiver.



To initialize the receiver, click **Initialize**.



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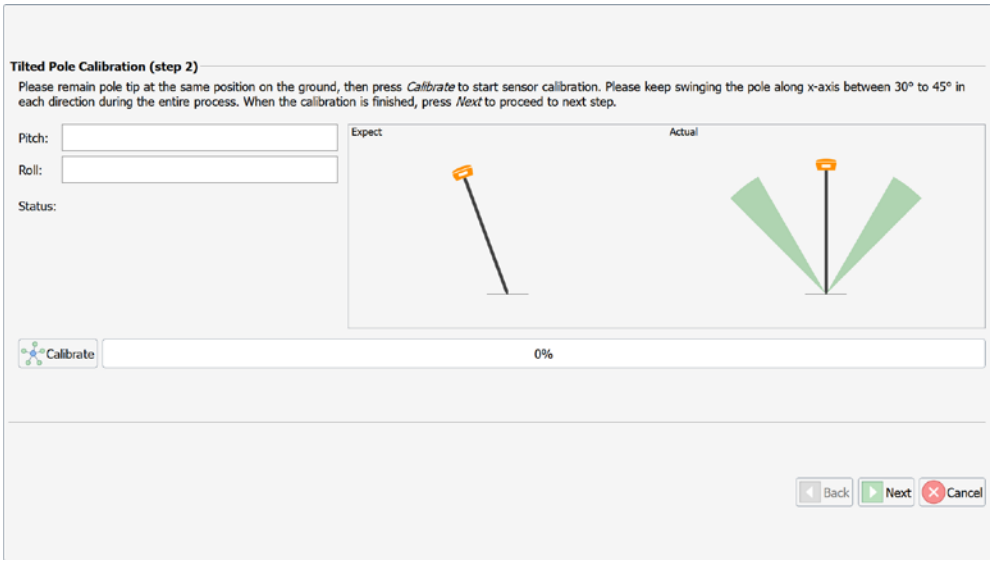
Using Rover, continued

A prompt displays to swing the receiver back and forth. Once initialized, the status bar will go to 100%. Click **Cancel** to skip calibration, or click **Next** to calibrate your IMU.

To calibrate, firmly place the point of the receiver on a point on the ground. Do not rotate or move the receiver. Click **Calibrate**. Swing the receiver back and forth as shown in the image.



Click **Next**. A prompt displays to swing the receiver back and forth in the other axis.

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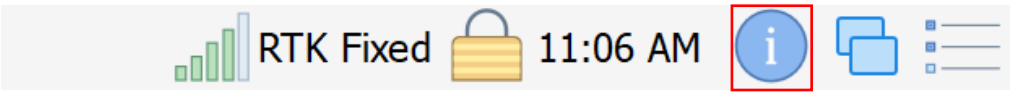
Quick Info

On the top menu bar, click the **Information** icon to display the information menu.



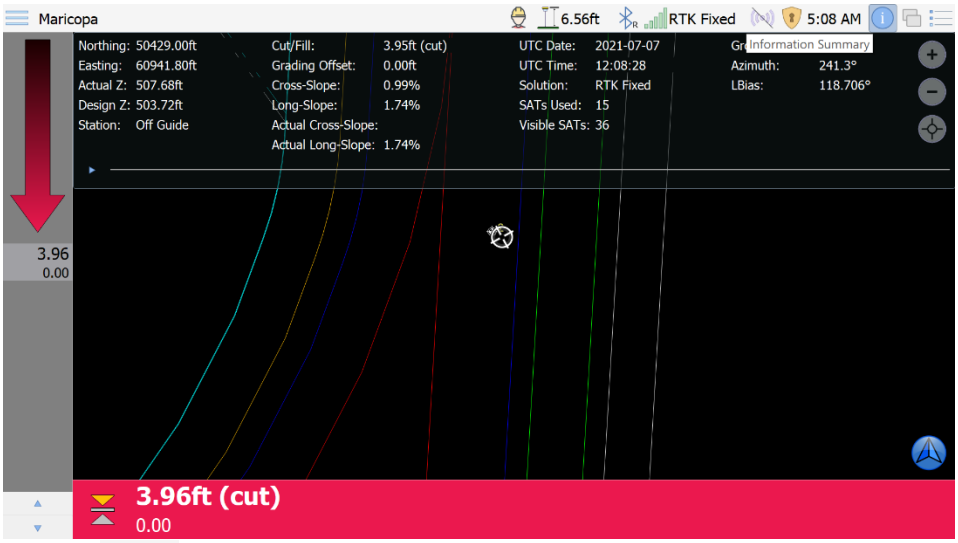
(Press anywhere in the pop-down screen to hide the menu.)

Term	Definition
Northing	Northward-measured distance from the origin, or the "Y"-axis.
Easting	Eastward-measured distance from the origin, or the "X"-axis.
Actual Z	Local height above the origin of the local coordinate system. Actual Z is the elevation, or the "Z" axis.
Design Z	Design elevation (Actual Elevation – Design Elevation = Cut Value (if negative-Fill Value).
Station	If using a guideline, indicates the current station on the guideline.
Cut/Fill	The difference between design and actual elevation.
Grading Offset	A small offset (positive or negative) that affects cut/fill in the design elevation.
Cross slope	The angle made between the left and right side of the tracks and a horizontal plane (also known as roll).
Long slope	An angle made between the front and back of the machine and a horizontal plane (also known as pitch).
UTC Date	The date based on UTC (Coordinated Universal Time) time zone.
UTC Time	Coordinated Universal Time zone.
Solution	The solution should read, "Real-time Kinematic."
Visible SATs	The quantity of SATS visible in the sky.
Ground Speed	The speed of the machine travel based on position data.
Azimuth	The angular measurement between the vector created from the back of the machine to the front of the machine and "true north."

Continued on next page

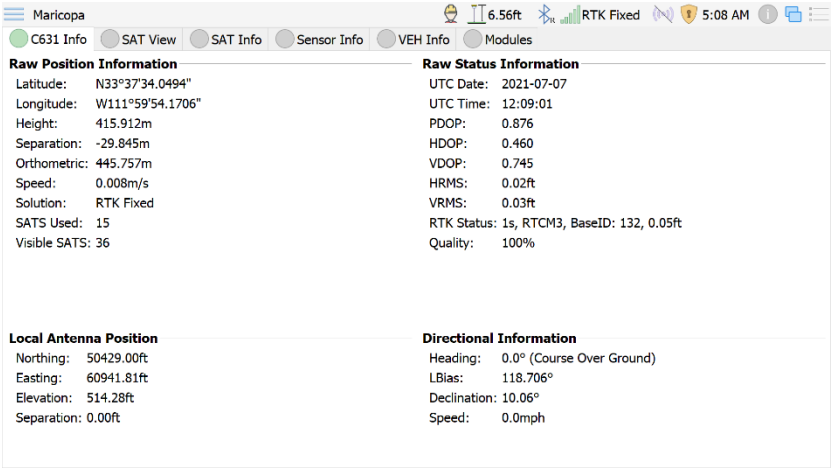
Quick Info, continued

Note: Select/de-select which information fields you want to display by clicking the **Settings** icon, and **Info Summary**.



Click the  icon in the upper right corner to view the **Information** screen.

This icon is disabled when the Quick Info menu is displayed. Turn off the Quick Info menu to enable the icon.



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Antenna Info

The **Antenna Info** tab provides the following information:

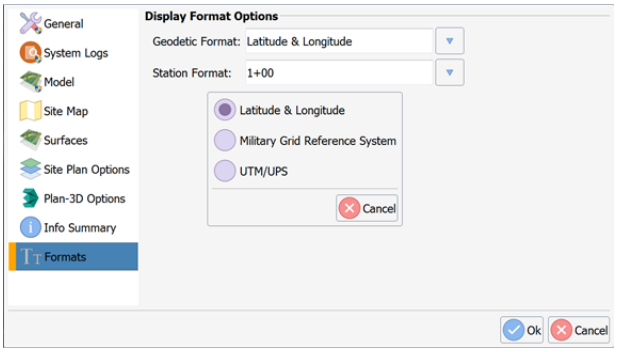
- **Raw Position Information** –raw position and GNSS quality information from the GNSS receiver
- **Raw Status Information** –additional GNSS status information (i.e., dilution of precision, RMS values, RTK latency, and UTC time) from receiver
- **Local Antenna Position** –the NEZ in local project coordinates
- **Directional Information** – the GNSS heading and an indicator (if GNSS), or derived heading. It also gives the declination and speed.

Note: The **Antenna Info** tab automatically displays the **Information** type specific to the connected antenna.

The **Raw Position Information** displays the current plan values for:

- Latitude
- Longitude
- Height (orthometric height)
- Separation (geoid separation)
- Ellipsoid (ellipsoid elevation)
- Speed
- Solution
- SATS Used
- Visible SATS

Note: To change latitude/longitude to a military grid or UTM (Universal Transverse Mercator) Go to **Settings -> Format**.



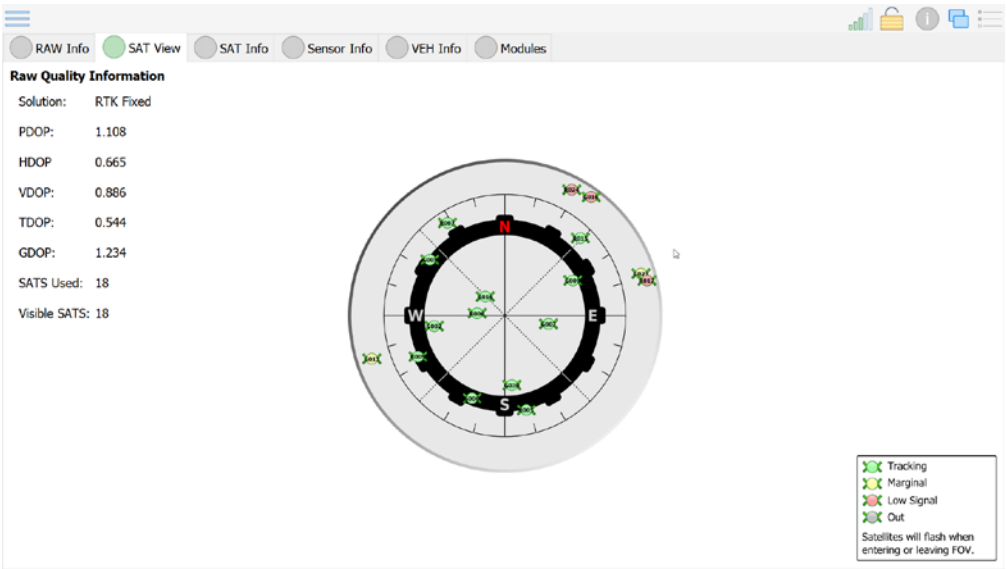
Continued on next page

SAT View

The **SAT View** tab displays available satellites. The strength of each satellite signal is color-coded.

Table 2-1: Satellite Signals

Signal	Color	Description
Tracking	Green	Strong signal -used in the solution
Marginal	Yellow	Weaker signal- only a partial use in the solution
Low Signal	Red	Not tracked in the solution
Out	Grey	No signal



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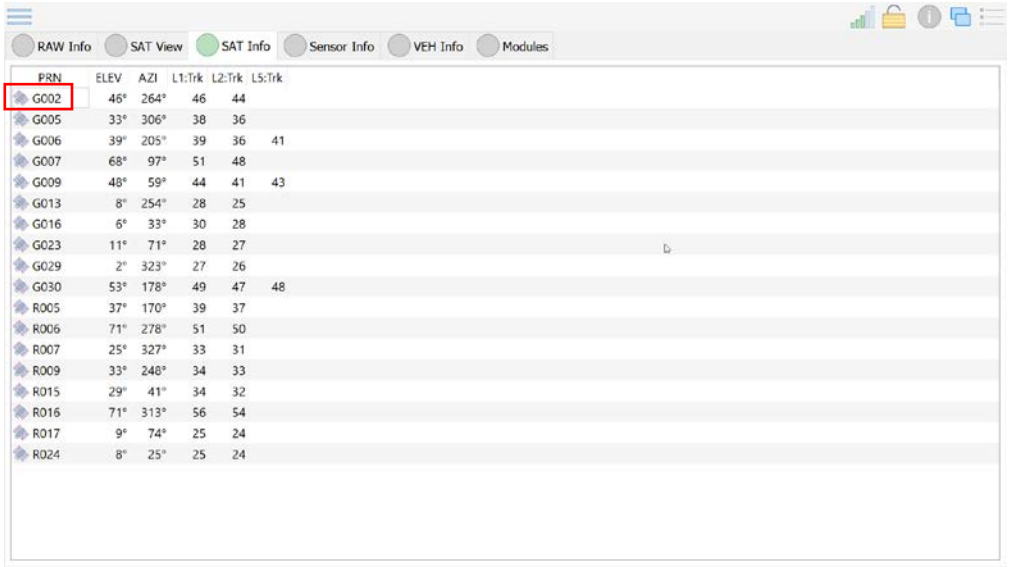
SAT Info

The **SAT Info** tab displays data-driven detail about each satellite used in the solution.



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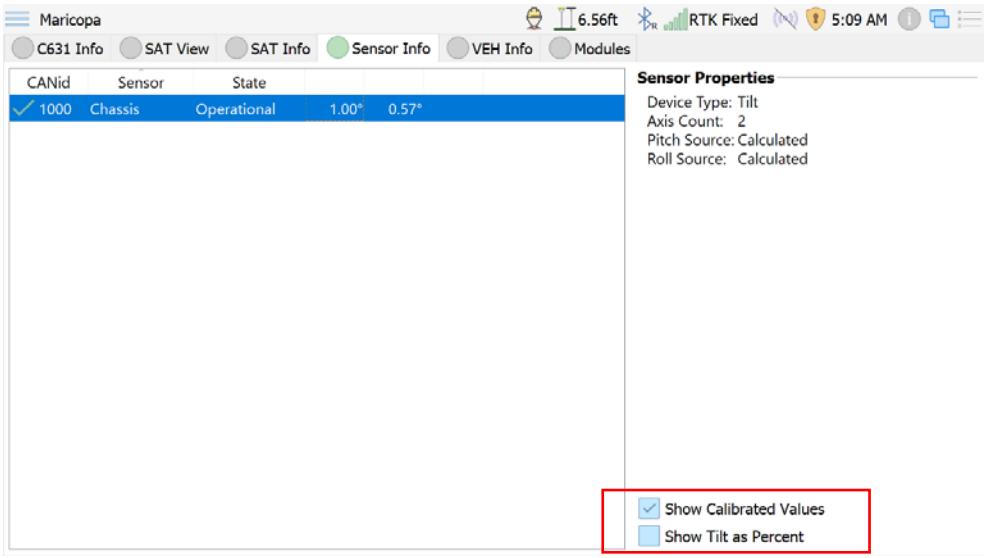
Sensor Info

The **Sensor Info** tab displays all the configured sensors. You can check the sensor operation and the pitch and roll.

Click **Show Calibrated Values** to view the calibrated (rather than the raw) tilt sensor value.



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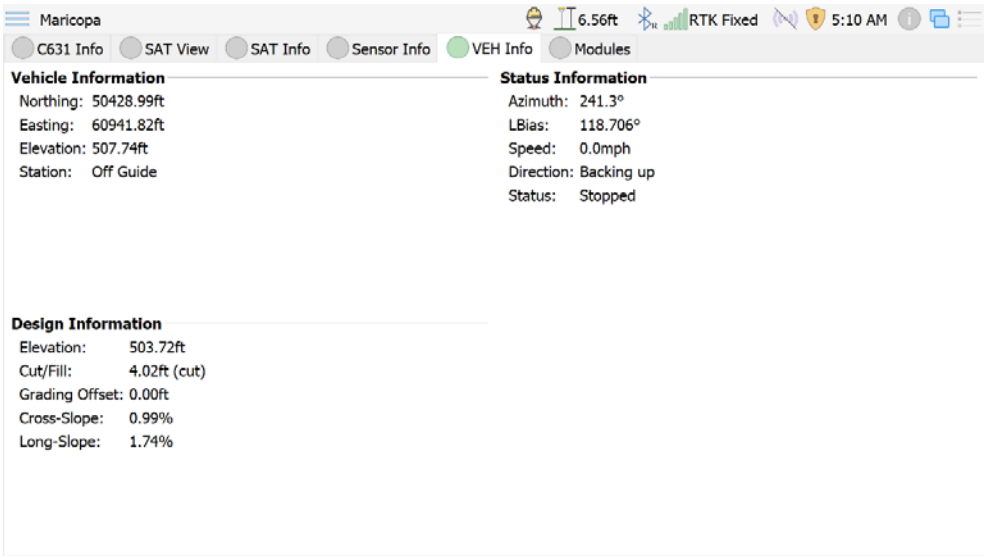
VEH Info

The **VEH Info** tab displays the following information:

- **Vehicle**-Northing, Easting, Elevation, and Station
- **Status**-Azimuth, HBias, Speed, Direction, Status
- **Design**-Elevation, Cut/Fill, Grading Offset, Cross-Slope, Long-Slope



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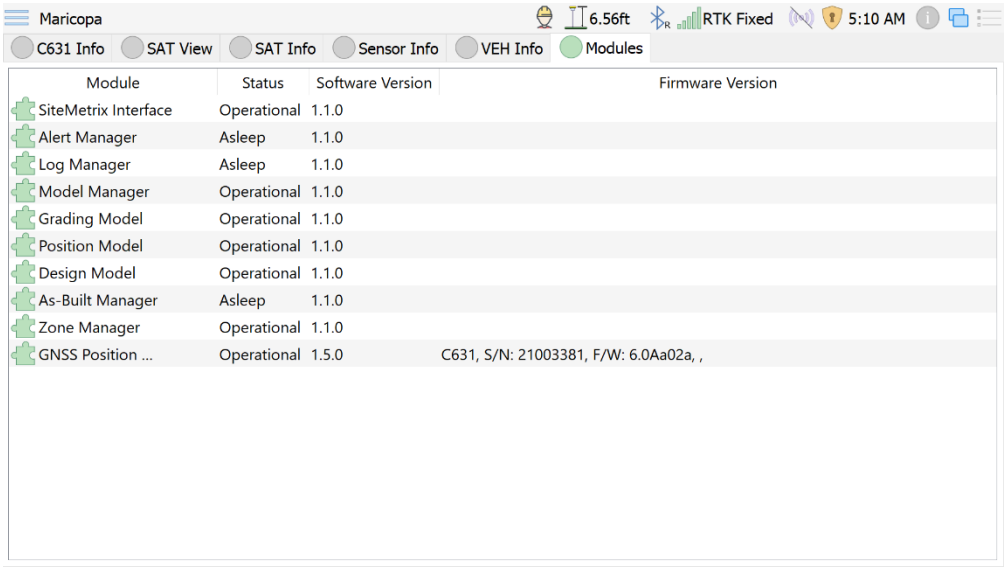
Modules

The **Modules** tab displays a listing of modules used and the status.



Return to main screen

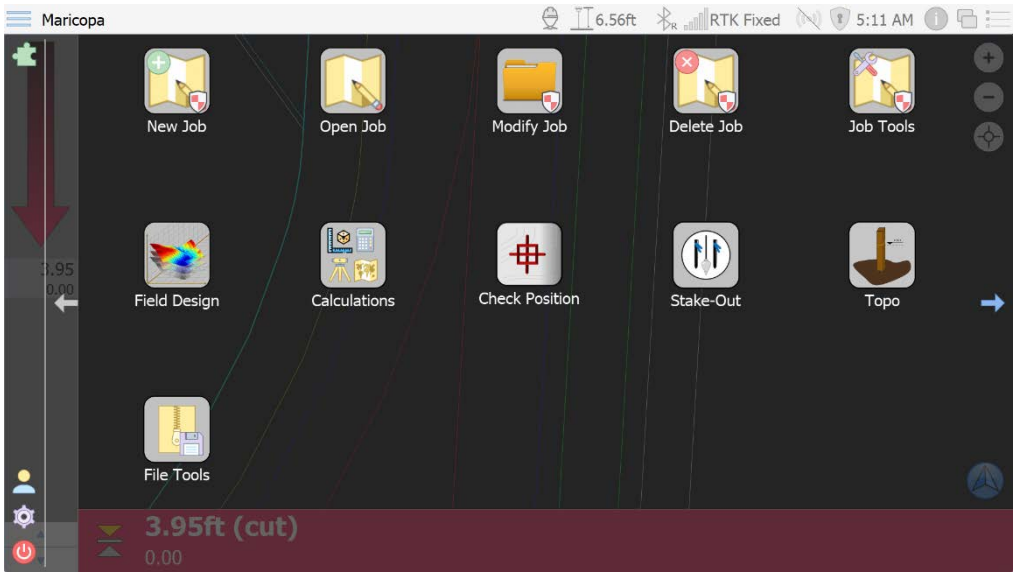
Click the  icon to de-select and return to the GradeMetrix main screen.

Continued on next page

SiteMetrix Grade file requirements

SiteMetrix Grade requires a **Plan View** file, **Design Surface**, and **Localization** file. These files are combined into a **Job File**. Other file types, such as a **Topo File** and **Guideline** file may be loaded.

To create a new job with these files, log into **Admin Mode**, and click **New Job**. Or click **Open Job** to load an existing job or **Modify Job** to modify an existing job.



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SiteMetrix Grade file requirements, continued

When you load an existing job, it automatically loads all files associated with the job. A description of some of these file types are below.

Table 2-2: Job File Types

File Type	Description
Job File	A collection of files (plan view, design surface, etc.) along with settings. Loading a job loads all files and settings.
Plan View	The map of a job site that shows distinguishable features (such as buildings, streams, etc.) as well as a general topo map of the site.
Design Surface	The digital terrain model that drives the cut/fill values. An elevation is associated with each northing and easting and this design elevation is compared to the actual elevation of the machine at the current northing/easting.
Guideline File	Provides steering offsets towards a polyline.
Topo File	A file that stores all of the points stored in the Topo routine.

SiteMetrix Grade Main Menu

Main Menu

The SiteMetrix Grade Main Menu displays the following:

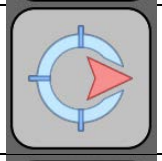
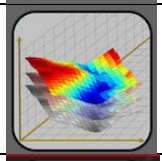
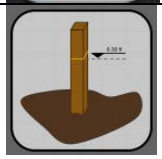
Table 2-3:- SiteM**etrix Grad**e **Main Menu Icons**

Icon Name	Icon	Description
New Job (*must be accessed by authorized Admin user)*		Create a new job.
Open Job		Open an existing or saved job.
Modify Job		Edit an existing or saved job.
Delete Job		Delete a created job.
Job Tools		Export a job file to external storage or rename a job.
Equipment Setup		Use in administrator mode. Configure the dimensions of your machine, the GNSS hardware you are using, and save/load these settings.

Continued on next page

Main Menu, continued

Table 2-3: SiteMetrix Grade Main Menu Icons (continued)

Icon Name	Icon	Description
Calibrate Sensors		Calibrate the sensor to determine a cross slope and long slope offset, based upon the sensor installation. Use this for body sensors.
Quick Calibrate		Use Quick Calibrate to check the cross slope/long slope is on a sensor.
RTK Source Configuration		This is where you can configure your RTK source (NTRIP, internal UHF radio, or external radio).
Navigation		Enter an NEZ or select from a list of control points. Grade Metrix provides distances/directions to that point.
Field Design		Use Field Design to create a surface when a model is not available.
Manage Points		Use Manage Points to add, remove, or edit Topo Points and Lines.
Topo		Use for conducting a topo. Software can be configured to store points automatically or manually in interval (distance or time).

Continued on next page

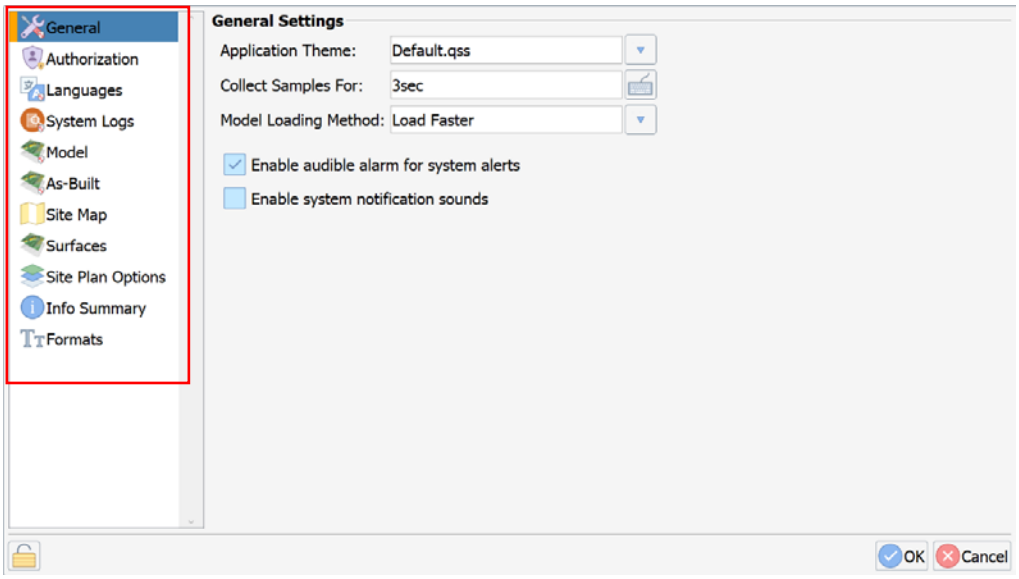
SiteMetrix Grade Main Menu, Continued

Settings

On the lower-left portion of the **SiteMetrix Grade Main Menu**, click the gear icon to access the program **Settings**.

Note: You must be logged on as **Administrator** to make changes to some SiteMetrix Grade **Settings**.

The **Settings** window displays. The left navigation menu lists the SiteMetrix Grade Settings options:



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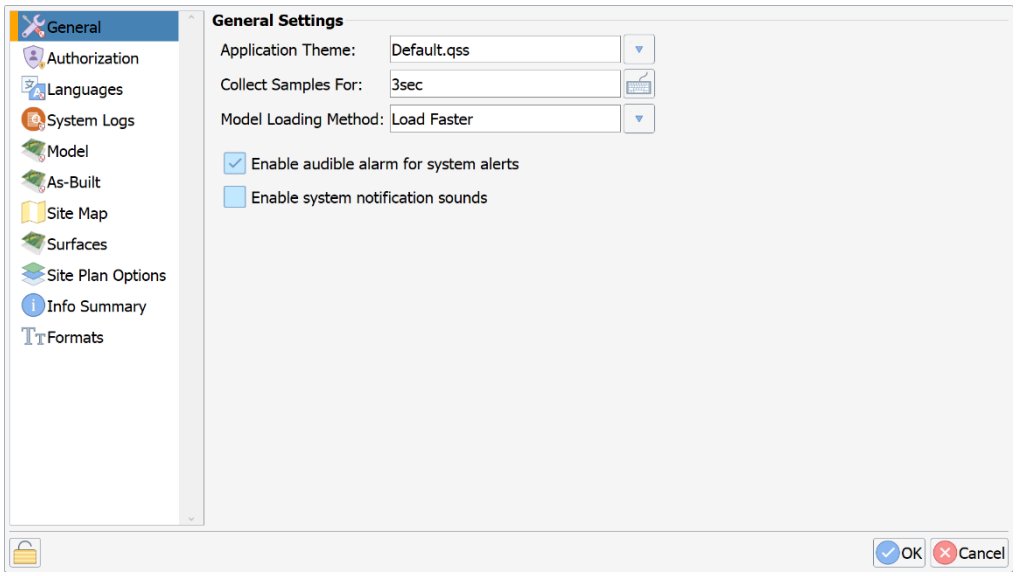
General settings

The following General settings can be configured:

1) **Collect Samples For:** The amount of time (in seconds) that a GNSS position (or heading) shot is averaged for when benching (in **Field Design**) or doing a machine calibration.
2) **Model Loading Method:** If set to **Save Memory**, when loading a tin file duplicate vertices will be searched for, which increases loading time. **Load Faster** is the suggested default setting.
3) **Enable audible alarm for system alerts:** If checked, audio alerts will be used to indicate a lost GNSS position (and other various errors).
4) **Enable system notification sounds:** If checked, a cut/fill audio indicator will be enabled

To save your settings, click **Ok**. To cancel your changes, click **Cancel**.



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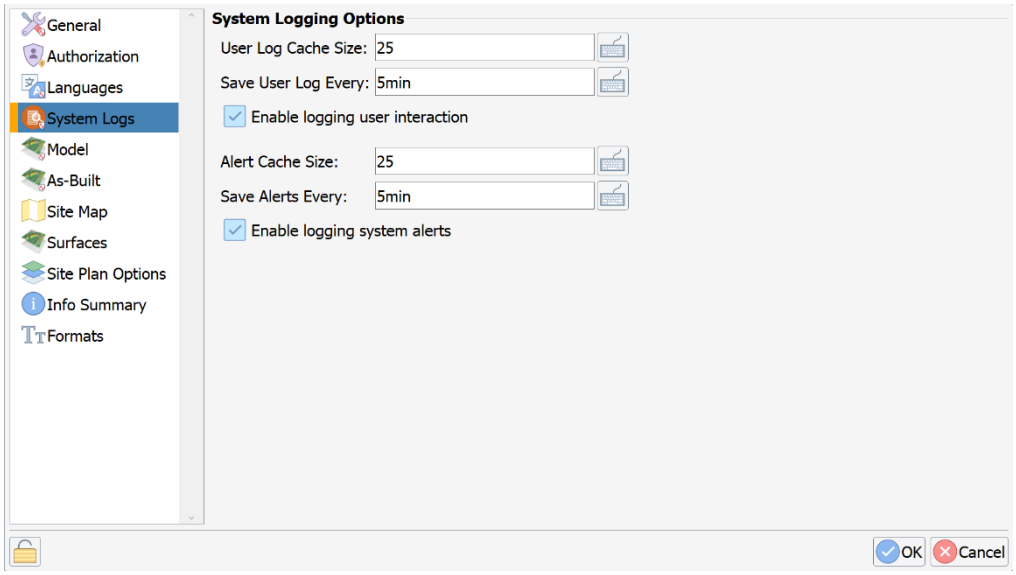
System logs

In the **System Logs** screen, click in the field to set the system logging options.

Table 2-4: System Logs

Option	Function
User Log Cache Size:	Determines number of logs held in memory before flushing them to a disk.
Save User Log Every:	Performs an autosave to disk.
Enable logging user interaction	Logs all user interactions.
Alert Cache Size:	Determines number of logs held in memory before flushing them to a disk.
Save Alerts Every:	Performs an autosave to disk.
Enable logging system alerts	Saves error message (GPS errors, sensor errors, etc.).

When you are finished setting the system logging options, click **Ok**. To cancel your changes, click **Cancel**.



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SiteMetrix Grade Main Menu, Continued

Model Options

On the **Model Options** screen you can check and edit the location settings for your GradeMetrix job in the **Model** screen.

Click to select/edit the following fields:

Table 2-5: Model Options

Option	Description
Speed and Heading Rate:	The rate at which speed and heading information update.
Motion Detection Tolerance:	SiteMetrix Grade uses your GNSS position to determine motion.
History Distance Tolerance:	Records the cumulative history movement and sets a history marker.
Maximum History Size:	The amount of history markers stored for your previous points.
Enabling Cut/Fill	If set to **When RTK Fixed**, Cut/Fill will only be shown when the C631 has an RTK Fix. If set to **Allow aRTK™ Fixed**, Cut/Fill will be shown when the C631 is RTK Fixed or aRTK Fixed. If set to **Allow Atlas®**, Cut/Fill will be shown when the C631 is Atlas Converged, aRTK Fixed/Converged, or RTK Fixed. If set to **Always Show**, Cut/Fill will be shown regardless of RTK status.
HRMS Tolerance:	Sets the Horizontal RMS thresholds for when an alert will occur.
VRMS Tolerance:	Sets the Vertical RMS thresholds for when an alert will occur.

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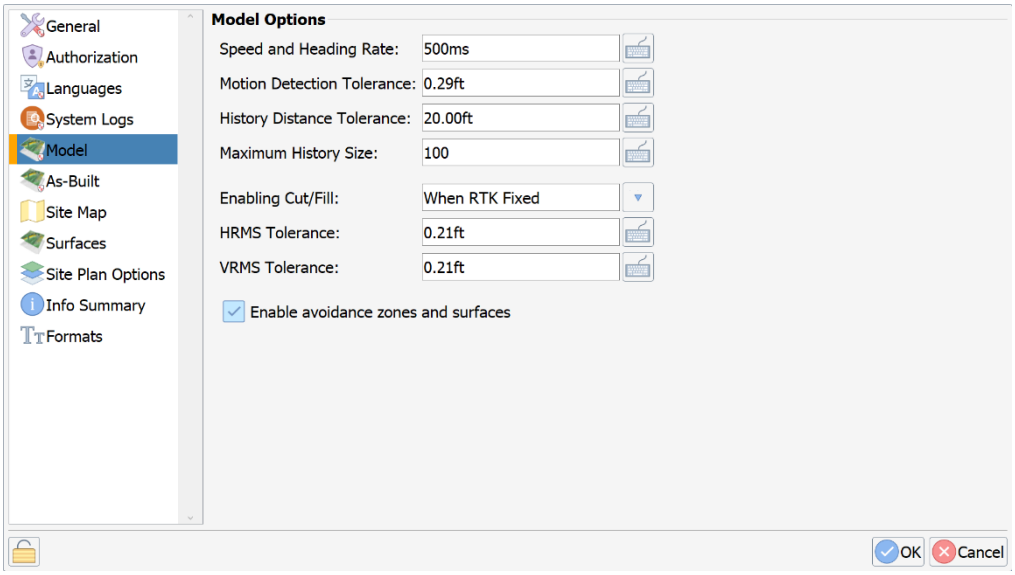
SiteMetrix Grade Main Menu, Continued

Model Options, continued



Click the checkbox to select **Enable avoidance zones and surfaces**. If the module is built with avoidance zones, an alarm will sound when entering those zones.

To save your settings, click **Ok**. To cancel your changes, click **Cancel**.

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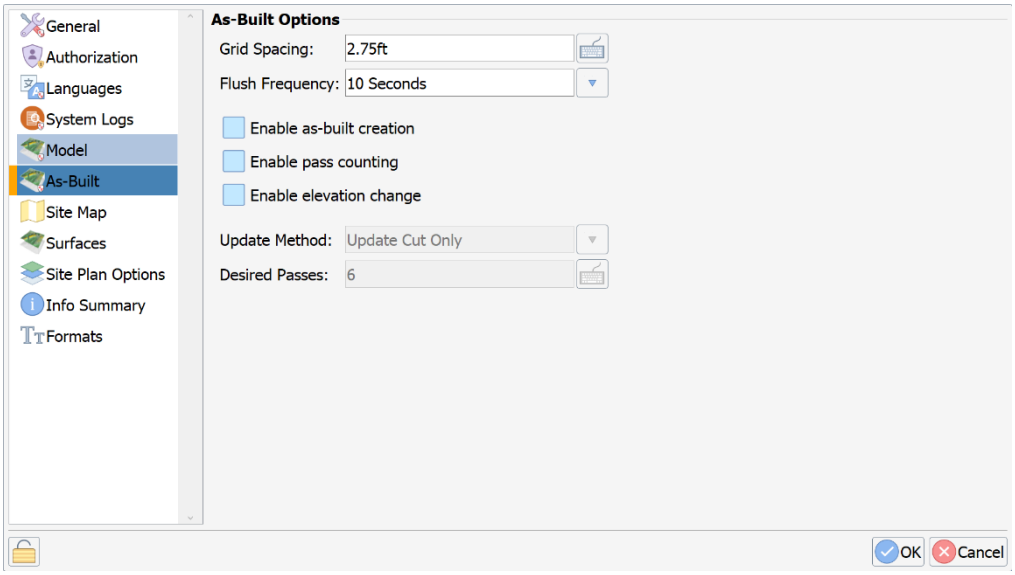
SiteMetrix Grade Main Menu, Continued

As-Built

The **As-Built** option tracks job progress and can be configured for pass counts or cut/fill.



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SiteMetrix Grade Main Menu, Continued

Site map

Use the **Site Map** screen to set display and zooming views for your SiteMetrix Grade job.

Click the down-arrow to select any of the following options from the pop-up window.

Show Display As: There are three display options to view your machine as the map rotates:

1. **Moving Map**-The map rotates to always head in the direction of the top of the screen.
2. **Fixed Rotation**-The top of the map is set to a fixed azimuth (if using Fixed Rotation, enter rotation angle).
3. **North Up**-The top of the map is always pointing north.

Click the keyboard icon to the right of the following fields to separate auto center and manage zooming:

- **Rotation Angle: I**f using fixed rotation, enter the degrees to rotate the map clockwise.
- **Zooming Factor:** Set the numeric value to zoom on the right side of the plan view. (The greater the value set (50 or above), increases the zoom out.)
- **Auto center the machine when the moving map is not selected:** The view adjusts as your machine moves to prevent your machine from driving off the screen.

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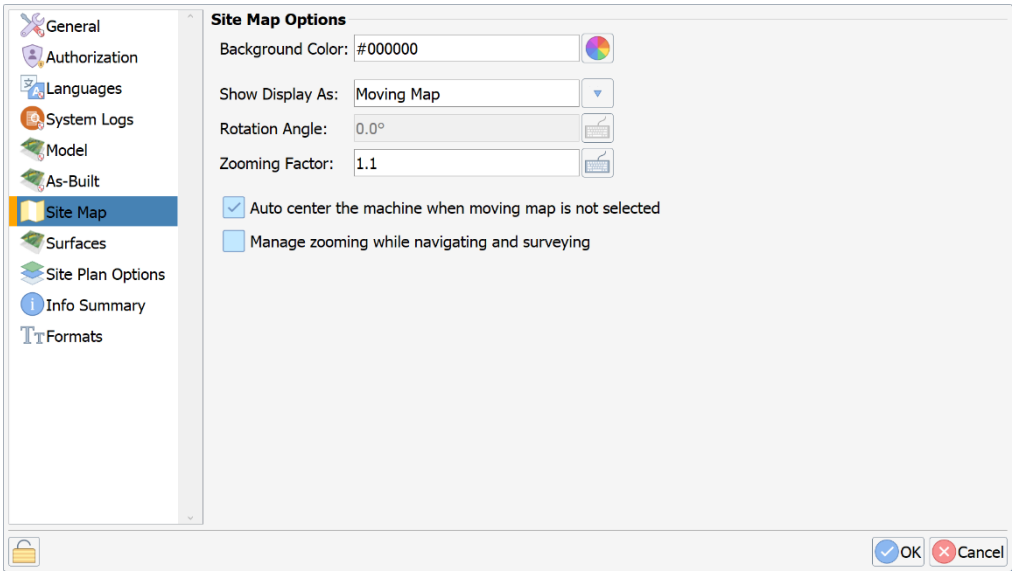
SiteMetrix Grade Main Menu, Continued

Site map, continued

Manage zooming while navigation and surveying: When staking out a point, the view will zoom in closer to the point.



To save your settings, click **Ok**. To cancel your changes, click **Cancel**.

Surfaces

The **Surfaces** option enable/disables on the background surfaces shown on the plan view.

Select from these options:

- Show Using:
- On-Count Color:
- Passes Color:

Show Cut/Fill-Select the box to display cut/fill surfaces on the plan view and color the grid based upon the cut/fill value.

Note: This option is only available if an existing surface file is loaded.

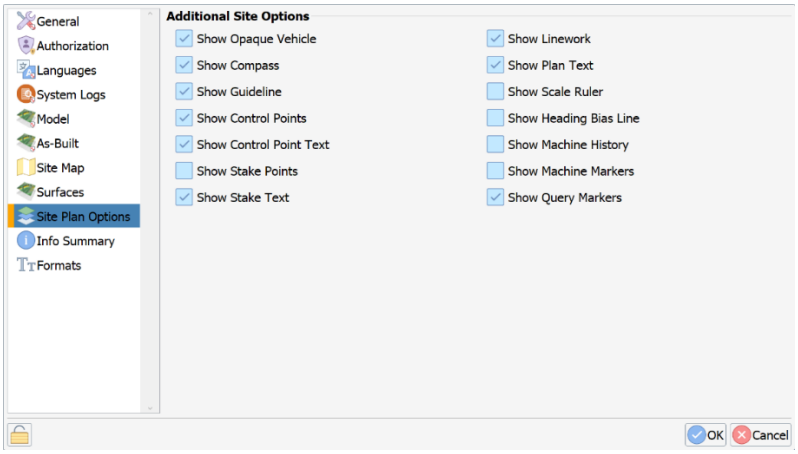
Continued on next page

SiteMetrix Grade Main Menu, Continued

Site plan Options

The **Site Plan Options** can be enabled/disabled to show on the **Plan View**.

- Show Opaque Vehicle – if deselected, the machine will be transparent, allowing you to see the linework behind the machine.
- Show Compass – if selected, an arrow pointing north is shown on the plan view.
- Show Guideline – if guidelines are enabled, this option must be selected to show the guidelines.
- Show Control Points – if selected, control points will be drawn on the **Plan View**.
- Show Control Point Text – if selected, descriptions associated with control points will be displayed on the screen next to the control points.
- Show Stake Points – if selected, points from your topo file are shown on the **Plan View**.
- Show Stake Text – if selected, associated text from the stake points is also shown. **Show Stake Points** must be checked.
- Show Linework – if selected, linework from your linework file will be shown. Deselecting turns off the linework.
- Show Plan Text – if selected, text in the linework file will be shown.
- Show Scale Ruler – if shown, a scale will be shown at the bottom of the **Plan View**.
- Show Machine History – if selected, breadcrumbs are drawn on the screen, showing recent machine history.
- Show Machine Markers – if selected, points of interest on the machine are shown.
- Show Query Markers – if selected, query markers are shown.



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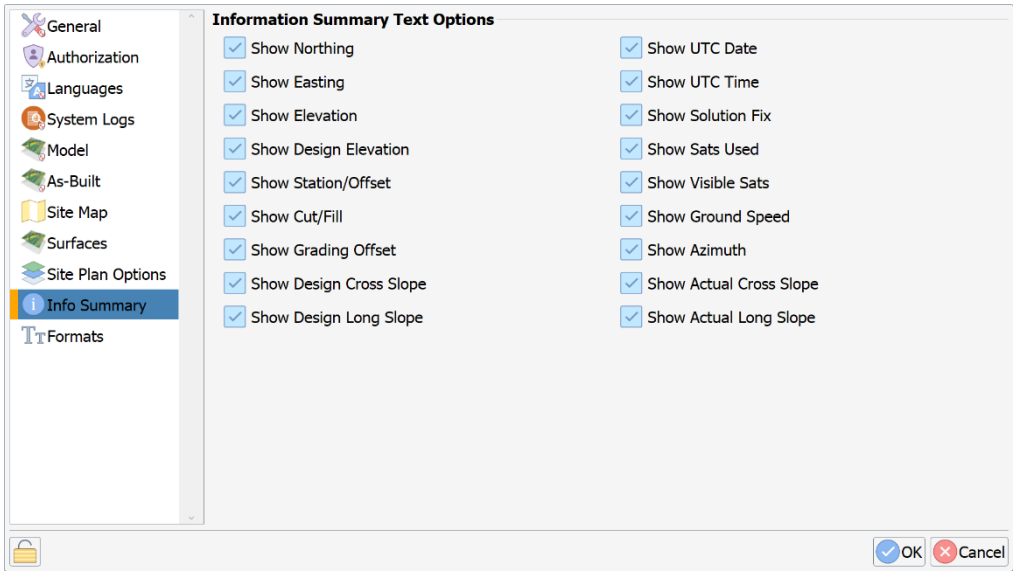
SiteMetrix Grade Main Menu, Continued

Info Summary tab

The **Info Summary** screen displays the list of text options to display on the **Quick Info** screen. Click to select the options you wish to display.

To de-select an option, click the box a second time. After making your selections, click **Ok**.



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SiteMetrix Grade Main Menu, Continued

Formats

The **Display Format Options** screen lists the format options that can be displayed for a job. Click the down-arrow to the right of each field to change a selection.

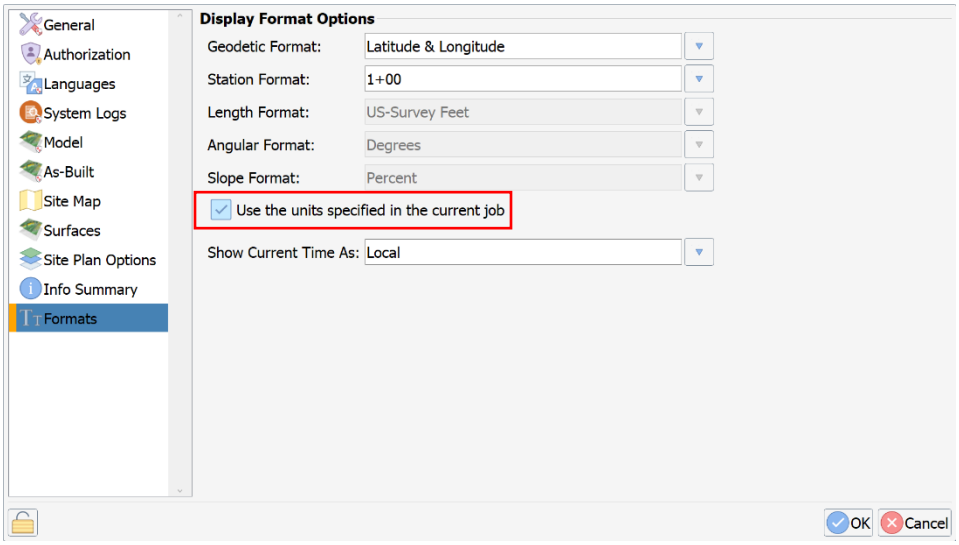
- **Geodetic Format** displays latitude/longitude, UTM, or military grid.
- **Station Format** shows stations when using a guideline.
- **Length Format** selects the unit of measure for northing and easting.
- **Angular Format** selects between Degrees and Gradians.
- **Slope Format** selects between percent and degrees.

Note: These fields can only be changed if the check box is unchecked. It is recommended to leave the box checked to minimize errors.

Show Current Time As: Click the down-arrow to select **Local**, **UTC**, or **Do Not Show**.

If desired, click to select the checkbox to select to **use the units specified in the current job.**

Click **Ok** to return to the SiteMetrix Grade Home screen.



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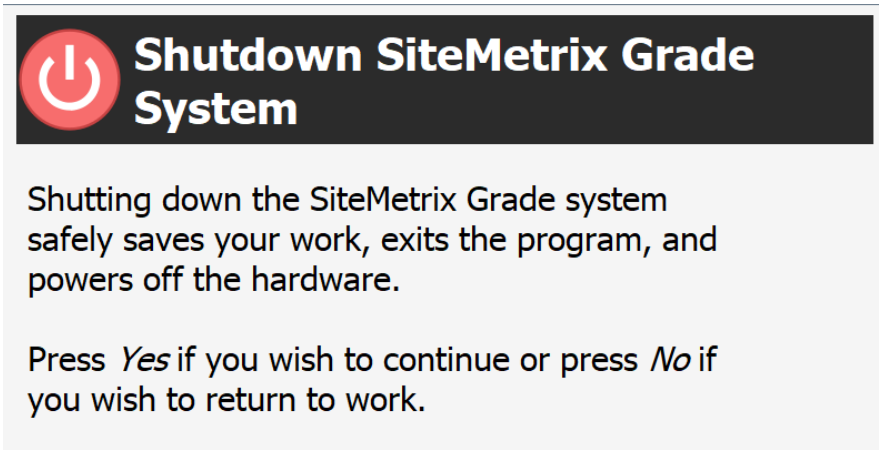
SiteMetrix Grade Main Menu, Continued

Exit SiteMetrix Grade

To exit SiteMetrix Grade, click the red power icon in the lower left side of the **SiteMetrix Grade Main Menu**.

Highlight and click the **Shutdown** option. The confirmation message displays:



Click **Yes.** The SiteMetrix Grade application closes.

Chapter 3: Working with SiteMetrix Grade Jobs

Overview

Introduction

This chapter covers the information you need to create, modify, delete and design jobs in SiteMetrix Grade.

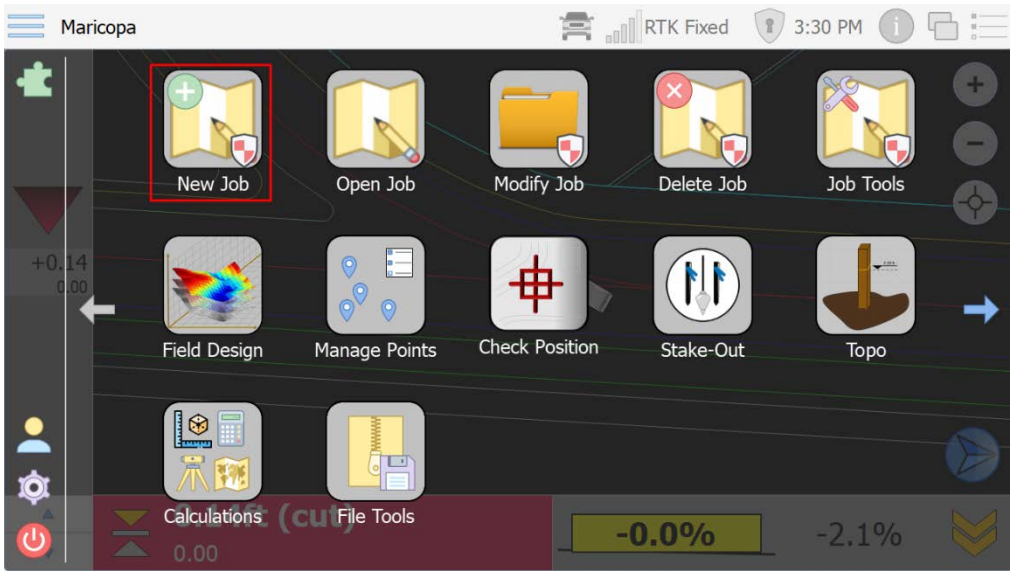
Contents

Topic	See Page
Create a Job	60
Open a Job	70
Modify a Job	71
Delete a Job	76
Job Tools	77
Field Design	79
Design a Job	84
Topo	91
Calculations	98
Manage Points	107
Stake Out	112
File Tools	114

Create a Job

Create a job

To create a job, on the SiteMetrix Grade Home screen, click **New Job**. The **Job Basics** screen displays.



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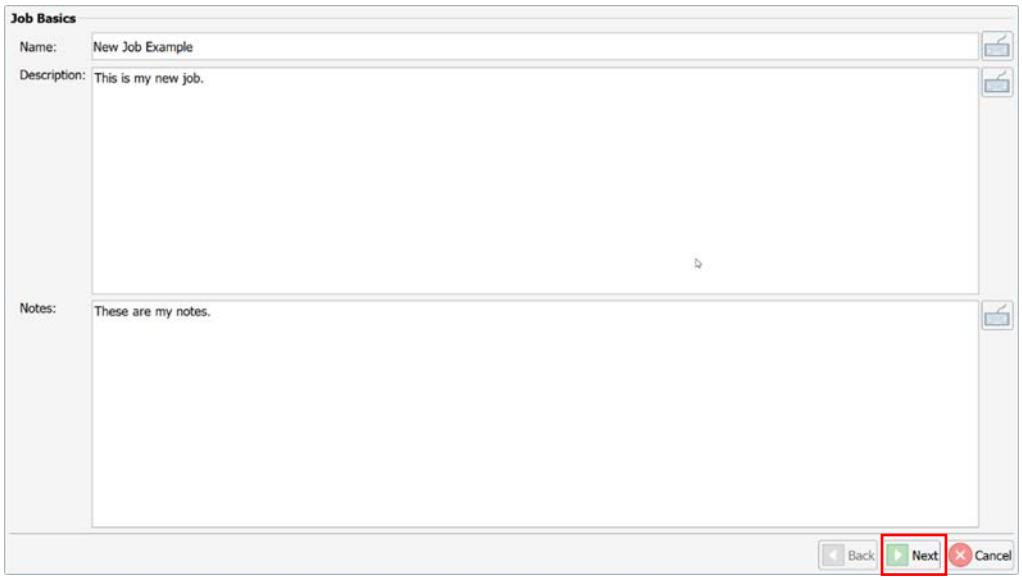
Create a Job, Continued

Job basics screen

Click the keyboard icon and type the job name, description and job notes.

Click **Next**.



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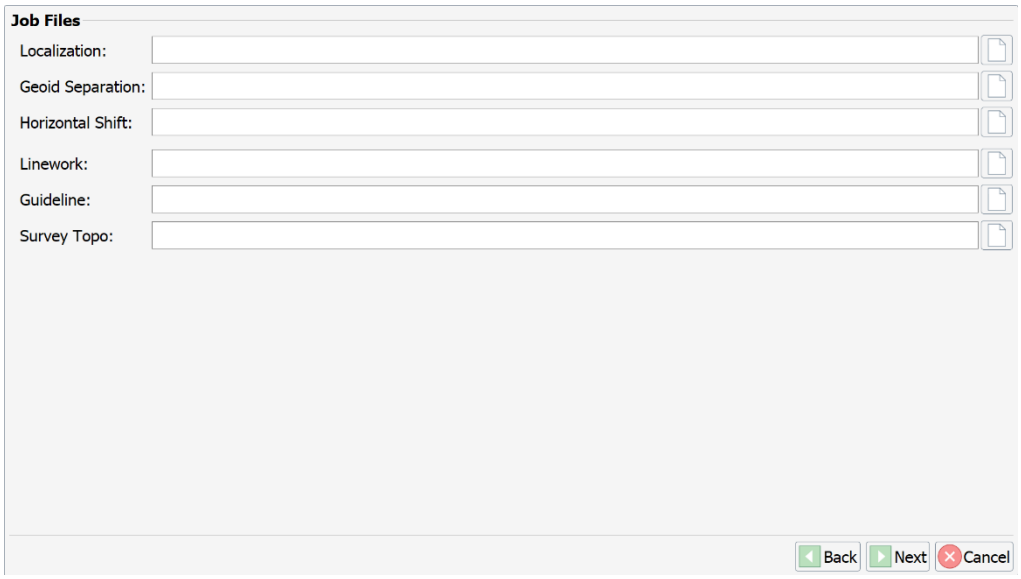
Create a Job, Continued

Job files screen

Click the document icon to the right of each field to add files to your SiteMetrix Grade job:

- Localization
- Geoid Separation
- Horizontal Shift
- Linework
- Guideline
- Survey Topo



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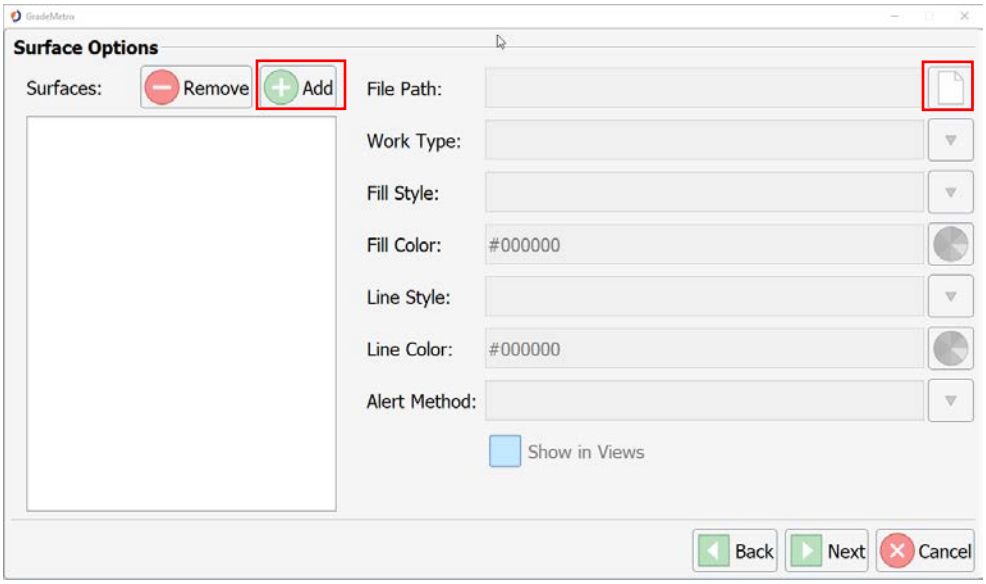
Surface options window

The **Surface Options** window displays. Click **Add** and type the name of the surface you would like to add.

Note: You can add multiple types of surfaces.

To upload a file, click the document icon to the right of the **File Path:** field and select the desired file.



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Surface options window, continued

Click the down-arrow to select a **Work Type** option.

- **Design**-The most commonly selected option. The **Design** surface is the surface you are grading to.
- **Actual** –Select **Actual** if you have a jobsite topo to upload to the current actual surface.
- **Warning** – Select to trigger a warning in the software if your elevation is either above or below the uploaded surface (see **Alert Method**).
- **Watch** – Similar to Warning. This allows for two levels of alert (i.e., You can choose to upload a **Watch** surface to set low priority alerts to an operator and set another **Warning** surface for higher priority alerts to an operator.
- **Pass Count** –color the screen based on how many times a machine has passed over a grid cell.

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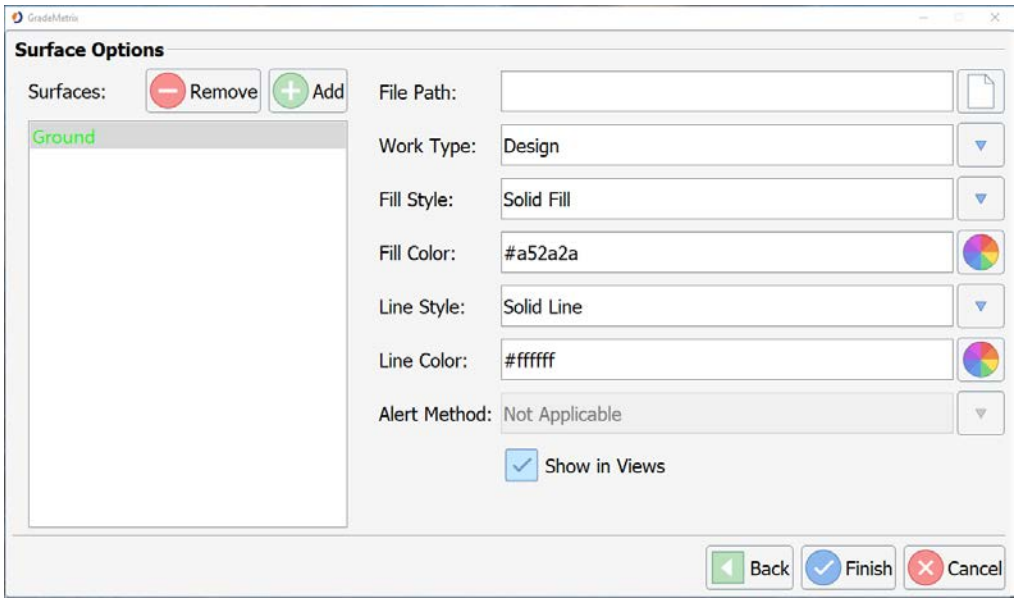
Surface options window, continued

The option you selected displays in the **Work Type:** list.



For each **Work Type** you must select (set) the following:

- Fill Style
- Fill Color
- Line Style
- Line Color
- Alert Method (**Note: Alert Method** is only applicable if **Work Type** is set to **Warning** or **Watch**. Select from **Alert When Below** or **Alert When Above**.)

Click to select the checkbox: **Show in Views**, and click **Next**.

Note: Show in Views must be selected to display your design in the design surface.

Continued on next page

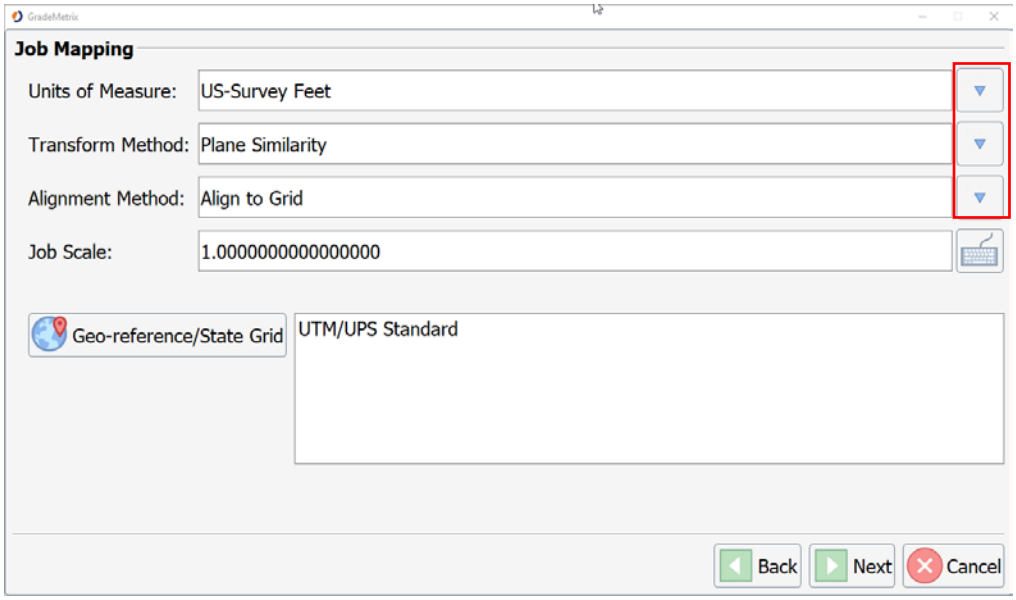
Create a Job, Continued

Job Mapping window

The **Job Mapping** window displays.

Click the down-arrow to select units for the following fields:
- Units of Measure
- Transform Method
- Alignment Method

Click to use the keyboard icon and type the **Job Scale**.



Continued on next page

Job Mapping window, continued

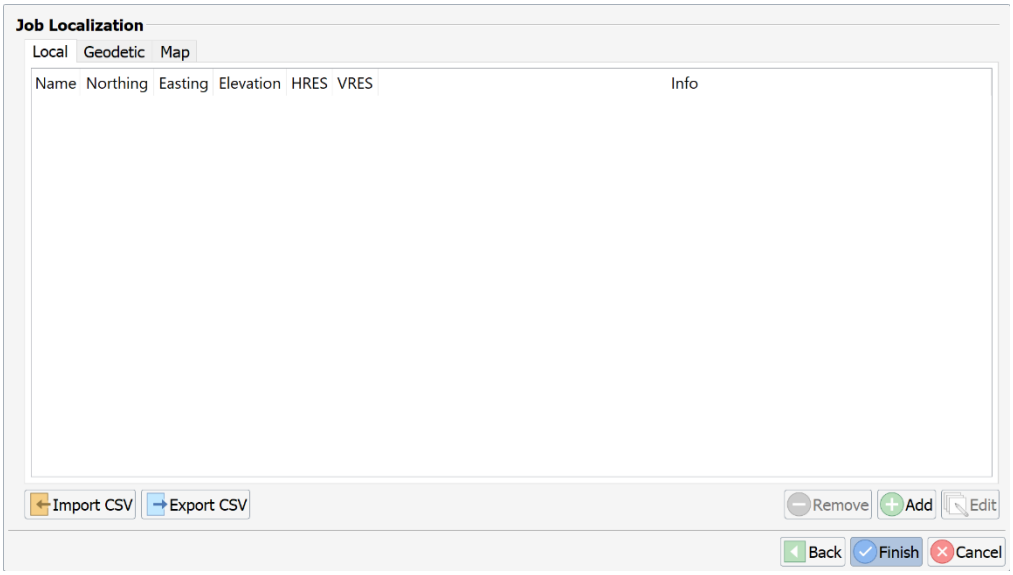
To set a geographical reference grid, click **Geo-reference/State Grid**. Click to select from the displayed list.

Click **Next**.

Continued on next page

Job Localization screen

The **Job Localization** screen displays. You can add points individually by clicking **Add** or import the points from a text file. To load points from a text file, click **Import CSV**.



Use the **Source File** field to select the file.

Delimiter: Fields can be separated with a space, tab, comma, or semi-colon.
Text Qualifier: If a field contains a delimiter, you can wrap the field around a text qualifier. The two supported text qualifies are double quotation markers and single quotation markers.
Skip Rows: This allows you to skip the top row(s) of your file in the case of there being a header.
CSV Format: Select from one of several pre-defined formats or set this field to **Custom**. If set to **Custom**, click **Custom Format** to the right and define the field order.
LLH Format: Select from **Degrees**, **Minutes**, and **Seconds** or **Decimal Degrees**.
Geodetic Height Format: Select from **Feet** or **Meters**.

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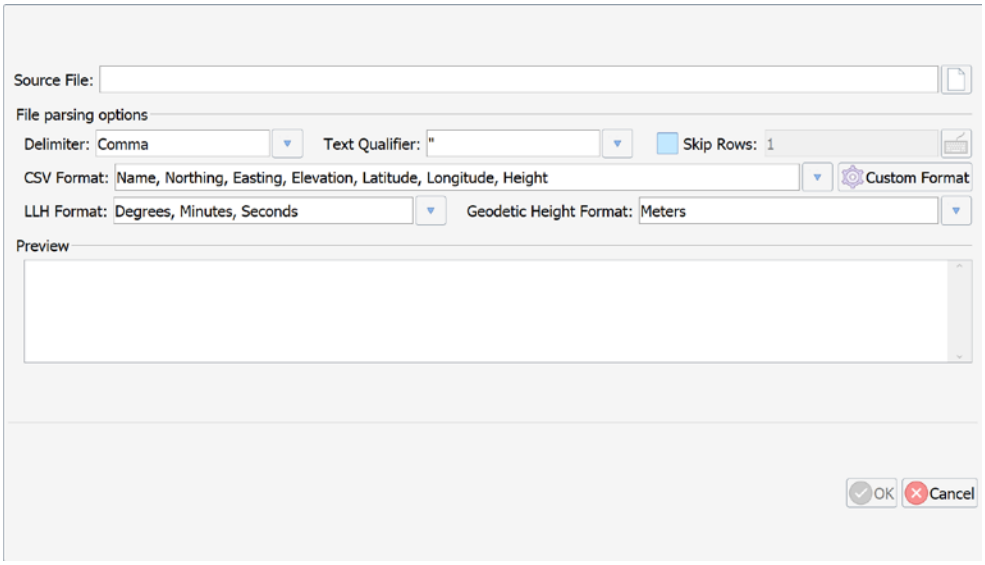
Create a Job, Continued

Job Localization screen, continued



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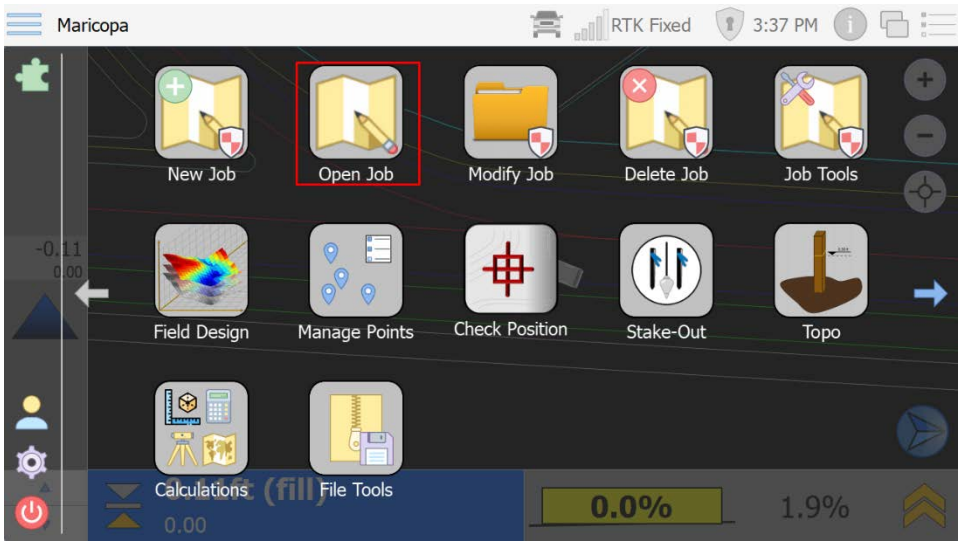
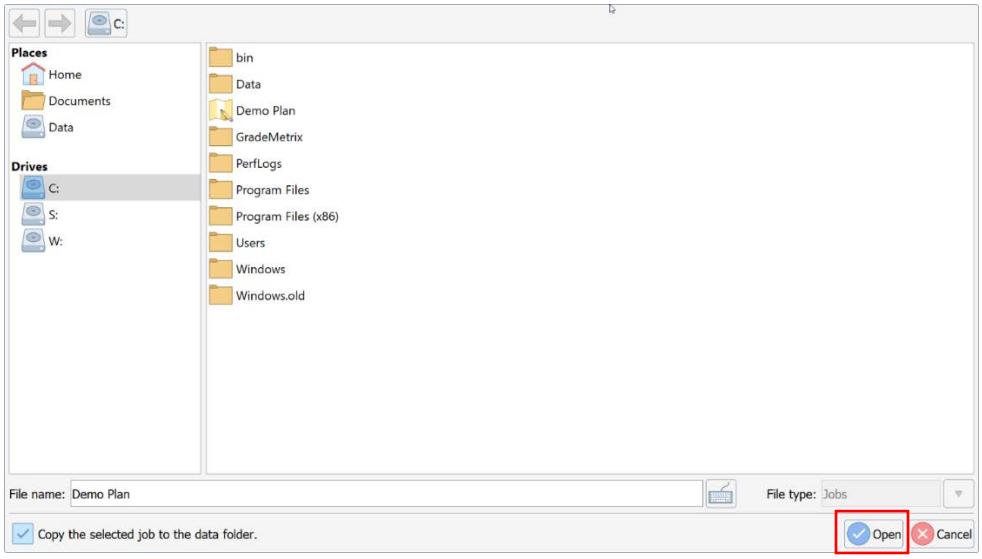
Open a Job

Open a job

To open an existing Job in GradeMetrix, on the Home screen, click the **Open Job** on the GradeMetrix home screen.



The file explorer displays. Navigate to the desired job and click to highlight the job you want to open. Click **Open**.

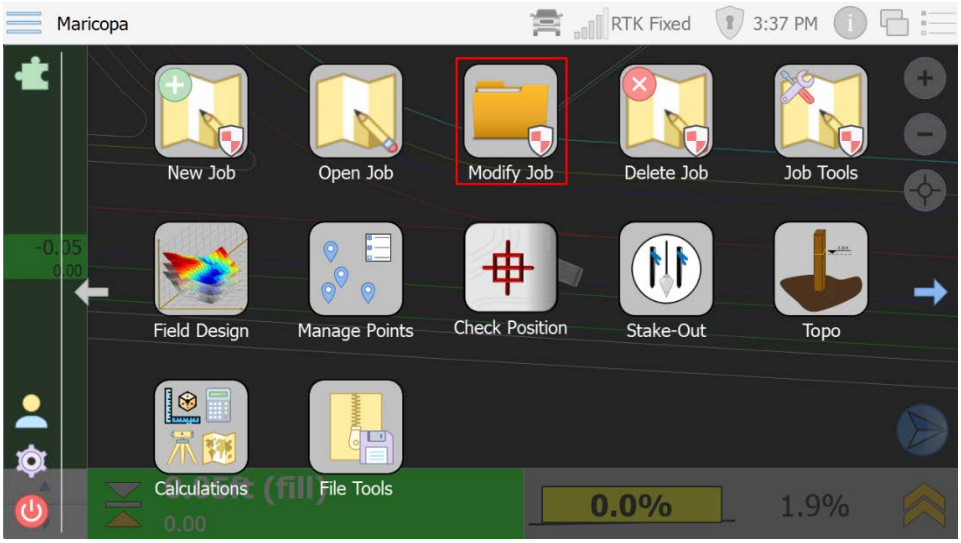


Modify a Job

Modify a job

To modify an existing job in SiteMetrix Grade, click the **Modify Job** icon on the GradeMetrix Main Menu.

Note: To modify some **Job** files, you must be logged in as **Administrator**.



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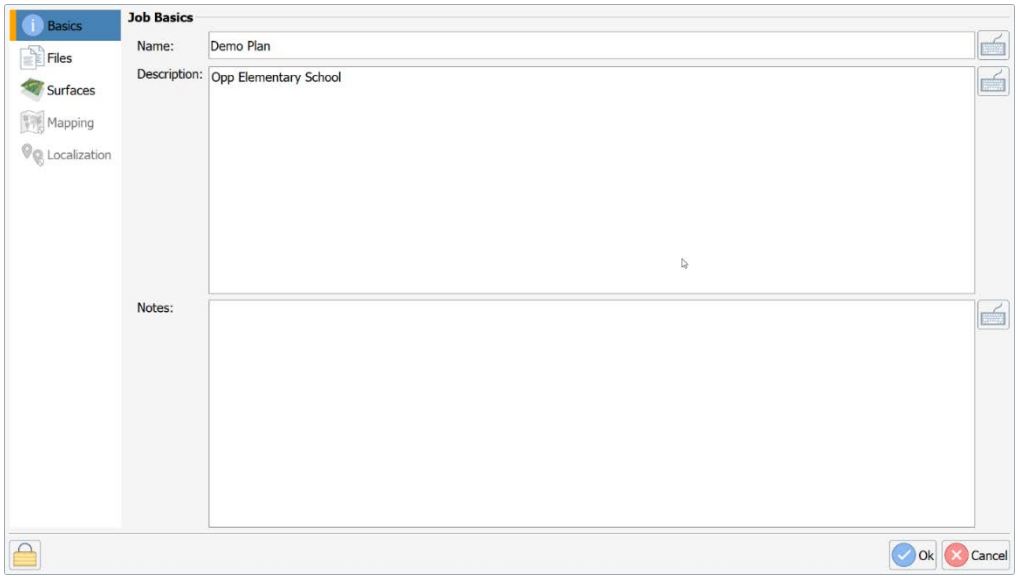
Modify a Job, Continued

Modify Job basics screen

The **Job Basics** screen displays the **Name**, **Description**, and **Notes** about the job. Click in each field to add the necessary information.



The left navigation menu provides links to the following job information:

- Basics
- Files
- Surfaces
- Mapping
- Localization

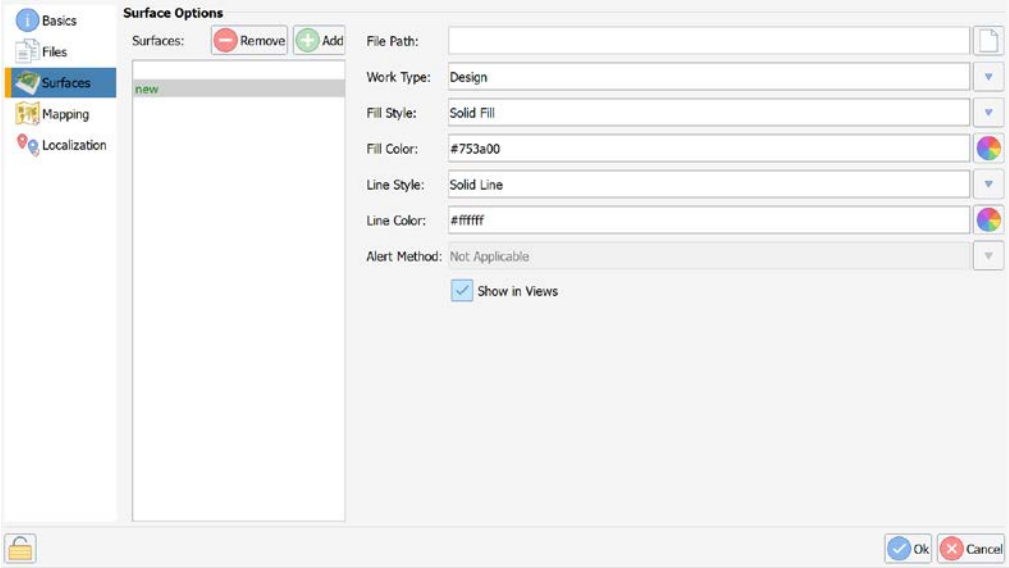
Continued on next page

Modify a Job, Continued

Add job surfaces

From the left navigation menu, click the Surfaces option. The **Surface Options** window displays.

To modify a **Surface**, see **Surface Options** in the **New Job** section of this manual.



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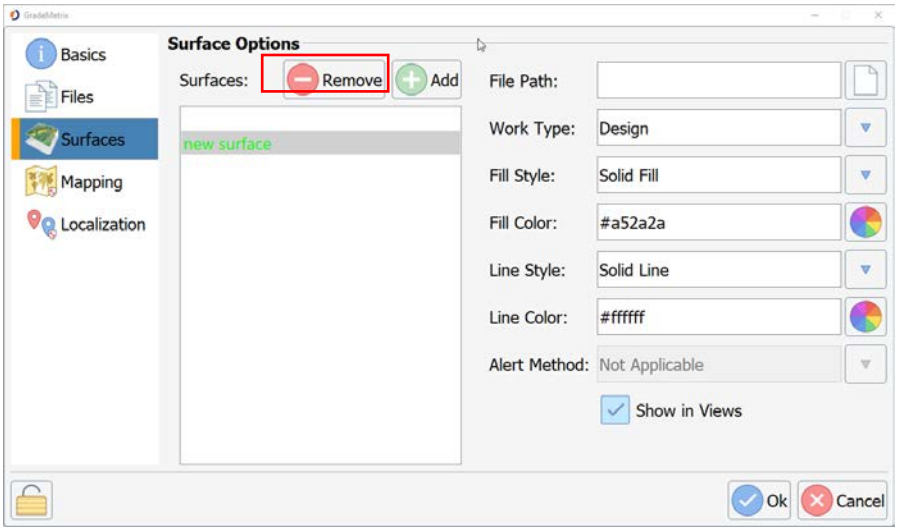
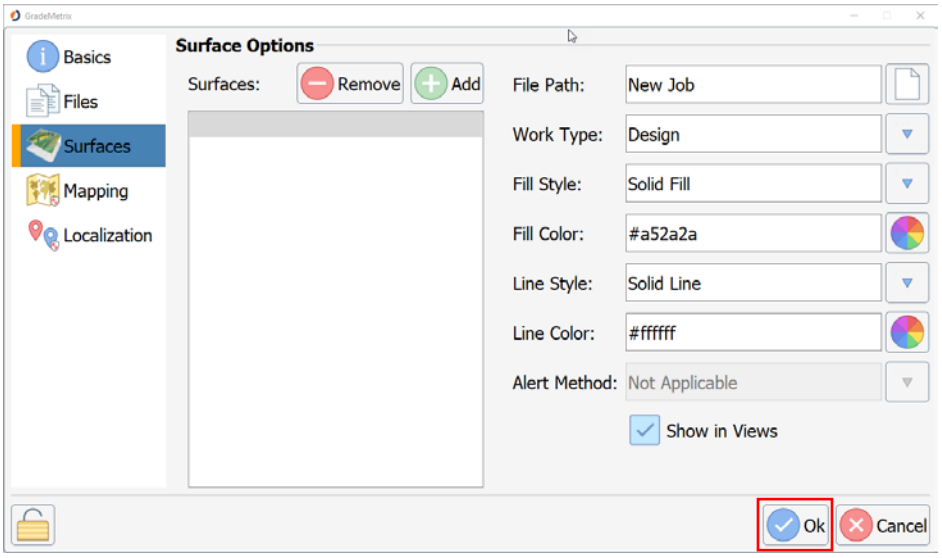
Modify a Job, Continued

Remove a surface option

To remove a **Surface Option**, click to highlight the **Surface Option** name and click **Remove**.



The **Surface Option** is removed from the **Surface Options** field. When you have finished modifying all the necessary **Surface Options**, click **Ok**.



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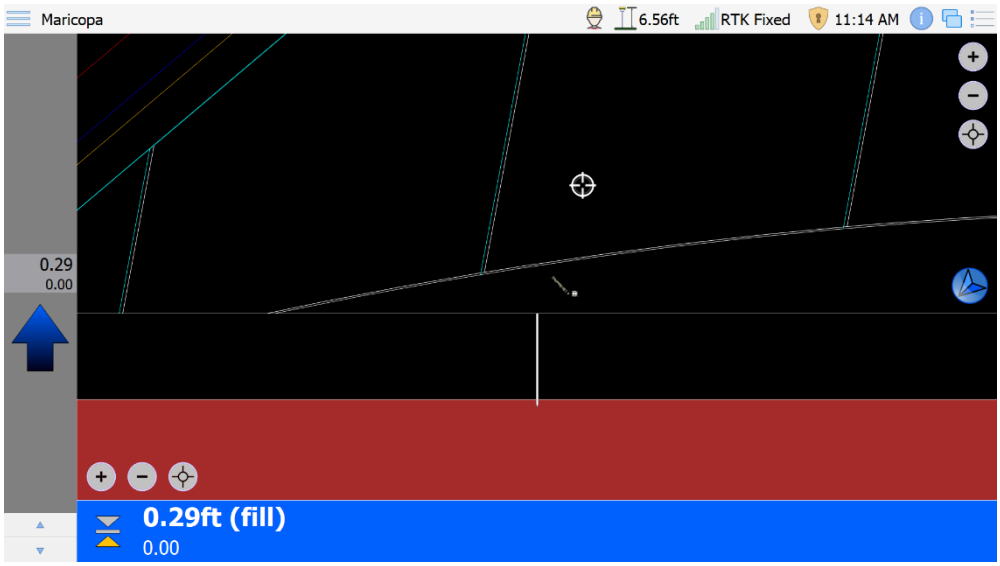
Modify a Job, Continued

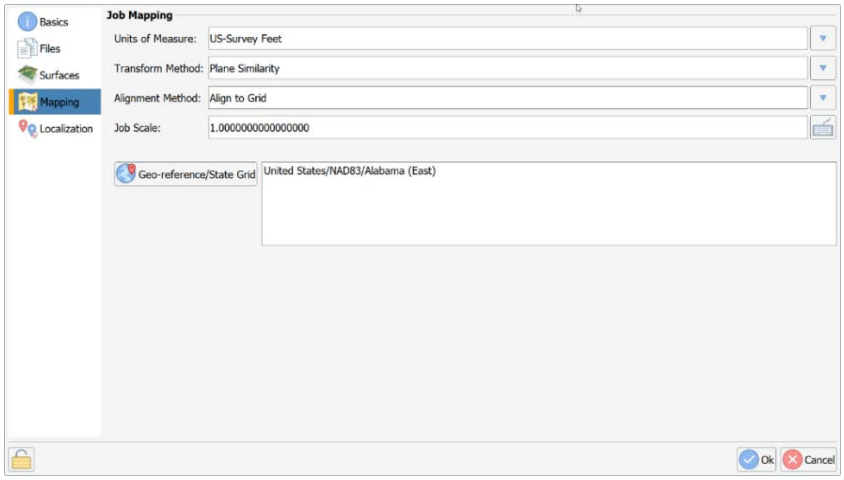
Remove a surface option, continued

The currently opened SiteMetrix Grade Job appears. A slight system delay will occur as SiteMetrix Grade applies the job modifications.



Modify Job mapping screen

From the left navigation menu, click the **Mapping** icon. The **Job Mapping** screen displays. To modify the job mapping, see **Job Mapping** in the **New Job** section of this manual.



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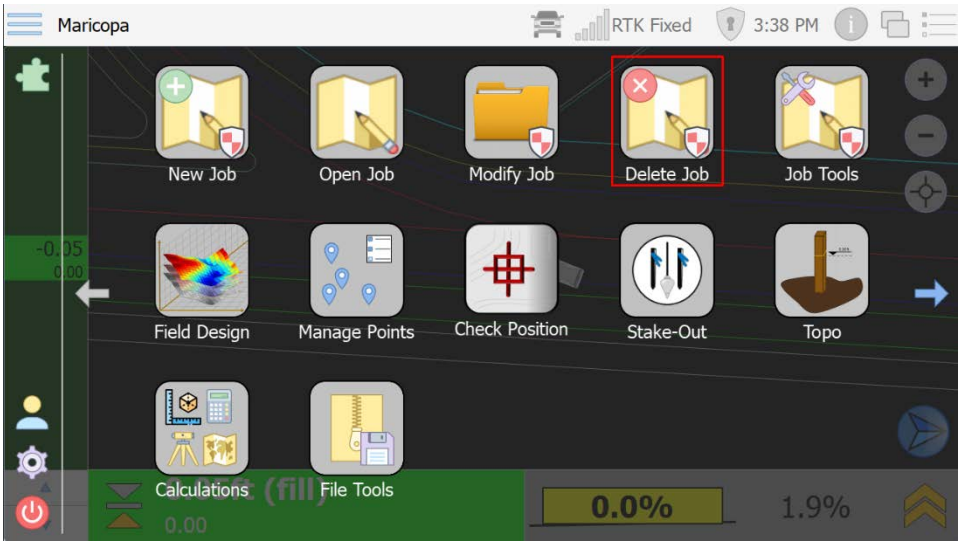
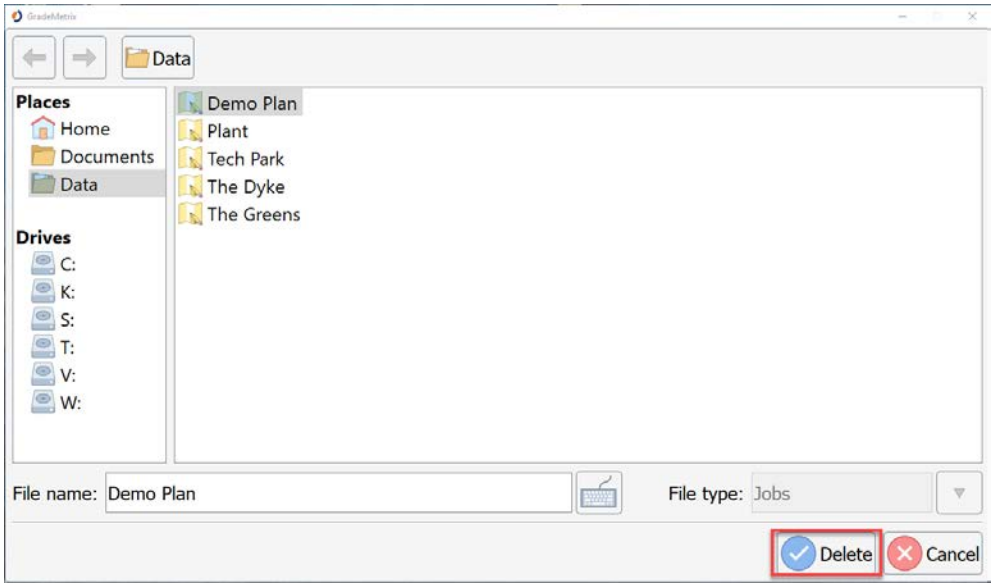
Delete a Job

Delete a job

To delete a job created in SiteMetrix Grade, on the Main Menu, click the **Delete Job** icon.



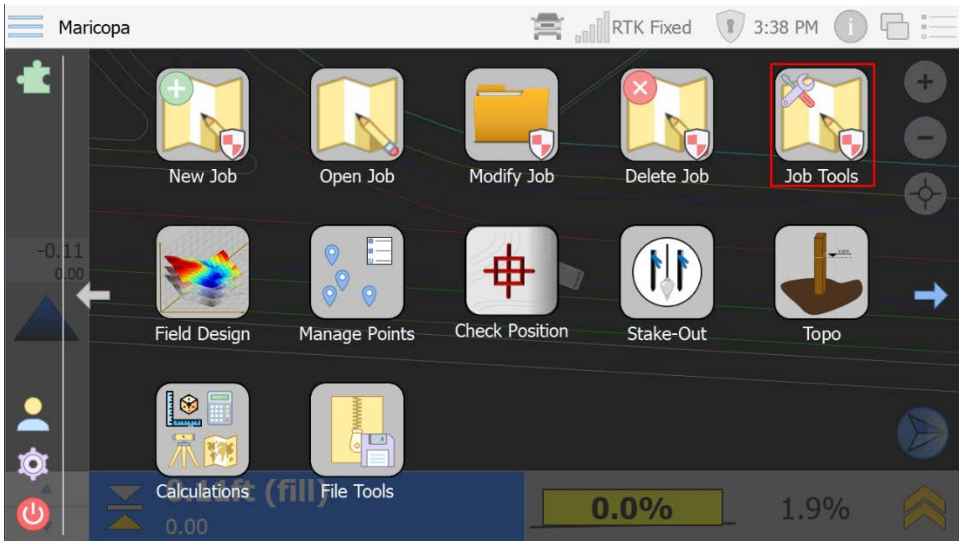
Click to highlight the name of the job you wish to delete and click **Delete**.



Job Tools

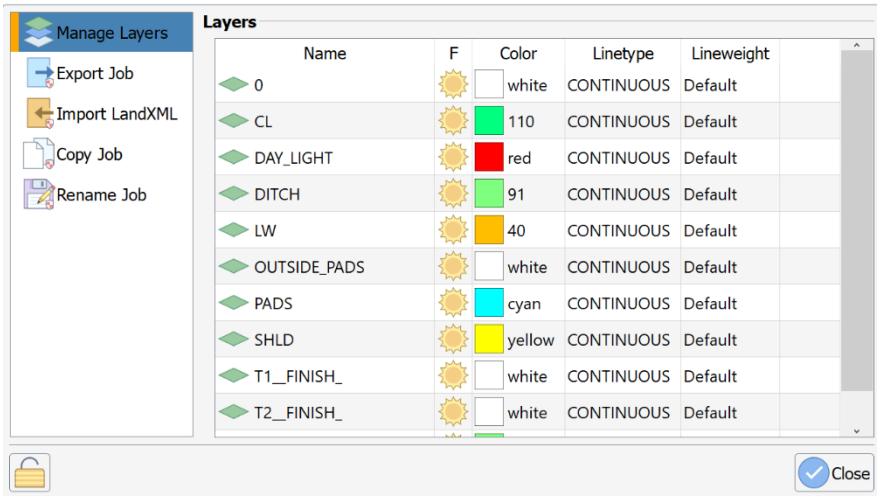
Job Tools

On the SiteMetrix Grade Main Menu, click the **Job Tools** icon.



You can select from five options:

1. Manage Layers-manage the layers contained in the linework of your job
2. Export Job-save your job to a thumb drive
3. Rename Job-change the name under which the job is saved
4. Import LandXML-import a LandXML file
5. Copy Job-copy a job file



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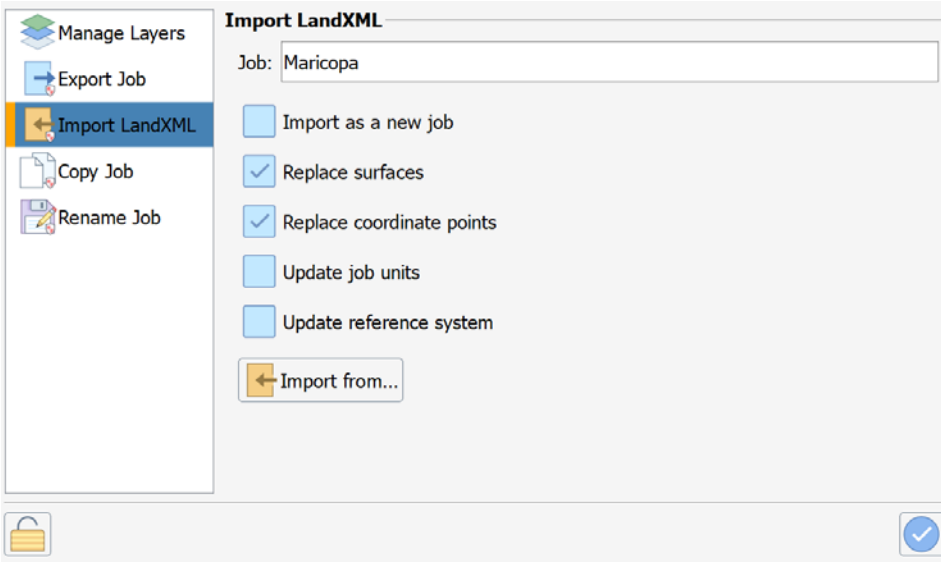
Job Tools, Continued

Job Tools, continued

If importing LandXML, select from a few options:

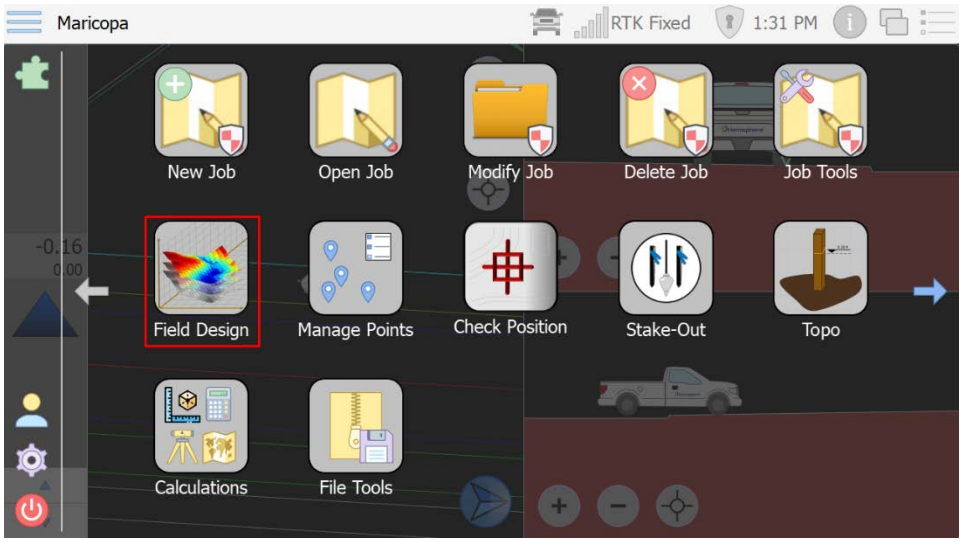


If uploading to use as a design surface, go back to **Modify Job** to set the surface type to **design**.

Field Design

Field design

To set job design settings. Click the **Field Design** icon in the SiteMetrix Grade Main Menu.



Flat pad

Use **Flat Pad** to enter a set elevation to grade to (regardless of design file).

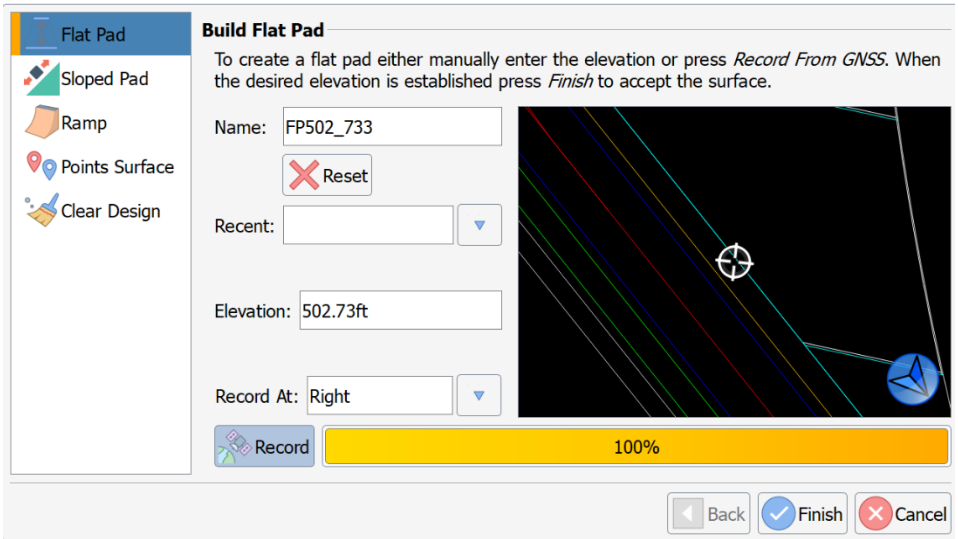
To set your flat pad elevation:

1. Type a name for the ‘pad.’
2. Type the average elevation .

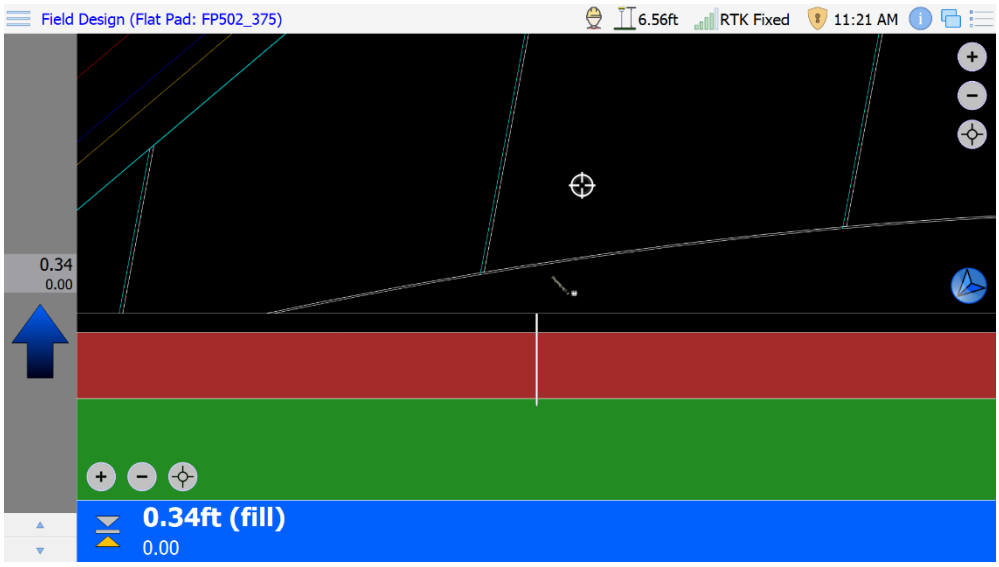
Continued on next page

Flat pad, continued

Click **Finish**. Design elevation is set to 502.73 ft. in the following example.



The surface shown in green is the field design; the surface shown in red is the DTM. The blue text at the top left reminds you that you are checking grade to a field design and not any surface associated with your job.



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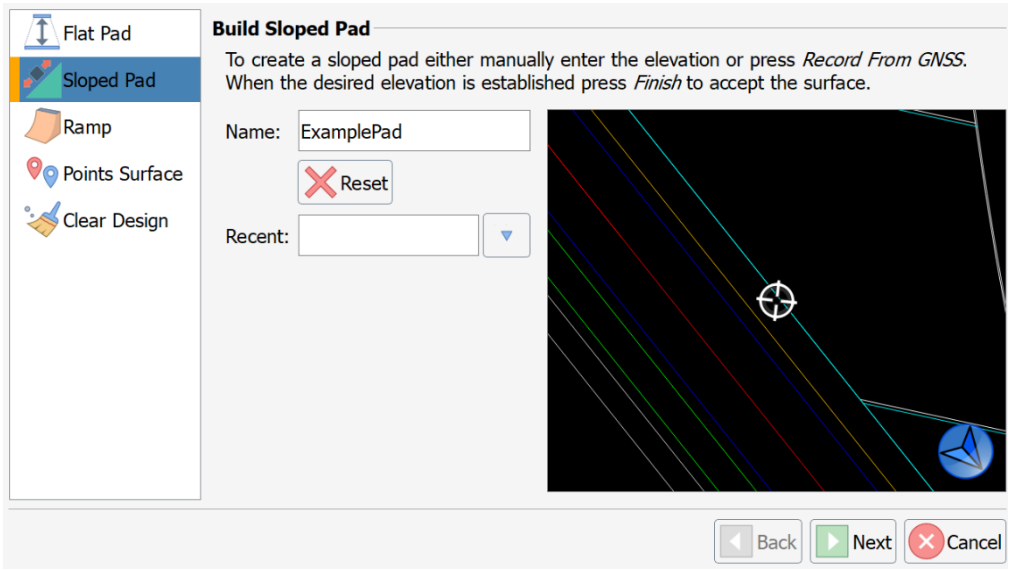
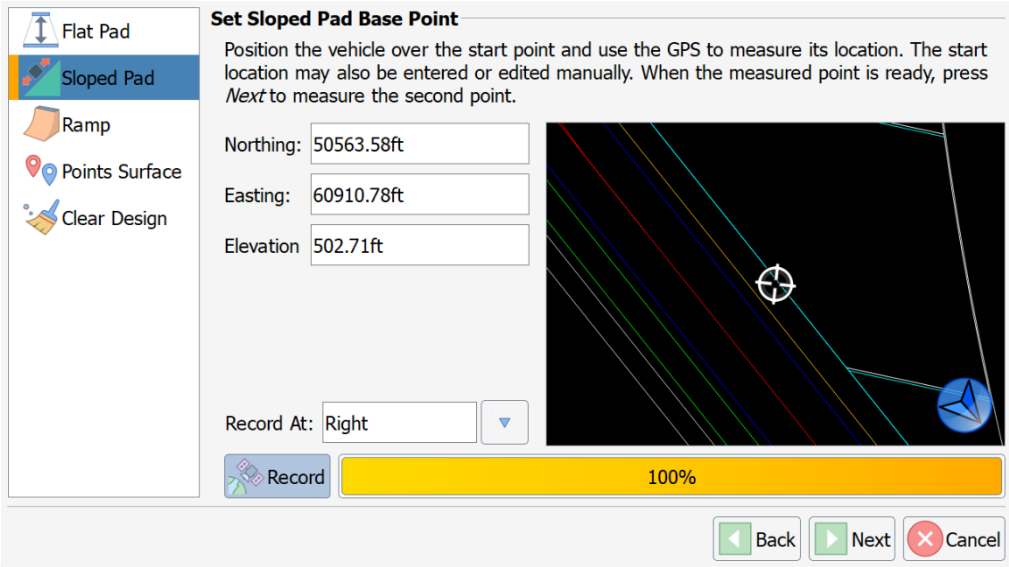
Field Design, Continued

Sloped Pad

Slope Pad allows the user to make a dual sloped pad. Enter a **Pad** name and click **Next**.



Click **Record** to average your position. Click **Next**.

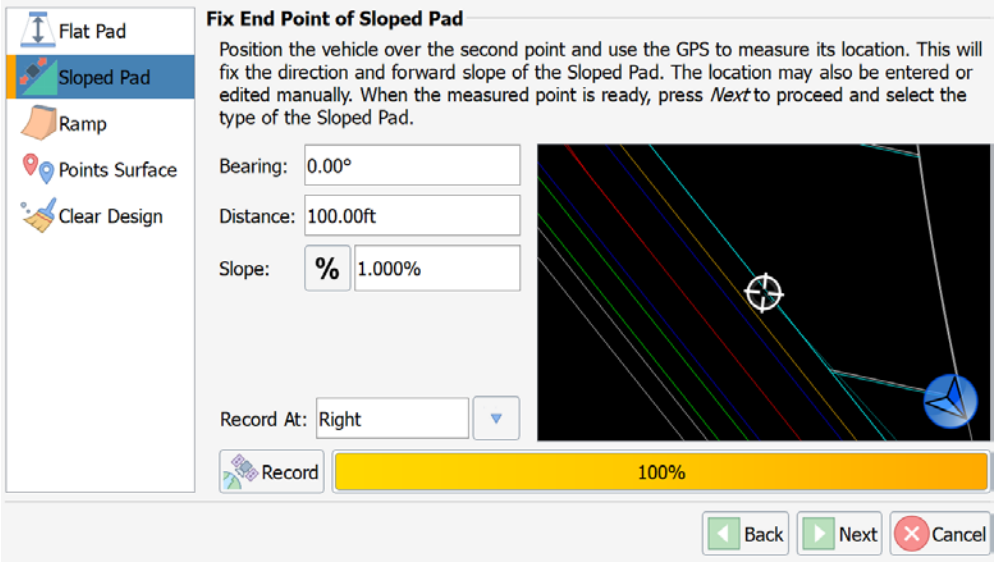


Continued on next page

Field Design, Continued

Sloped Pad, continued

Move to the end point of the pad and click **Record**. Edit bearing, distance, and slope (long slope) if necessary. For Slope, you can select between **Percent**, **Rise over Run**, or **Run over Rise**. Click **Next**.



You can create a pad of infinite width or configure width. If you want to configure width, deselect **Create an infinite Sloped Pad** and enter a width.

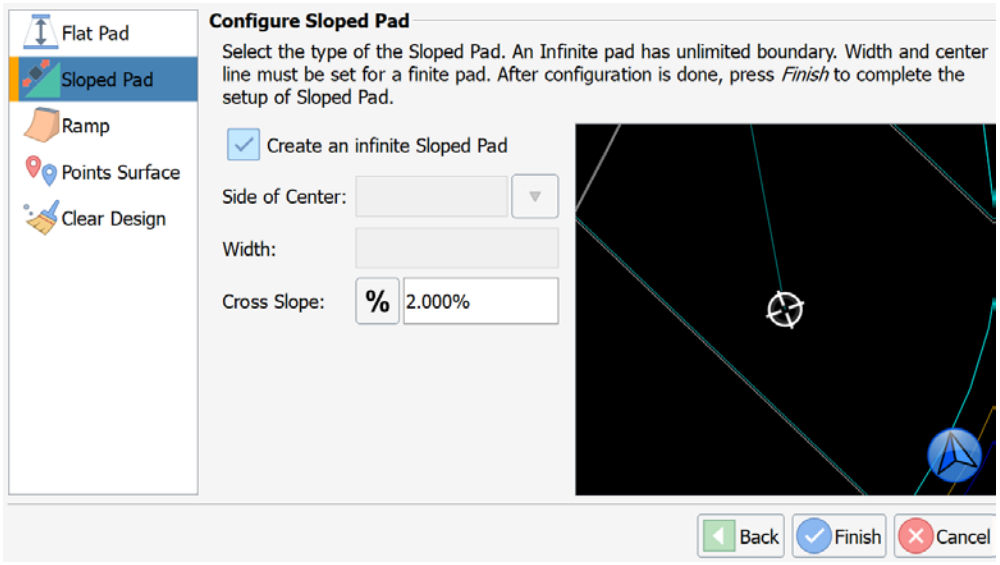
You can select if this width needs to be left of center, right of center, or centered (half the width on each side of centerline). Enter a **Cross Slope,** it can be entered as percent, rise over run, or run over rise.

Continued on next page

Field Design, Continued

Sloped Pad, continued

Click **Finish**.



Design a Job

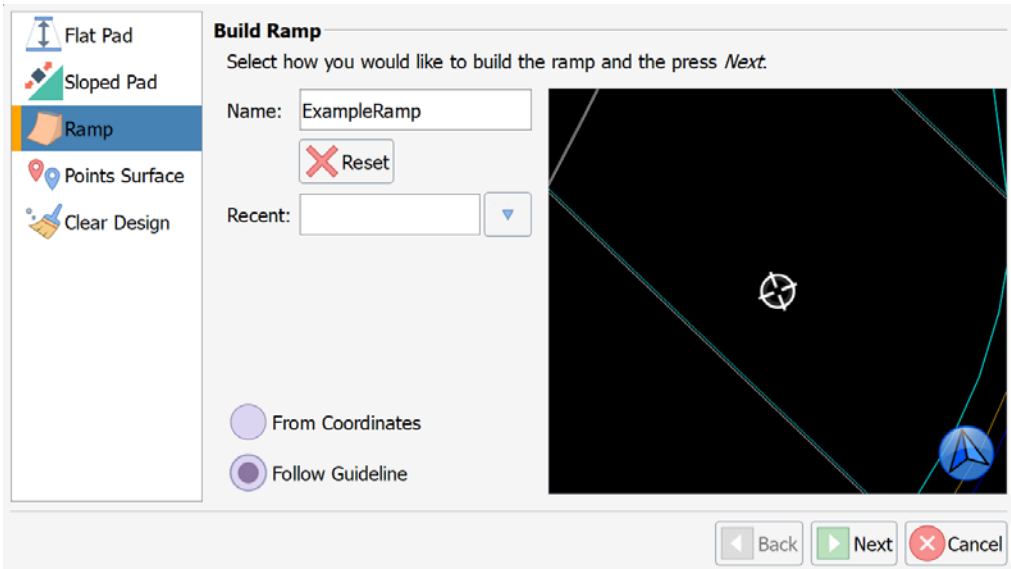
Ramp

Choose **Ramp** to build the ramp by using coordinates for following a set guideline.

Note: If you do not have a guideline selected, you must create this ramp based on coordinates.

To set your ramp type a **Ramp Name** using the keyboard icon. You can create a ramp by using two sets of coordinates (select **From Coordinates**) to create a baseline, or by following a Guideline (select **From Guideline**).

Press **Next**.



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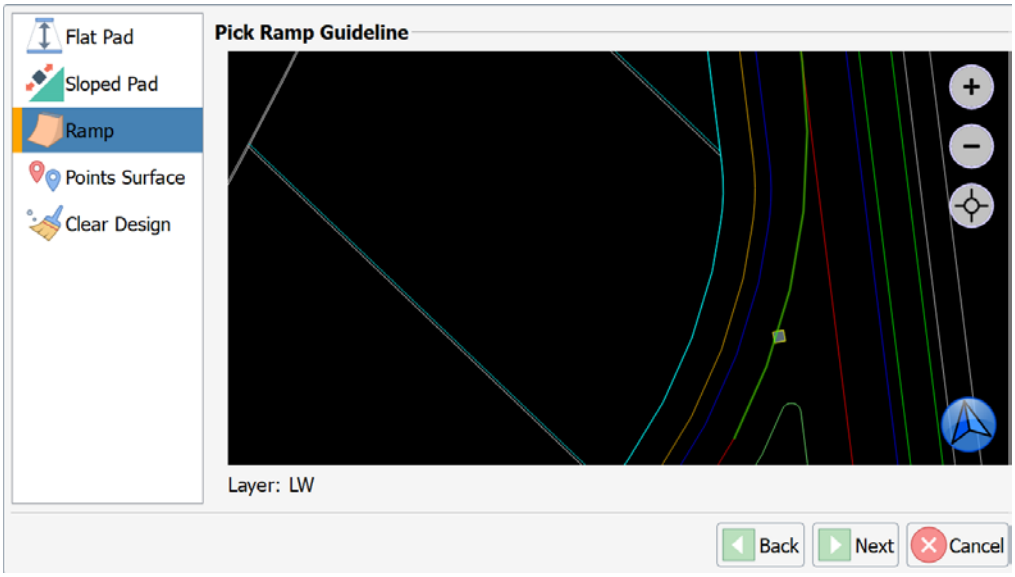
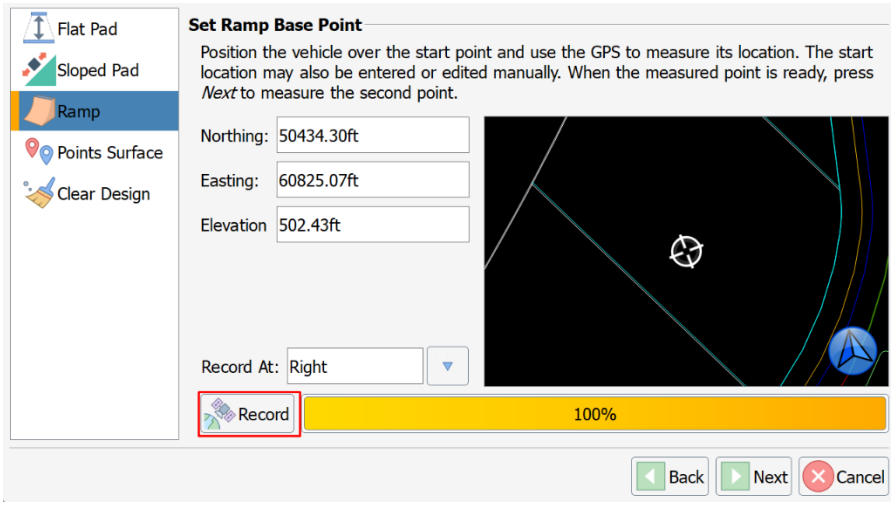
Ramp, continued

If you selected **From Guideline**, you will be prompted to select a guideline.



Or drive to the starting point and click **Record**.



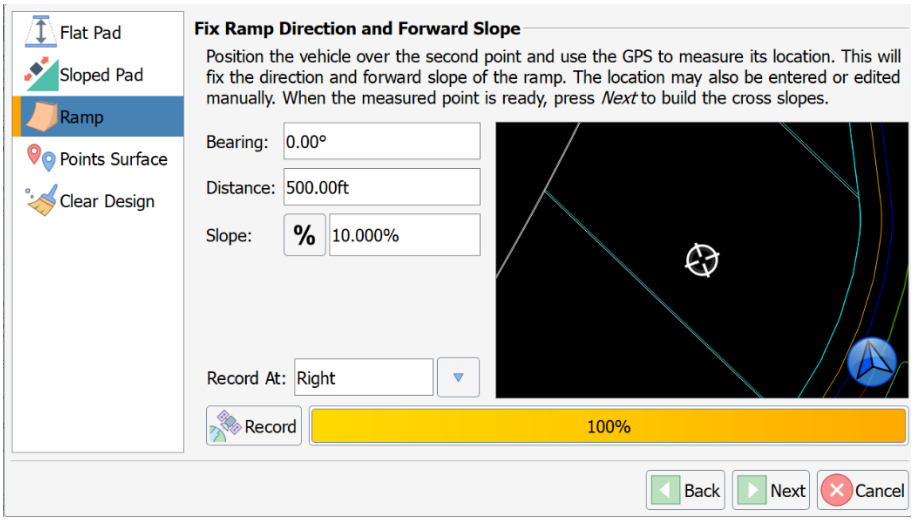
Drive to the second point (calculates heading). Click **Record**.

Continued on next page

Design a Job, Continued

Ramp, continued

Note: If you wish this ramp to exceed the length the vehicle has driven, edit the distance. You can also edit the calculated heading (bearing) and slope. Slope can be entered as percent, rise over run, or run over rise.



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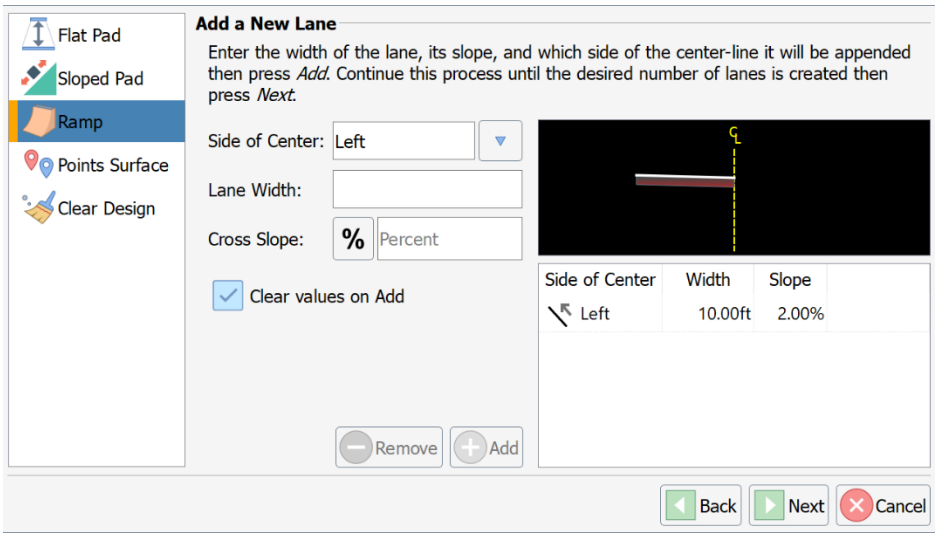
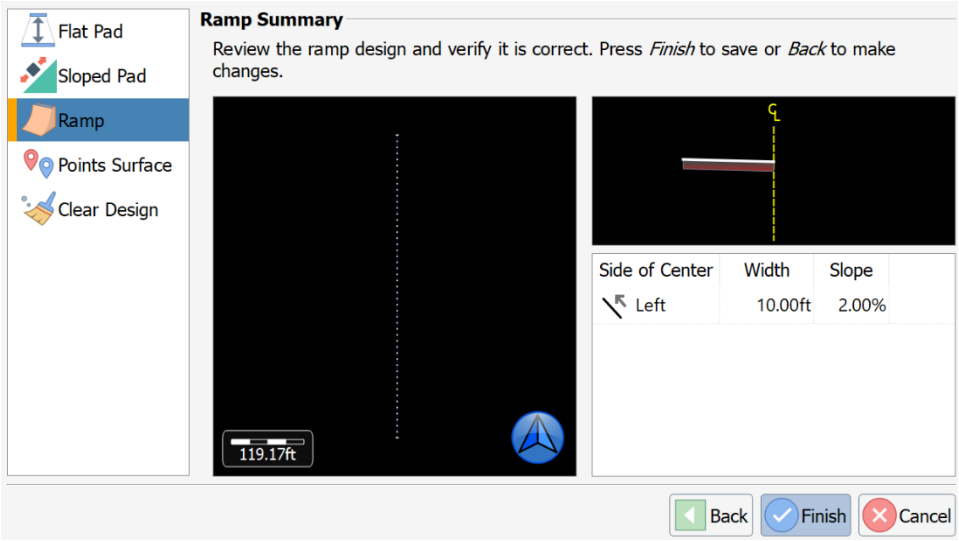
Ramp, continued

To remove cross slope fields, click **Clear values on Add**. This will clear the field a new value can be added each time the **Add** button is pressed. Click on a lane and press **Remove**.



Review ramp and press **Finish**.



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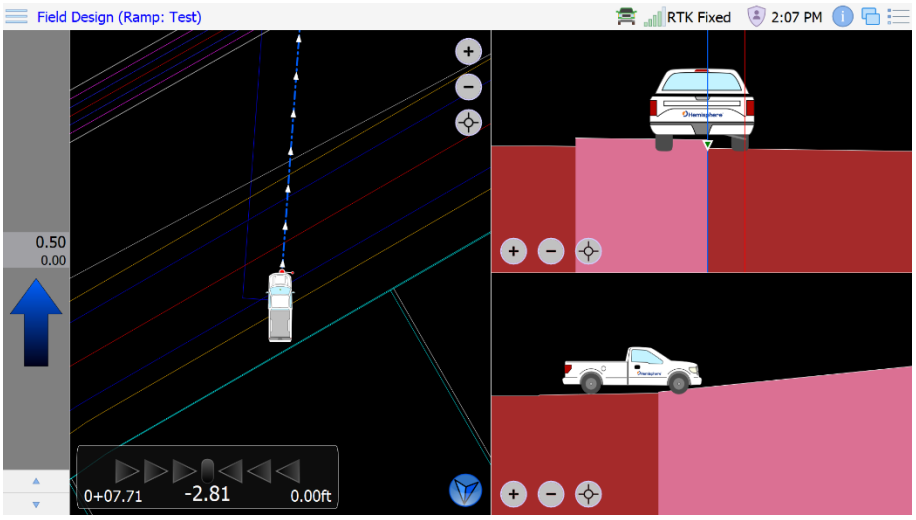
Design a Job, Continued

Ramp, continued

The example below shows the newly created ramp (in blue). To make the ramp longer, edit the distance towards the beginning.

Important: This ramp becomes the job design. If the machine is not on the ramp, the machine is off the job design.

The below example shows the machine blade exceeding the edge, and no longer on the job design.



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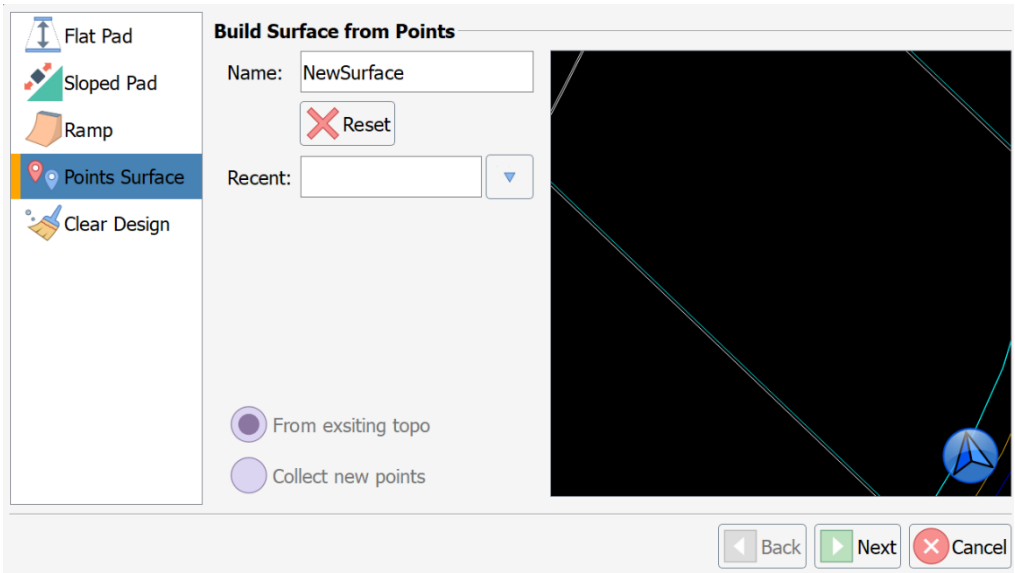
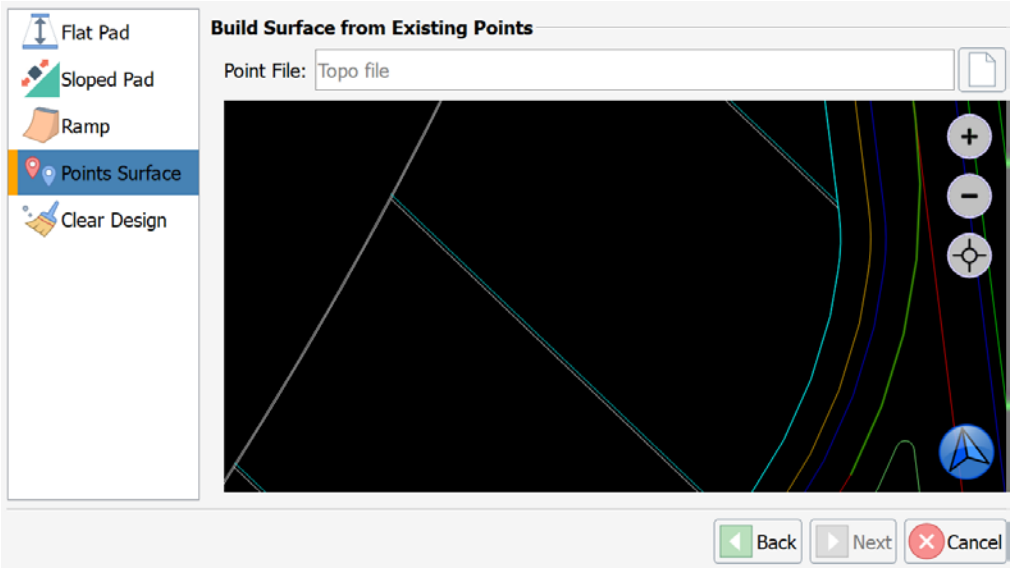
Points Surface

You can generate a surface from existing topo points.



After entering the name of the new surface, select **Next**.

Select the topo file that will be used to generate a surface. A perimeter will be drawn around the outermost points.



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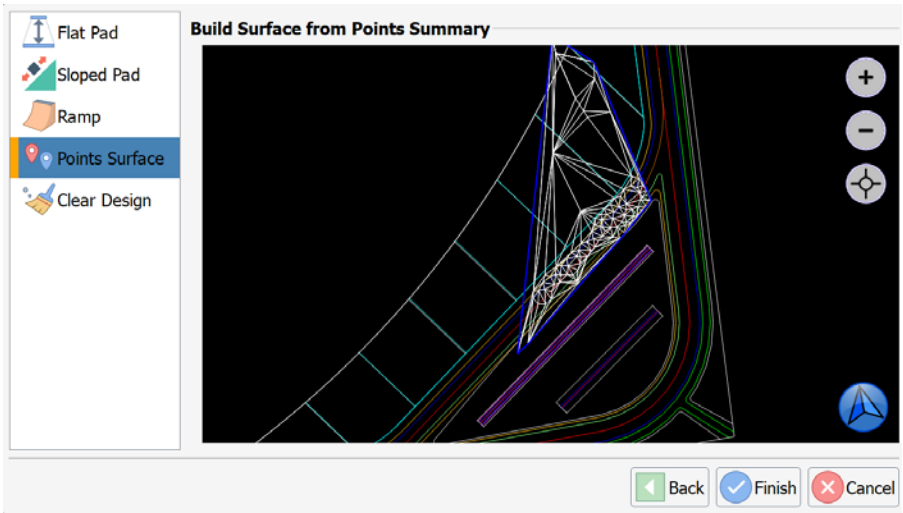
Points Surface, continued

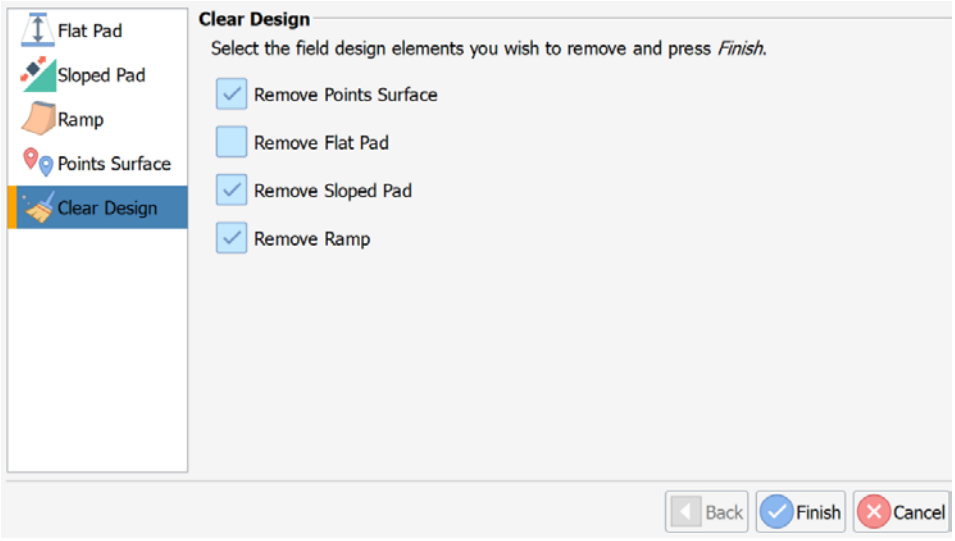
The surface will be shown prior to clicking **Finish** and saving the surface.



Clear design

If you wish to remove a field design element, click to select one of the options in the **Clear Design** list.

For example, to remove the flat pad option, select and click **Finish**.

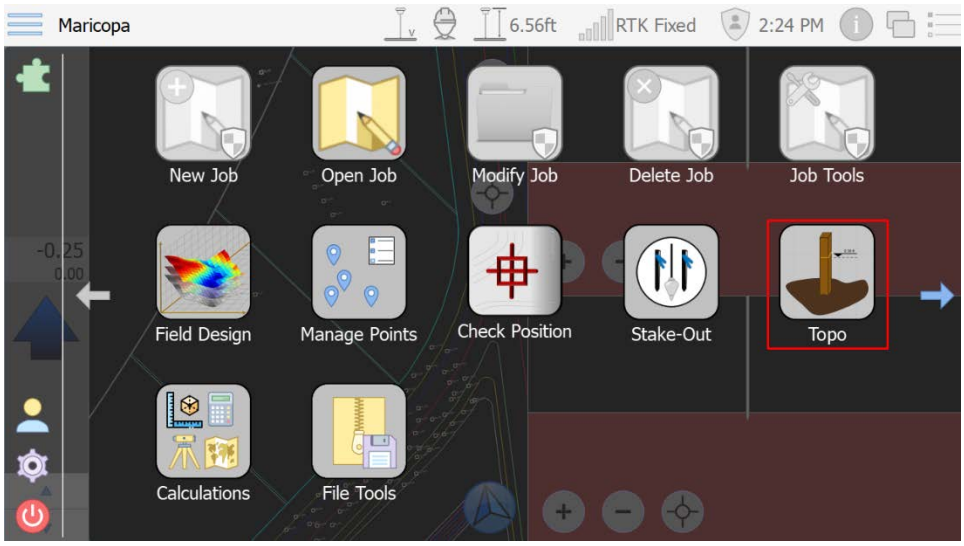


Your design elevation returns to the previously loaded Digital Terrain Model (DTM) file.

Topo

Topo

Use **Topo** to create a topo point file by either manually storing points, or auto-storing points by time or distance intervals.



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Topo, Continued

General Settings

The **General Settings** window displays the following selections:

Setting	Description
Survey Topo:	Create a Survey Topo to store points. Click the icon to the right of the dialogue box and name the file.
Point of Interest:	Select the point of the truck that the NEZ will be taken from when storing points. If using a survey rod, this feature is not applicable.
Starting Point Id	Each time a point is stored, a corresponding point ID is created. Starting Point ID increments by 1 each time you shoot a point. The value entered indicates the ID of the first stored point.
Save Method:	Click the down-arrow to select from the following options: – **Time**-the number input into **Save Every** must be in seconds. – **Distance**-store the point by distance interval. Type a distance value in the **Save Every** field. – **Manual**-store points only when **Single Shot** is pressed.
Collect Samples For	The length of time that a point is averaged for when collecting points.
Save first point on start when auto-saving	Click the checkbox to select. This option may only be selected if the **Save Method** is **not** manual.
Prompt for feature code	The software prompts to select from one of the available feature codes.
Allow time profile while stationary	Allow SiteMetrix Grade to collect points on a time interval even while the receiver is stationary.

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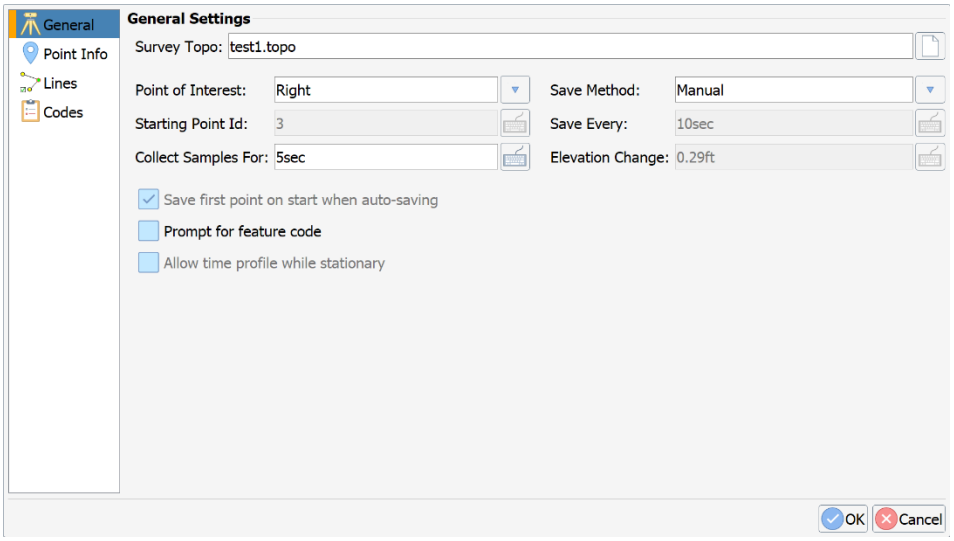
Topo, Continued

General Settings, continued



Storing points

On the **General** tab, click on document icon to the right of the **Survey Topo** field to select or create a new file.

Continued on next page

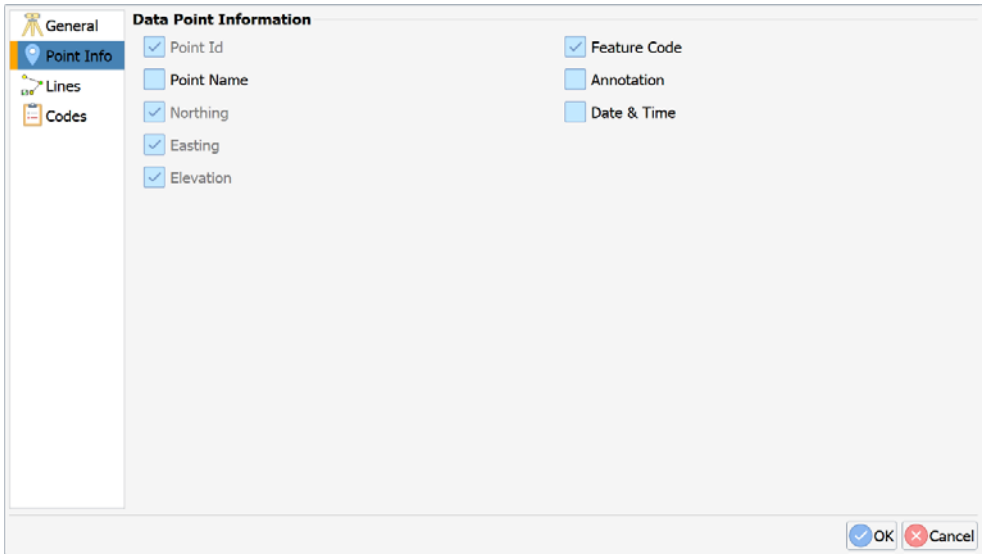
Storing points, continued

Click or type to select the following options:

- **Point of Interest:** Choose where to store the point from.
- **Save Method:** Set to store a point manually, or autosave every several seconds or several feet driven.
- **Starting Point Id:** Each point has an ID and increments.

Click **Point Info**. The **Point Information** screen displays.

Click the box to select the options you wish to save to the topo file. When you are finished making your selections, click **Ok**.



Codes

You can select to prompt for **Feature Code**. When a point is stored, you will receive a prompt for a code.

The **Manage Feature Codes** screen displays the listing of feature codes. Click to highlight the **Feature Code** you wish to add and click **Add**. Press **OK**.

Note: Do not select this feature if auto storing points.

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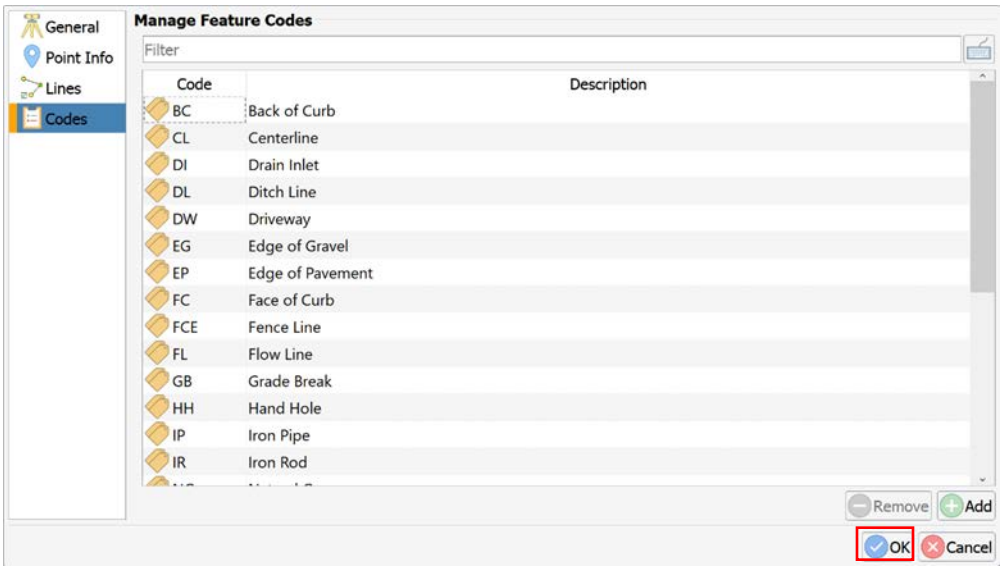
Topo, Continued

Codes, continued



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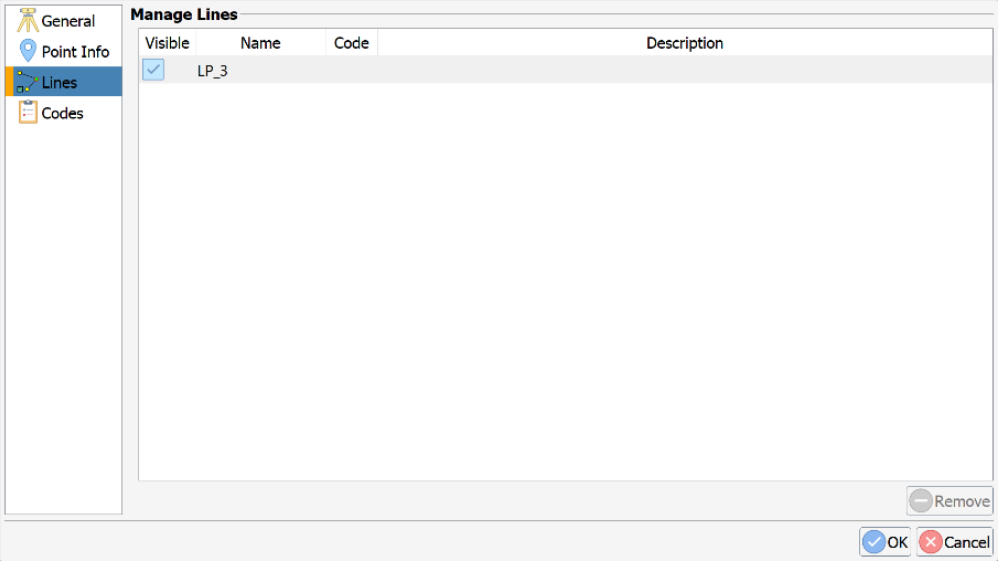
Topo, Continued

Lines

The **Lines** tab allows you to select from lines you have created as well as remove them.



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Topo, Continued

Topo

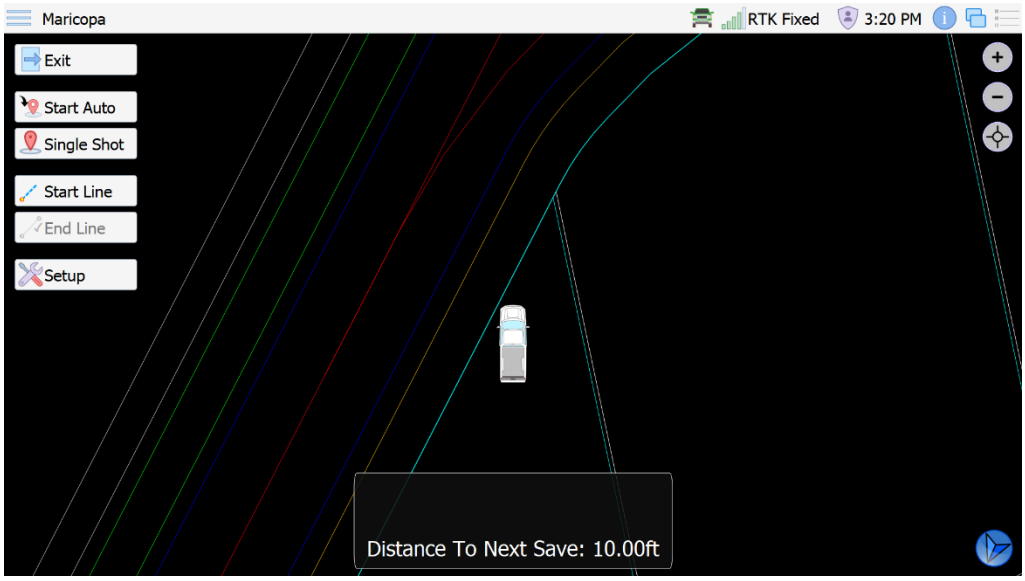
After configuring the options, click **OK**.

If you selected to store topo by the time or distance interval, you can click **Start Auto** to begin your auto topo. **Single Shot** will store a single point at your location.

Setup returns to the **Configuration** page.

Exit returns to the **Plan View** screen.

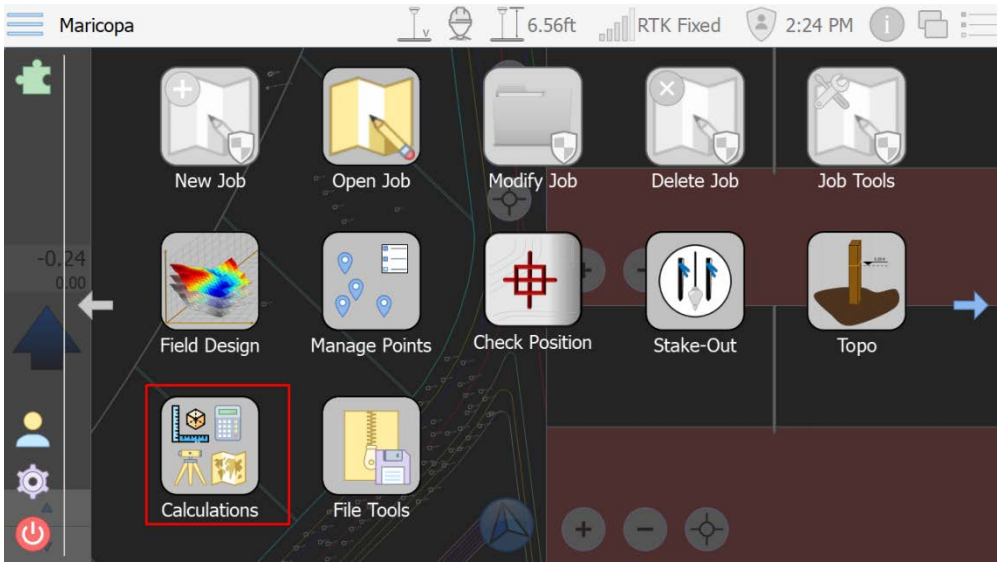
Click **Start Line** to shoot topo points and create a line. Click **End Line** to finish the line.



Calculations

Calculations

Use the **Calculations** tab to calculate volumes, inverse between points, or do a 3D Calibration for a GradeMetrix dozer or excavator.



After clicking on **Calculations**, options display for the **Vehicle Calibration Wizard, Volumes,** and **Inverse**.

Continued on next page

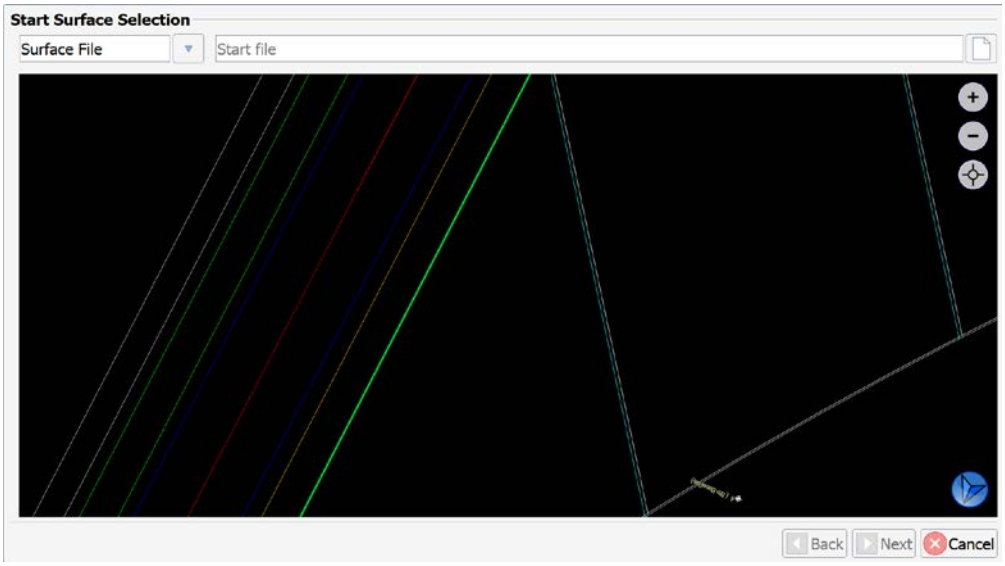
Calculations, Continued

Calculations, continued

For information on the **Vehicle Calibration Wizard**, please see the GradeMetrix Excavator Installation Guide or GradeMetrix Dozer Installation Guide.

Volumes compares two surfaces and calculates cut/fill between those two surfaces.

Volumes will prompt you to select a starting surface.



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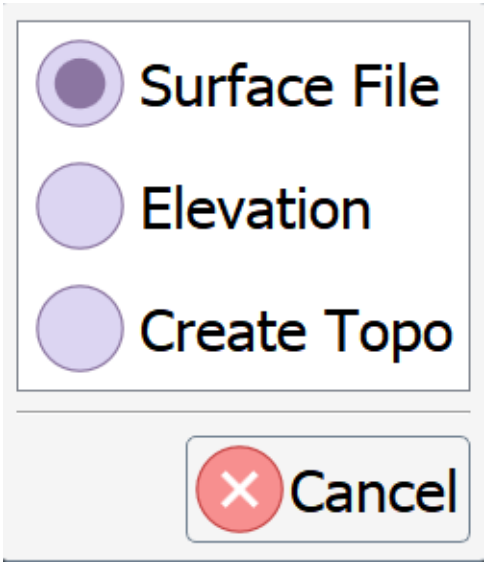
Calculations, Continued

Calculations, continued

Select the option to create a surface in real-time by making a topo, loading a surface file (such as a DTM or in-field design surface), or comparing to a constant elevation.



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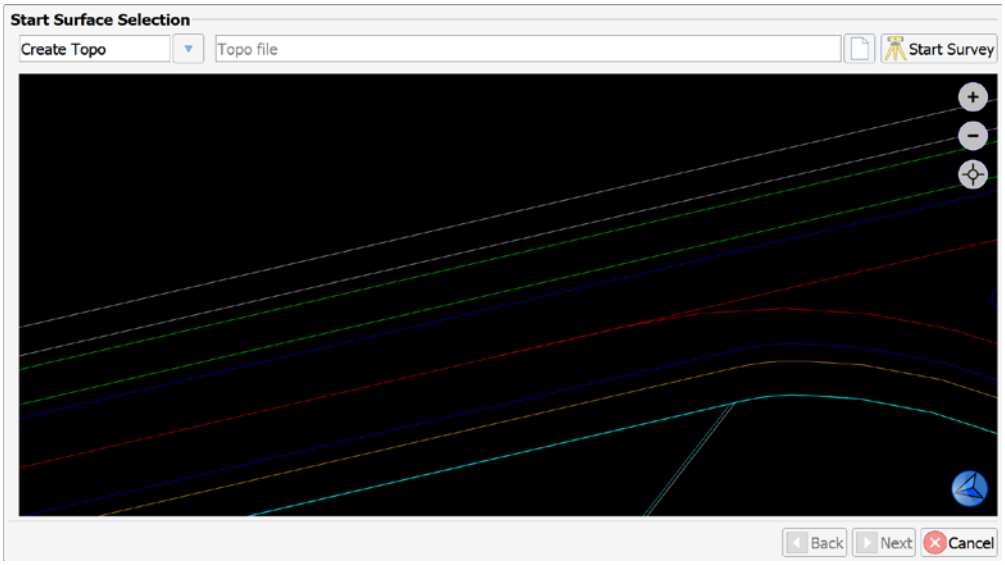
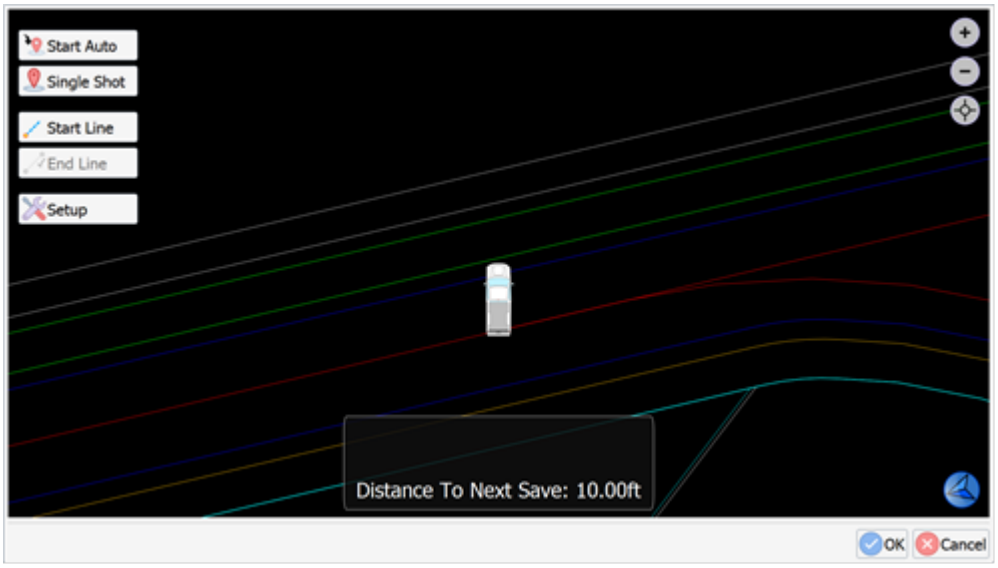
Calculations, Continued

Calculations, continued





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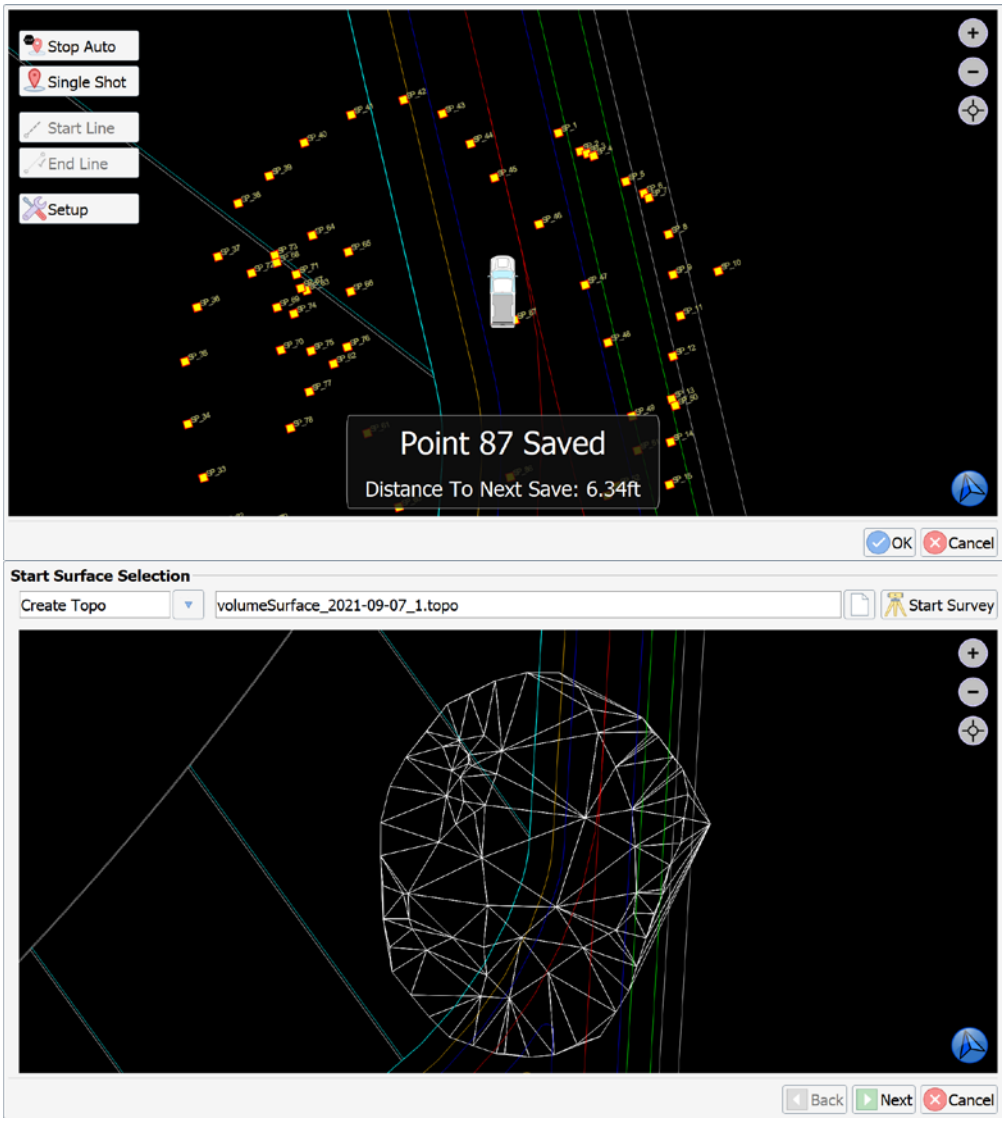
Calculations, Continued

Calculations, continued



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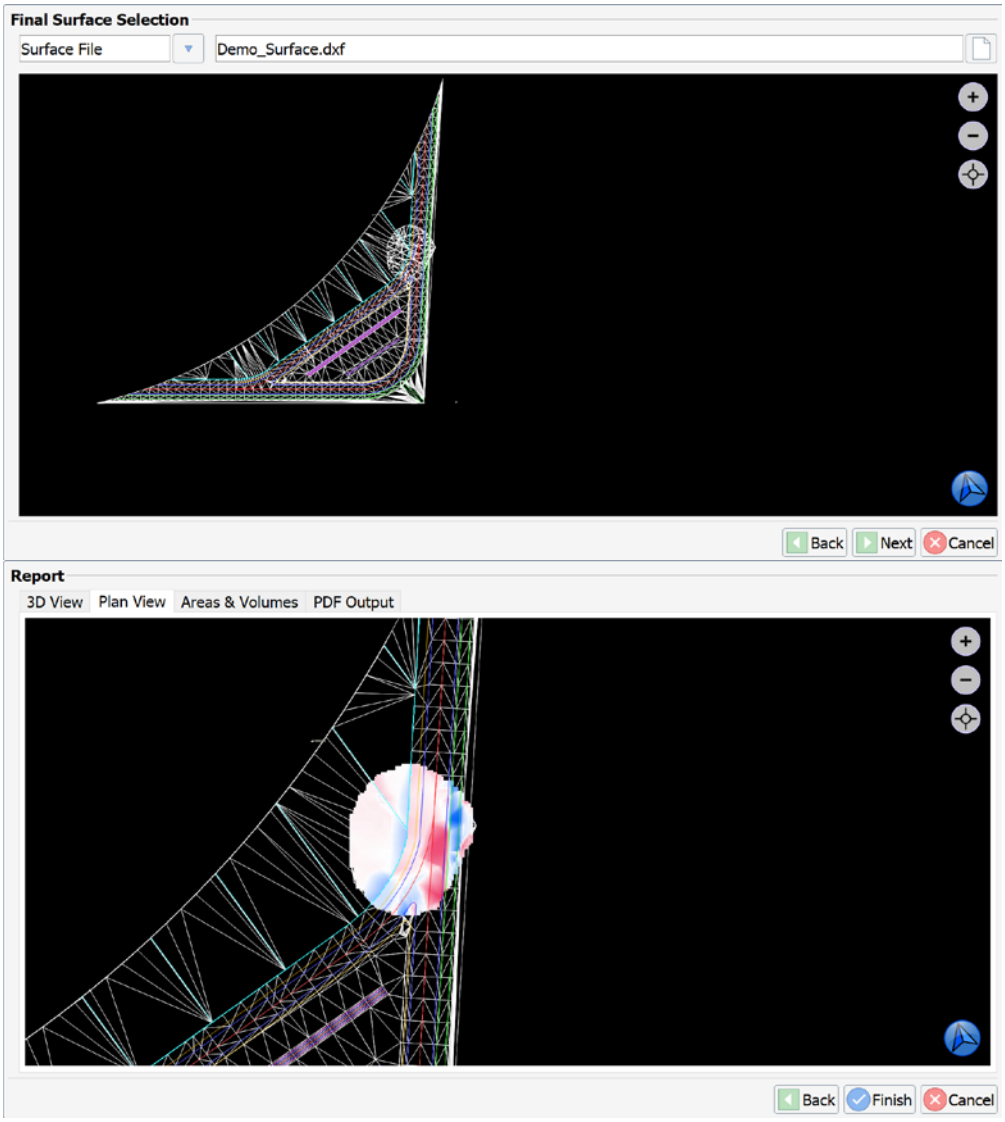
Calculations, Continued

Calculations, continued



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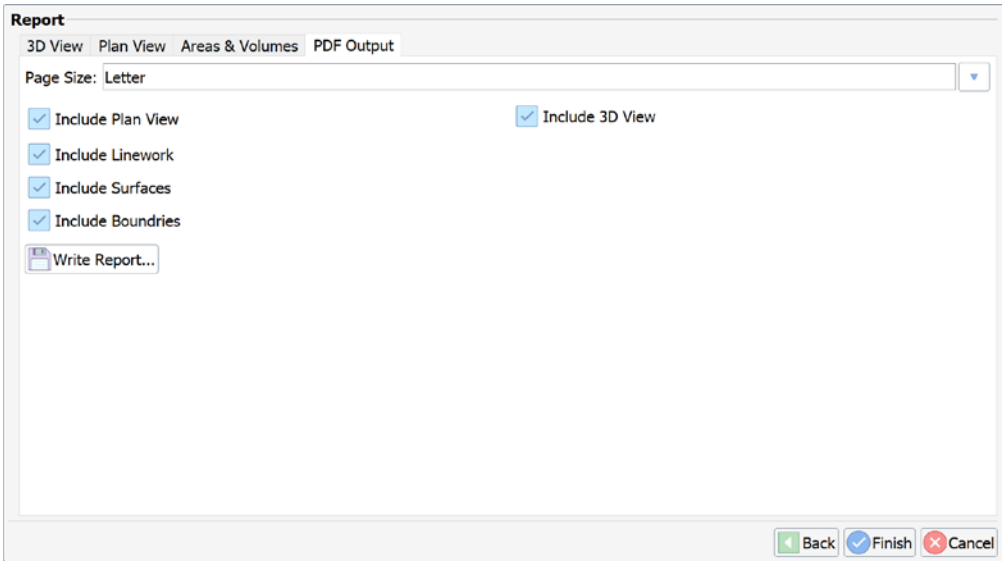
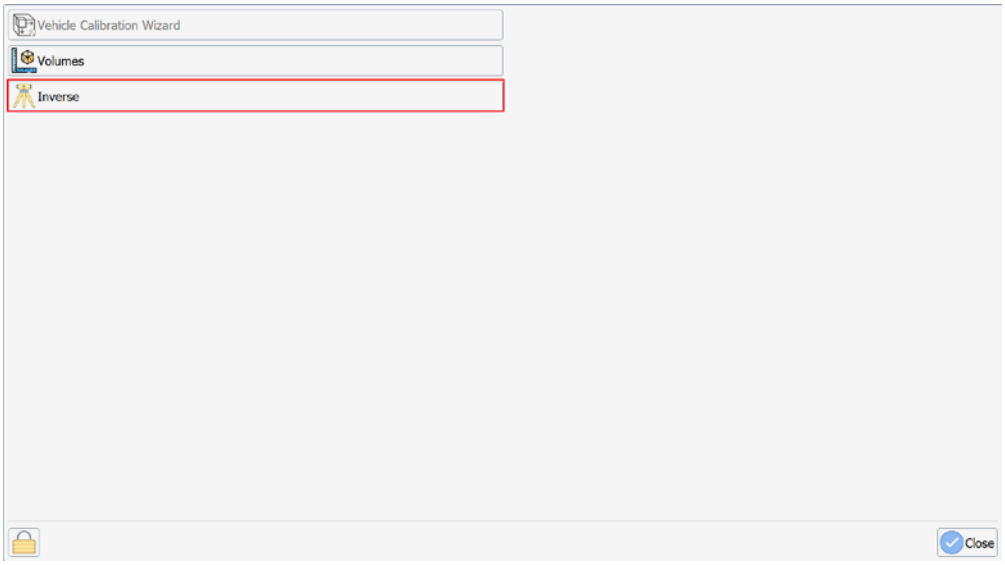
Calculations, Continued

Calculations, continued



The **Inverse** routine allows for calculating distance, azimuth, and bearing between points.



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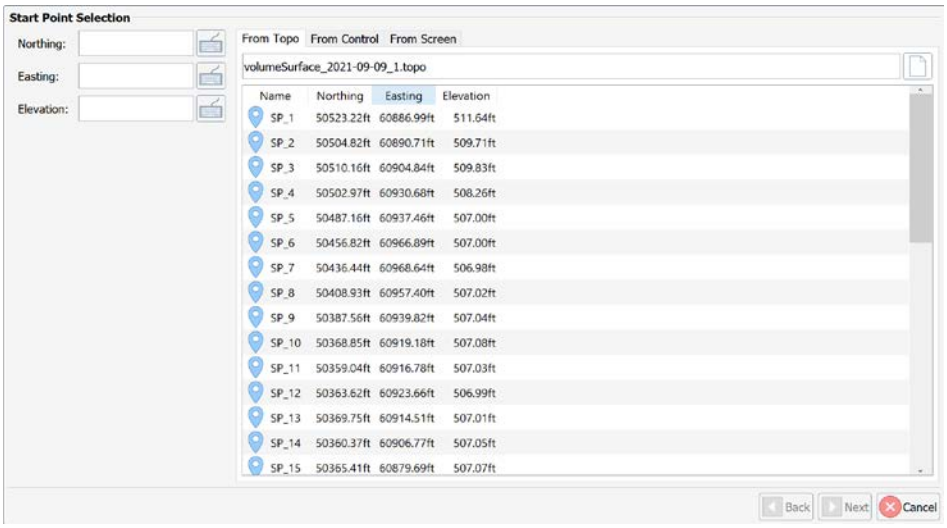
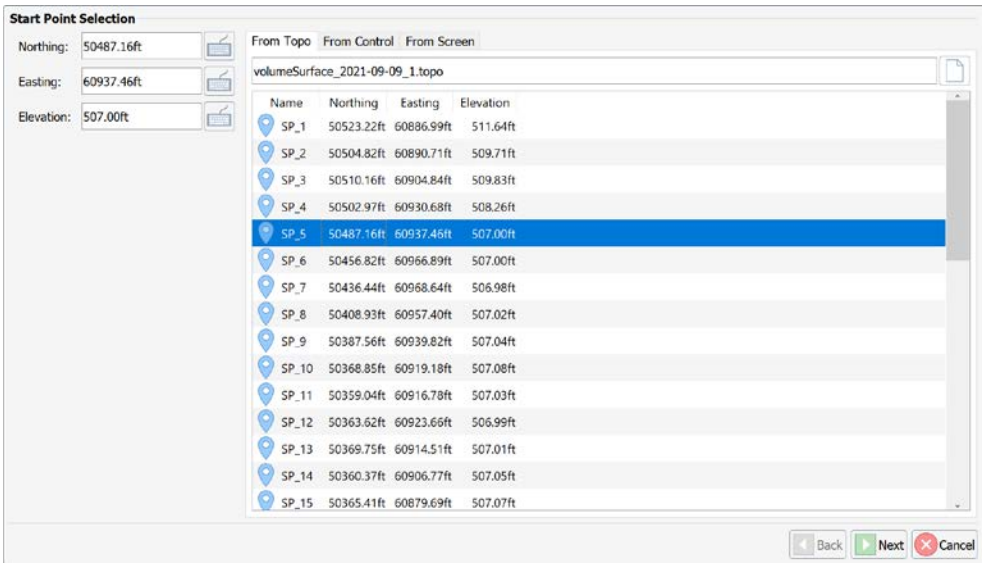
Calculations, Continued

Calculations, continued

You can select points from your topo file, your localization file, or from the screen.



Select the desired tab at the top (**From Topo** = from the topo file loaded; **From Control** = from localization file; **From Screen** = allows you to click on a point that is drawn on the screen).



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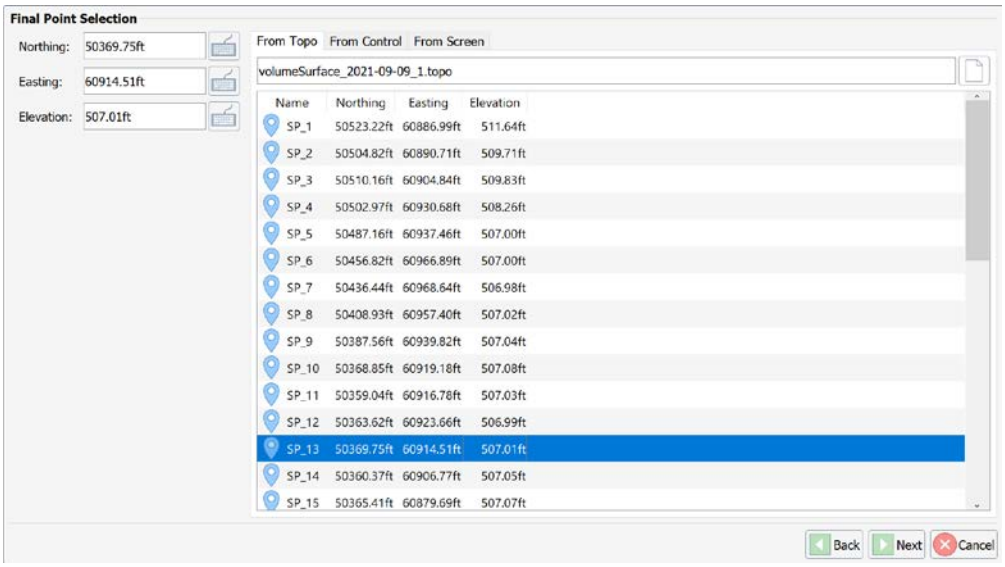
Calculations, Continued

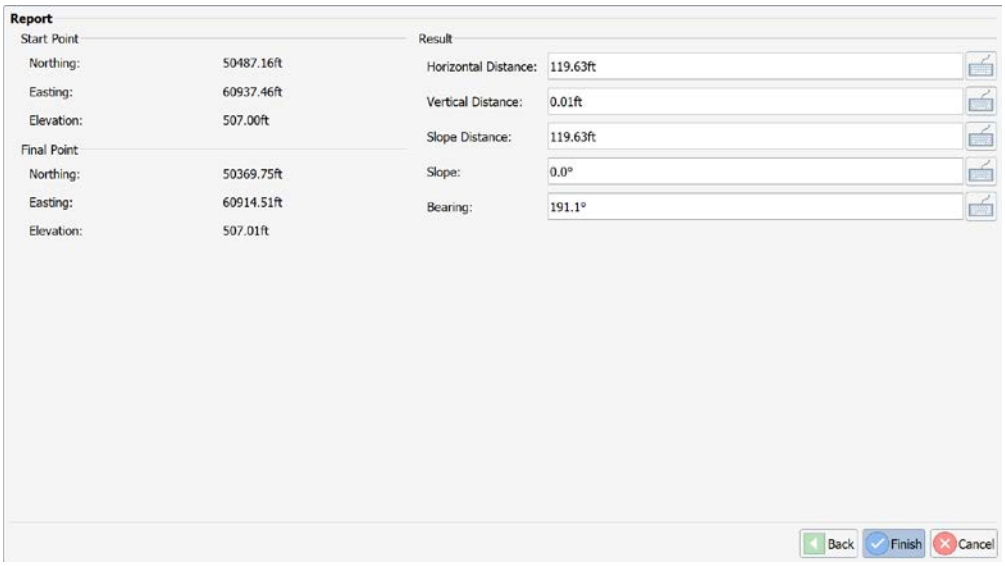
Calculations, continued

Click **Next**.

Select the second point.



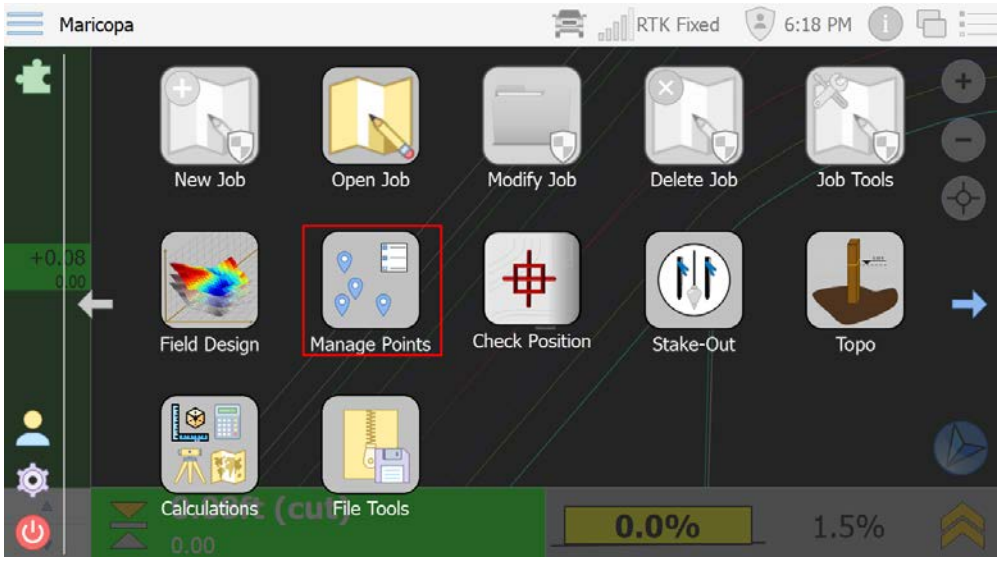
Click **Next**.



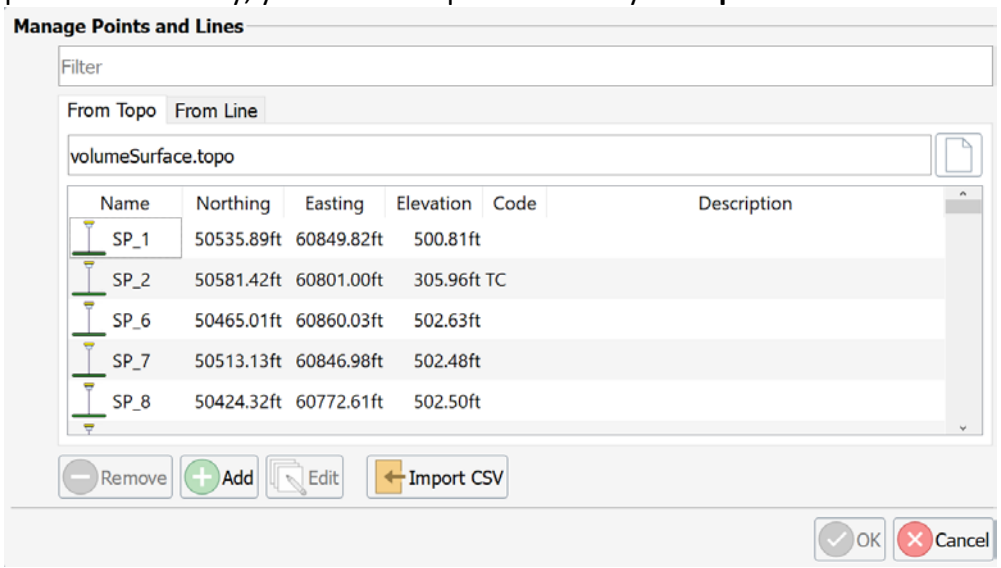
Manage Points

Manage Points

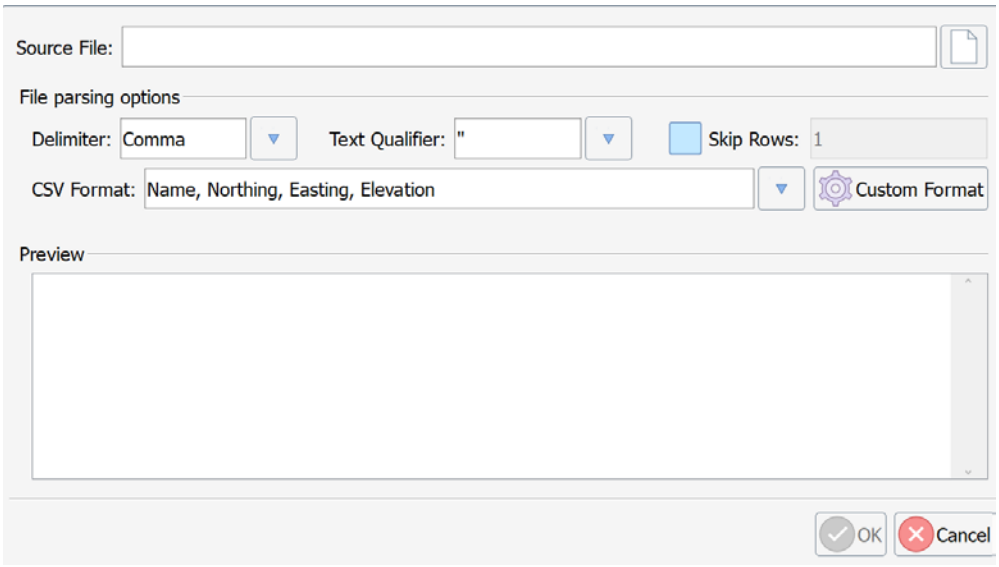
Use **Manage Points** to add, remove, or edit Topo Points and Lines.



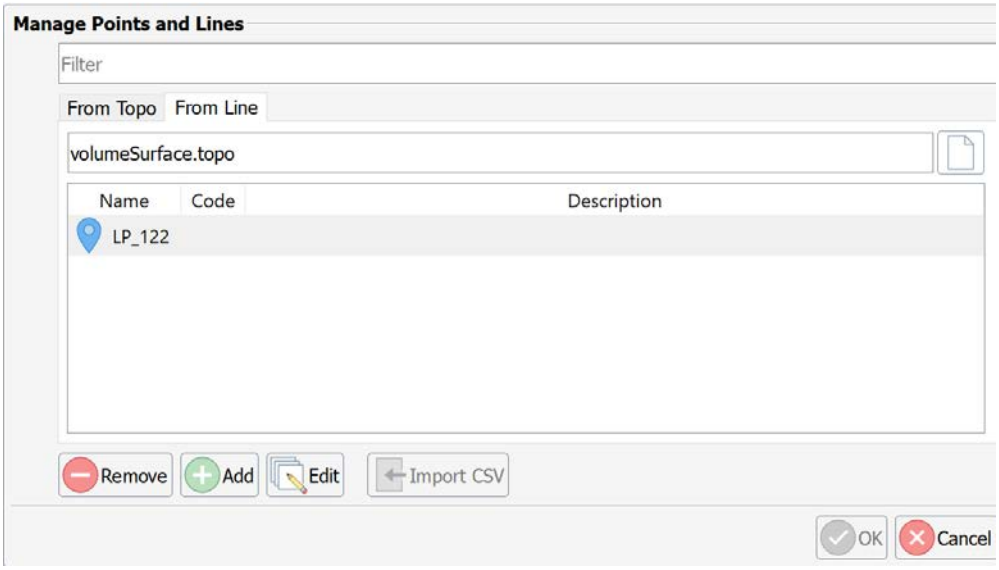
Select a point and you have the option to remove that point or edit that point. Additionally, you can add a point manually or **Import CSV**.



Importing from CSV allows you to select the fields of the CSV file from several predetermined formats or select a custom format.

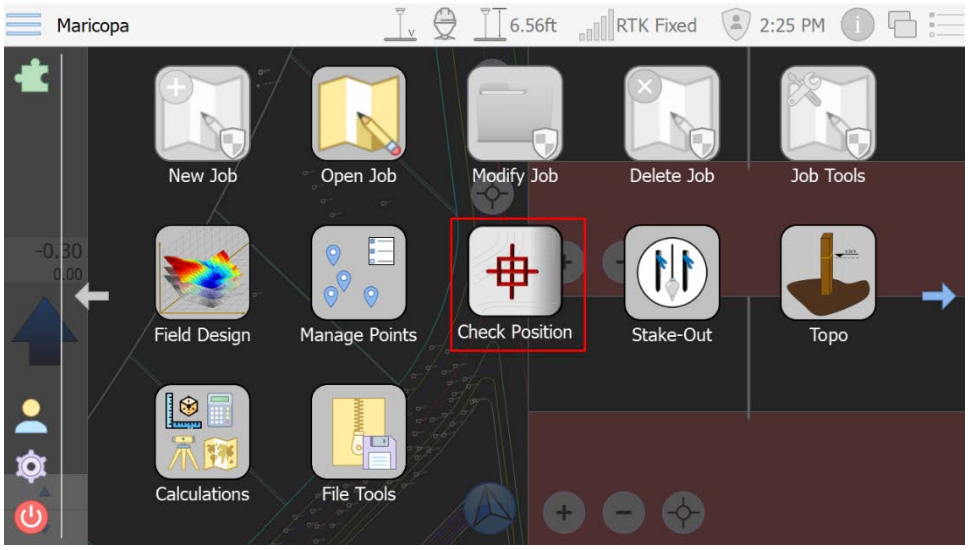


The **From Line** tab allows you to see lines that were created in the Topo routine. You can add or remove lines manually as well as edit the nodes of existing lines.



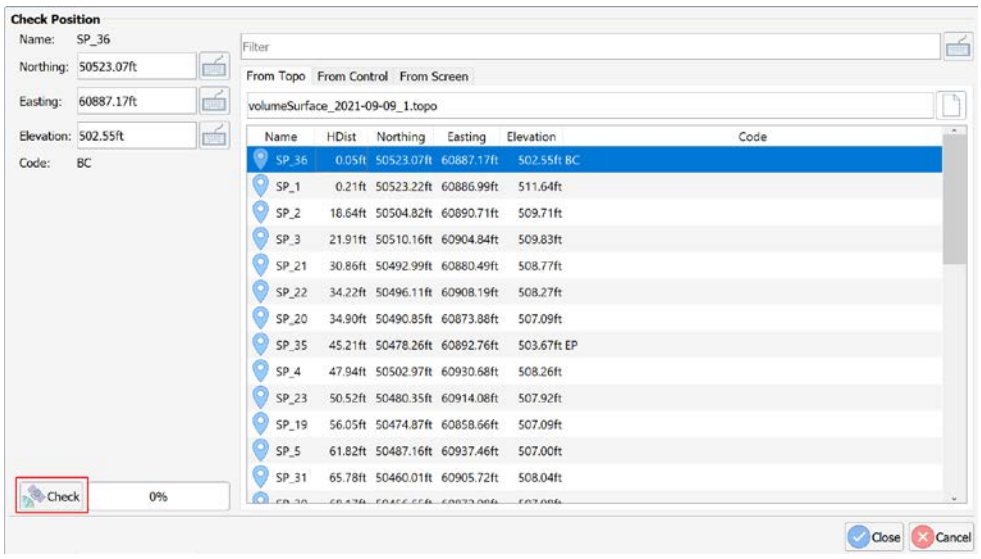
Check Position

Check Position



Check Position checks the accuracy of your GNSS receiver. Place the receiver onto a control point, select the point from the loaded file, and click **Check**. Your current GNSS position is read and averaged, and the deltas to that point are checked.

You can select a file **From Topo**, **From Control**, or **From Screen**.



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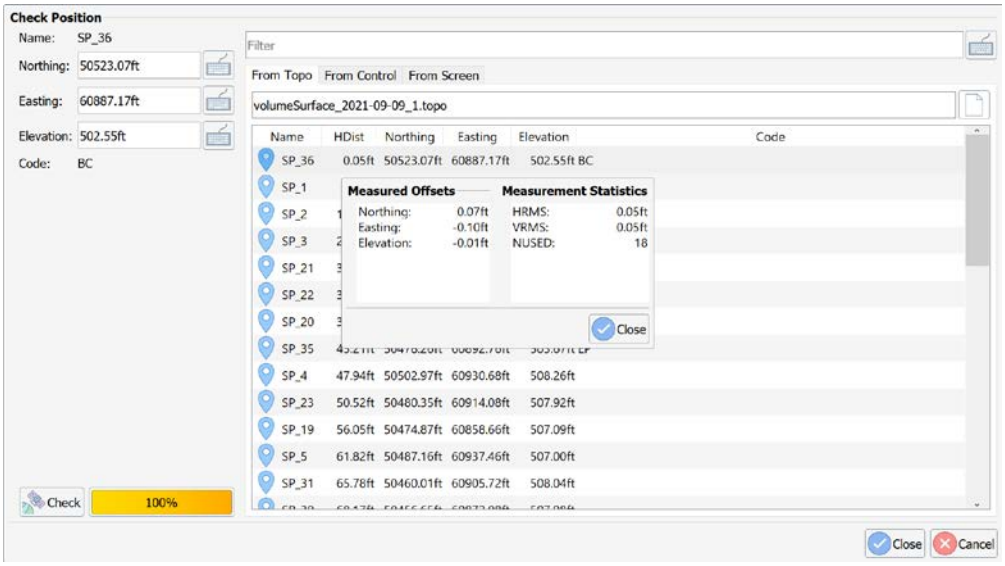
Check Position, Continued

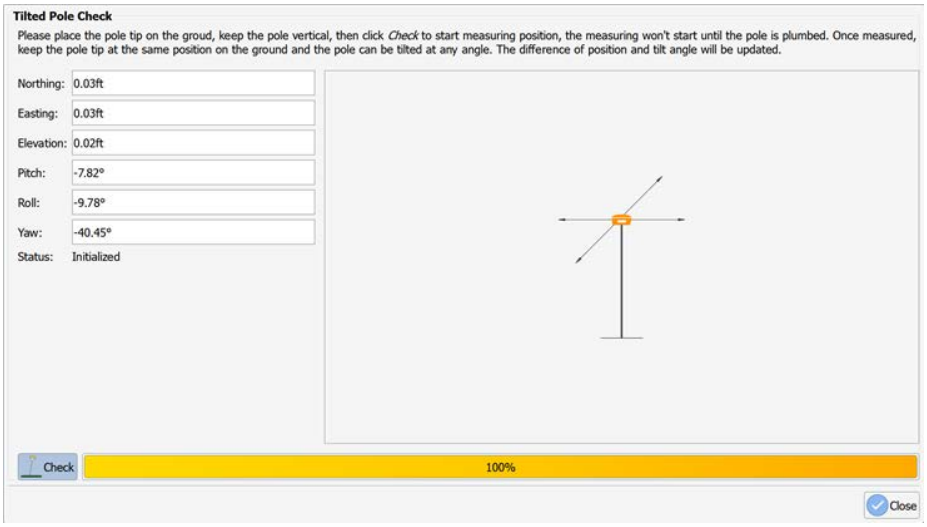
Check Position, continued

Click the point below your GNSS receiver and click **Check**.

Delta Northing, **Easting**, and **Elevations** are provided, along with **HRMS**, **VRMS**, and satellite count.



In **Tilt Compensation Mode**, you are given the option to test the accuracy of tilted pole measurements. Plumb your pole and click **Check.** The position will be averaged for ten seconds.



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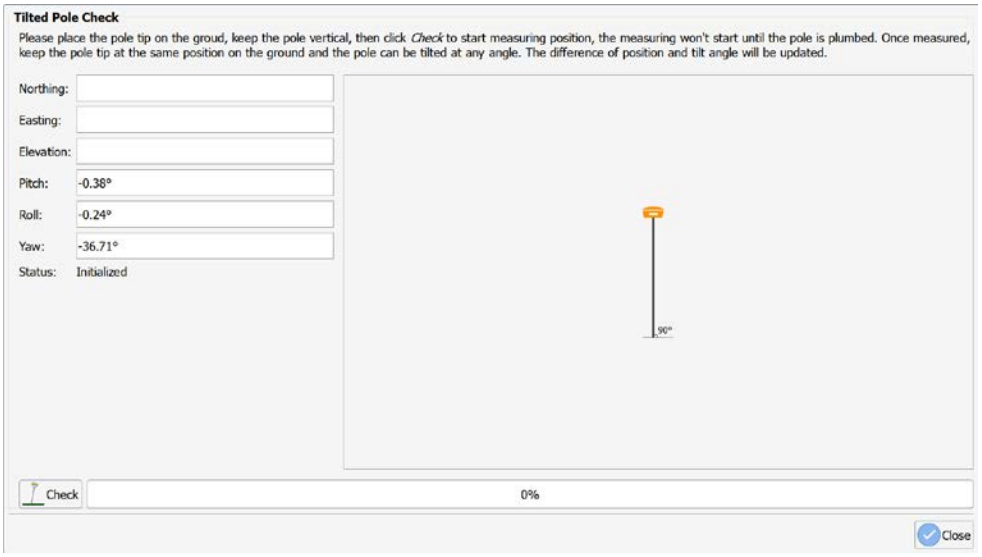
Check Position, Continued

Check Position, continued

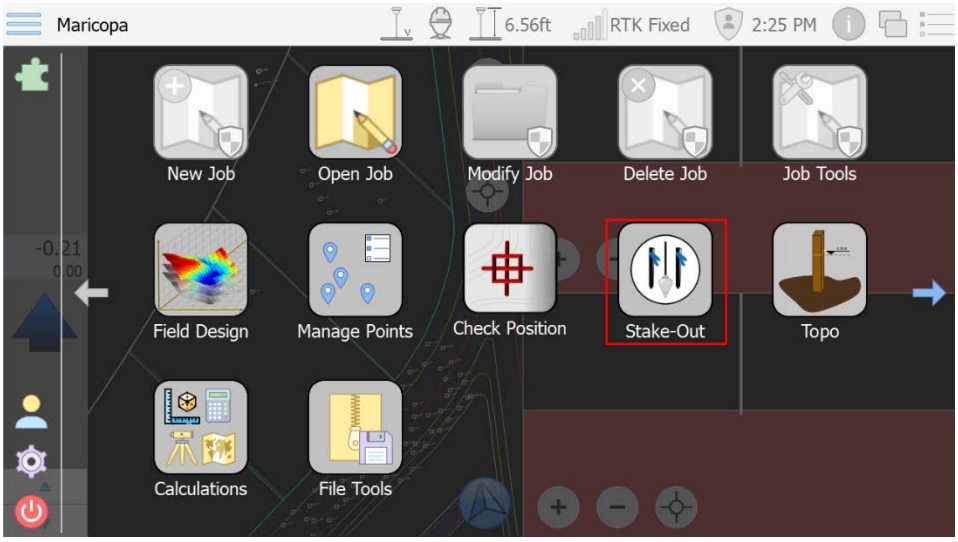


Tilt the pole in various directions and SiteMetrix Grade will calculate **Delta Northing**, **Delta Easting**, and **Delta Elevations**.

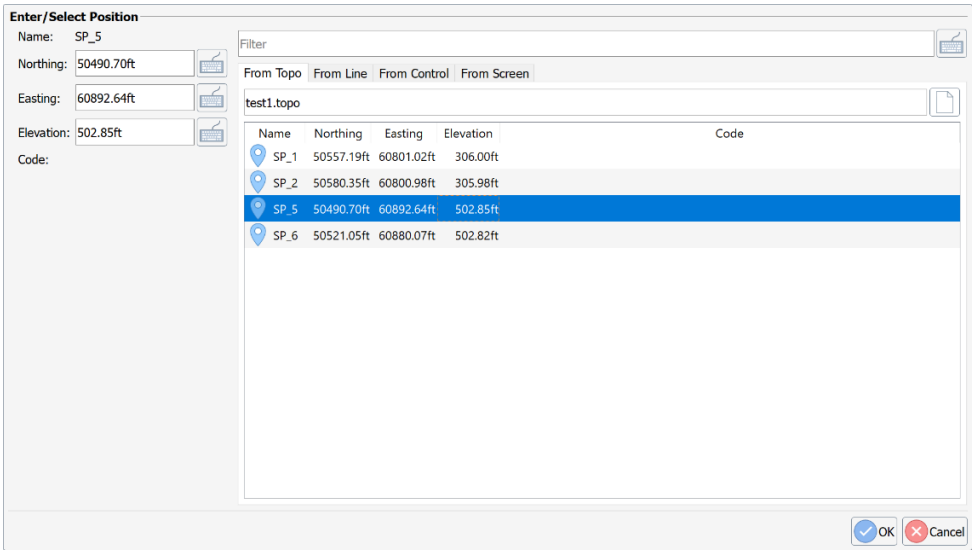
Stake Out

Stake Out

SiteMetrix Grade can stake a topo point, localization point, or a line.



When you enter the **Stake-Out** routine select a point from your topo file, localization file, or the screen. Select a point and click **OK.**



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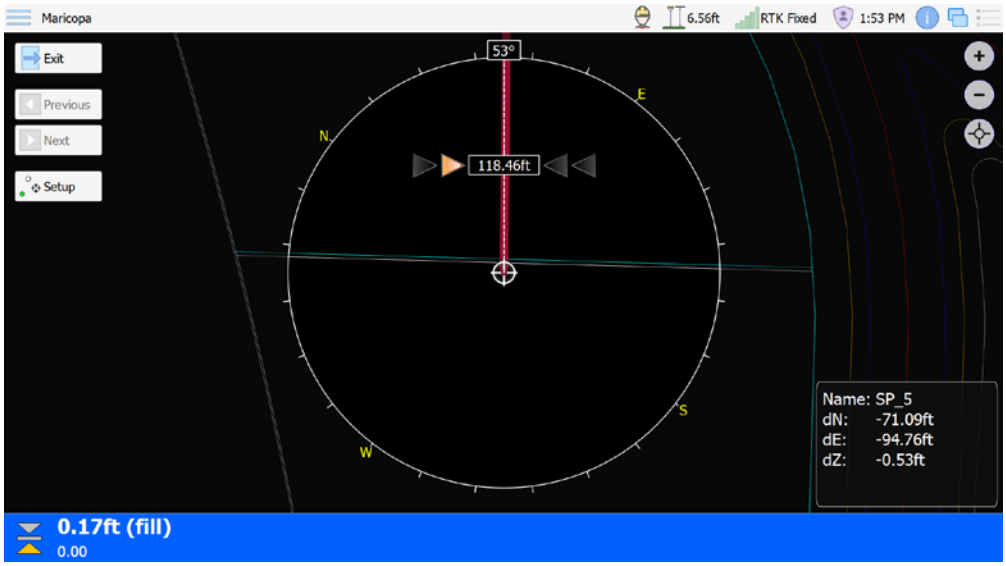
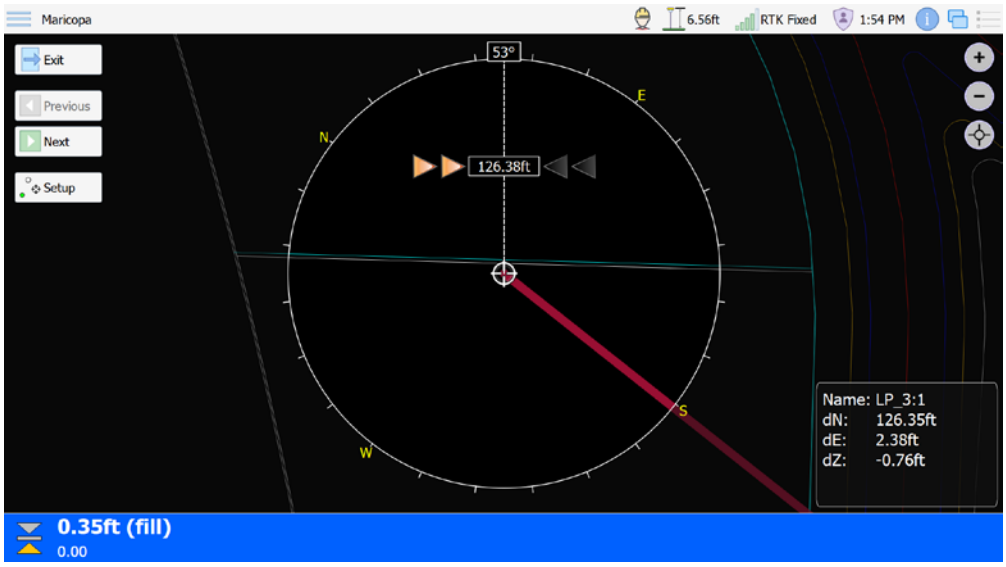
Stake Out, Continued

Stake Out, continued

Delta northing, easting, elevation along with total distance and azimuth displays, allowing you to stake the point.



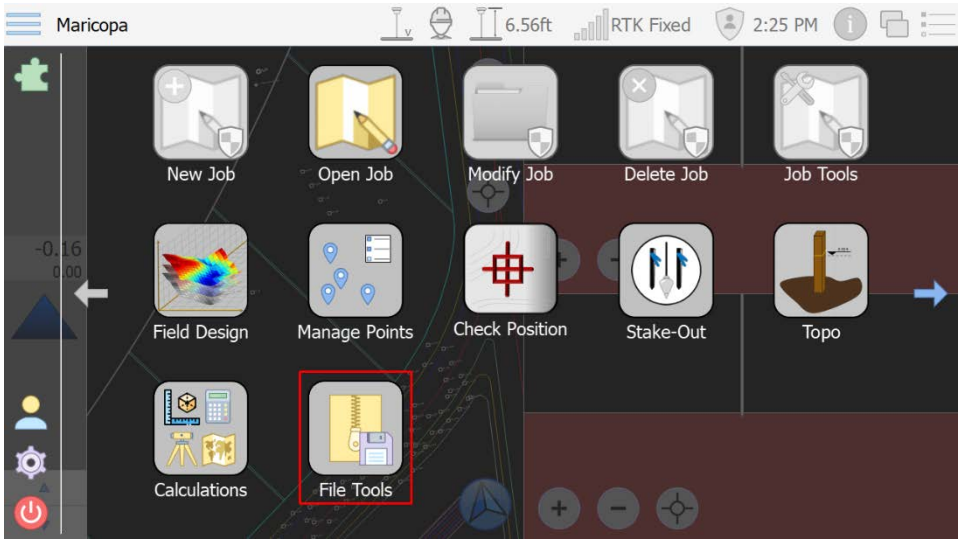
If you select a line to stake, click **Previous** or **Next** to switch between nodes.



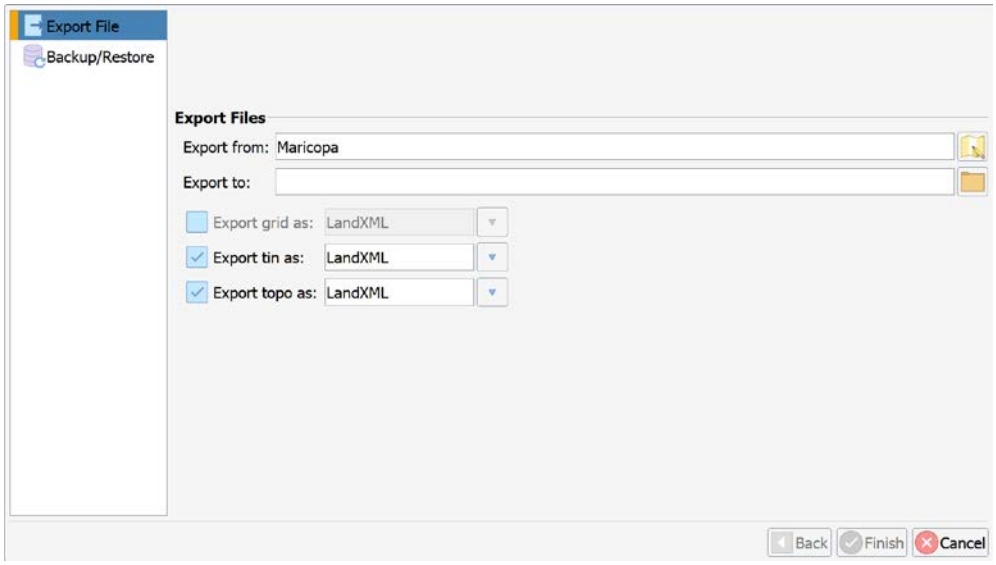
File Tools

File Tools

File Tools exports your grid, tin, or topo.



If you select to export your topo, you can export it as LandXML or CSV.



Appendix A: Troubleshooting

Overview

Introduction

This chapter contains frequent questions that may arise while using SiteMetrix Grade and how to troubleshoot them.

Contents

Topic	See Page
Troubleshooting	116
Overview	117
C631 Smart Antenna	118
HT20 Data Collector	123
Index	126

Troubleshooting

Troubles-hooting

Table A-1: Troubleshooting

Symptom	Possible Resolution
Wrong Position	Check your C631 over a control point. If the Northing, Easting, and Elevation do not match, first check to make sure that your C631 is RTK Fixed. If it is RTK Fixed, ensure your base station coordinate is correct. Check to ensure you have the correct localization loaded, and the residuals are within tolerance.
No RTK	If using NTRIP, check to see if network coverage is available. If using the WiFi or Cellular on the HT20, exit SiteMetrix Grade and try to access the internet with a web browser. If using a SIM card in the C631, check the Cellular Signal Quality. If using UHF, first ensure the base station radio is transmitting. Most radios have a TD or Tx light that will blink once per second. Next, ensure you are in range of UHF. Set the C631 next to the base station radio to see if it is functioning.

Appendix B: Technical Specifications

Overview

Introduction

Appendix B contains the technical specifications for the C631 Smart Antenna and the HT20 Data Collector.

Contents

Topic	See Page
C631 Smart Antenna	118
HT20 Data Collector	123
Index	126

C631 Smart Antenna

C631 Smart Antenna specifications

The following lists the specifications for the C631 Smart Antenna.

Table B-1: GNSS Receiver

Item	Specification
Receiver type	Multi-Frequency GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS, and Atlas L-band
Signals Received	GPS L1CA/L1P/L1C/L2P/L2C/L5 GLONASS G1/G2/G3, P1/P2 BeiDou B1i/B2i/B3i/B1OC/B2A/B2B/ ACEBOC GALILEO E1BC/E5a/E5b/E6BC/ALTBOC QZSS L1CA/L2C/L5/L1C/LEX IRNSS L5 Atlas
Channels	800+
RTK Formats	RTCM2.1, RTCM2.3, RTCM3.0, RTCM3.1, RTCM3.2 including MSM
Recording Intervals	Selectable from 1, 2, 4, 5, 10 Hz (20 Hz or 50 Hz optional)

Continued on next page

C631 Smart Antenna specifications, continued

Table B-2: Accuracy

Item	Specification
Secondary antenna	GPS L1,L1P,L2C,L2P GLONASS G1,G2 BeiDou B1,B2 Galileo E1,E5b L-band
GPS sensitivity	-142 dBm
SBAS tracking	3-channel, parallel tracking
Update rate	10 Hz standard, and 20 Hz available
Positioning	<table><tr><th></th><th>RMS (67%)</th><th>2DRMS (95%)</th></tr><tr><td>RTK[1,2]</td><td>8 mm + 1 ppm</td><td>15 mm + 2 ppm</td></tr><tr><td>Atlas (H10)[1,2]</td><td>0.04 m</td><td>0.08 m</td></tr><tr><td>SBAS[1]</td><td>0.3 m</td><td>0.6 m</td></tr><tr><td>Autonomous, no SA[1]</td><td>1.2 m</td><td>2.4 m</td></tr><tr><td>Static Performance[1]</td><td>2.5 mm + 1 ppm</td><td>5 mm + 1 ppm</td></tr><tr><td>Tilt Compensation (within 30°)</td><td>2 cm (with 1.8 m pole)</td><td></td></tr><tr><td>Tilt Compensation (within 30°)</td><td>2 cm (with 1.8 m pole)</td><td></td></tr><tr><td>Initialization Time</td><td>< 10 s</td><td></td></tr></table>

Continued on next page

C631 Smart Antenna specifications, continued

Table B-3: L-Band Receiver Specifications

Item	Specification
Receiver Type	Single Channel
Frequency Range	1525 to 1560 MHz
Sensitivity	-130 dBm
Channel Spacing	5.0 kHz
Satellite Selection	Manual and Automatic
Reacquisition Time	15 seconds (typical)

Table B-4: Communications

Item	Specification
Bluetooth	Bluetooth 2.1+EDR / 4.0 LE
Wi-Fi	802.11 b/g
Network	LTE FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/ B18/B19/B20/B25/B26/B28 LTE TDD: B38/B39/B40/B41 UMTS: B1/B2/B4/B5/B6/B8/B19 GSM: B2/B3/B5/B8
Radio	Frequency range: 410MHz ~ 470MHz and 902.4MHz ~ 928MHz Channel Spacing: 12.5 KHz / 25 KHz Protocol: TrimTalk 450S, PCC EOT, TrimMark III(19200)
WebUI	To upgrade software, manage settings, data download, via smartphone, tablet or other electronic device, configure advanced radio settings

Continued on next page

C631 Smart Antenna specifications, continued

Table B-5: Connector Ports

Item	Specification
TNC	For connecting to UHF radio antenna
LEMO 5-pin	For connecting to external power supply, external radio
LEMO 7-pin	For serial port, USB
Card Slots	For Micro SIM card and Micro SD card

Table B-6: Data and Storage

Item	Specification
Storage Type	8 GB internal, SD card up to 32 GB

Table B-7: Physical

Item	Specification
Weight	1.19 kg (1 battery), 1.30 kg (2 batteries)
Dimensions	156 x 76 mm

Table B-8: Environmental

Item	Specification
Operating Temperature	-30°C ~ +65°C
Storage Temperature	-40°C ~ +80°C
Protection	IP67. Protected from temporary immersion to a depth of 1 m
Shock Resistance	MIL-STD-810G, method 516.6. Designed to survive a 2 m pole drop on concrete floor. Designed to survive a 1 m free drop on hardwood floor.
Humidity	Up to 100%
Vibration	MIL-STD-810G, method 514.6E-I
Inflammability	UL recognized, 94HB Flame Class Rating (3) 1.49 mm
Chemical Resistance	Cleaning agents, soapy water, industrial alcohol, water vapor, solar radiation (UV)

Continued on next page

C631 Smart Antenna specifications, continued

Table B-9: Electrical

Item	Specification
Input Voltage	9 to 28 V DC
Battery	With removable dual battery, for single battery parameter: 7.2 V, 3400 mAh, 24.48 Wh
Working Time	12 hours in Rover UHF mode (2 batteries)

Table B-10: User Interface

Item	Specification
Button	Switch receiver on/off, broadcast current operation mode and status
LEDs	Power, Satellite, Data Link, Bluetooth
WebUI	Supports software updates, receiver status and settings, and data downloads via smartphones, tablets, or other Wi-Fi capable devices.

[1]Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
[2]Depends also on baseline length
[3]Requires a subscription from Hemisphere GNSS

HT20 Data Collector

HT20 Data Collector specifications

Tables B-11 through B-20 show the HT20 Data Collector specifications.

Table B-11: System specifications

System	Specification
Processor	Quad-core Intel® Pentium N4200
Operating System	Microsoft® Windows 10
Storage	128 GB Flash Storage

Table B-12: Display specifications

7.0”
1200x800
Sunlight-viewable
multi-touch capacitive touchscreen

Table B-13: Camera specifications

Rear: 13MP
Front: 5MP

Table B-14: Connectivity

System	Specification
Cellular	4G LTE multi-carrier capable 2x2 MIMO
Wireless LAN	Wi-Fi 802.11 a/b/g/n/ac 2.4 GHz and 5 GHz
Bluetooth	5.0
NFC	Yes

Table B-15: Power

System	Specification
Battery	Removable Li-Ion battery, 43.2 Whr
Technology	Operates 8–10 hours on one charge Optimized for powerful performance in cold temperatures

Continued on next page

HT20 Data Collector, Continued

HT20 Data Collector specifications, continued

Table B-16: Mechanical

System	Specification
Dimensions	137 x 215 x 35 mm
Weight	680–907 g

Table B-17: Rugged Features

Feature	Specification
IP Rating	IP68 waterproof & dustproof
Drop Tested	multiple drops from 4’ (1.2 –1.5 m) onto concrete
Water	1.4 m (4’ 7”) for 2 hours
MIL-STD	MID-STD-810G MIL-STD-461F
Environmental	Operating Temp -20°C ~ 50°C Storing Temp -30°C ~ 70°C
Shock Resistance	MIL-STD-810G, Method 500.5
Low Pressure (Altitude)	Method 501.5

Table B-18: Temperature

	Specification
High	Method 502.5
Low	Method 503.5
Shock	Method 506.5
Rain	Method 507.5
Humidity	Method 510.5
Sand and Dust	Method 512.5
Immersion	Method 514.6
Vibration	Method 516.6 Shock

Continued on next page

HT20 Data Collector, Continued

HT20 Data Collector specifications, continued

Table B-19: Certifications

FCC Class B, CE Marking, Industry Canada, EN62368 Safety, RoHS 2 Compliant, Optional Class

Table B-20: Interfaces

	Specification
I/O Ports	USB 3.0 x 1
	3.5 mm audio jack
	Optional RS-232 9-Pin

Index

Alert Method 65
BeiDou 119
Control 12
Description 61, 72
Files 12, 72
Fill Color 65
Fill Style 65
Formats 47
GLONASS 119
GPS 119
Guideline 62
Home screen 47, 57, 58, 60, 70, 71
Job Basics 60, 72
Line Color 65
Line Style 65
Linework 62
Name 72
Open Job 70
SBAS 119
Settings 47
Show in Views 65
Shut down 58
Site Calibration 72
Surface Options 74
Surface options window 63
Surfaces 65
Survey Top 62

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End User license agreement

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Warranty notice

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Continued on next page

Warranty Notice, Continued

Warranty notice, continued

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