

Your First CR+ / Zoom 90 Carlson SurvCE Job

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**The commonly asked Zoom 90 questions
have moved to a separate document:**

(see 'FAQ_Zoom90_CRx_CommonIssues...')

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Mail List: If you purchased a Zoom90 robot from iGage, **please sign up for the Zoom90 mail list.** We will automatically send you commonly asked questions and answers as we encounter them. We will also send you firmware and software update notices. You can sign up here: www.igage.com/ml (that's slash M L for Mail List), look for the 'Zoom90 Robot' group.

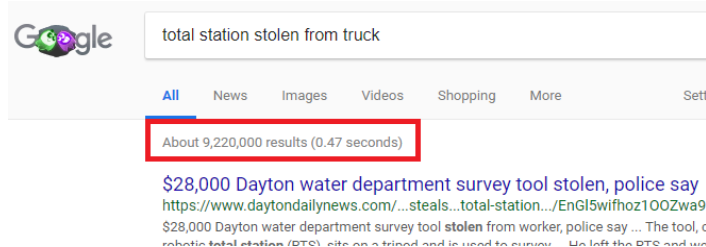


First off, let's list some important rules for robotic total stations. These are fundamental rules of nature:

1. Robotic total stations have over one-million small mechanical, fragile parts in them. Robots are CRAZY expensive. Treat your robot like the very expensive, very fragile device that it is.
2. Do not leave your robot in the truck if it is hot or cold. Never put a wet or damp robot in the case for more than long enough to get back to the shop to dry it out.
3. Use only top quality tripods with dual-clamps.
For 1" the TriMax 90553 (~\$323) is a good choice
For 2" and 5" the GeoMax 8248660 (~\$175) is acceptable

Clean the sliding parts of the tripod. Adjust the top leg clamps and the lever clamp. Always lock both the Lever and the Screw clamps. Set the legs far enough apart to keep the instrument from blowing over. If it is windy, wire the tripod down. Remember that if the tripod blows over, it will cost you \$15,000 to replace the gun. Toppled robots are 'Never the Same.' Ever.

4. Always keep one hand on the handle if the robot is not secured to a tripod or in the case. If the tribrach nut is loose, you must have the robot in hand. If you loosen the nut, you must immediately put the robot in the case. The only place that a robot can ever be is on a secure tripod with the nut tight, in your hand moving between the Tripod and case or in the case.
5. Never move an uncased robot. If you need to traverse a robot, most companies require you to remove the robot from the tripod, put in latched case, move the case and remount. Again, most companies will not allow you to move a robot mounted on a tripod.
6. Always secure your robot, in the case, in your truck. Never place a robot case or robot on the tailgate or in the bed of a pickup. (I like to seat-belt the case in the center of my back seat.) Always lock your truck if it contains a robot:



Google says over 9 million robotic total stations have been stolen out of vehicles.

7. Try to set the robot in a safe place on every site:
 - a. away from frontages where a van can drive up and quickly steal the robot.
 - b. away from vehicle traffic, especially places where vehicles are likely to back into the robot.
 - c. away from heavy equipment paths.
8. If you drop or tip a robot onto the ground, the robot will NEVER-EVER be the same. Ever. The robot is bricked. This Damage is Never Covered by Warranty.
9. Every time you lift the robot by the top handle, make sure the handle is not partially released:



Oh Crap!!!

10. All Total Stations (Robotic or Manual) should be field calibrated if they are moved a significant distance or encounter rough handling. Field calibration is described on page 39 of the GeoMax User Manual.

Your First SurvCE Job

For our first job, let's assume that our robot is sitting on a hub, driven at a random point on our job. We are going to call this hub: 1000.0, 1000.0 at 4,200 feet elevation. There are no other known points on our job however we have set a backsight at a random distance from the robot at a bearing we would like to call 0 0' 0".

1. Setup a good tripod (use a Tri-Max or Heavy-Duty GeoMax.) Robots shake a lot and you will have horrible repeatability if you use an inexpensive tripod. Make sure the legs are solid. Make sure the lever locks and the screw locks are set. Make sure the tripod nut that holds the tribrach is really-tight.

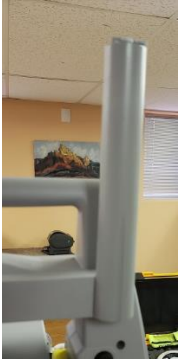
2. Mount the robot on the tripod, rough-level it using the physical bubble (the one on the tribrach):



3. Level the robot using the bubble on the instrument:

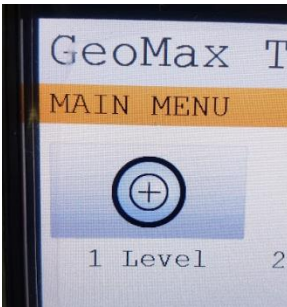


4. Flip up the Bluetooth antenna on the handle:



Check to make sure that the antenna is not partially pulled out from the handle. If it is pulled out, push/snap it back into place. The radio range will be reduced if the antenna is not firmly connected.

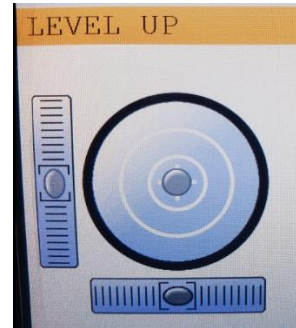
5. Put a fresh battery in the CR+/Zoom 90. Turn on the robot by pressing and holding the ON/OFF key.
6. From the main menu, click on the 'Level' icon or press the '1' button:



The laser plummet will fire, slide the tribrach on

the tripod head to center the robot over the ground mark. You can adjust the laser intensity to effectively reduce the spot size as small as possible while bright enough that you can still see its location on the ground mark (GM).

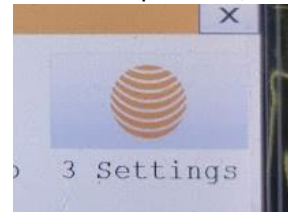
7. Use the Electronic bubble:



to 'fine' level the instrument.

8. Then slide the robot to center the laser plummet over the GM, finally check the level again and tighten the tripod and instrument nut.

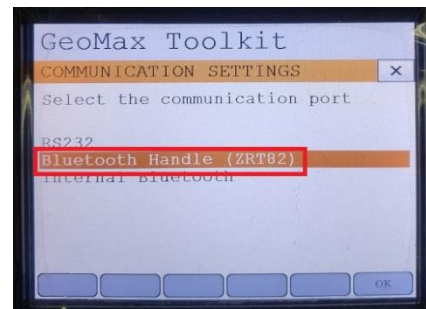
9. Exit the level up screen, then click on 'Settings':



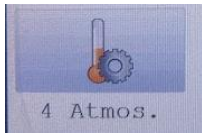
10. Click on 'Comm':



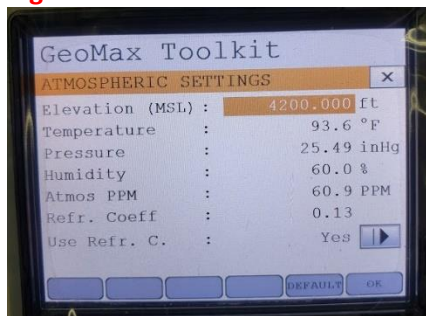
11. Insure that the 'Bluetooth Handle (ZRT82)' is selected:



12. Return to the previous menu, then click on 'Atmos.'



13. **IMPORTANT: Configure the proper atmospheric settings:**



The elevation, temperature, pressure and humidity are used to compute an 'Atmospheric PPM'.

You can either enter the:

Elevation, Temperature and Humidity

Or the:

Pressure, Temperature and Humidity

Pressure is entered as a 'Station Pressure' or 'Absolute Pressure' not the 'Sea Level Pressure'. (See the 'Common Issues' document for a detailed discussion of pressure and the 'Atmospheric Settings' inputs.)

The Elevation and Pressure are interdependent. If you enter the Elevation, then the corresponding pressure will be computed. If you enter the Station Pressure, then the equivalent elevation (for the current conditions) will be computed.

It is usually best to enter:

Elevation, Temperature and Humidity

How important are these settings?

I will summarize the common setting errors that I observe in my community:

Elevation: Operator leaves Elevation set to 0, but is in the Salt Lake City area. A 4,200 foot elevation error results in a 0.32' measurement error per mile.

Temperature: Robot is set to 54 degrees, actual temperature is 94 degrees: 0.10' error per mile.

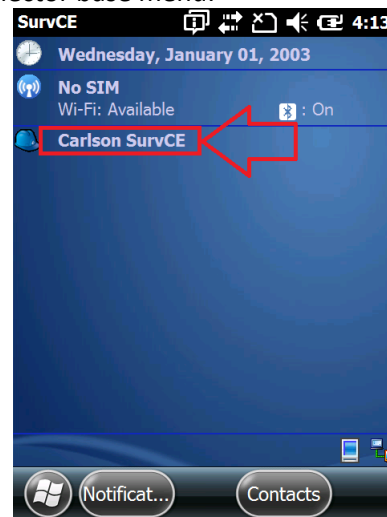
Pressure: Gun is set to 25.5 InHg, actual is 30.5 InHg: 0.23' error per mile.

Humidity: Gun is set to 30%, actual humidity is 5%: 0.003' error per mile.

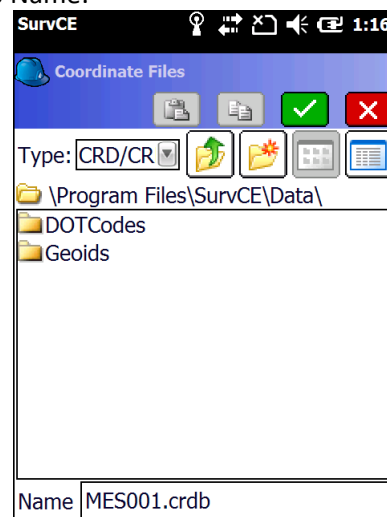
Conclusion: get the Temperature, Pressure or Elevation close. Adjust Temperature during the day. Don't worry as much about the humidity.

14. From the 'ATMOSPHERIC SETTINGS' screen click OK to store your settings, then return to the main menu.

15. Start **SurvCE** by clicking on **SurvCE** from the data collector base menu:

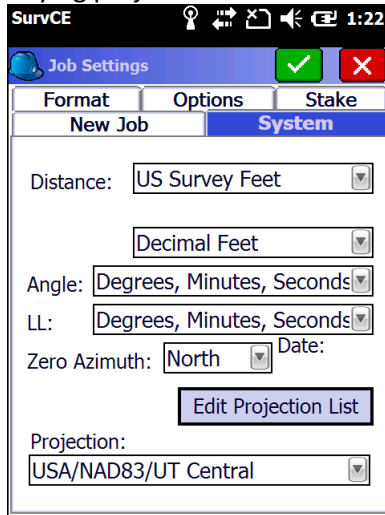


16. Click on 'Select New/Existing Job' and enter a new job Name:



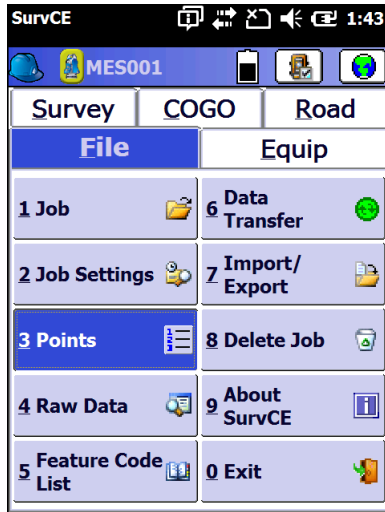
If you enter the '.crdb' extension, your point descriptions can have extra characters and large jobs will sort faster. Click on the green check mark to accept.

17. On the 'System' tab, choose a reasonable underlying projection:



18. Click on the green check mark to return to the main menu, if asked about connecting to a previous device, decline and 'Continue without connecting.'

19. From the main menu:

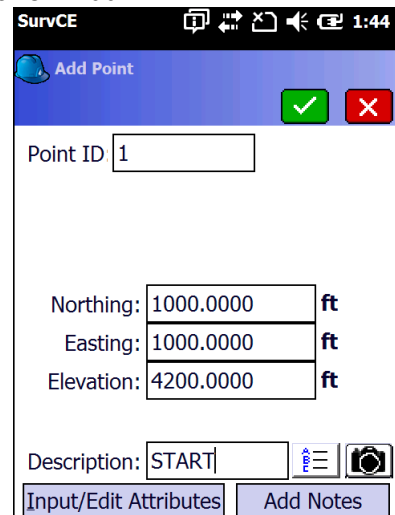


Click on the '3. Points' button.

20. If there is not a starting point:



Click on 'Add':



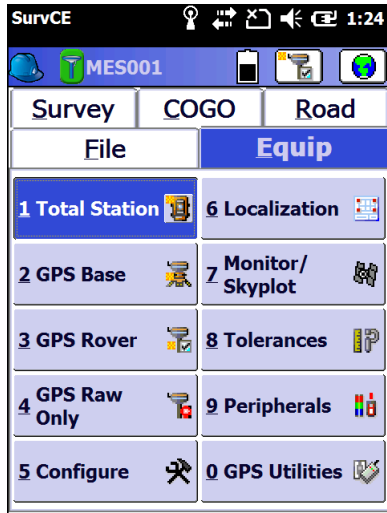
and add a suitable start point (the initial point where your robot is setting.) If you have known coordinates for the gun location enter them. If you are starting at a random location, choose coordinates that will remain positive over your entire job site.

Choose a starting elevation that is close to the actual elevation of the robot's position so that the 'Sea Level Correction' is correct.

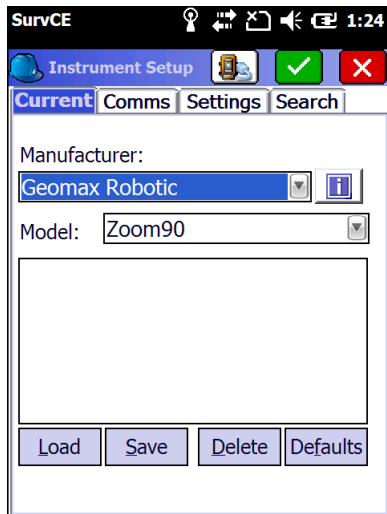
Click the green check mark when you are satisfied with the initial point.

Click the red back arrow to return to the main menu.

21. Go to the 'Equip' menu, then click on the '1. Total Station' button:

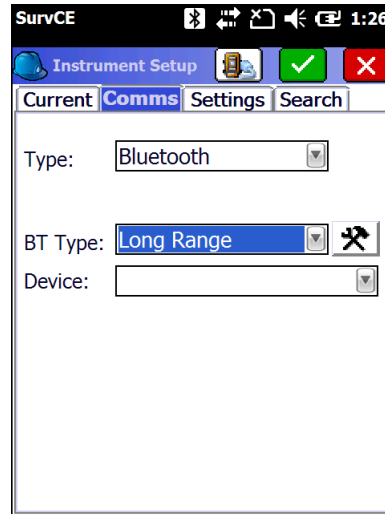


22. On the 'Current' tab:



For GeoMax Zoom 90: Select 'GeoMax Robotic' and 'Zoom90' as shown above.
 For Carlson CR+: Select 'Carlson Robotic' and 'CR2/CR5'.

23. Click on the 'Comms' tab:

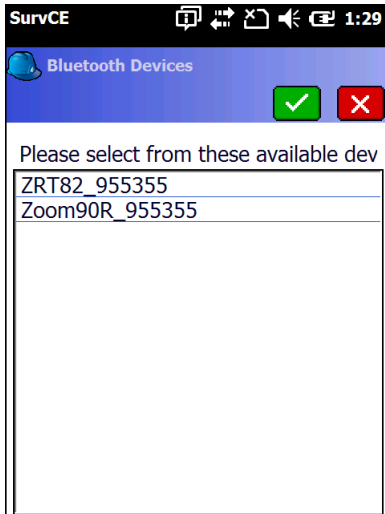


If your data collector has a separate long-range Bluetooth modem (Like the Howay T18): select Type = Bluetooth and 'BT Type' = 'Long Range' as shown above; otherwise select 'BT Type'='Windows Mobile'.

24. Click on the hammer wrench (setup) button to the right of the 'BT Type':



25. Click on the 'Find Device' button, after 20 seconds a list of available Bluetooth devices will be shown:



Notice that the CR+/Zoom90 has both regular and the long-range Bluetooth handle 'ZRT82_XXXXX'. **Click on the 'ZRT82_...'** selection, then click on the green checkmark. (Do not use the 'Zoom90R...' selection because it is not enabled on the robot.)

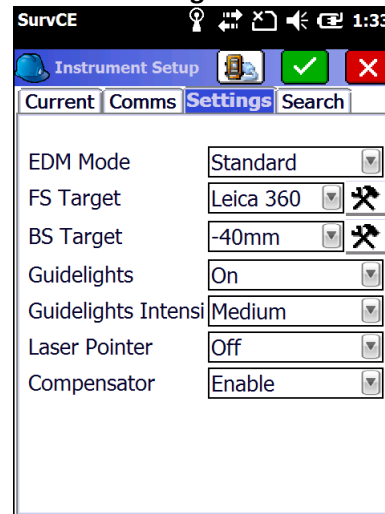
26. Back at the Bluetooth Devices menu:



click on the Bluetooth Connect button:



27. Click on the 'Settings' tab:

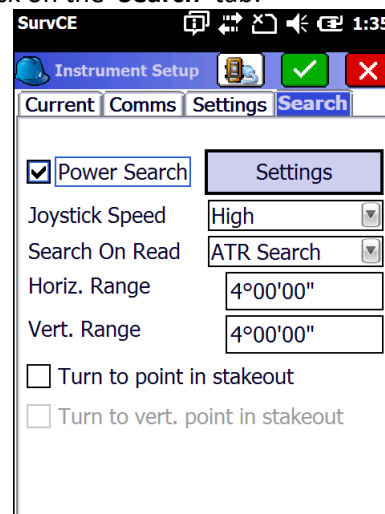


Choose the proper prism for your foresight and backsight targets. (You may need to use the settings button to configure a new prism.) Set the Guidelights On, the Guidelights don't use much power, they may reduce the battery life by 5- minutes in a 7 hour expected dat. There is no reason to turn them off.

Always enable the Compensator.

If you are working close to the robot (less than 50') or hand holding the prism on a pole, set the EDM mode to 'Fast'.

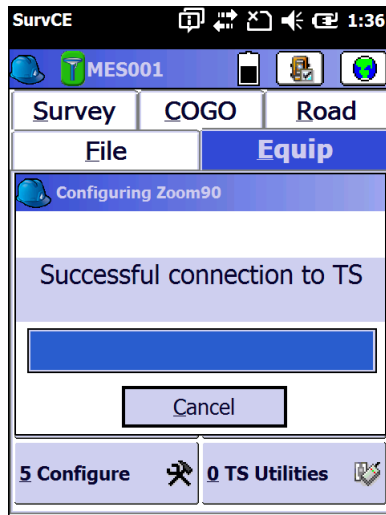
28. Click on the 'Search' tab:



The values above should work great, you can change them at any time from the Setup button in Survey.


You may want to consider setting the Horizontal Range to 8°, however for larger search ranges, the power search function is typically much better anyway.

29. Click the green check mark in the upper right corner. You will see:

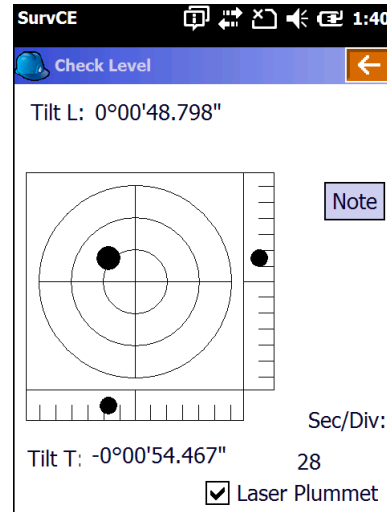


30. Now, we are connected to the robot:



The yellow instrument icon on the top-left:  indicates that the robot is communicating, but is not locked on a prism.

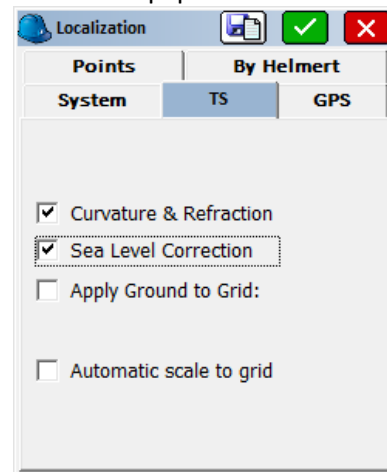
31. We can quickly make sure that we are communicating with the robot by clicking on the '**7. Check Level**' button:



If a bubble is shown, you are connected. Adjust the tribrach if required.

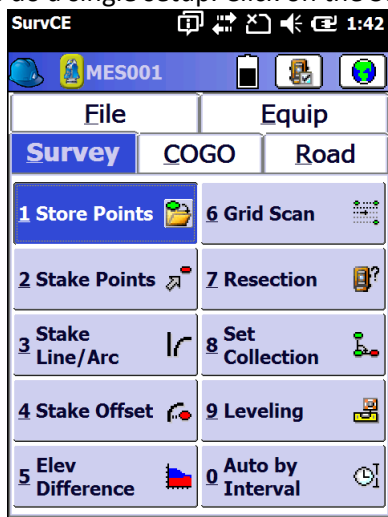
Clicking on the 'Note' button will add a bubble note in your current .RW5 (Raw) file. Click on the red back arrow to return to the main menu.

32. From the 'Equip: Localization: TS (tab) menu:



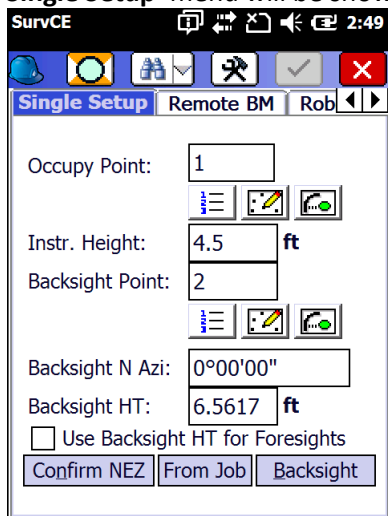
Make sure that 'Curvature & Refraction' and 'Sea Level Correction' are both checked.

33. Let's do a single setup. Click on the **Survey** tab:



then click on '1. Store Points'.

34. The 'Single Setup' menu will be shown:

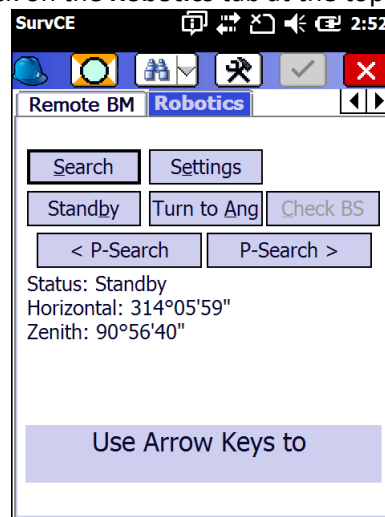


Set the 'Occupy Point' to the point number the robot is setup over, in this case 1.

Set the instrument Height. Measure from the ground mark to the small dot on the side of the instrument.

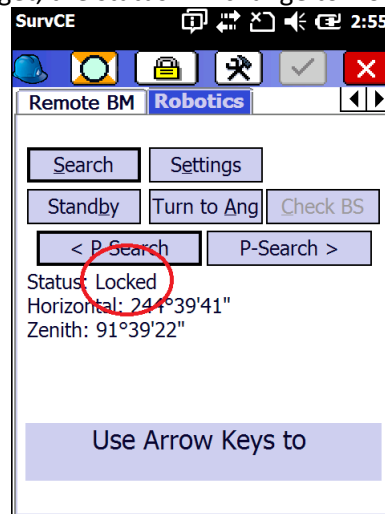
Since we only have one point in our point list, set the backsight point to a new point number (we are just going to zero the circle on the backsight for now.)

35. Click on the **Robotics** tab at the top:

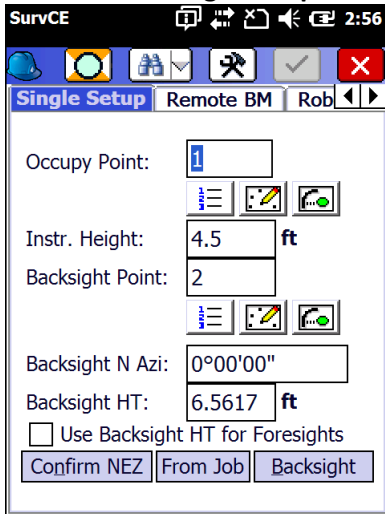


You could use the arrow keys on the keyboard to move the head left-right / up-down then search for the prism, but it is always **faster to just click on the left or right power search button**.

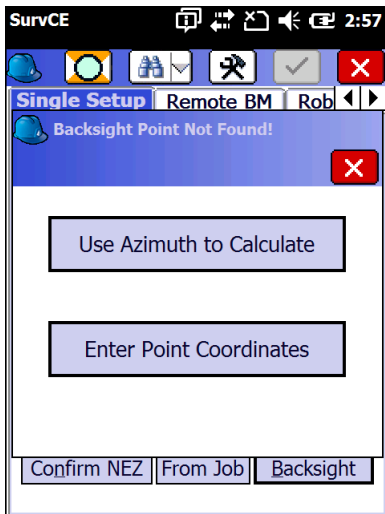
36. After a few seconds the robot will lock on the target, the status will change to 'Locked':



37. Click back to the 'Single Setup' tab:

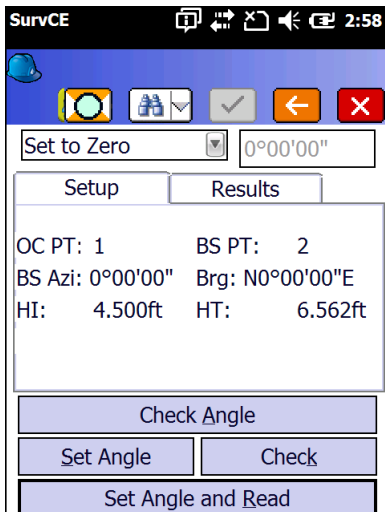


38. Click on the 'Baksight' button at the lower right corner:



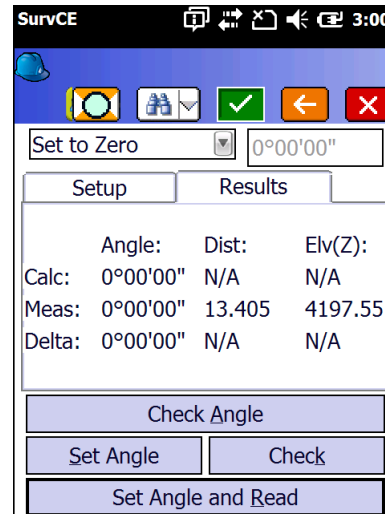
The 'Baksight Point Not Found' screen is shown (since point 2 does not exist yet.)

39. Click on 'Use Azimuth to Calculate':



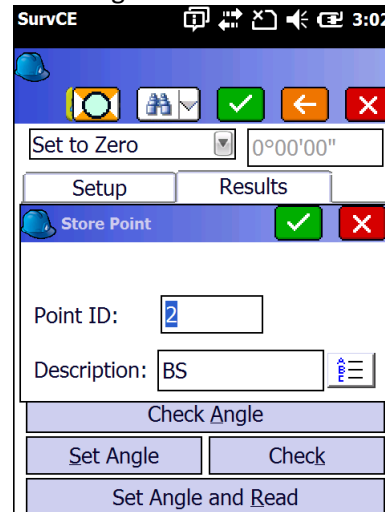
Make sure 'Set to Zero' is set for the circle setting selection at the top. If you are sighting to a known point choose 'Set to BS Azimuth'.

40. Click on 'Set Angle and Read' (this will zero the circle and read the distance). The Results tab is shown:



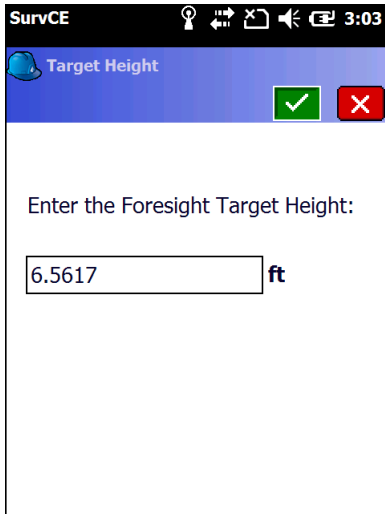
Verify that the 'Measured Distance' is reasonable.

41. Click on the green check mark on the top-right:



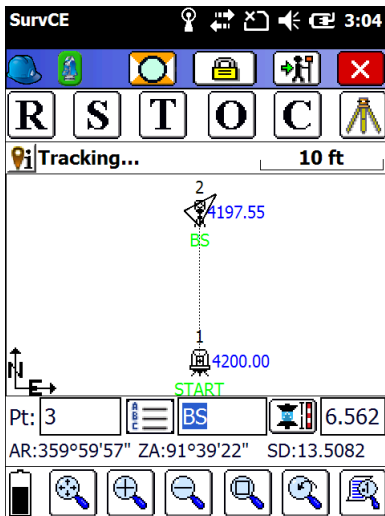
You will be prompted to enter a description for the backsight point. Enter something reasonable (like BS) and then click on the green check mark to store the backsight point into your job.

42. You may be prompted to enter the Foresight target height:



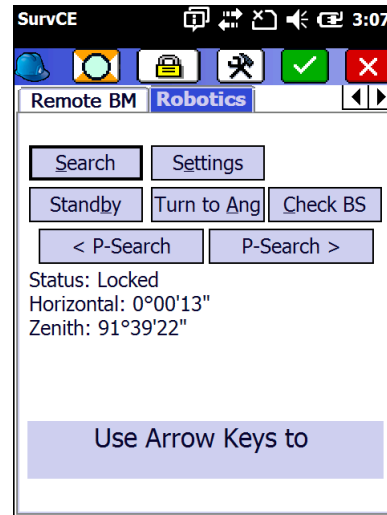
Enter the correct prism height.

43. At this point, the robot will be pointed at the back sight:

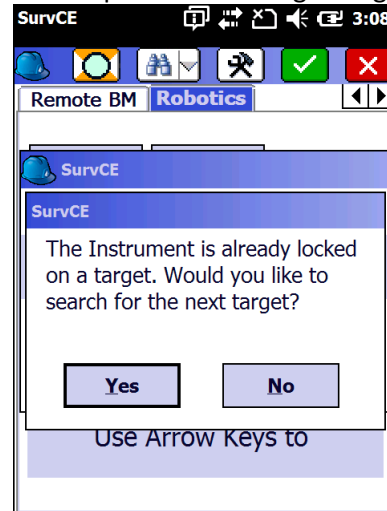


We would like to turn and point the robot at the foresight.

44. Click on the tripod icon  to get back to the robotics menu:

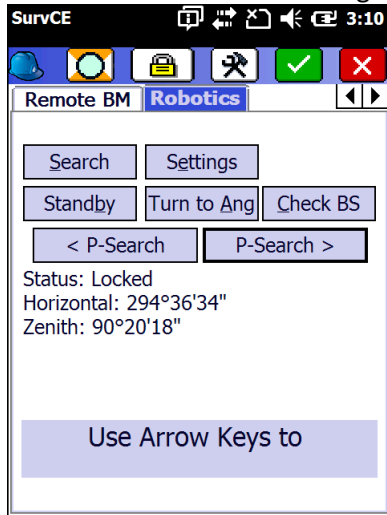


45. Click on the left or right Power Search button 'P-Search' to spin to the foresight target:

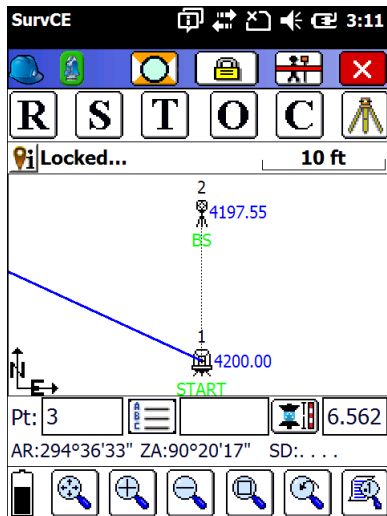


SurvCE will warn you that you are already locked on a target (the backsight).

46. Click on 'Yes' and the robot will spin in the selected direction and lock on the next target:




47. Click on the green check mark to return to the 'Store Point' menu:

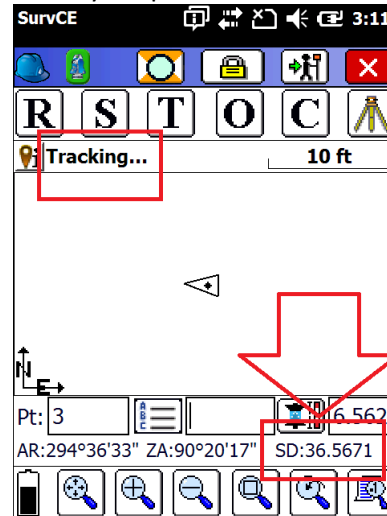


48. Turn on tracking by clicking on the tracking button:

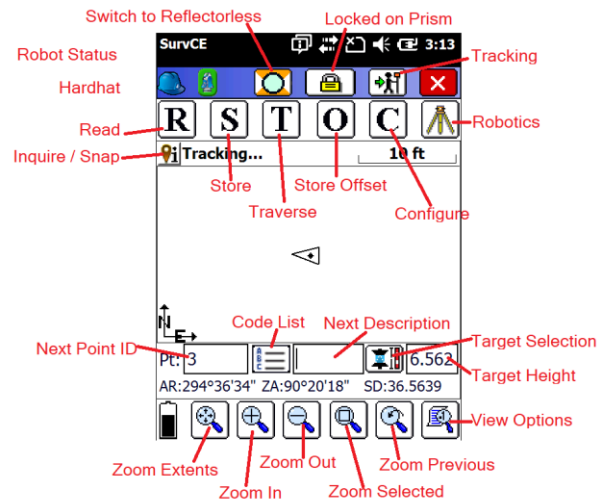


The button will change to  and the status will change to 'TRACKING'. The AR, ZA and SD will now

update as your prism moves:



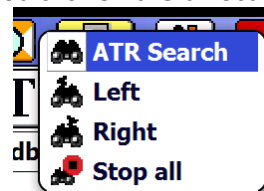
49. Here are some button hints:



50. If you are not locked on a prism, the lock icon will change to:



if you click on the binocular icon:



you can directly do an ATR (Automatic Target Recognition) search or a Left or Right Power Search.

51. Usually after a search you will need to click on the:



button to start tracking. Once the gun is

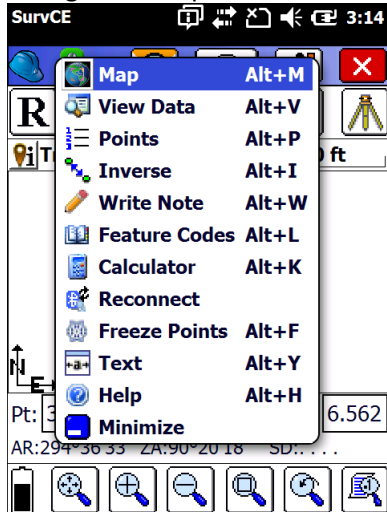
firing the icon will change to:



52. If you click on the 'Hardhat' button



you will get these quick links:



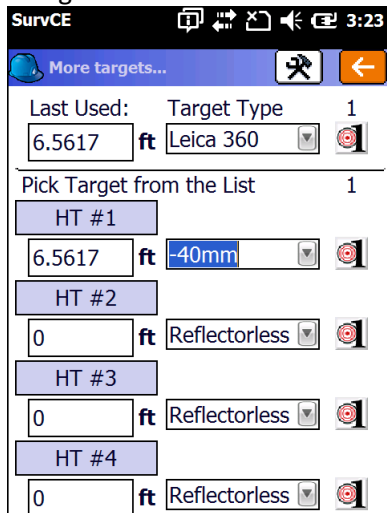
Minimize is useful for returning to the system menu to change data collector settings.

Reconnect is useful if the Bluetooth becomes disconnected

53. If you click on 'Target Selection' button:



you will get:

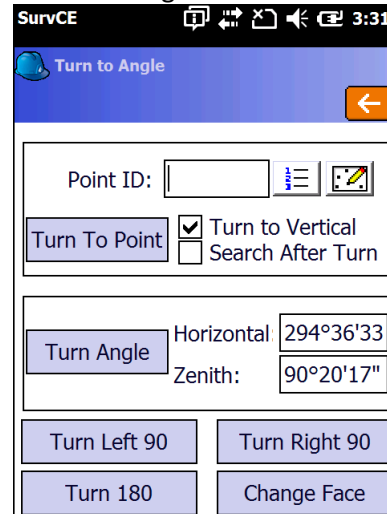


And you can setup prism and target types. These buttons:



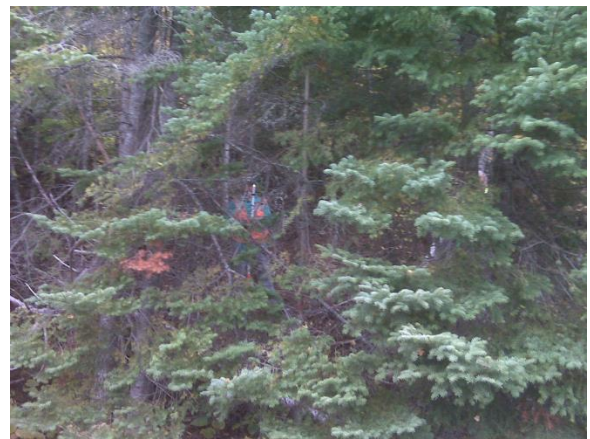
will take a single shot with the new prism type and automatically return to the previous prism selection

54. HINT: You can turn to any point in your current point list by clicking on 'Robotics' (Tripod) button, then 'Turn to Ang':



Enter a point ID, (typically) check 'Search After Turn' and then click on 'Turn To Point'.

55. HINT: Surprisingly the easiest place to track and find a prism is in the brush:



The prism appears to be a 'HOT' reflector and is the ONLY thing that appears bright to the robot's sensor. Moving from place to place is troublesome as the prism is hidden from the robot as it moves, but as long as it appears within the Camera's Field of View, the robot will turn and follow the momentary sightings.

HINT: If you are working in heavy trees, set the prism at the same height as your eye. Now if you hold the prism in front of your eye, and your eye can see an unobstructed path to the gun, the gun will be able to see the prism.

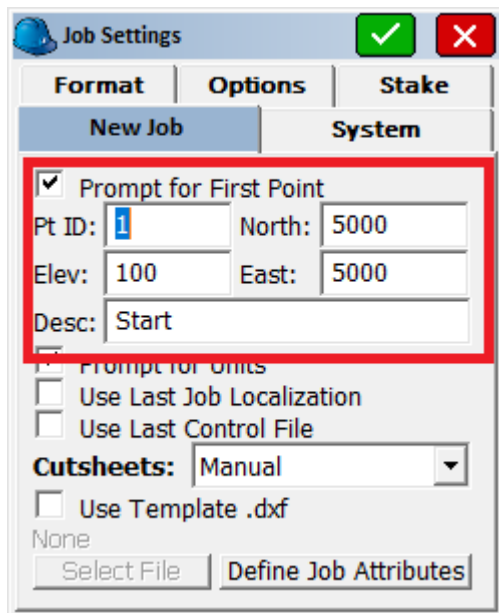
Often, when working in heavy trees or bushes with

the prism set high above your head, you will be able to see the gun, but there will be branches between the gun and the prism. **The robot has to be able to see the prism to operate. (Duhh!)**

Carlson Settings

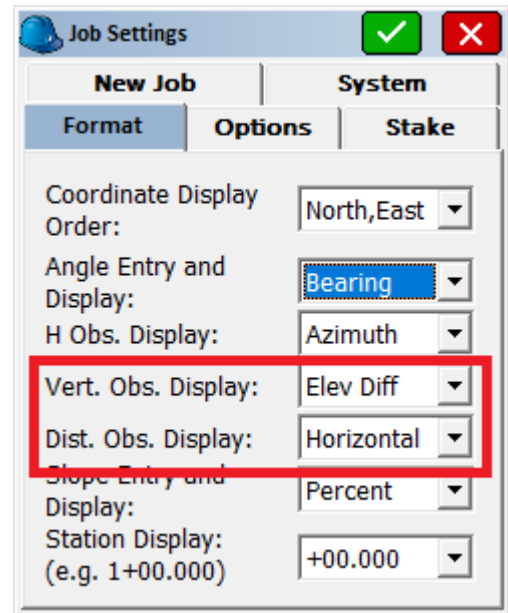
There are a lot of settings for Robots in Carlson. Here are the more commonly changed:

File: Settings: New Job



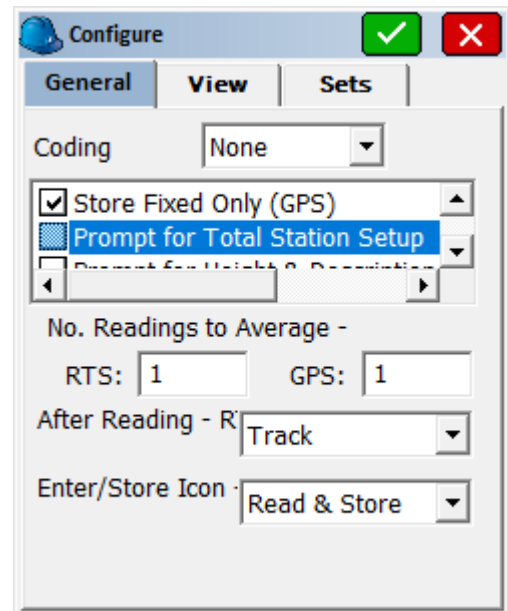
File: Settings: New Job (tab): Check 'Prompt for First Point' and when you make a new job, SurvCE will automatically add a starting point for you to set your robot on to begin a survey.

File: Settings: Format



File: Settings: Format (tab): Vertical observations can be Zenith Angle, Vertical Angle or Elevation Difference. Distance Observation Display can be Horizontal or Slope. I like 'Elev Diff' and 'Horizontal'.

Equipment: Configure: General



RTS: __ is the number of times the gun is fired for measurements which are then averaged to form an observation.

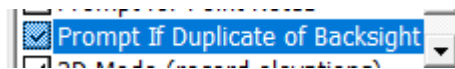
After Reading: Track is most common, you can also choose:

Standby Lock Track
Previous State

Enter/Store Icon: if Read & Store, then the gun fires a new observation (might be multiple measurements) and then stores the result. If 'Store' then the last measurement (the result of tracking) will be stored immediately. Usually the track shots are fast and less accurate than making a reading.

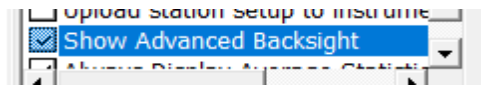
There are several settings in the grid area which are described below.

Prompt for Duplicate Backsight



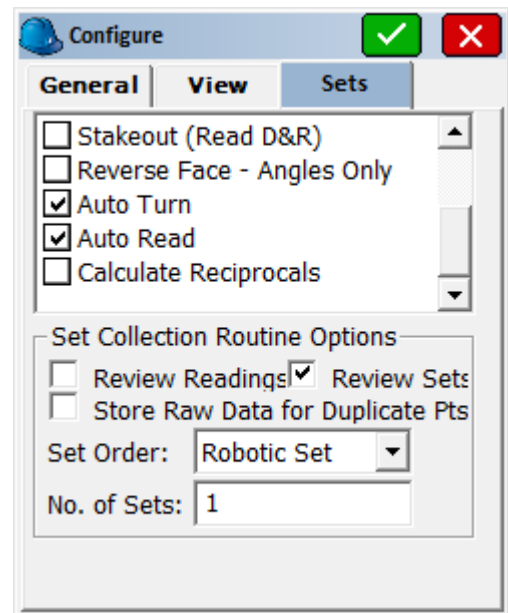
Check if you want to be warned if you attempt to use the same point ID for two, potentially desperate, backsights.

Show Advanced Backsight



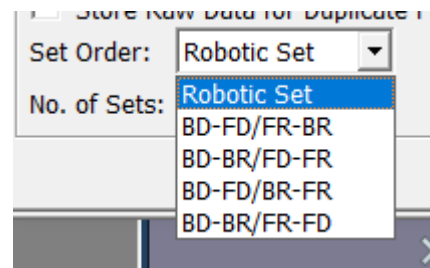
Show Advanced Backsight: This option applies to total station work and allows for multiple reference backsight points, each one of which can be sighted and measured multiple times. Then, based on least squares analysis, the program will compute a "best fit" backsight for purposes of zeroing the total station. The command can be likened to a special Resection for purposes of zeroing the instrument (or setting it to a backsight azimuth). This is a more commonly used in Europe. You can still obtain very accurate backsight to a single backsight point using direct and reverse methods, so most surveyors do not turn on this feature. The feature has some built-in error checking to prevent improper calculation if the coordinates for the backsight reference points are not correct or in proper relation to each other.

Equipment: Configure: Sets (tab)



This is where you configure automatic measurement sets.

The 'Set Order' usually is set to 'Robotic Set' but these choices are also available:



Check the boxes for the measurement styles that you want to apply sets to. Typically backsight, Traverse, Resection are checked.

Search Settings

You can get to the Search settings from the 'Search' tab when configuring the robot, from the 'Settings' button of the Single Setup