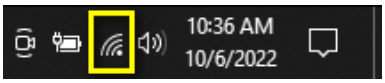
MSPS Fall Conference - Accuracy Course

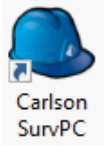
Before beginning, establish an Internet connection via the WiFi indicator on the tablet:



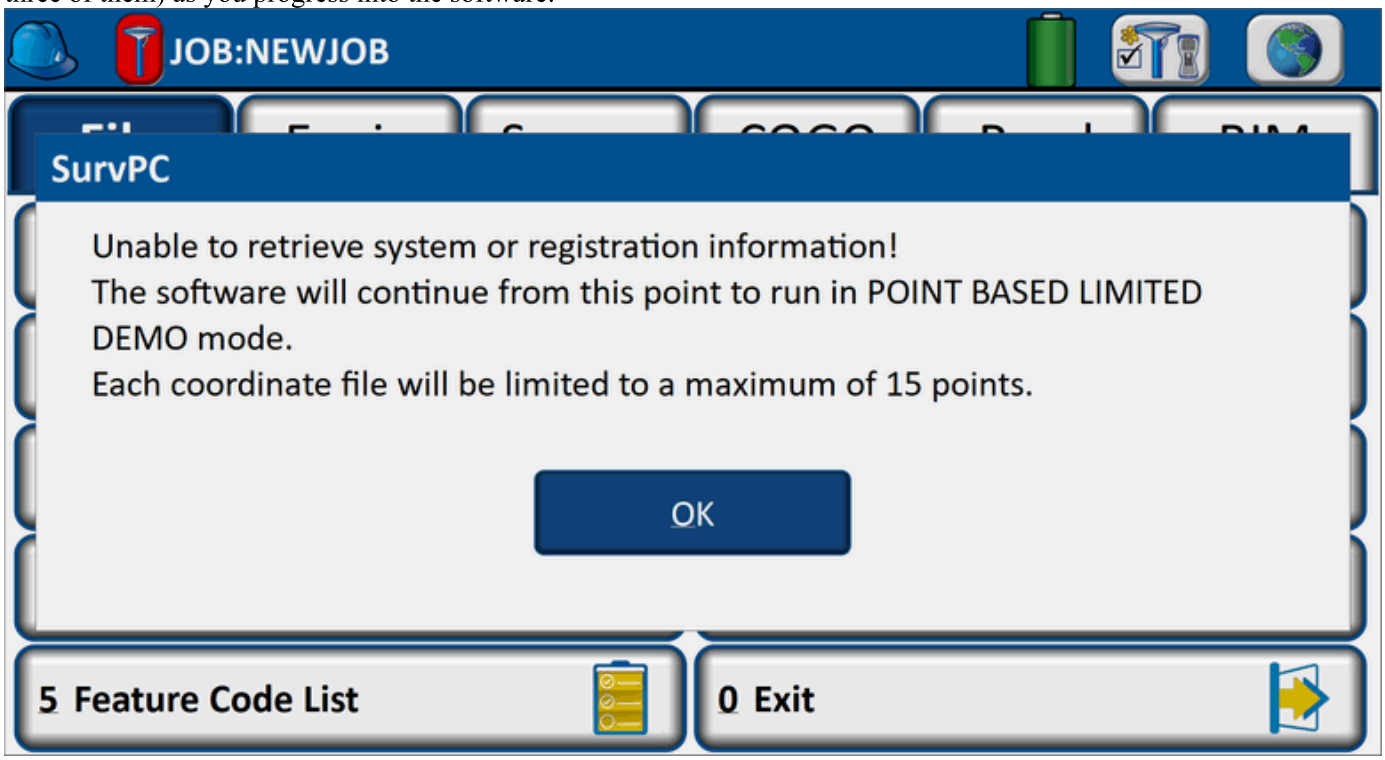
NOTE: If you plan to use a network rover for this exercise, obtain proper credentials as available at https://gpsweb3.modot.mo.gov/. It may take an hour or longer for the credentials to be generated.

Startup/Control File Creation

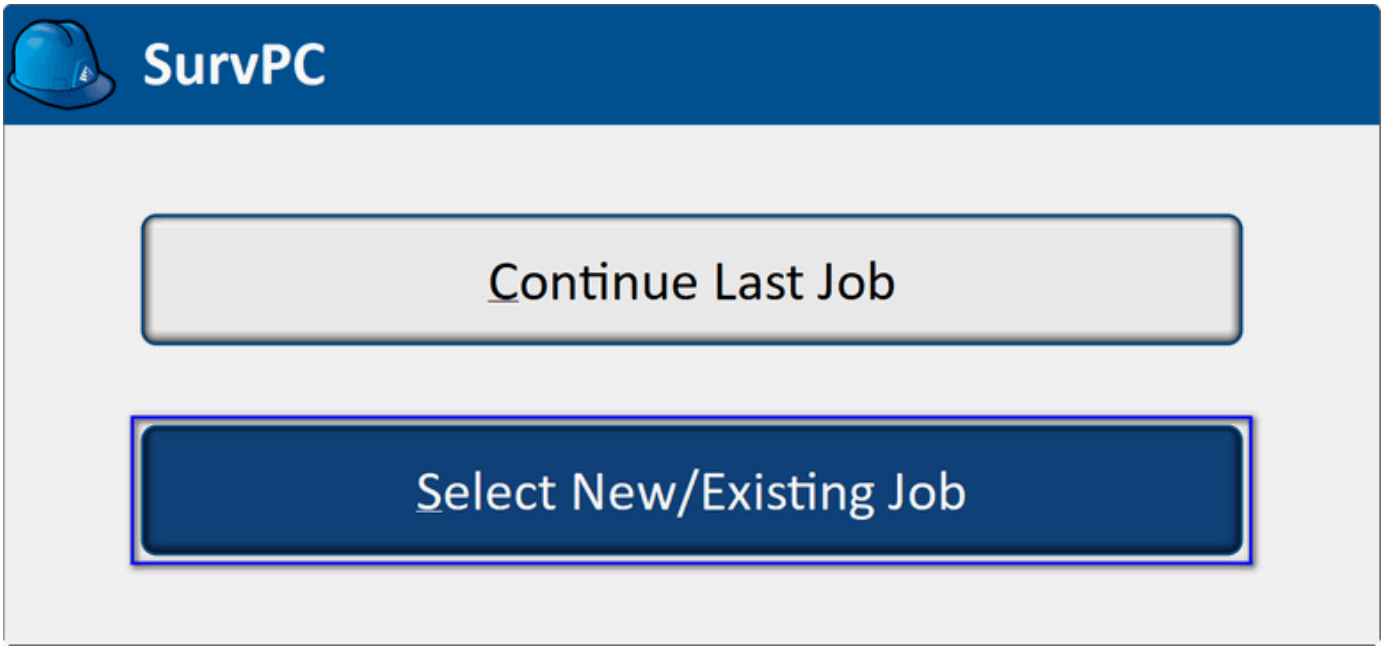
1. Locate the Carlson SurvPC icon on the tablet desktop and double-tap to launch the application:

   NOTE: Throughout this guide, the ***SurvPC 7*** interface will be shown with variants as found in SurvPC 6 cited where necessary.
2. Presuming you have the 15-point evaluation version of SurvPC installed, accept any alerts or indications (there may be three of them) as you progress into the software:

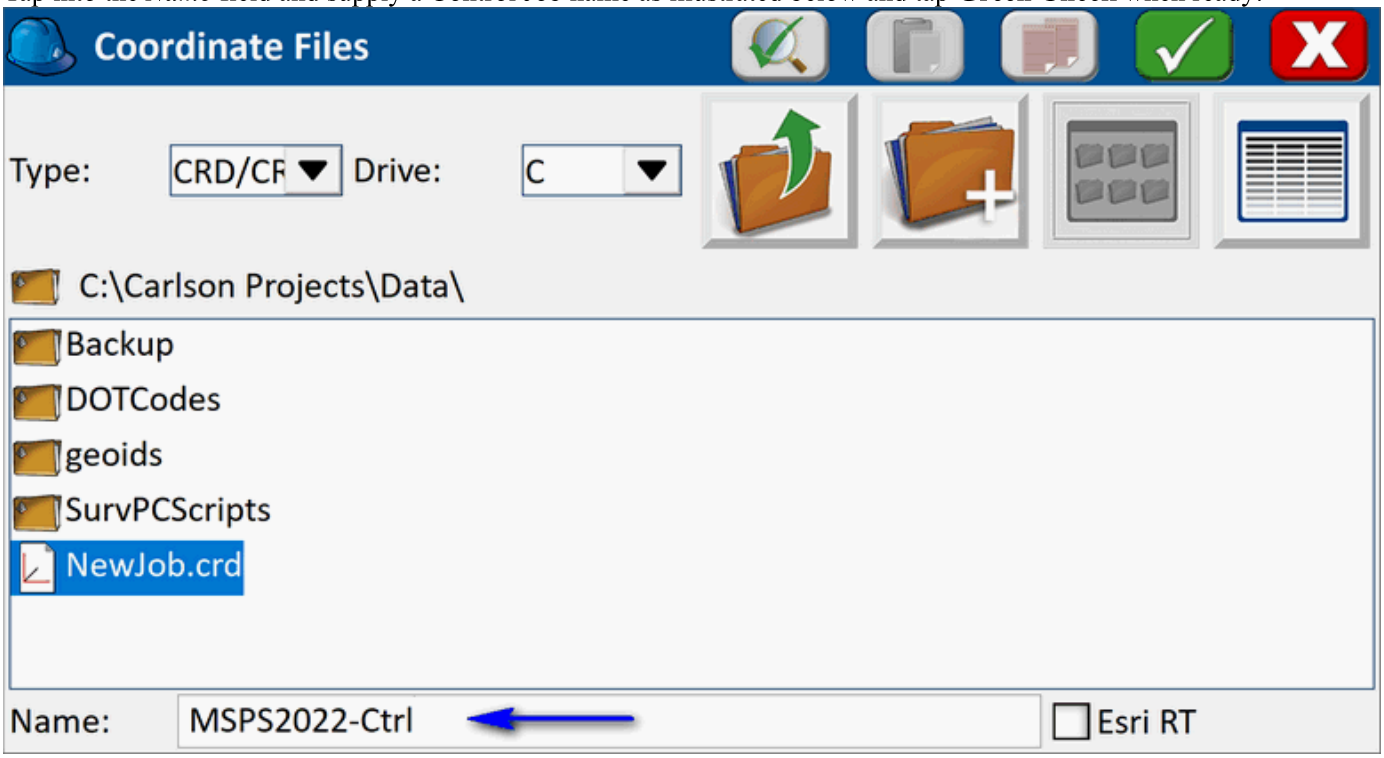
3. Our first main task will be to create what will become a "control" ("CTRL" for short) job file. Tap **Select New/Existing Job**:



NOTE: If time-constraints are an issue, the *Control* file we're about to create below can be downloaded from the Internet by visiting:

https://web.carlsonsw.com/owncloud/index.php/s/cMNjk3bXhAg2vlq (password **msps2022**). Upon downloading and specifying this file as the file to open, you may skip to the List Points discussion below.

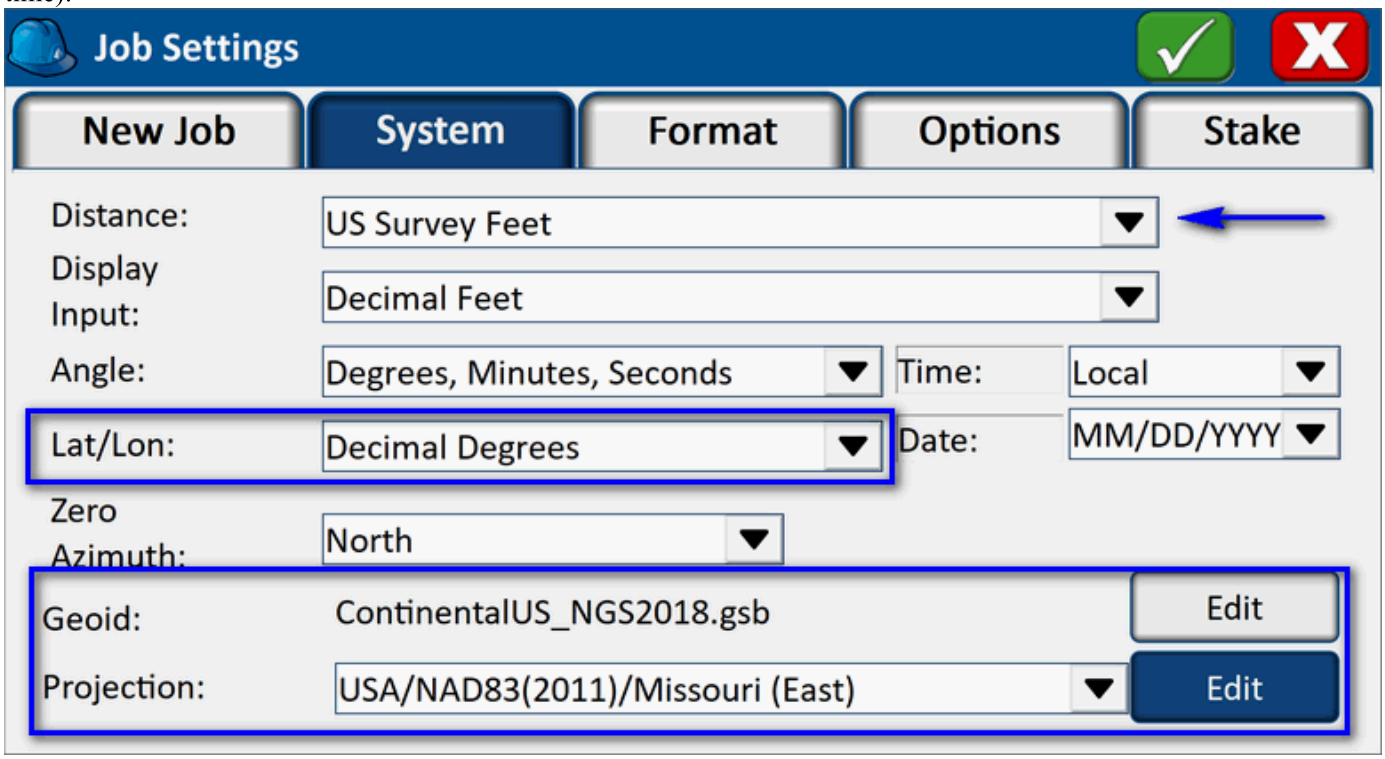
4. Tap into the *Name* field and supply a Control Job name as illustrated below and tap **Green Check** when ready:



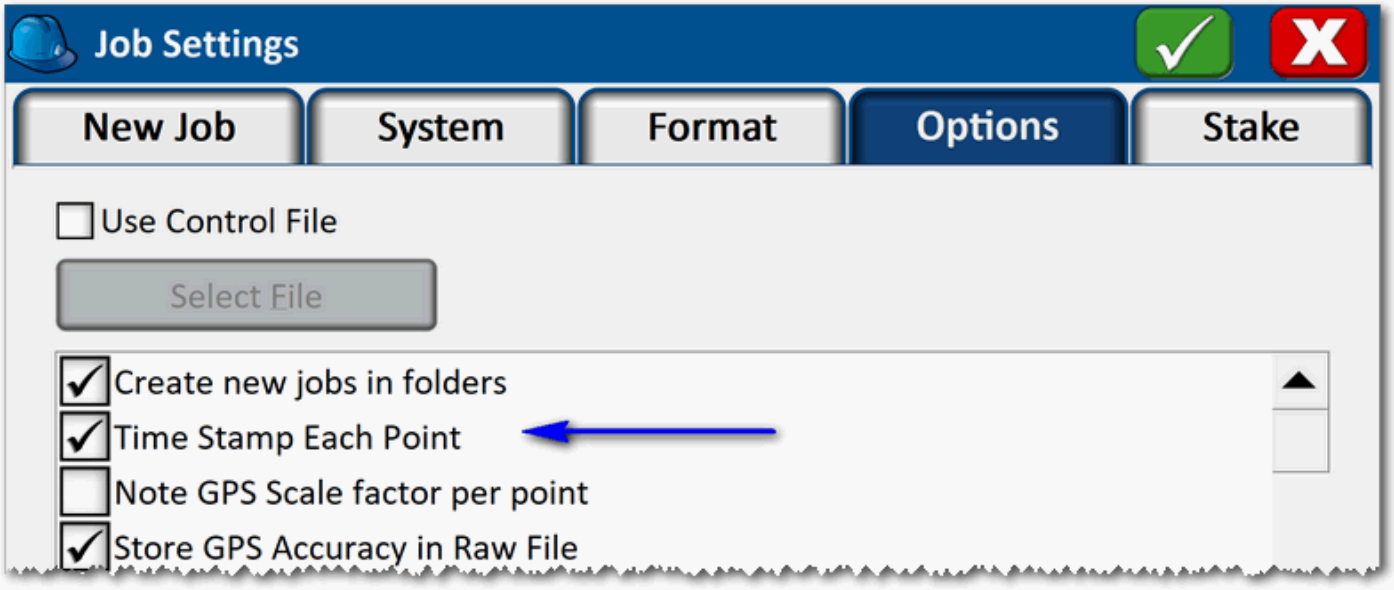
NOTE: "*Green Check*" is used throughout the application as the OK/Accept button. For commands below that have a *Green Check* button, tap this button to implement the instructions unless otherwise noted.

5. Approximate positions of the "ground control" points have been provided in Lat/Long positions in Decimal degree (d.dddddd) format and we ultimately want State Plane coordinates as indicated below (but do not tap *Green Check* at this

time):

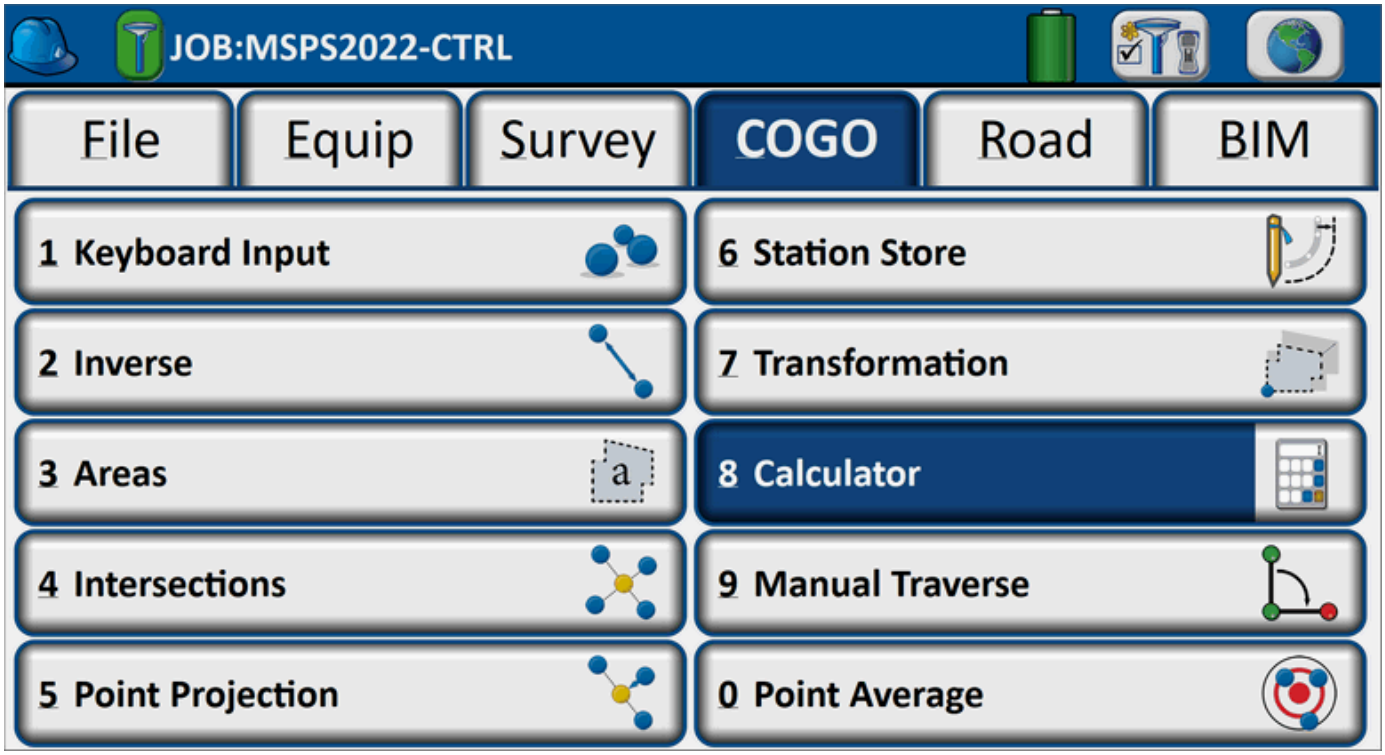


6. Continue to review settings and activate the **Options** tab as shown below:

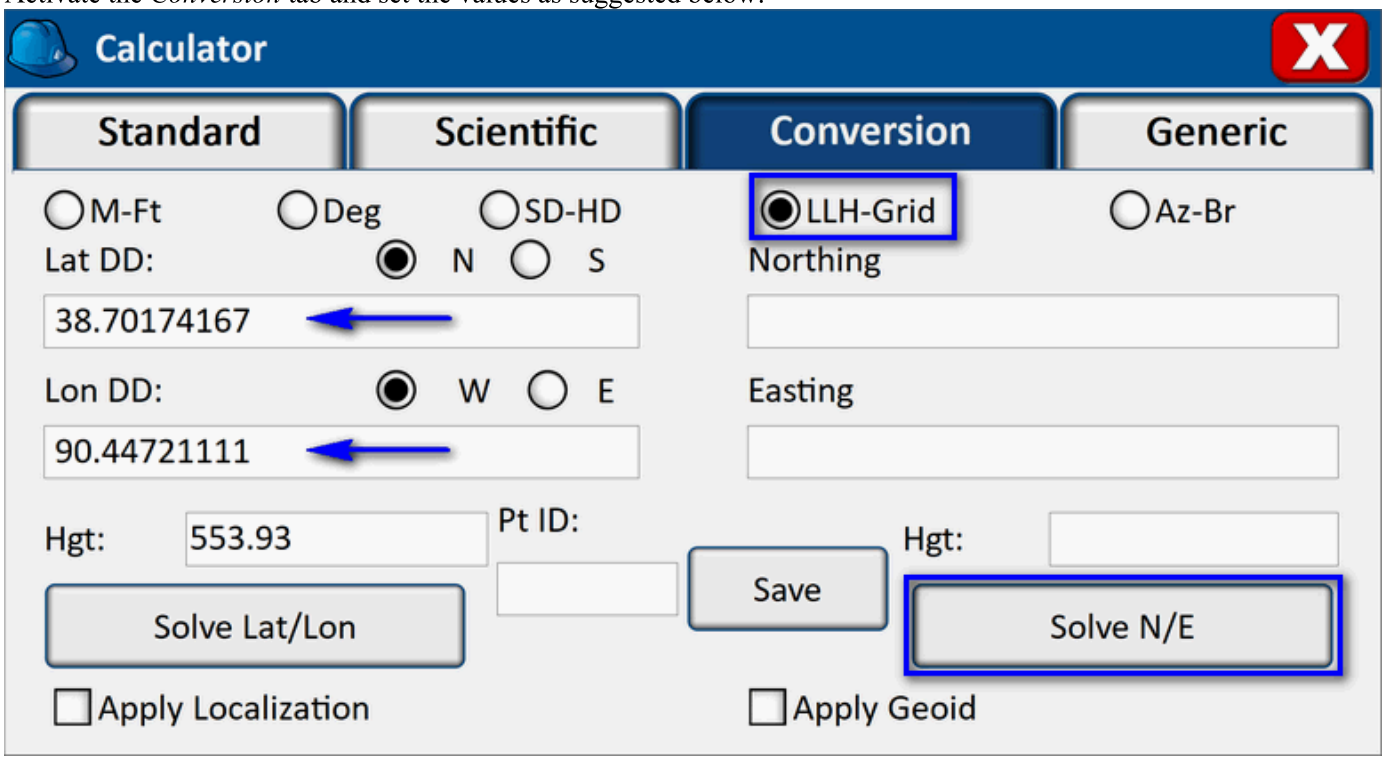


7. When applicable Job Settings have been established, tap *Green Check*.
   NOTE: You can always return to these settings via the File tab of the SurvPC main menu and tapping button #2 - *Job Settings*.
8. Our next task will be to convert the approximate Lat/Long values of the Ground Control "course" targets into approximate State Plane coordinates so we can use those coordinates to locate the targets. Locate the **Calculator** routine

as shown below:

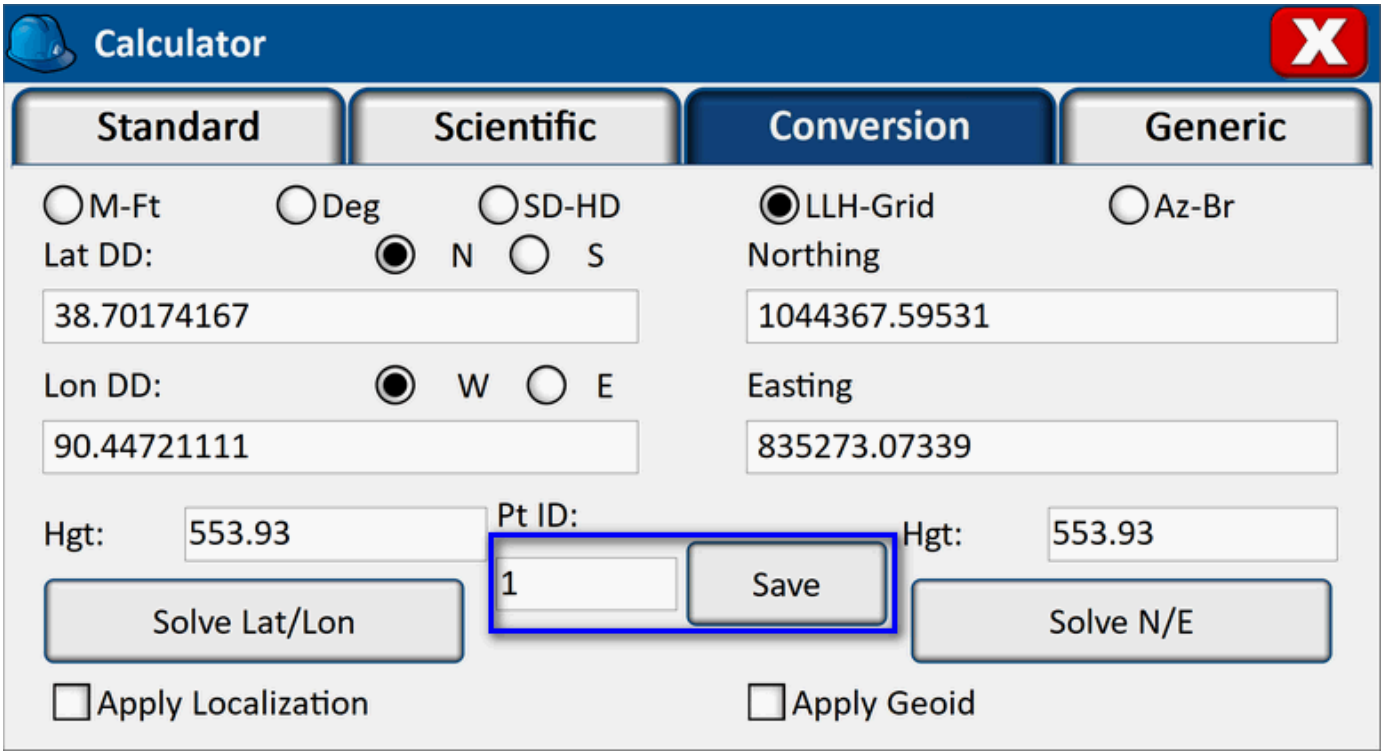


9. Activate the *Conversion* tab and set the values as suggested below:

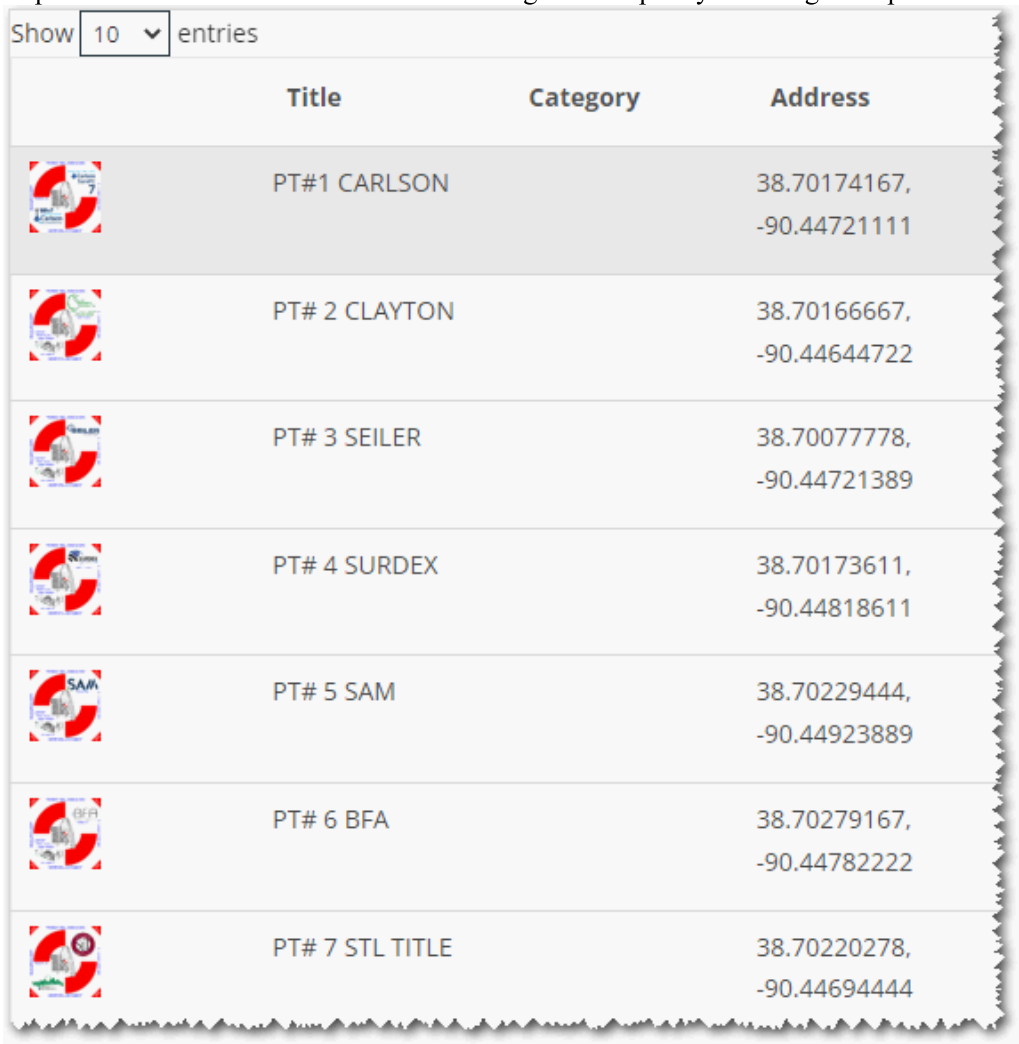


NOTE: Course data is summarized below. Refer to the official data at https://stlsurveyor.org/accuracy-course/ for official values.

10. Upon inputting the specified values (approximate elevation shown), calculate the coordinate and save as the designated point number as illustrated below:

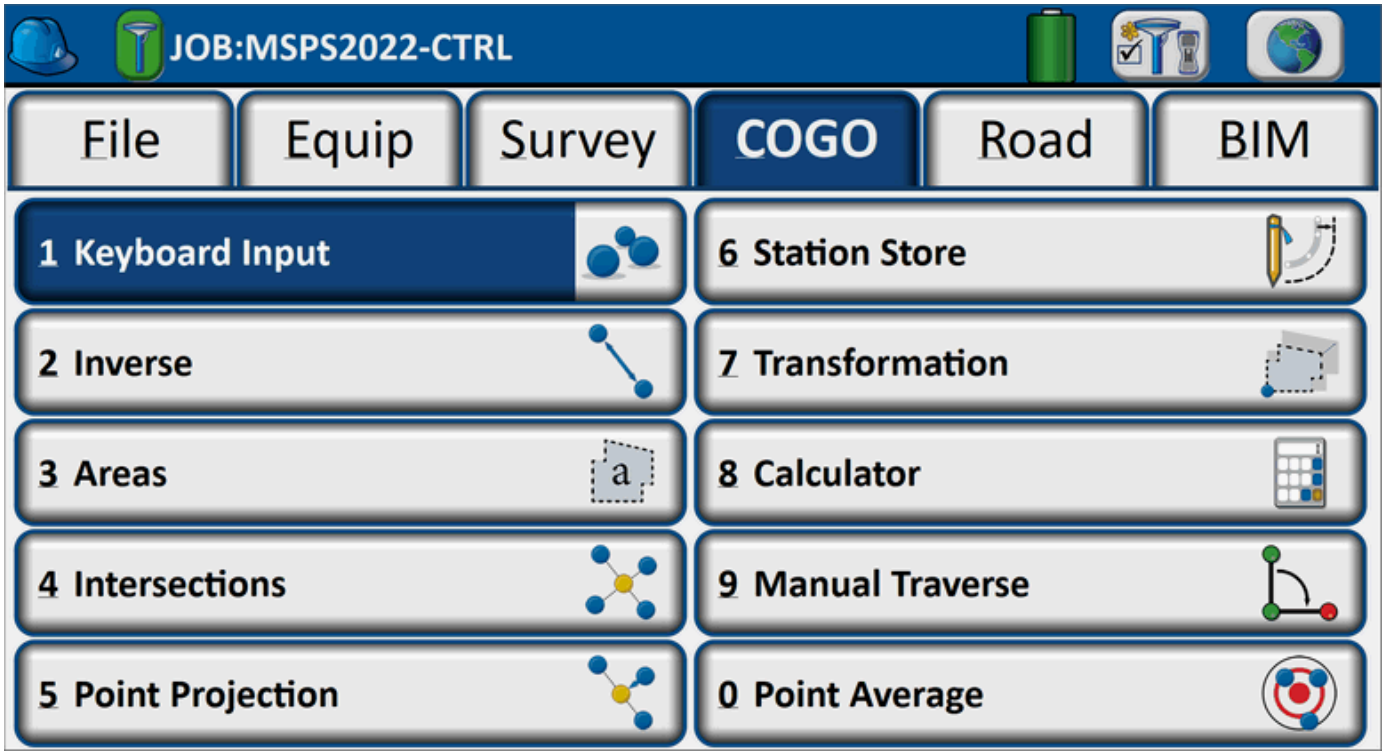


11. Repeat for each of the course locations making sure to specify the designated point number prior to storing the point:



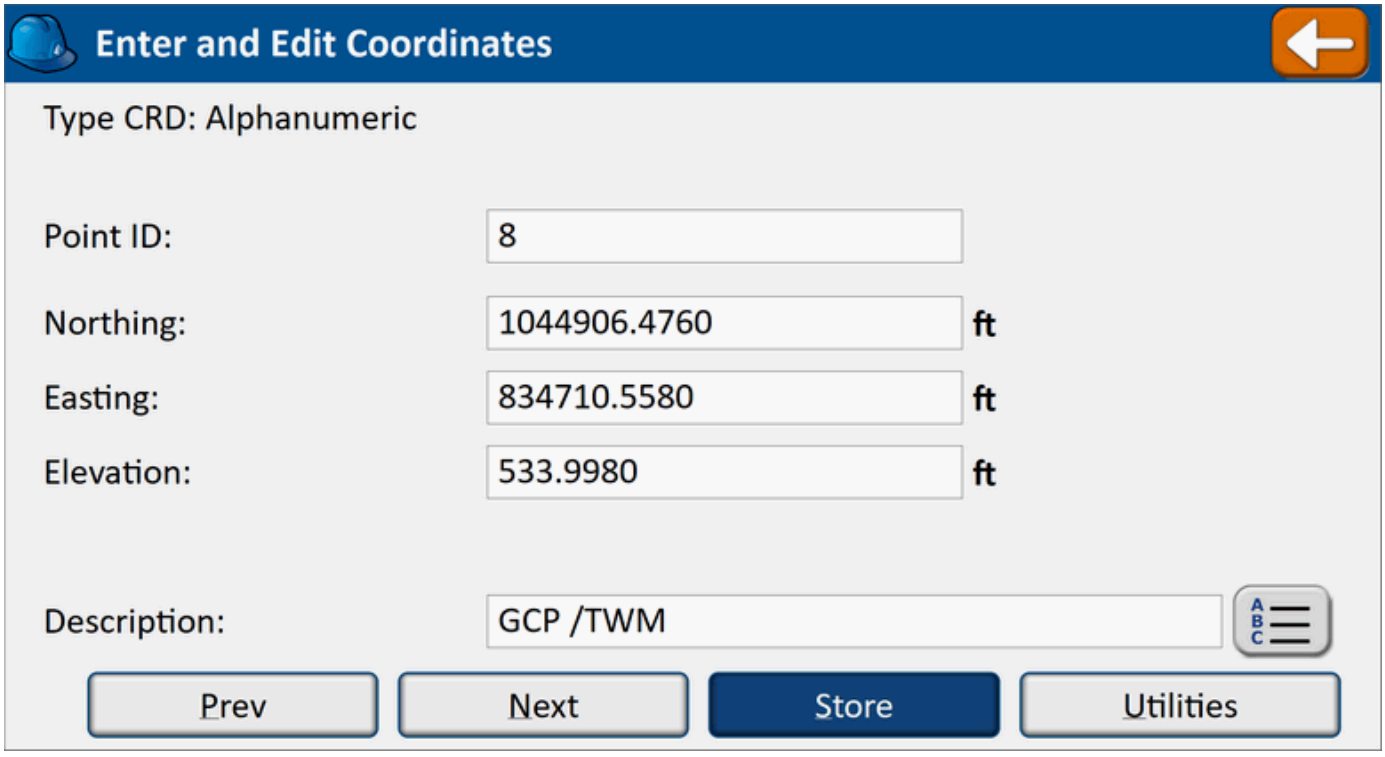
NOTE: Upon completion of all values, tap **Red X** to dismiss the Calculator routine.

12. Our next task will be to input the exact values of the Ground Control "control" targets as given State Plane coordinates so we can use those coordinates to locate the targets. Locate the **Keyboard Input** routine as shown below:



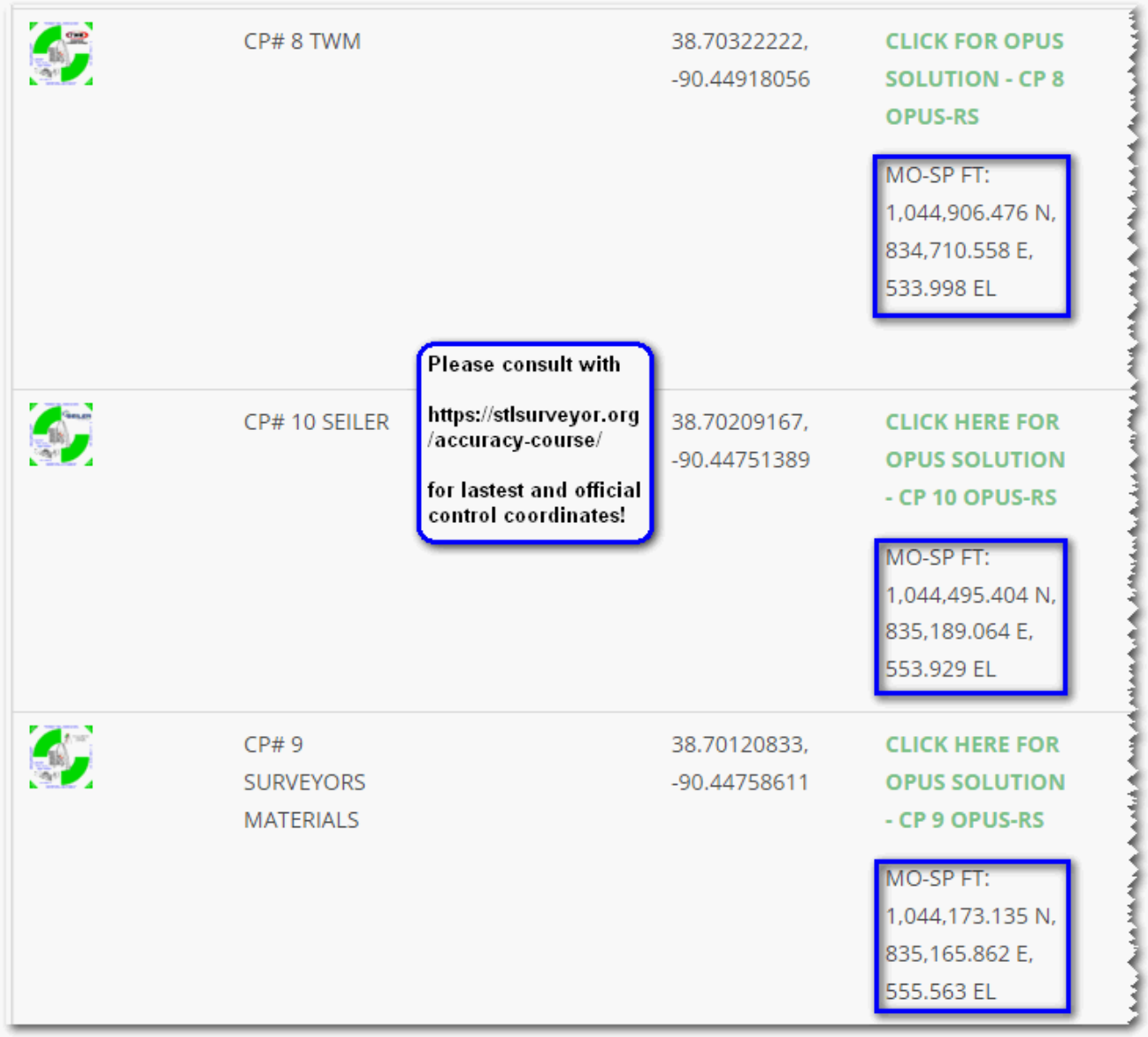
NOTE: Control data is summarized below. Refer to the official data at https://stlsurveyor.org/accuracy-course/ for official values.

13. Upon inputting the specified values (suggested description shown), save the designated point number as illustrated below:



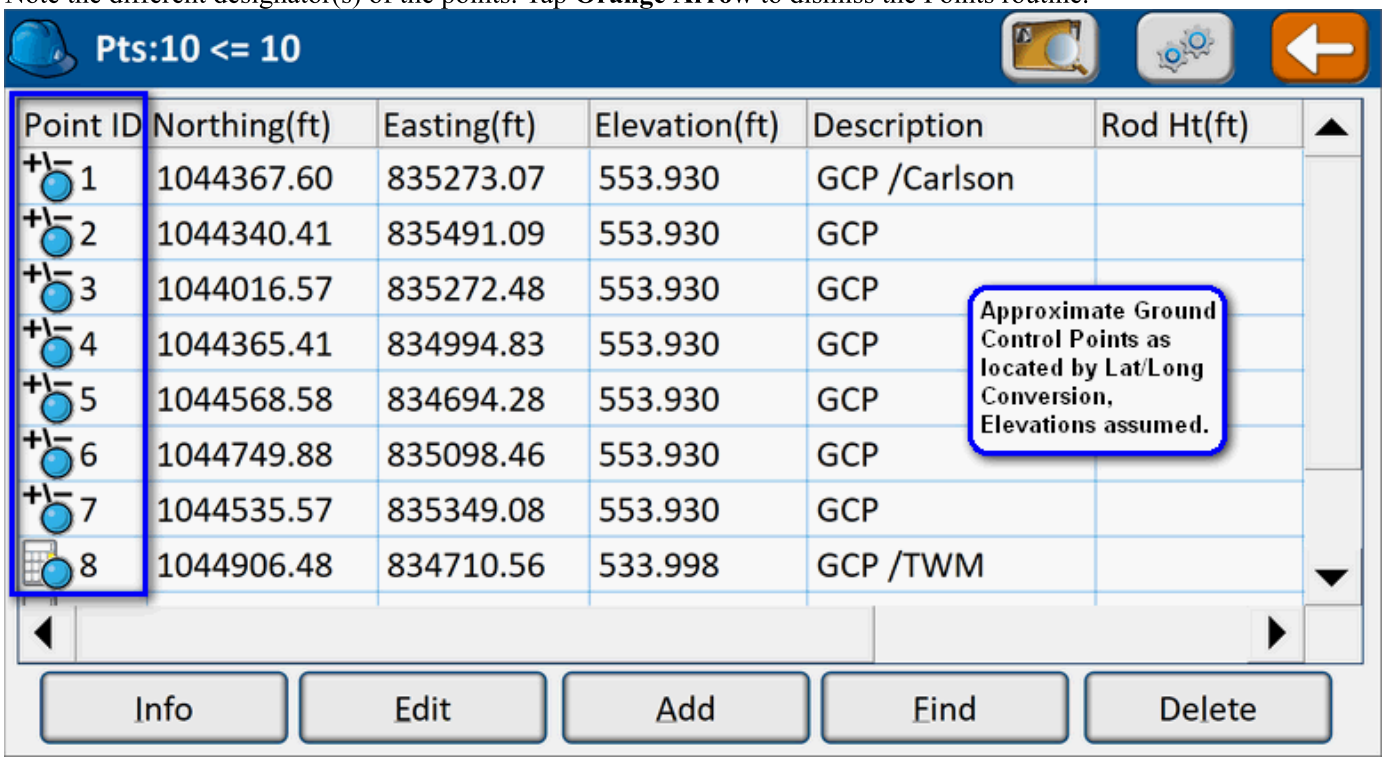
NOTE: Tap the *Next* button to establish a new point.

14. Repeat for each of the control locations making sure to specify the designated point description prior to storing the point:



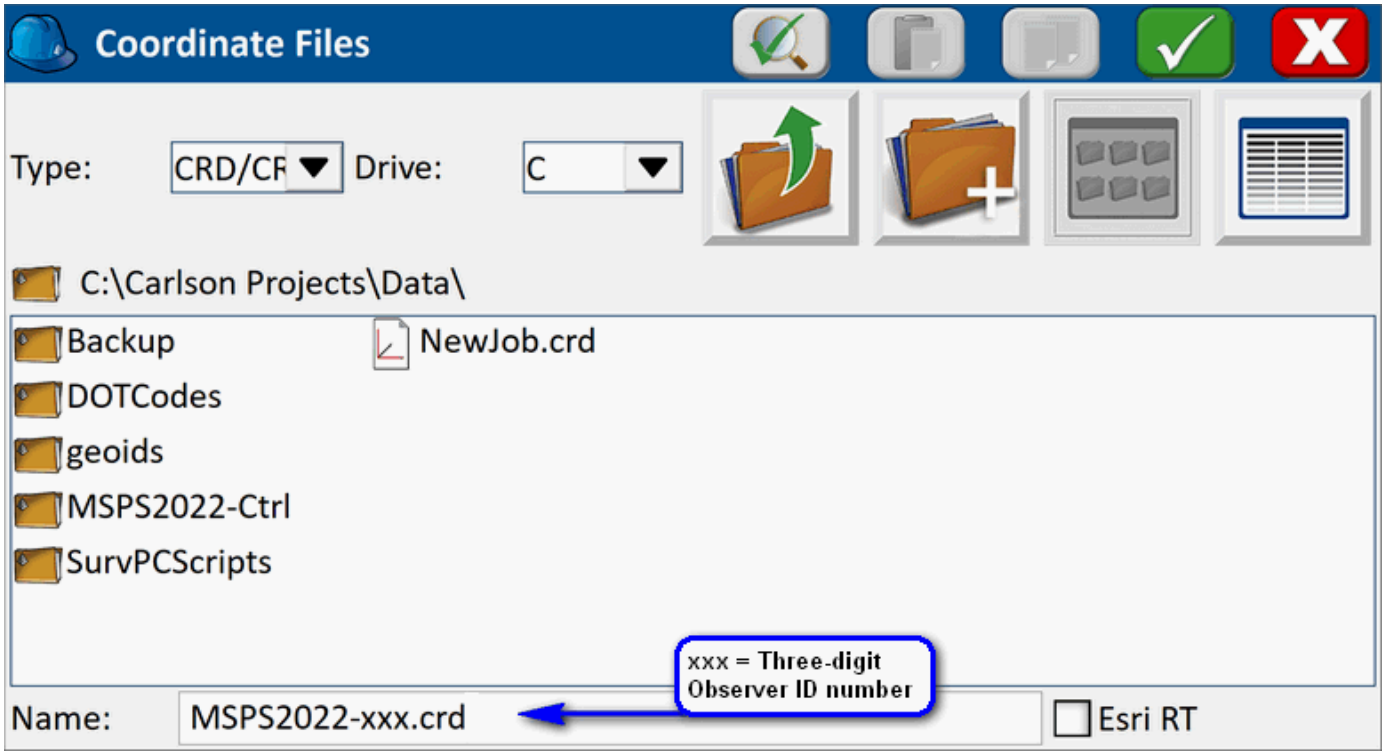
15. Let's review what we've established thus far. Locate the **Points** routine as shown below:

16. Note the different designator(s) of the points. Tap **Orange Arrow** to dismiss the Points routine.

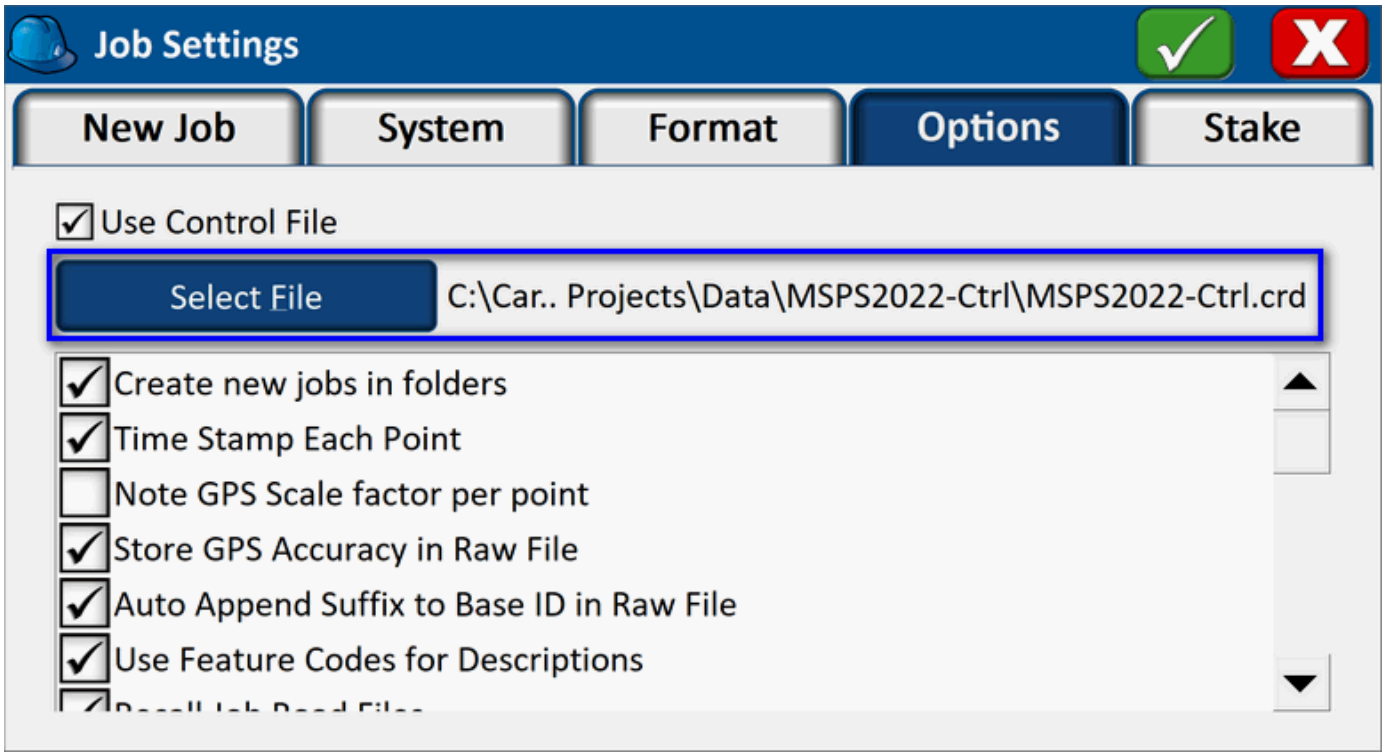


Working Job Creation/Equipment Initialization

1. From the **File** tab, tap button *1 Job* to create a new Job (this one to contain the locations you are measuring. Set a job name as indicated by the course instructions:



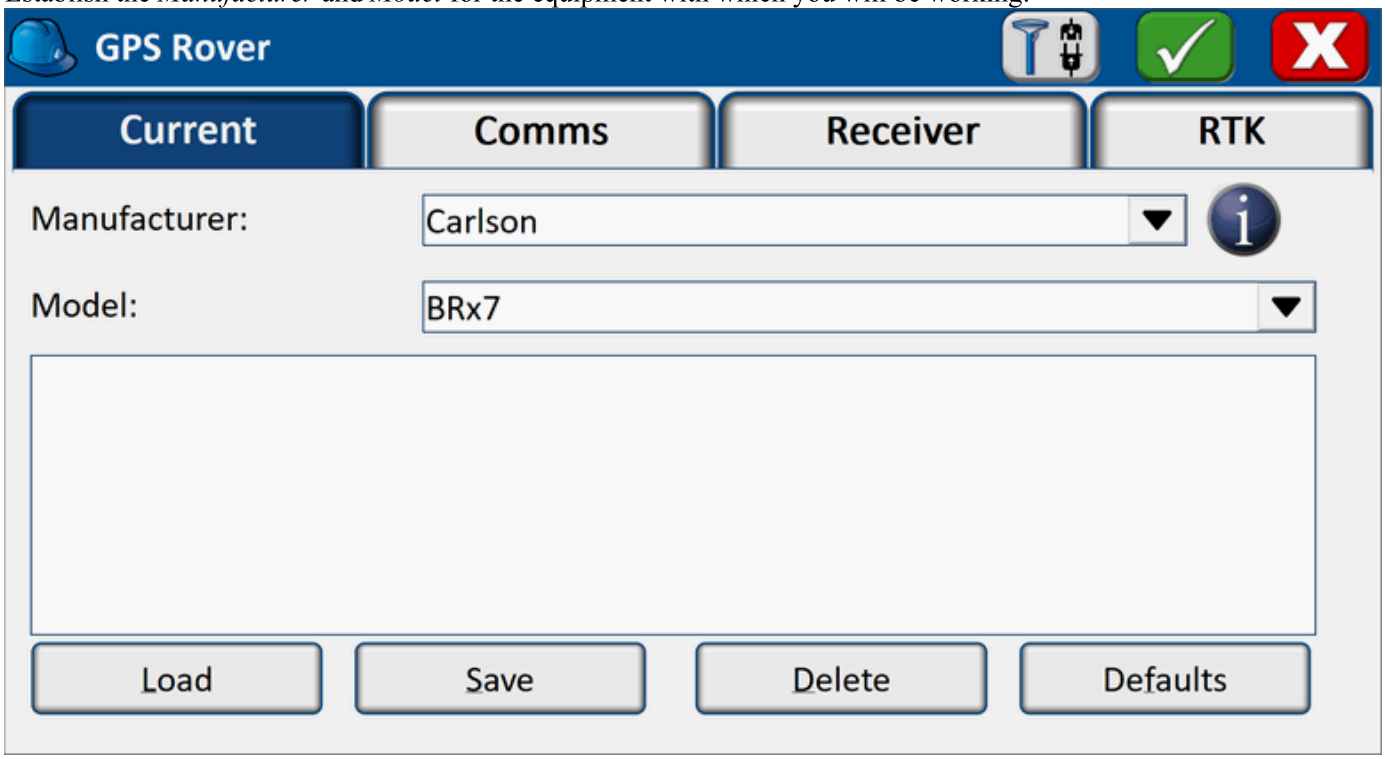
2. Continue with the review and establishment of any other settings making note to reference the previously created *Control* file:



3. Our next task will be to establish communications with our desired field equipment. Locate the **GPS Rover** routine as shown below:

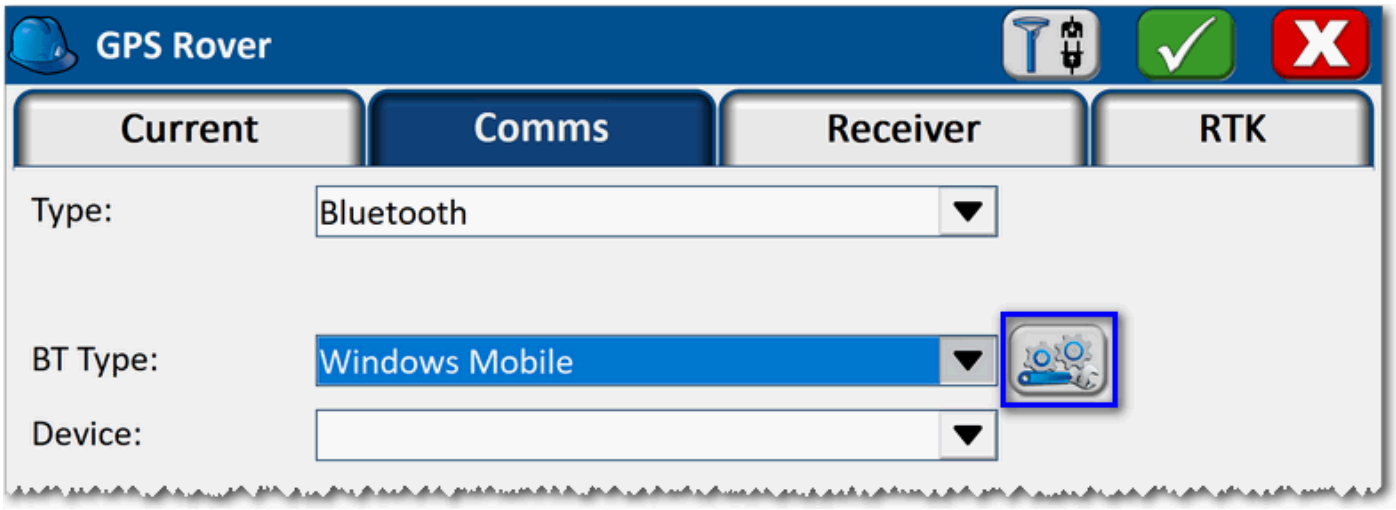
NOTE: If working with a traditional base/rover setup, you'll want to first use the **GPS Base** (similar setup instructions as GPS Rover).

4. Establish the *Manufacturer* and *Model* for the equipment with which you will be working:

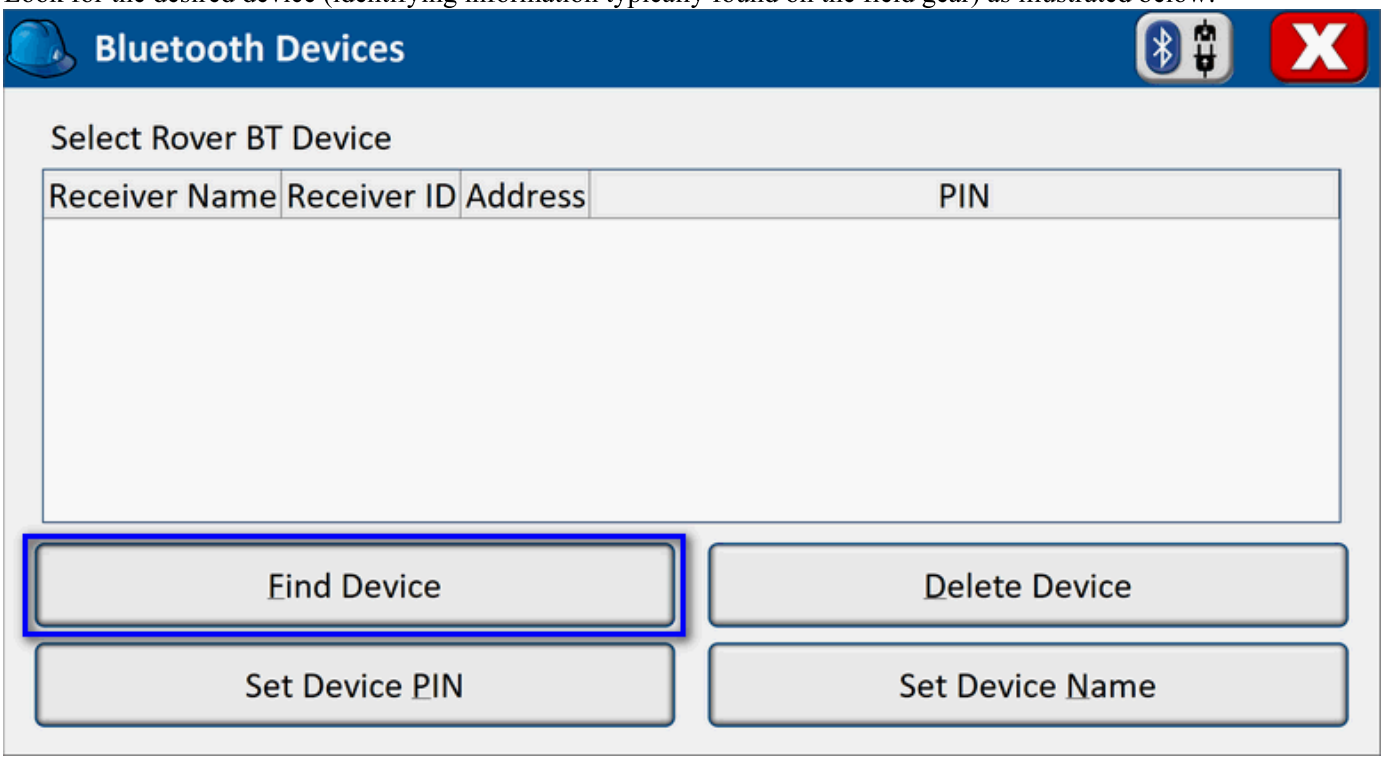


Activate the *Comms* (Communications) tab.

5. If this is the initial setup for the equipment, establish the desired communication type (generally, Bluetooth) and tap the "Wrenches" button as illustrated:

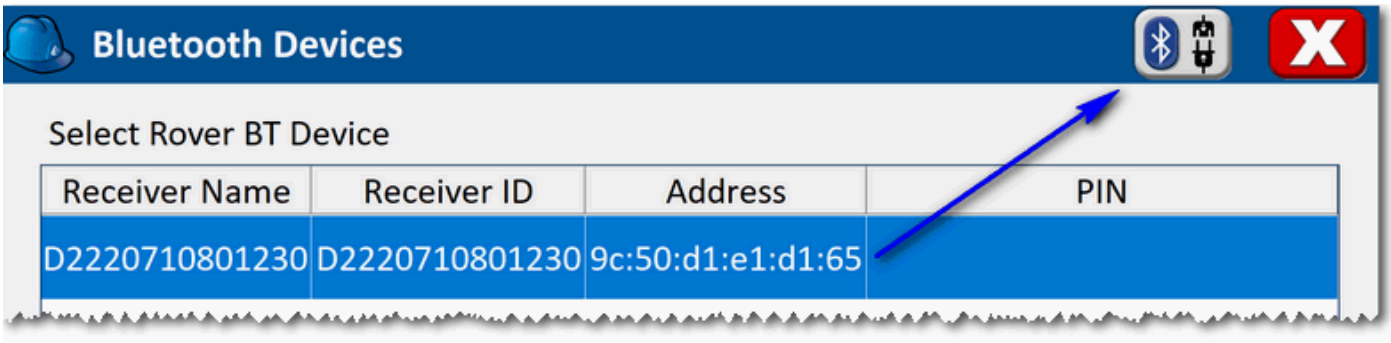


6. Look for the desired device (identifying information typically found on the field gear) as illustrated below:



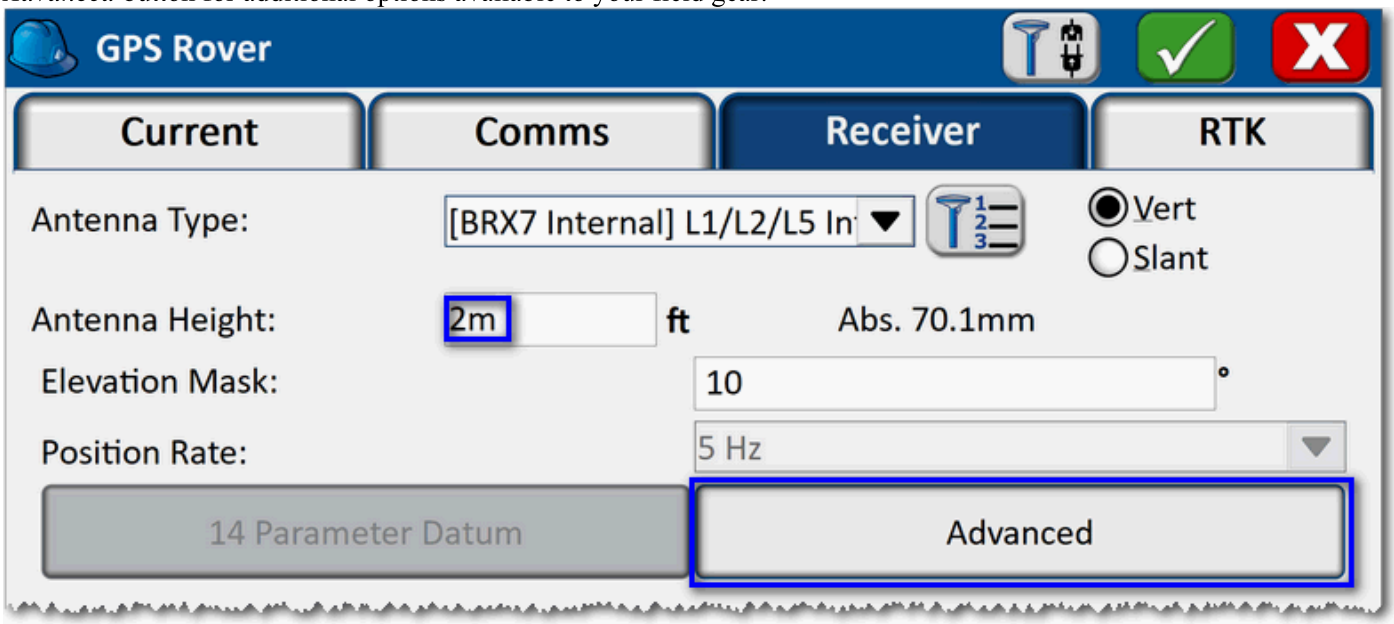
7. Once the desired field gear item has been found (the *Find Device* may need to be run a second time in "noisy" Bluetooth areas), select/highlight the device and tap **Green Check**:

8. The device will be added to the list of desired devices. Select/highlight the device and tap **Bluetooth Connect**: button to pair the controller to the field equipment:

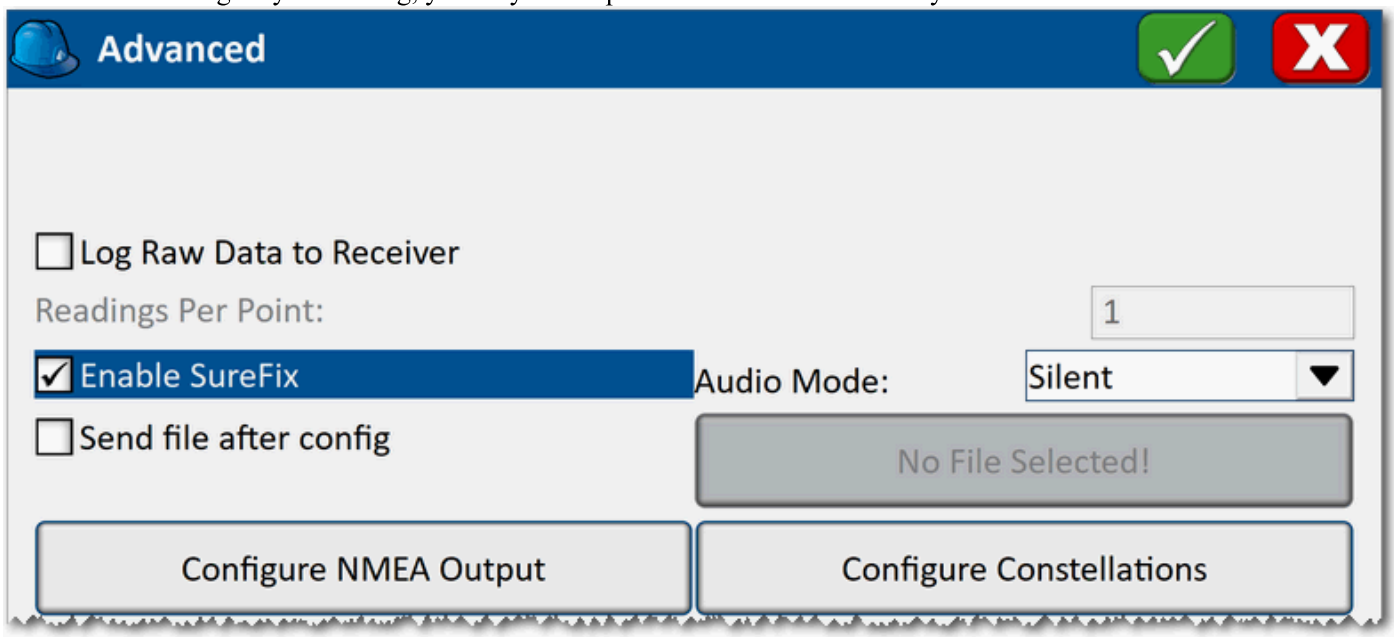


Upon a successful pairing, activate the *Receiver* tab.

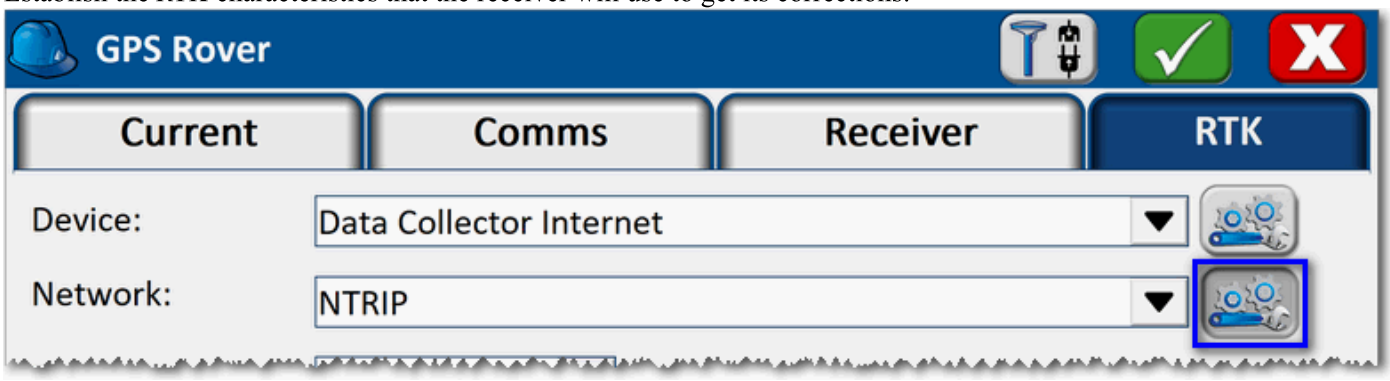
9. Verify and set the desired values. **NOTE**: If using a metric-based pole height (typically as measured from the pole tip to the bottom side of the receiver), you can indicate the metric value and apply a label (*e.g.* m = meters, mm = millimeters, " = inches, ft = feet, *etc*) and even equations (*e.g.* 2m + 40mm) if additional items (e.g. quick-disconnects) are part of the pole height. Switching focus from the field will compute the value in the customary units for the current job. Tap the *Advanced* button for additional options available to your field gear:



10. Based on the field gear you're using, you may have options for additional accuracy checks as illustrated below:

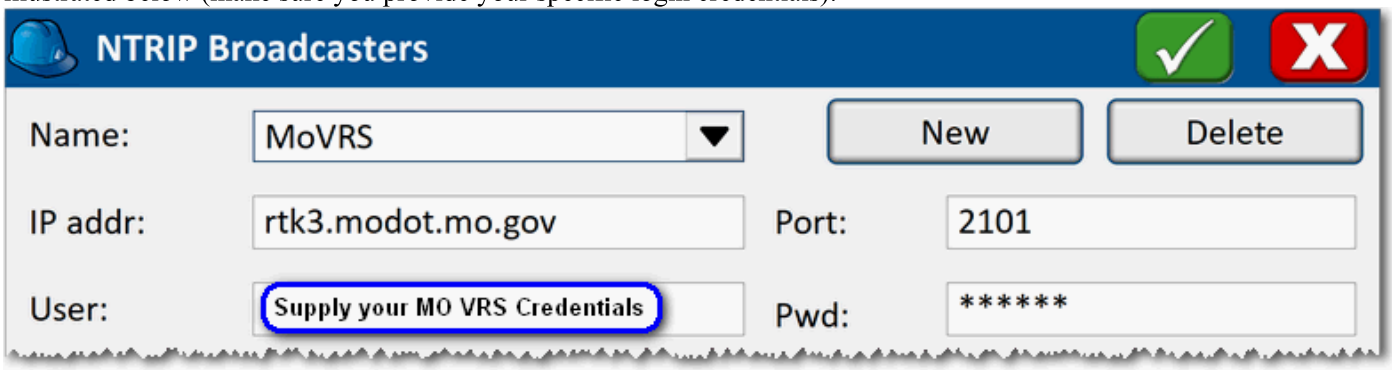


11. Establish the *RTK* characteristics that the receiver will use to get its corrections:

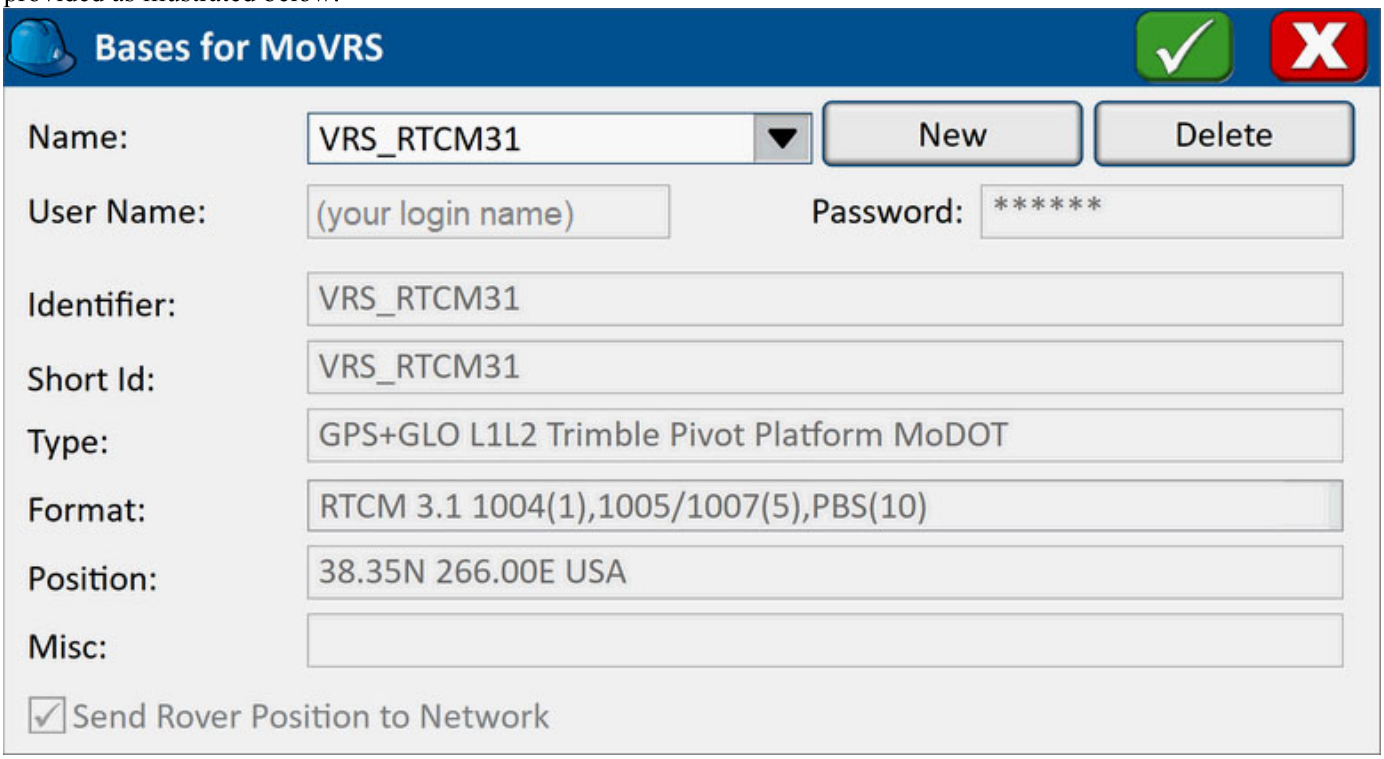


NOTE: The following section presumes MoDOT VRS credentials have been established (you may register for the service at https://gpsweb3.modot.mo.gov/).

12. If a desired NTRIP provider has not already been established, create a *New* set of NTRIP Broadcaster credentials as illustrated below (make sure you provide your specific login credentials):



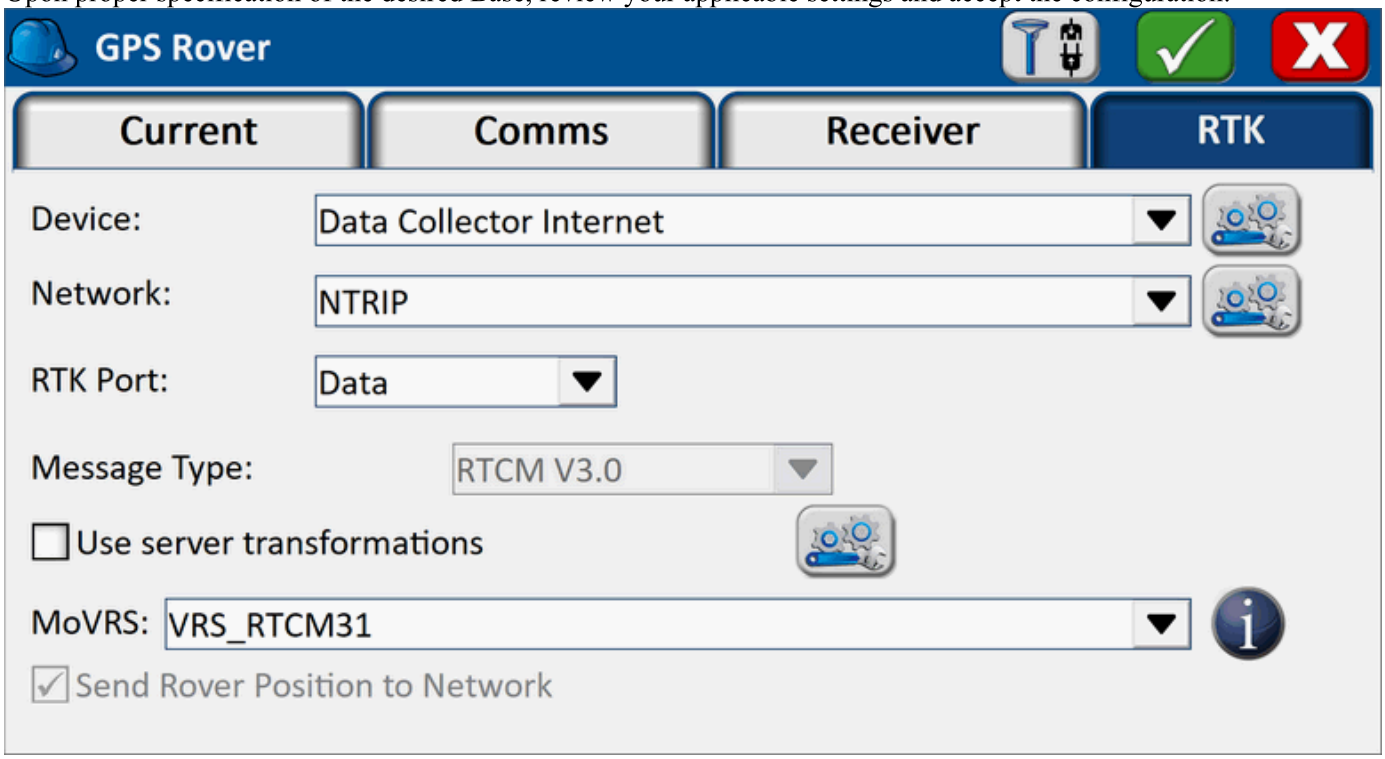
13. Upon successful creation, authentication and accessing of the NTRIP Broadcaster, an available list of *Bases* will be provided as illustrated below:



NOTE: It is generally advisable to utilize a Base in the following preferred order of availability:

1. **RTCM 3.2**: GPS (including L5)+GLO+GAL+BDS
2. **RTCM 3.1**: GPS+GLO
3. **RTCM 2.3**: GPS Only

14. Upon proper specification of the desired Base, review your applicable settings and accept the configuration:

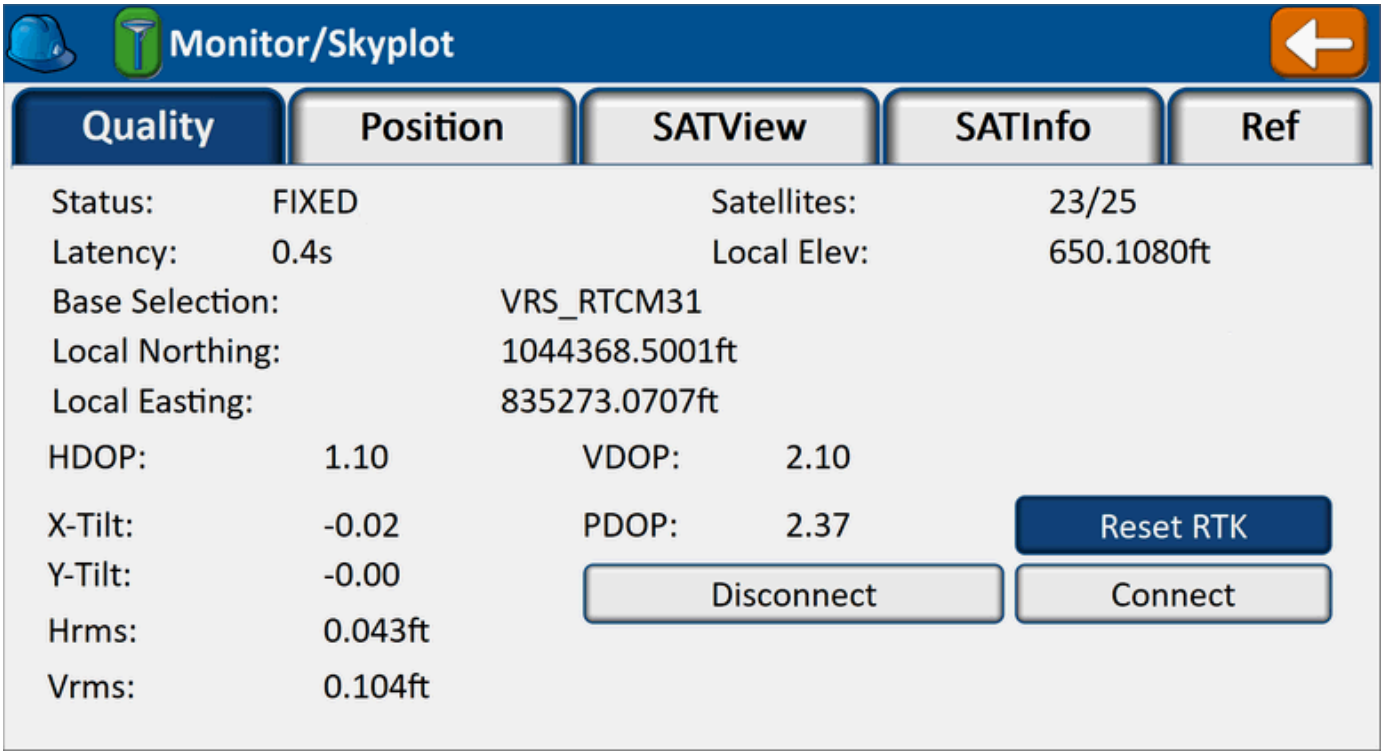


NOTE: Once set, these values will be retained as default values for subsequent uses of the equipment.

Equipment Configuration

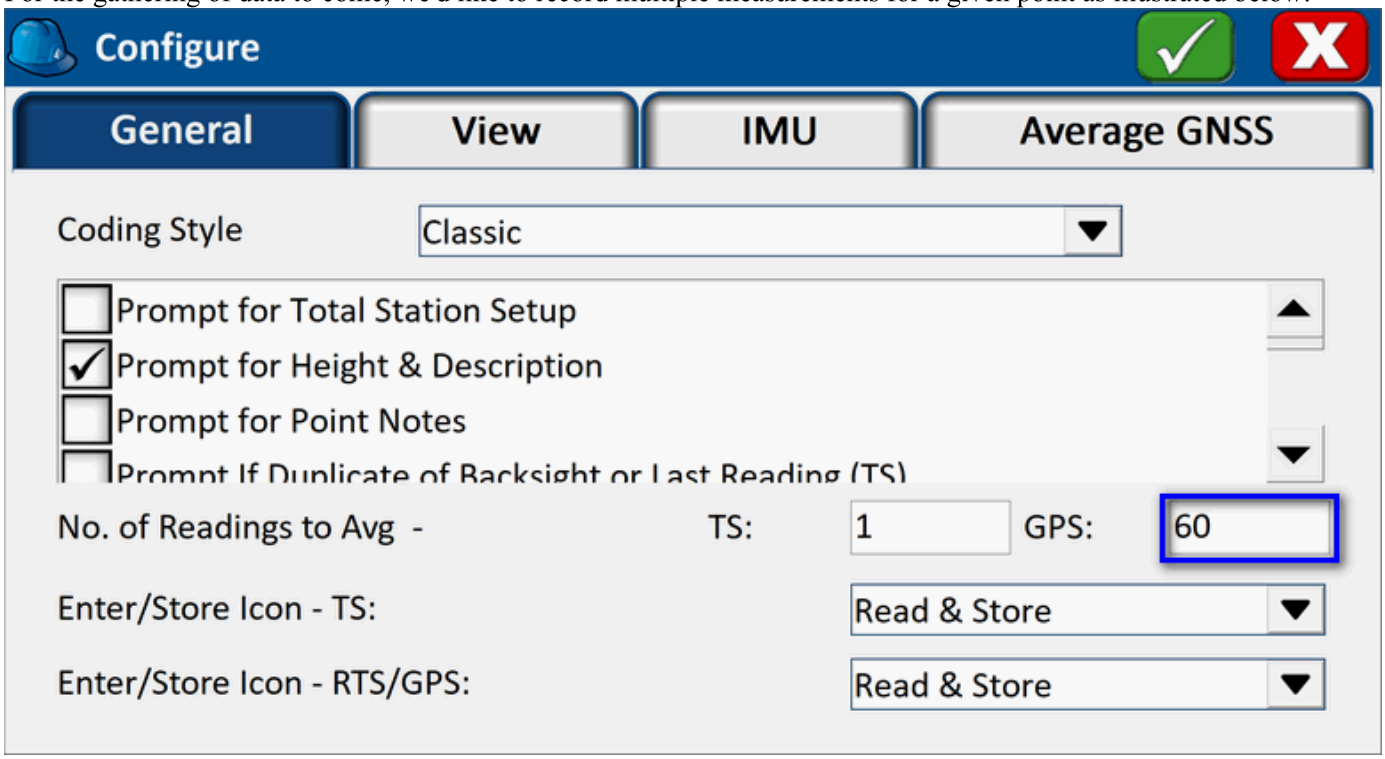
1. Once complete, it is a recommended practice to ensure the receiver is able to obtain at least a **Fixed** GNSS solution prior to performing any work. Tap the *Monitor/Skyplot* button as illustrated below to check the current GNSS status:

2. Within *Monitor/Skyplot*, common items of interest include:
   - **Status**: The accuracy solution of the receiver (should be **Fixed** or **SureFixed**)
   - **Latency**: The age of the RTK correction (latency values greater than 5 seconds may indicate Internet connectivity problems or radio interference issues)
   - **HRMS**: Horizontal Root Mean Squared accuracy, 1-sigma (68%); essentially, expected horizontal error
   - **VRMS**: Vertical Root Mean Squared accuracy, 1-sigma (68%); essentially, expected vertical error

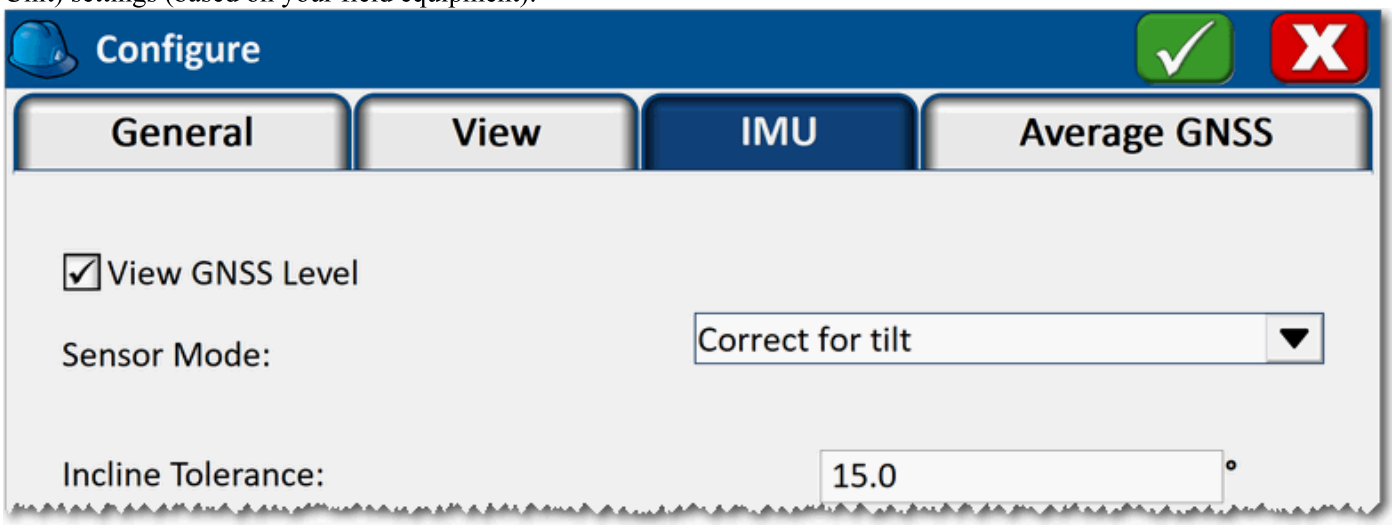


3. Once a **Fixed** GNSS solution has been attained, let's set some other useful values. From the Main menu, tap *Configure* as illustrated below:

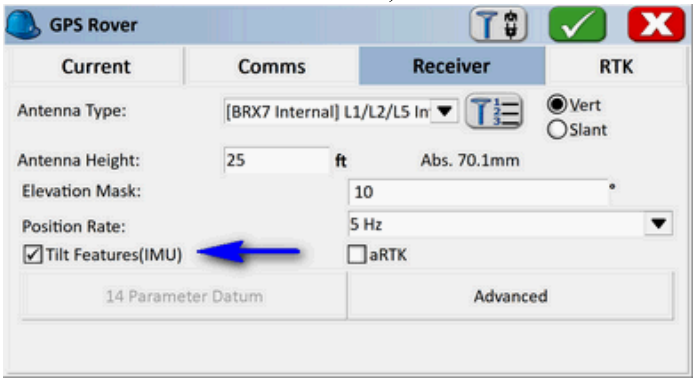
4. For the gathering of data to come, we'd like to record multiple measurements for a given point as illustrated below:



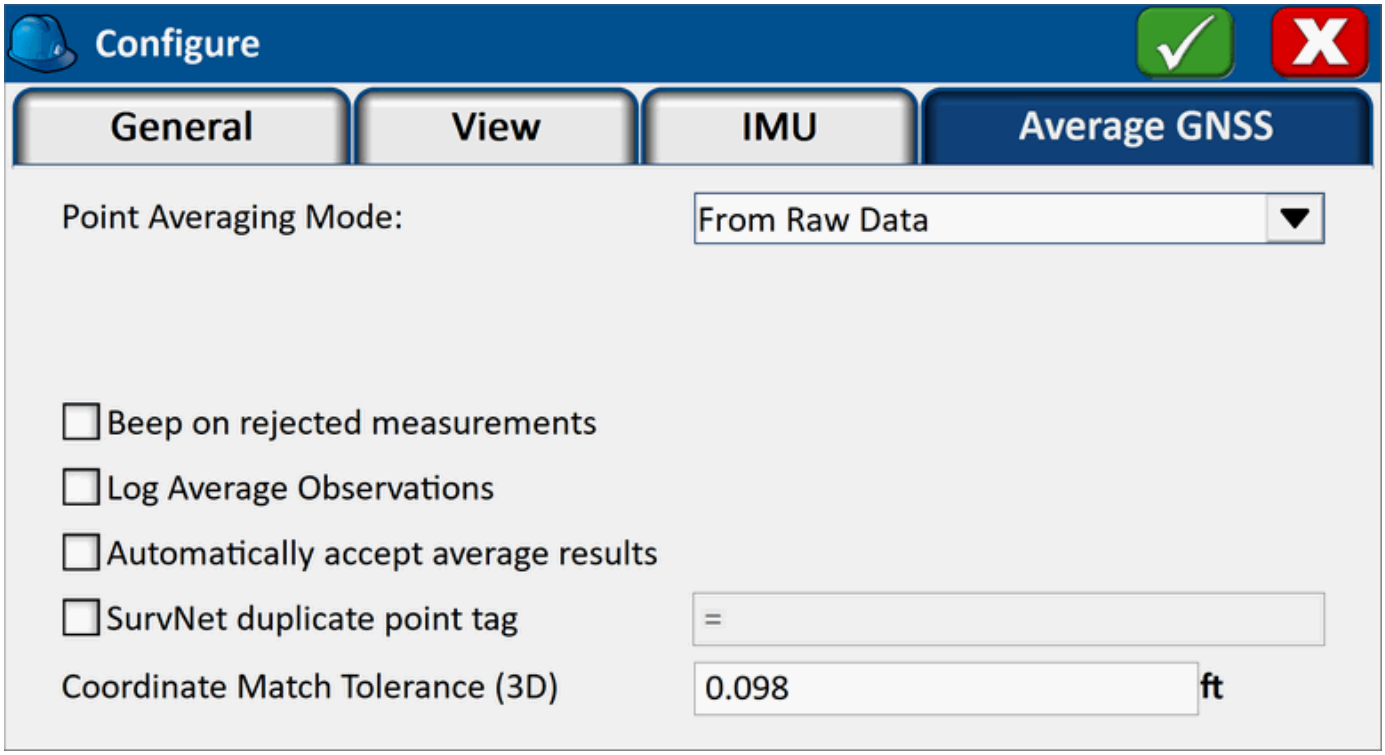
5. (*Optional*) Based on your desired use of correction for tilted-pole, indicate your preferred *IMU* (**I**nertial **M**easurement **U**nit) settings (based on your field equipment):



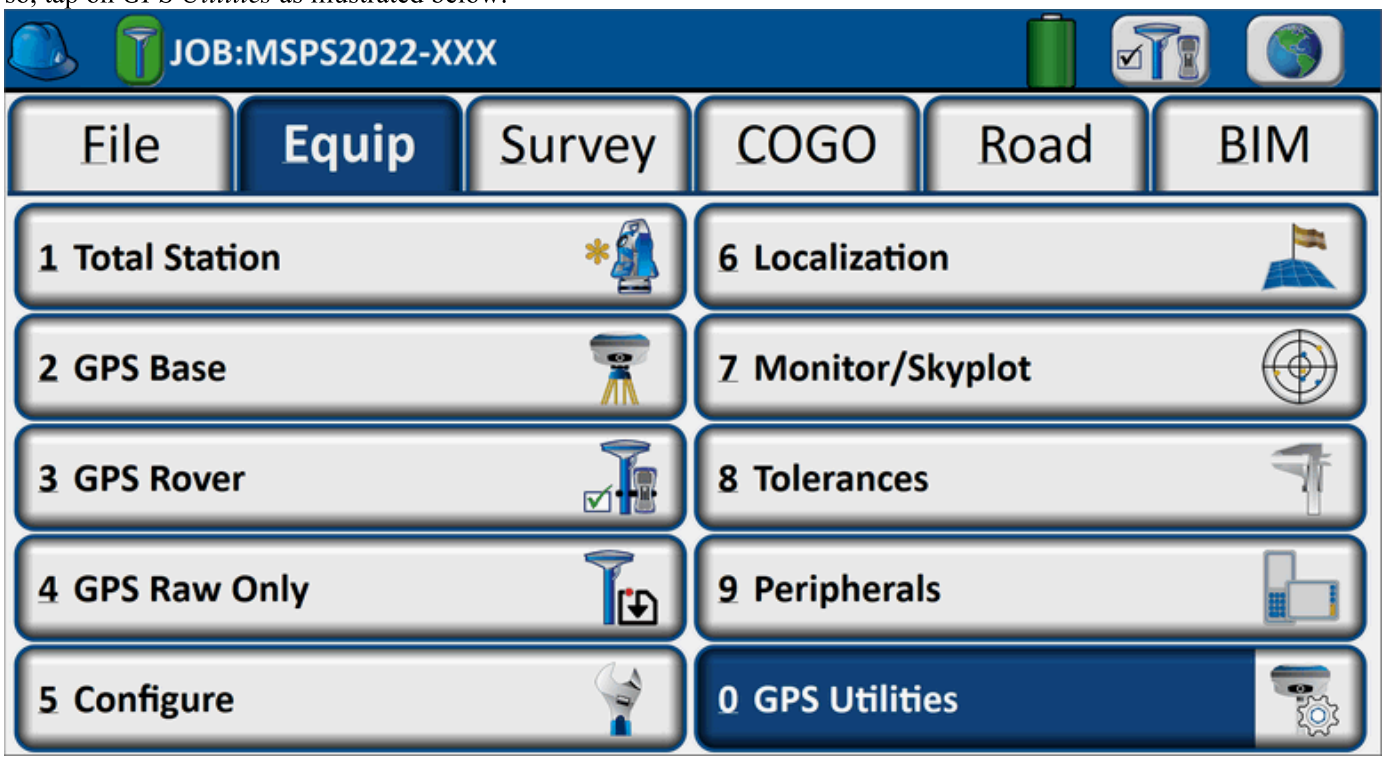
NOTE: In SurvPC 6.x and earlier, locate this feature under Equip → GPS Rover → Receiver tab:



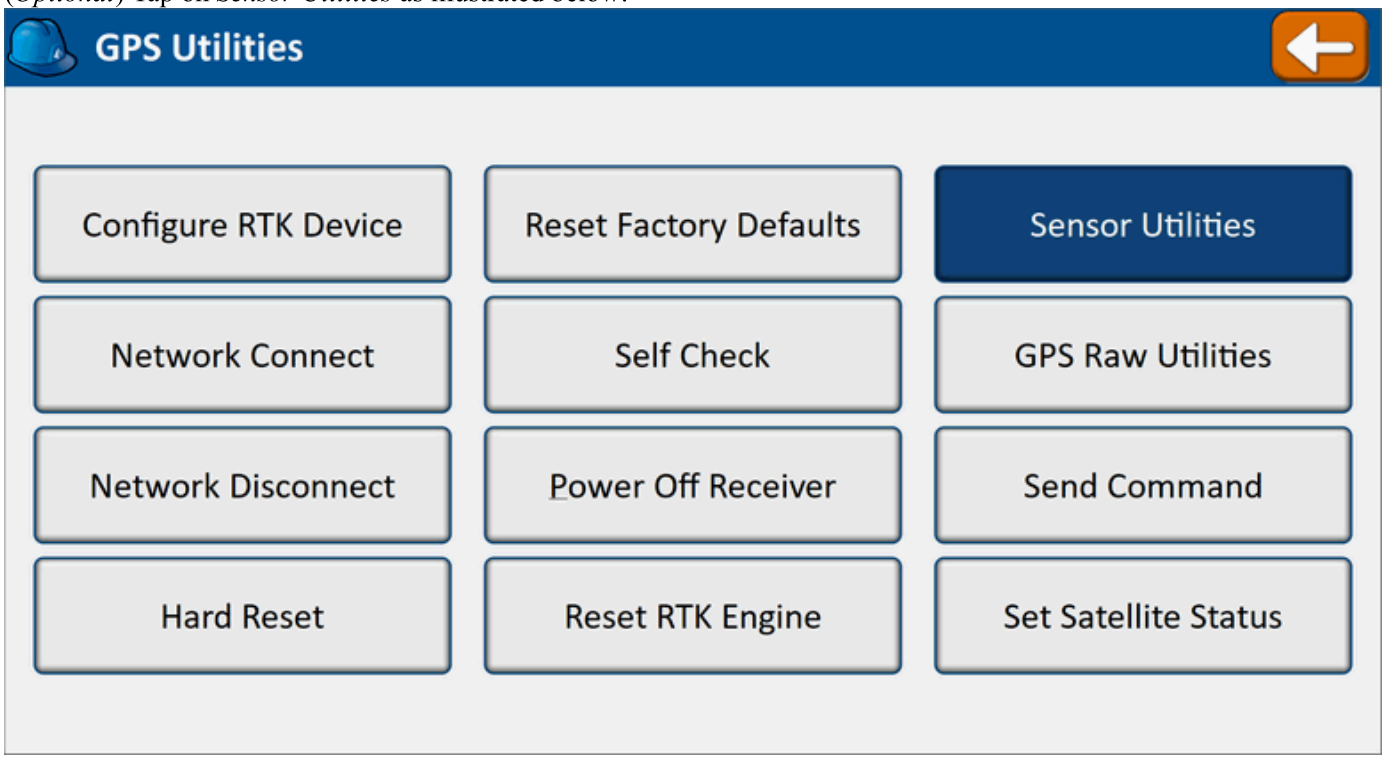
6. As you are likely going to be averaging your measurements to obtain a coordinate, set/review the *Average GNSS* settings:



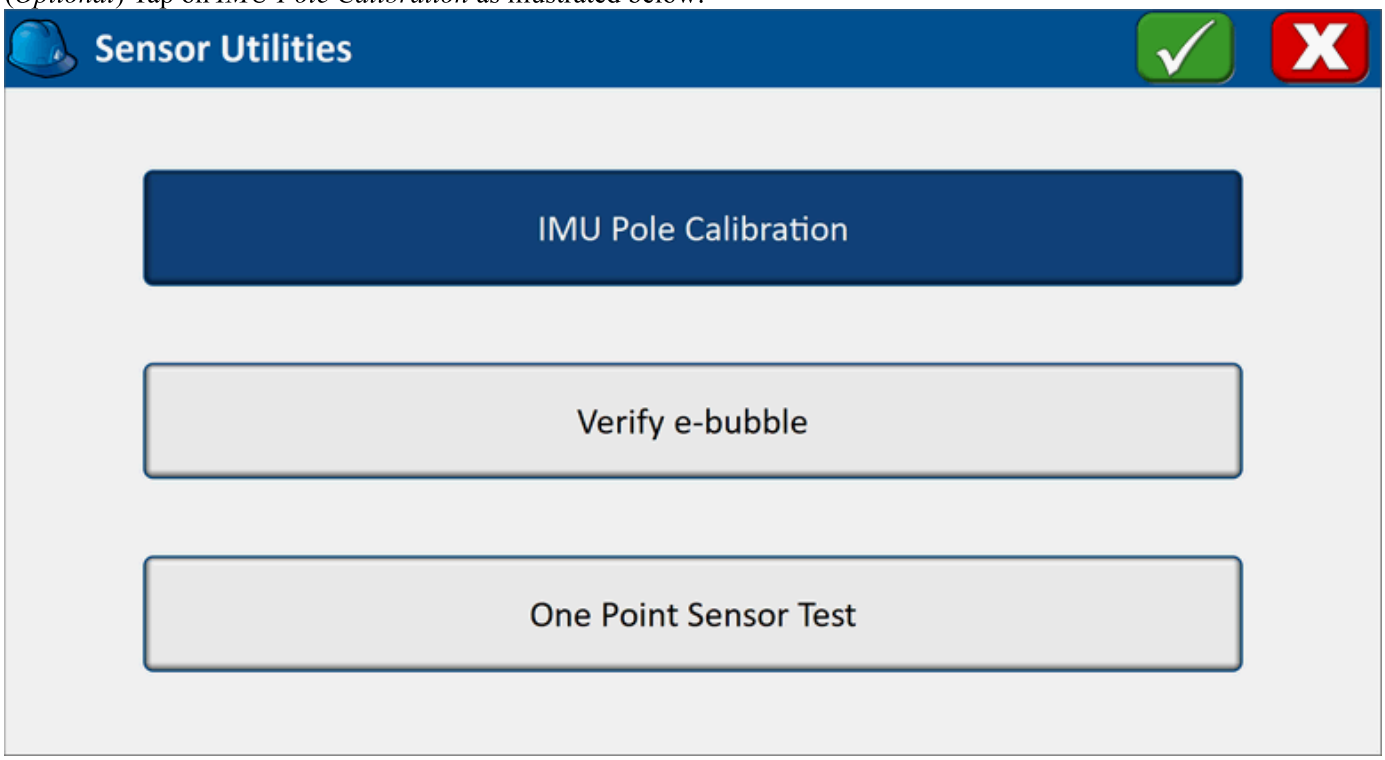
7. (*Optional*) Based on your desired use of correction for tilted-pole, you may want to perform an IMU Pole Calibration. If so, tap on *GPS Utilities* as illustrated below:



8. (*Optional*) Tap on *Sensor Utilities* as illustrated below:



9. (*Optional*) Tap on *IMU Pole Calibration* as illustrated below:

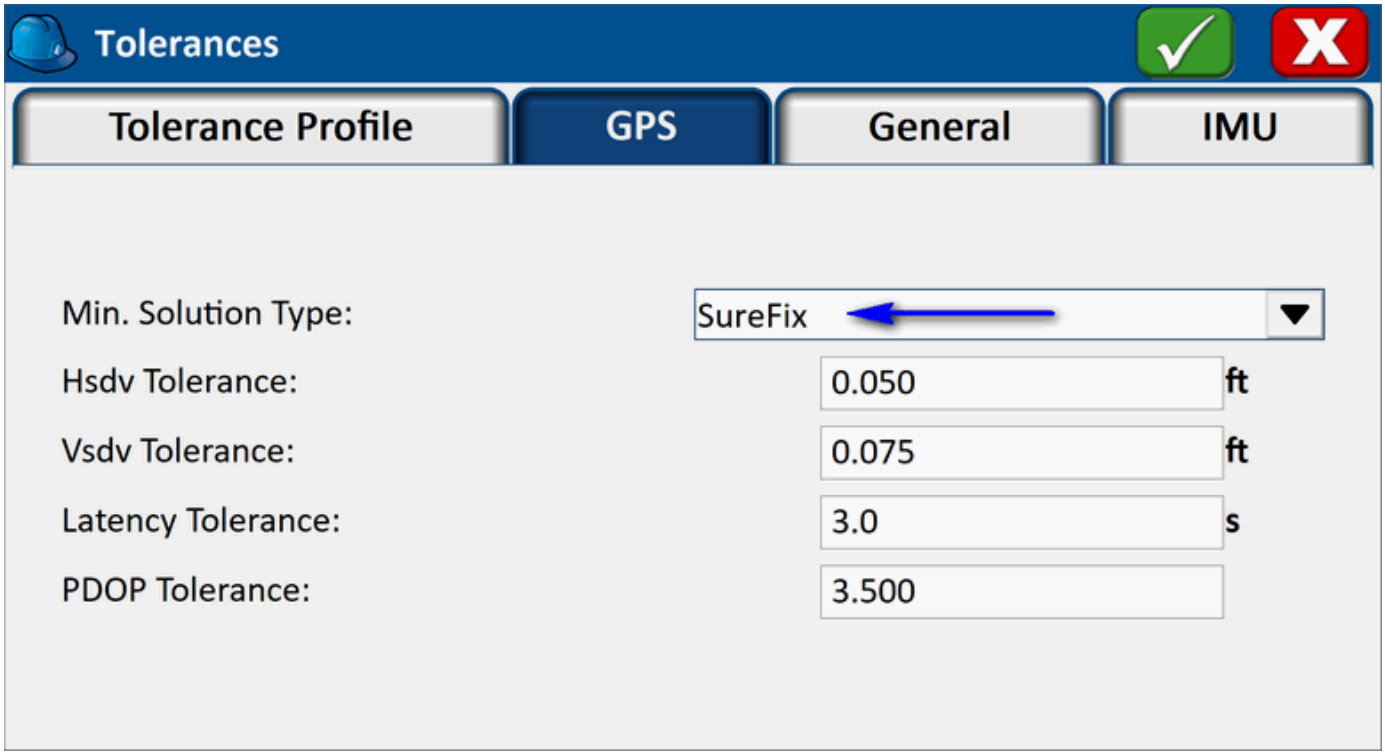


NOTE: Refer to https://web.carlsonsw.com/files/knowledgebase/kbase05.php?action=display_topic&topic_id=1198 for additional information regarding IMU calibration.

Measurement Tolerances and Aides

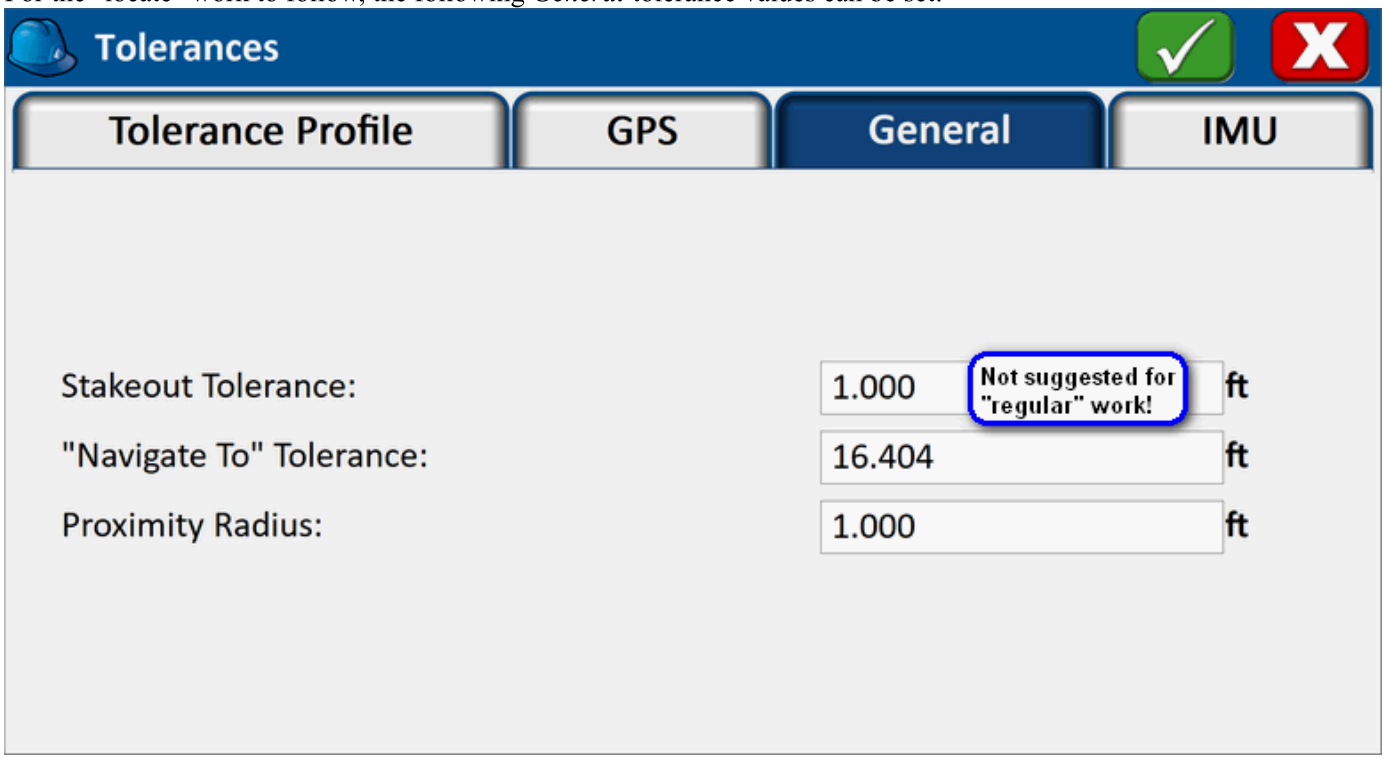
1. Our next task will be to review and set applicable *Tolerances* as accessed below:

2. Based on the brand/model of equipment, you will typically want to employ the highest *Solution Type* (*aka* Fix Quality) as illustrated below:

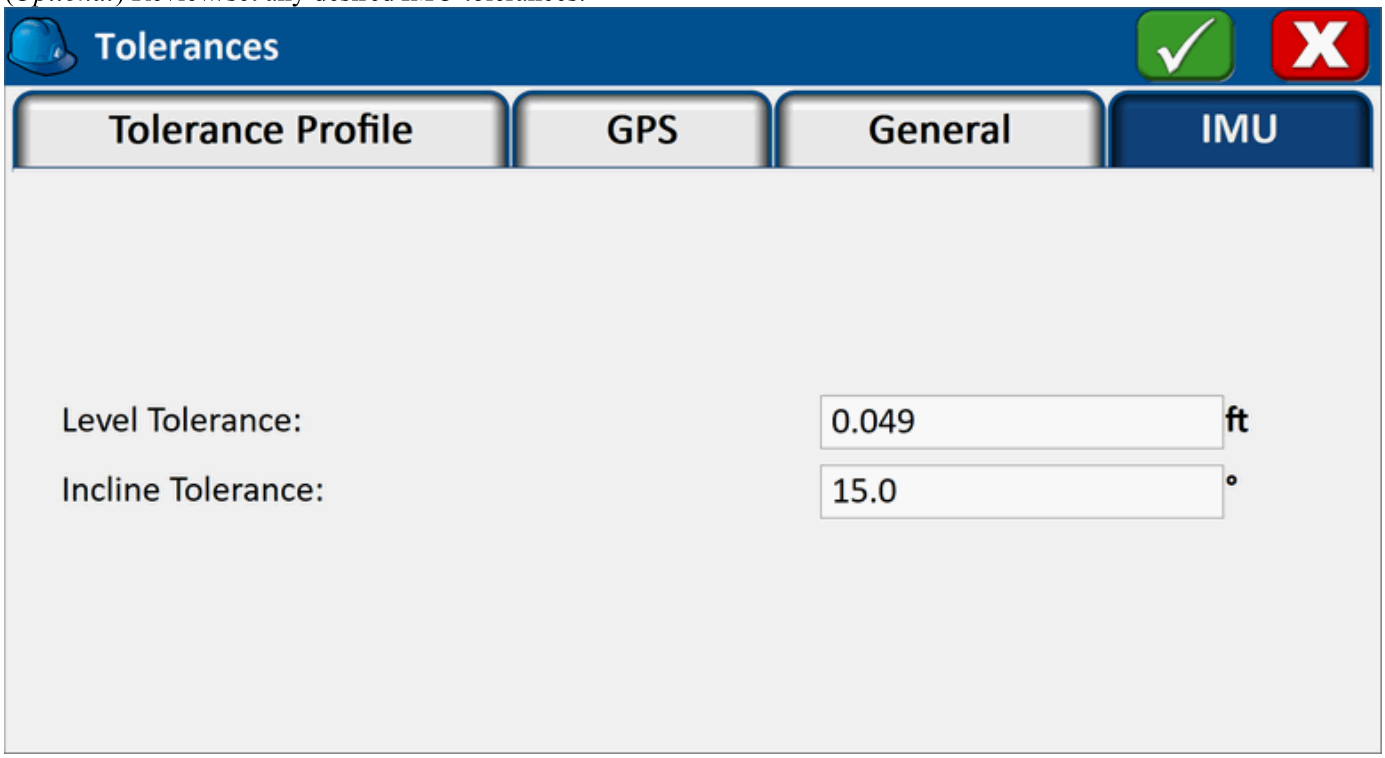


Set other desired maximum tolerances as suggested above.

3. For the "locate" work to follow, the following *General* tolerance values can be set:



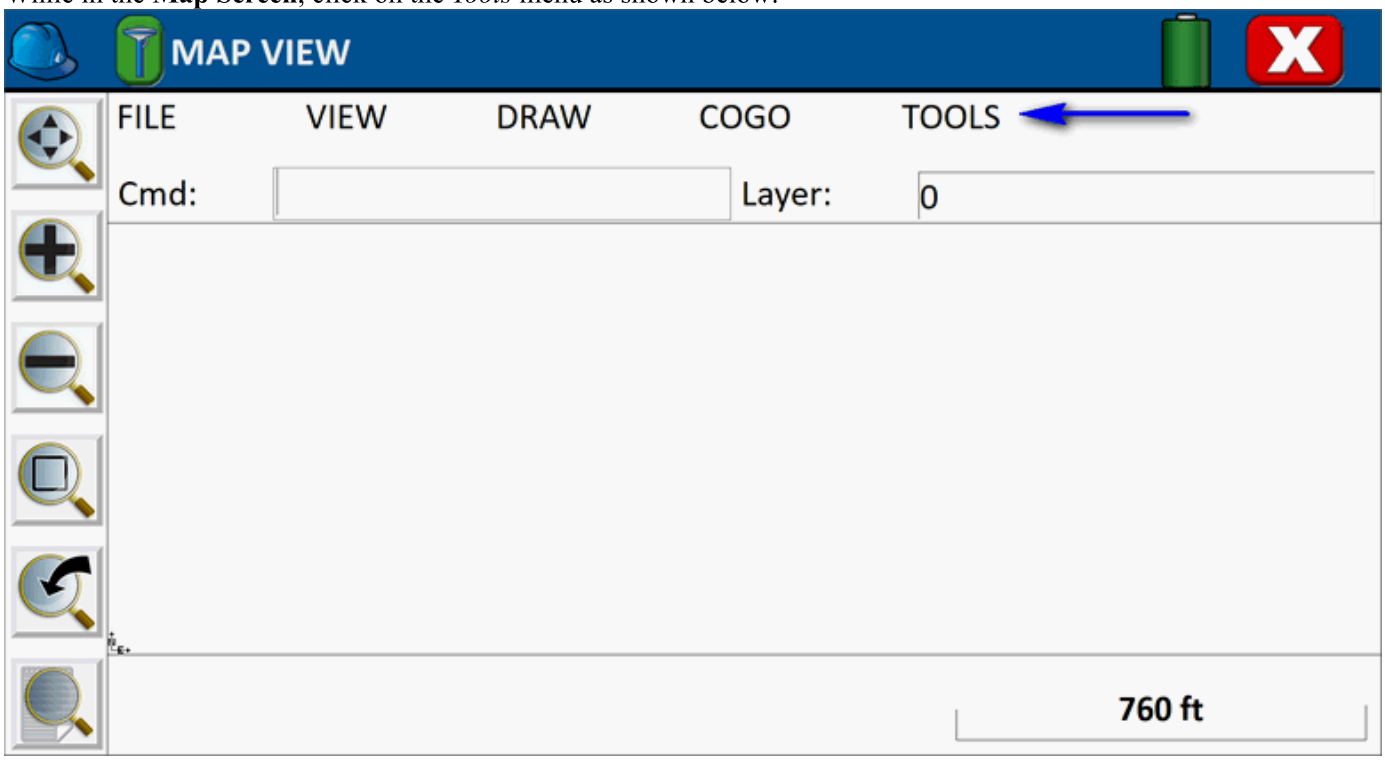
4. (*Optional*) Review/set any desired *IMU* tolerances:



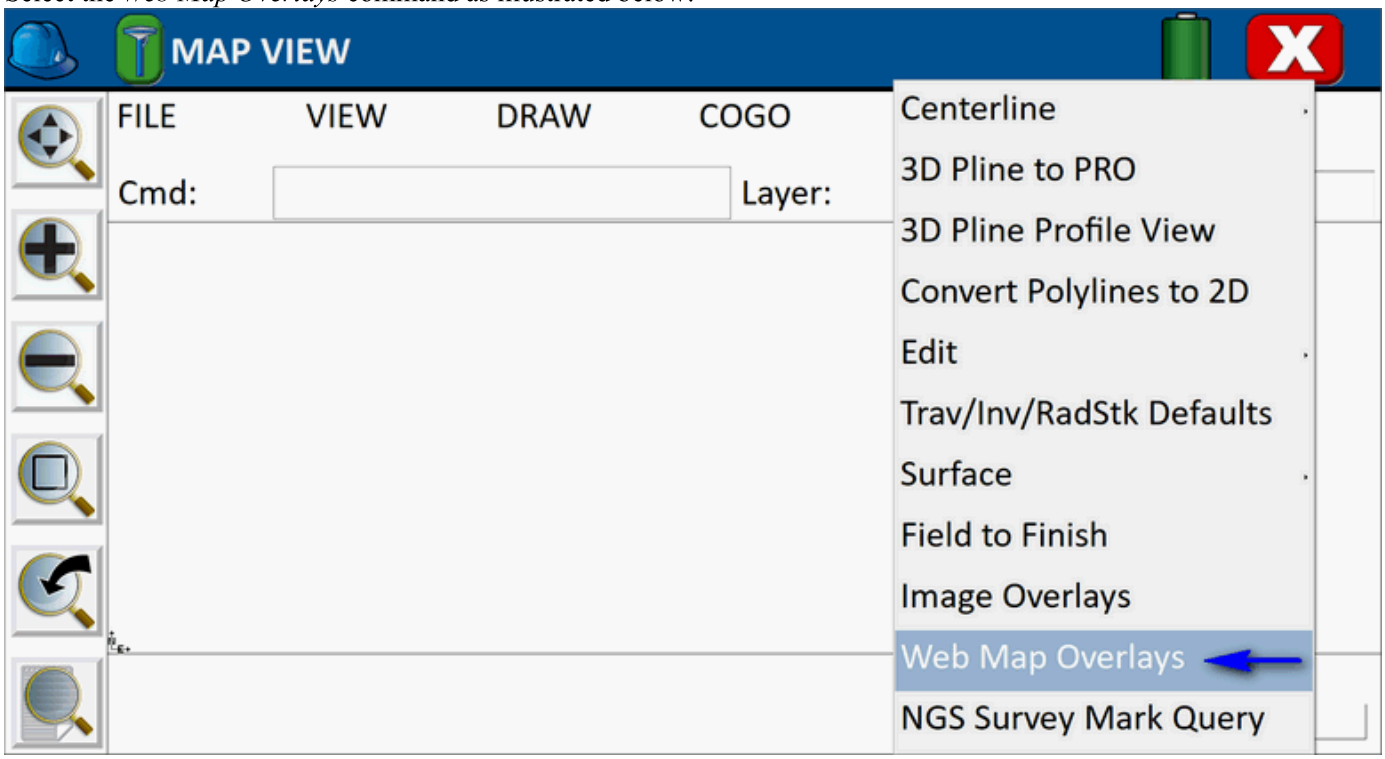
NOTE: Upon completion of these desired tolerances, they can be saved into a named **Tolerance Profile** for quick re-use in other similar projects.

5. (*Optional*) In the event you'd like to see background imagery (*e.g.* from on-line source such as Google to aid with navigation), you might consider enabling the option through the use of the *Map* screen as illustrated below:

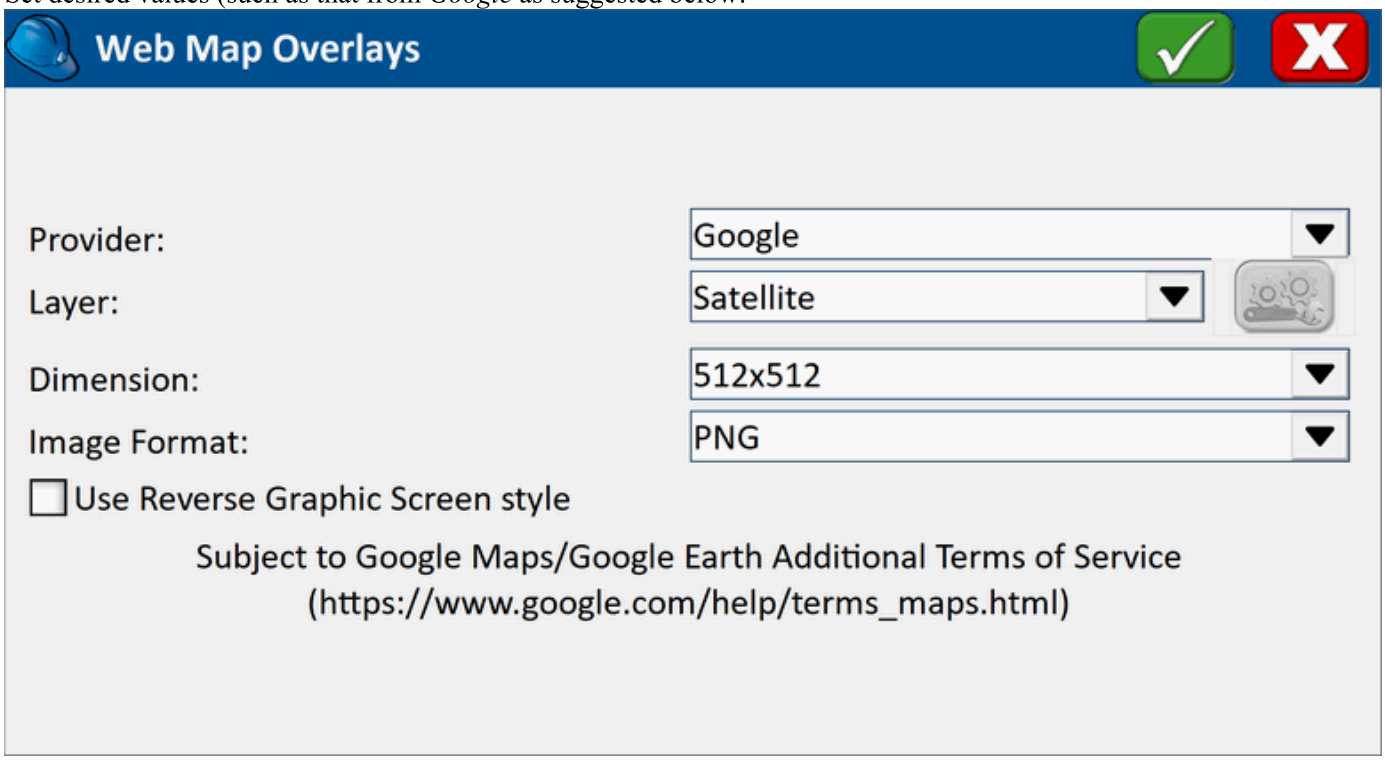
6. While in the **Map Screen**, click on the *Tools* menu as shown below:



7. Select the *Web Map Overlays* command as illustrated below:



8. Set desired values (such as that from *Google* as suggested below:

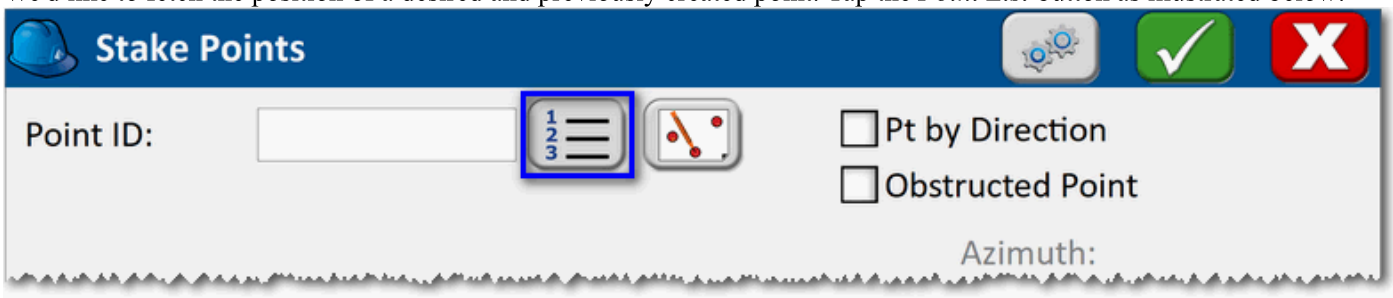


NOTE: For large coverage areas (being excessively "zoomed" out) or for slow/poor internet connection speeds, it may take several seconds or minutes for the imagery to appear.

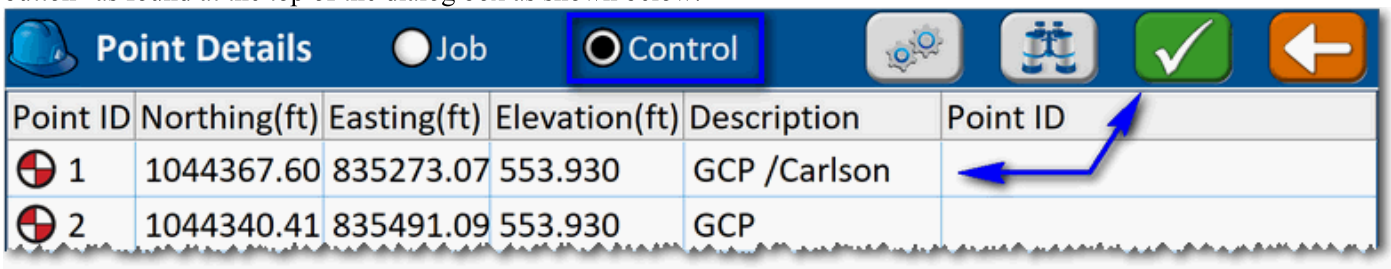
Locating Points

1. We should now have the basics established for the gathering of our data. Let's locate our course points and take readings where we find them to be. Issue the *Stake Points* command as shown below:

2. We'd like to fetch the position of a desired and previously created point. Tap the *Point List* button as illustrated below:

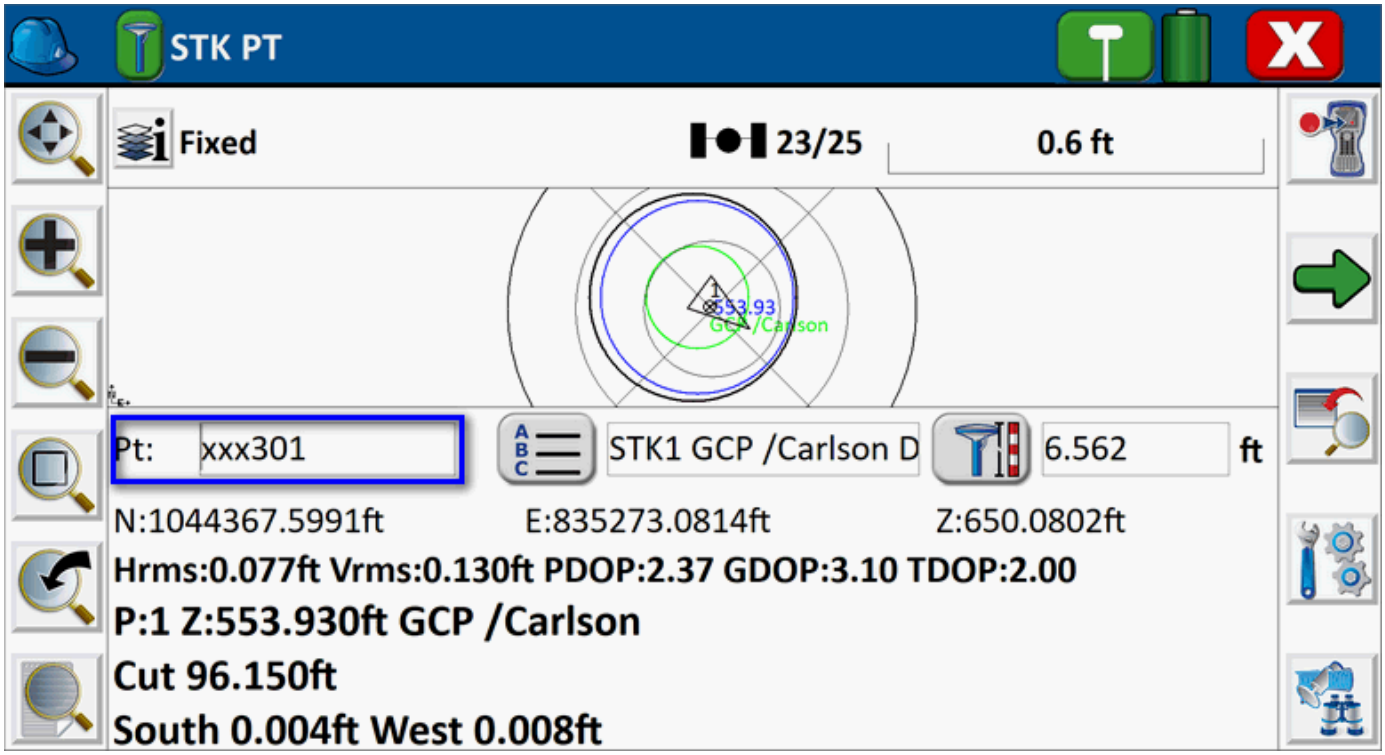


3. Since our desired point is housed within an external and referenced *Control* file, set the applicable **Control** source "radio button" as found at the top of the dialog box as shown below:



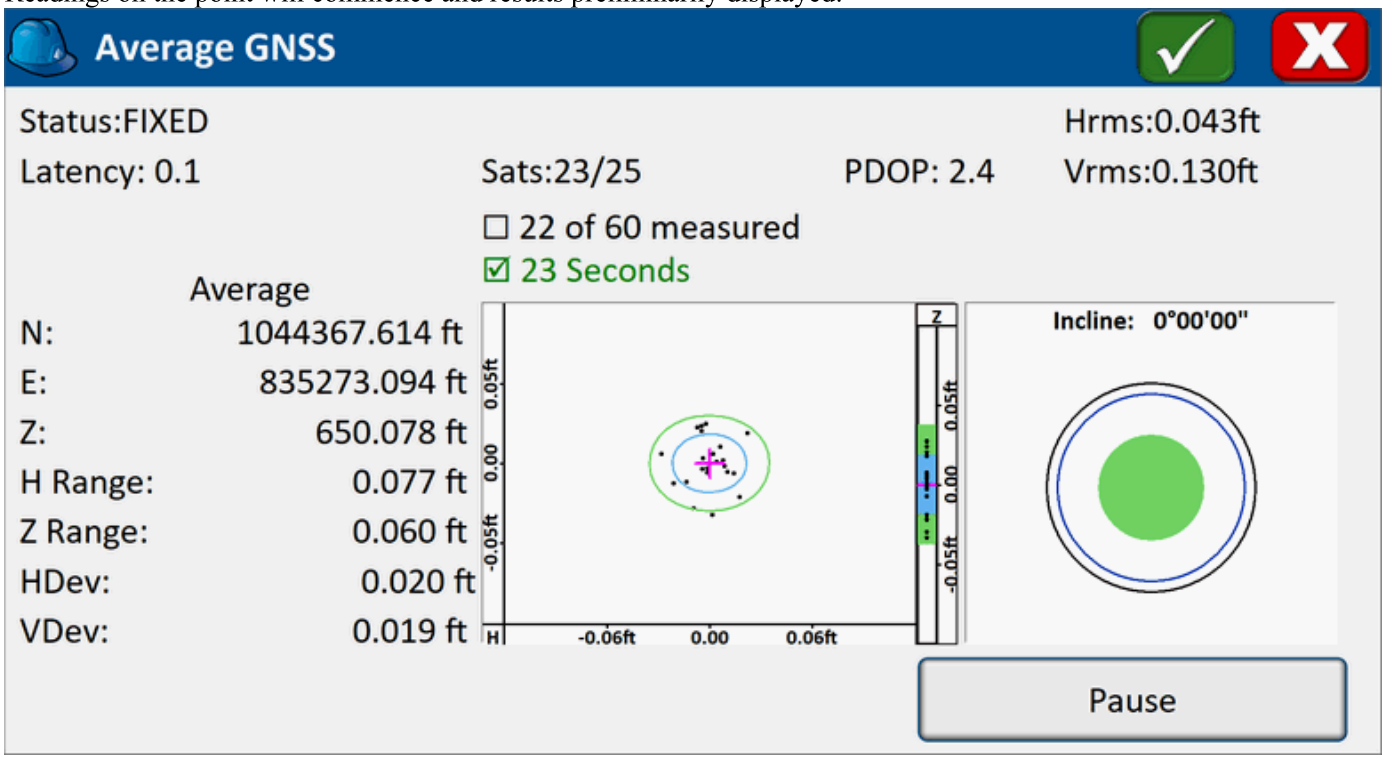
Highlight/select the desired point from the list and tap *Green Check*.

4. You will be provided with relative directions on where the desired point is in relation to where the receiver is. Navigate to the point and establish the GNSS receiver over the point when located:

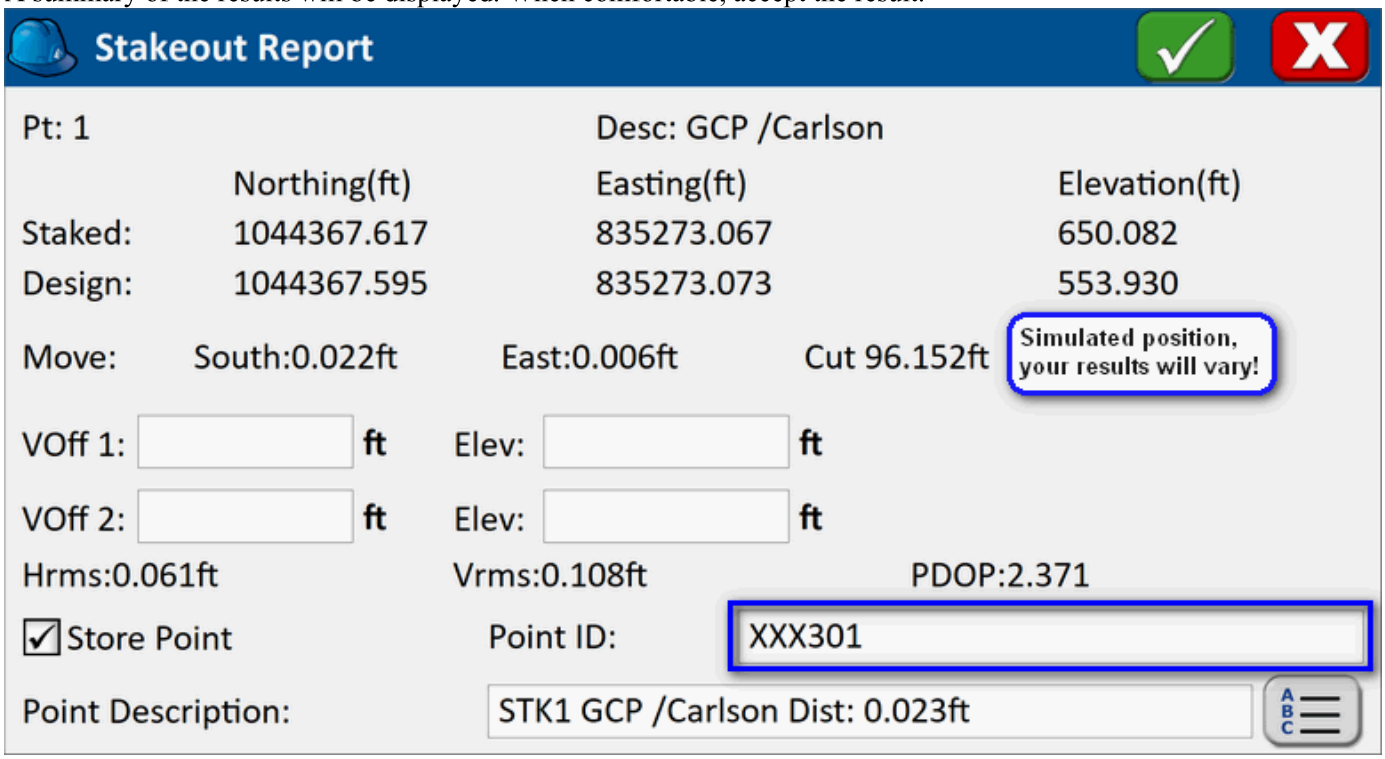


NOTE: Make sure to override the default **Point Number** with the pertinent point number syntax as provided for the course. When ready, initiate readings with the "*Store Point*" button (data collector with red dot toward the upper right of the interface).

5. Readings on the point will commence and results preliminarily displayed:



6. A summary of the results will be displayed. When comfortable, accept the result.

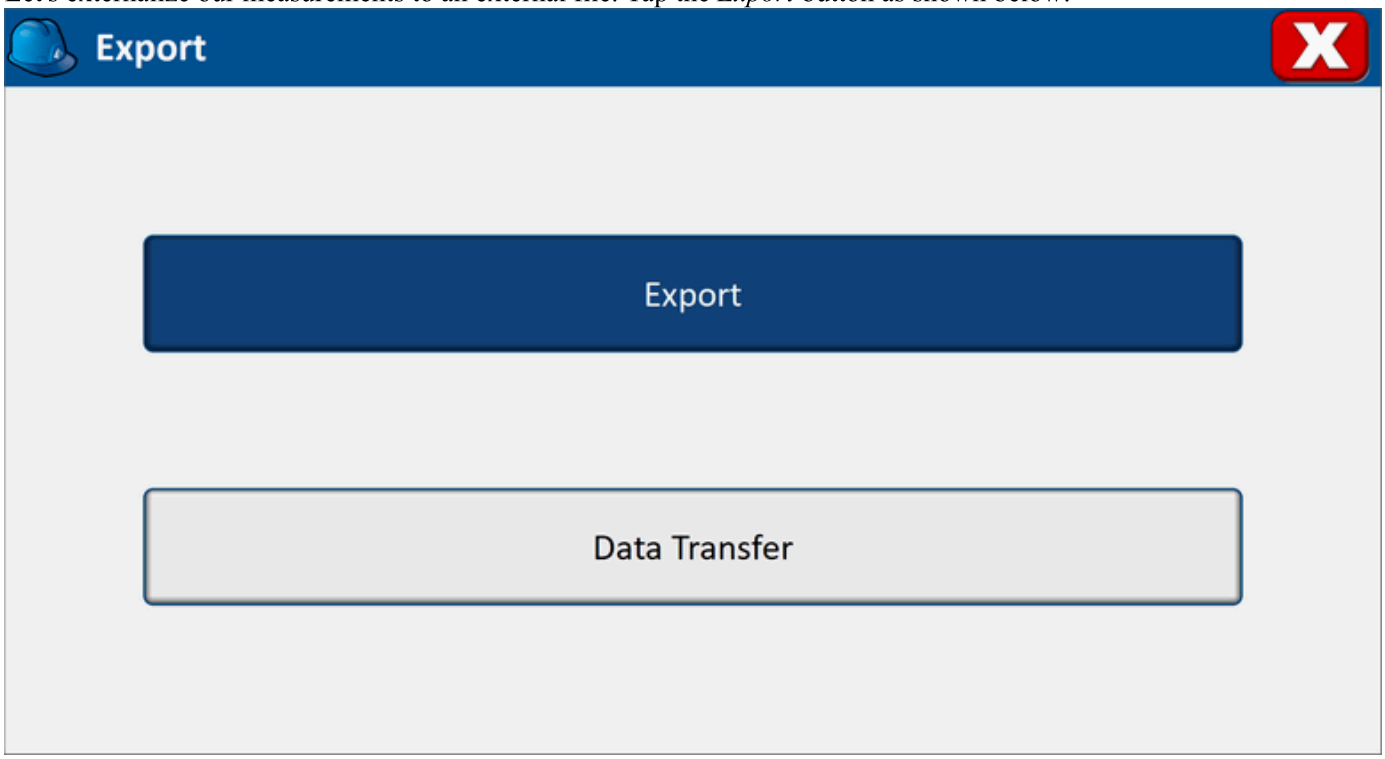


7. Repeat the process by tapping the *Green Arrow* and establishing the next desired point.

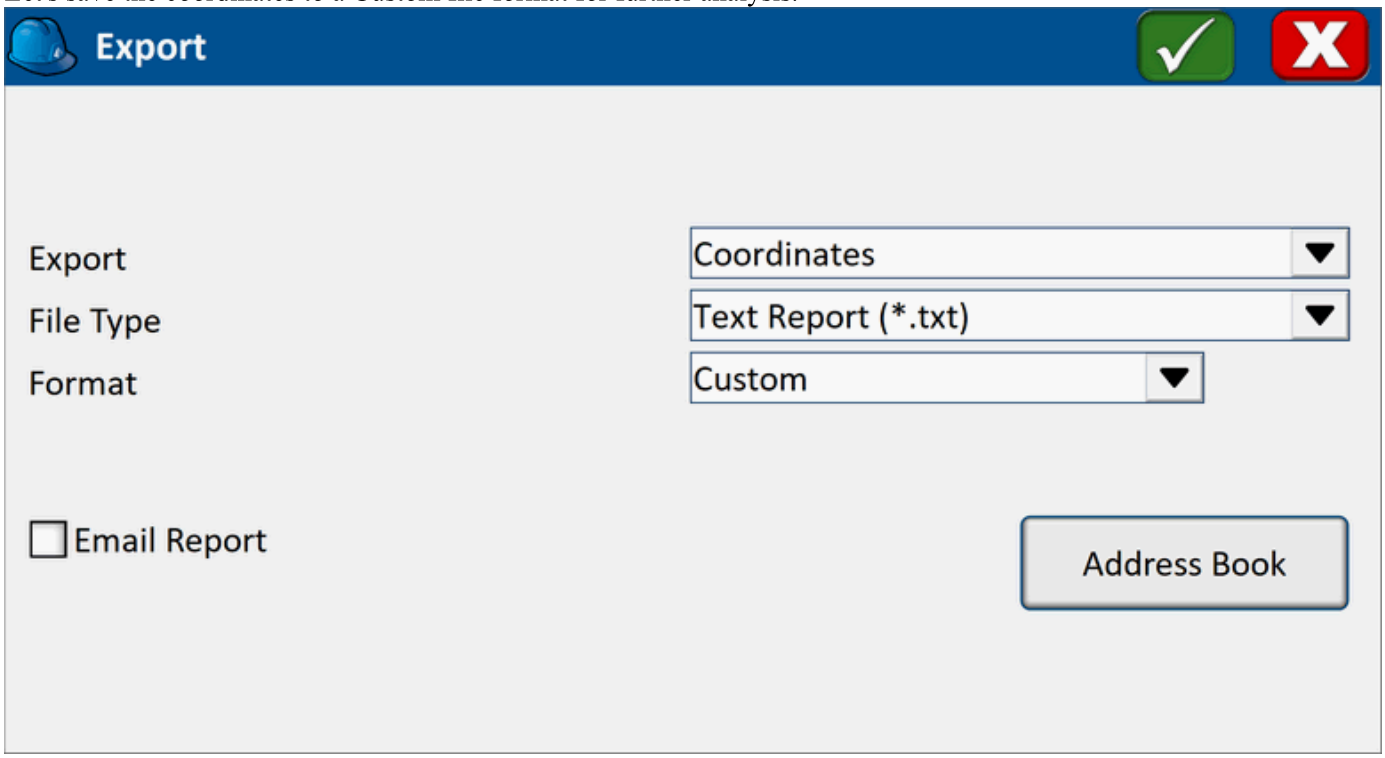
Exporting Data

1. When all measurements have been completed, tap the *Export* button as shown below:

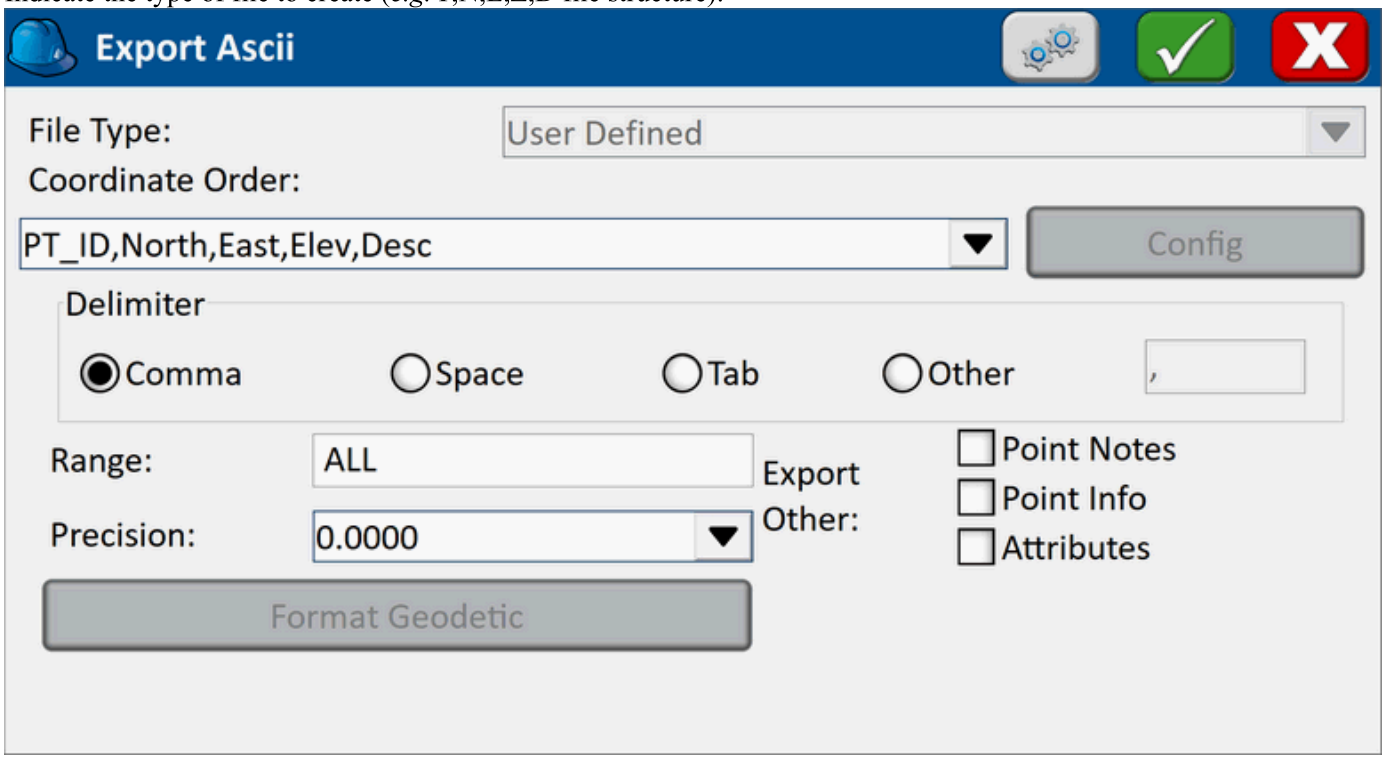
2. Let's externalize our measurements to an external file. Tap the *Export* button as shown below:



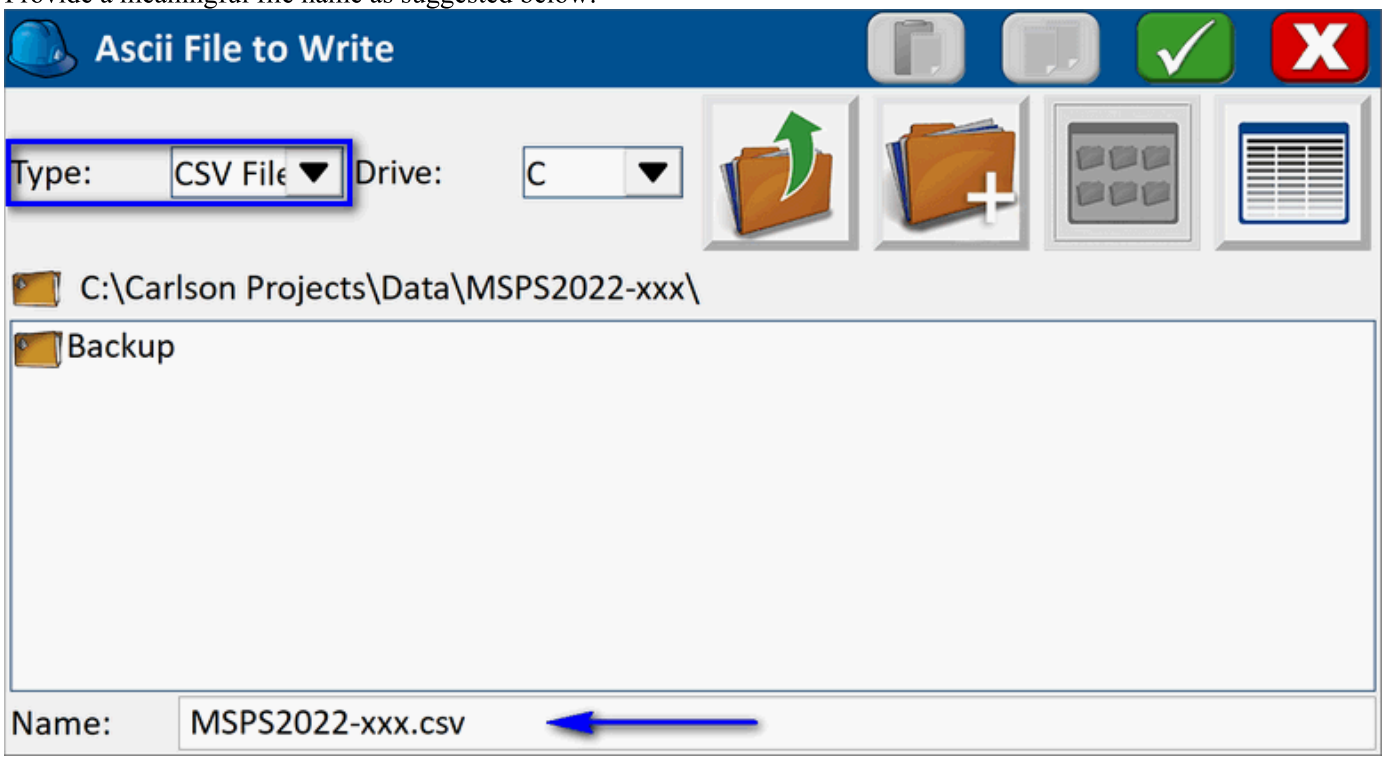
3. Let's save the coordinates to a Custom file format for further analysis.



4. Indicate the type of file to create (*e.g.* P,N,E,Z,D file structure):

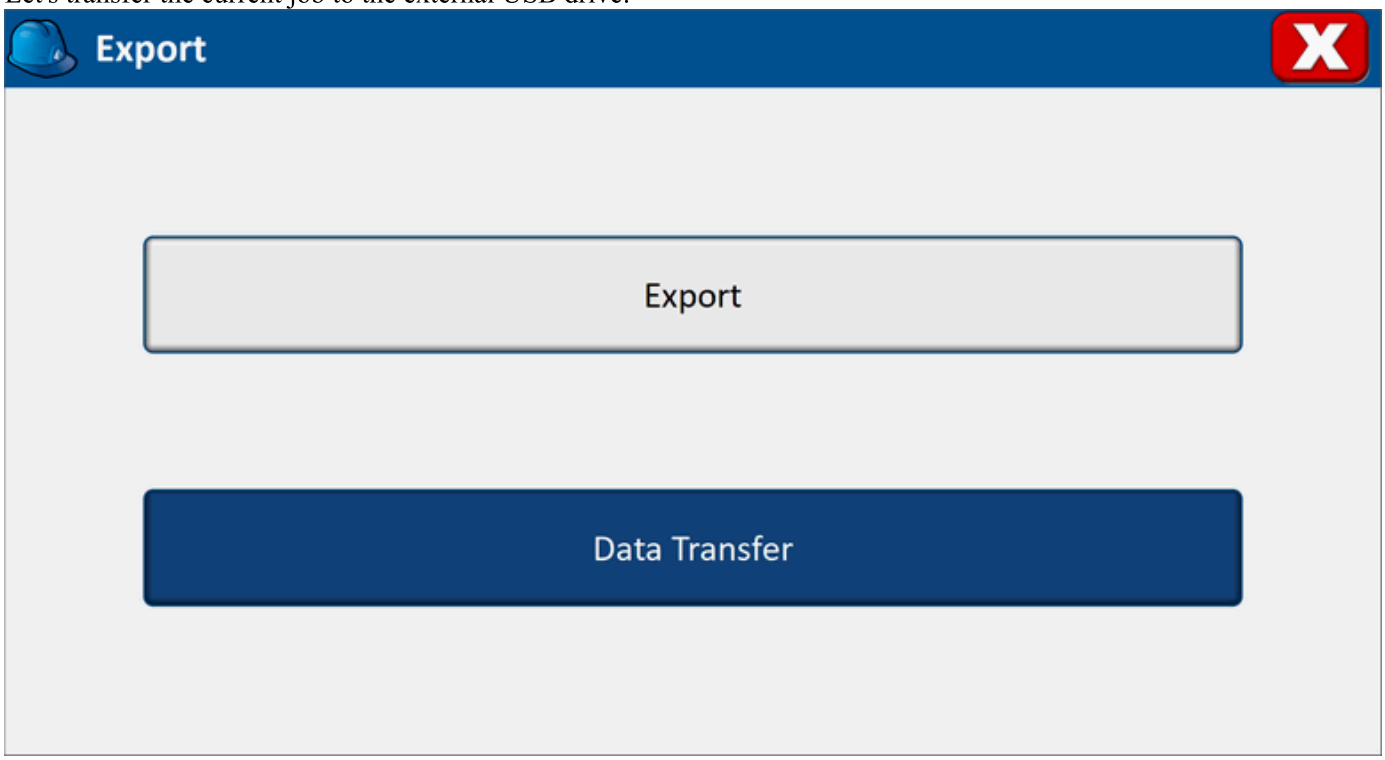


5. Provide a meaningful file name as suggested below:

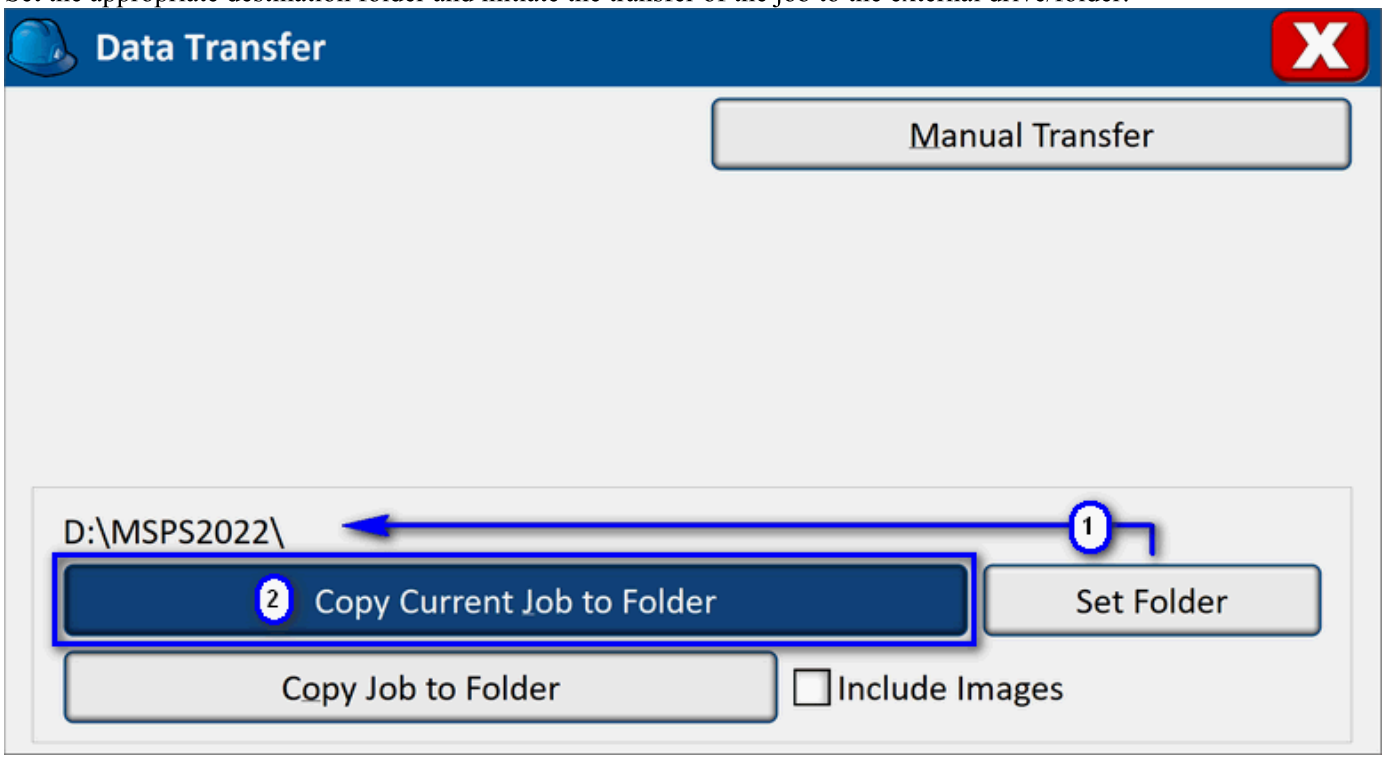


6. Attach a removable USB "jump" (or "thumb") drive to the data collector/controller (the operating system will likely assign it a "D:" logical drive letter). Return to the *Export* button as shown below:

7. Let's transfer the current job to the external USB drive:



8. Set the appropriate destination folder and initiate the transfer of the job to the external drive/folder:



This completes the suggested exercise. As desired, exit from SurvPC via the File → Exit SurvPC button.