International Union of Operating Engineers

Local 49

SPS930 & Siteworks Field Reference Guide

2023

INDEX

Instrument Digital Leveling & Settings

1. To power on the instrument, press the button shown below in picture

Power Button

2. On the Instruments display screen, using the middle down arrow button, press until the double arrows are pointing at "Setup/Level" as shown below, then press the "Enter" button

Enter Button
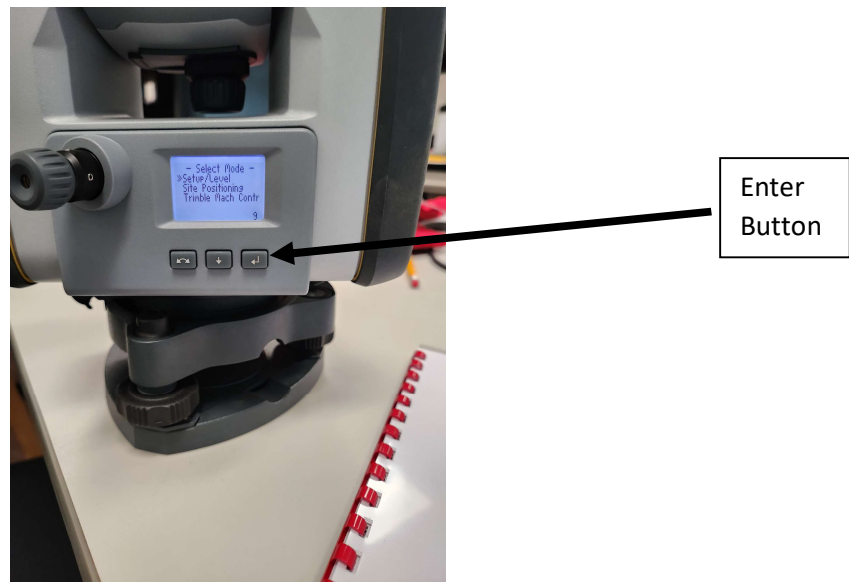
3. **You are now in the digital leveling of the instrument. <mark>NOTE: if you are setting up over a "Known Control Point", if you adjust the tribrach to level the instrument, it will move the Instrument off the Control point</mark>, make sure to re-center over the Control Point. If you are setting up on an arbitrary location, it is ok to adjust the level the instrument with the tribrach, see below**

4. **Continue making tribrach adjustments until the bubble is centered, press the middle down arrow button**

5. **The 1:100 scale screen opens, make adjustments until centered, Press the middle down arrow button**

6. **The 1:10 scale screen opens, this is fine-tuning leveling. <mark>NOTE: make small adjustments to the tribrach, as it will move quick at this scale.</mark> When centered, Press the left double arrow button, to exit, see picture below**

7. **Select Mode screen opens. Press the middle down arrow button until the double arrows are pointing at "Site Positioning", Press "Enter"**
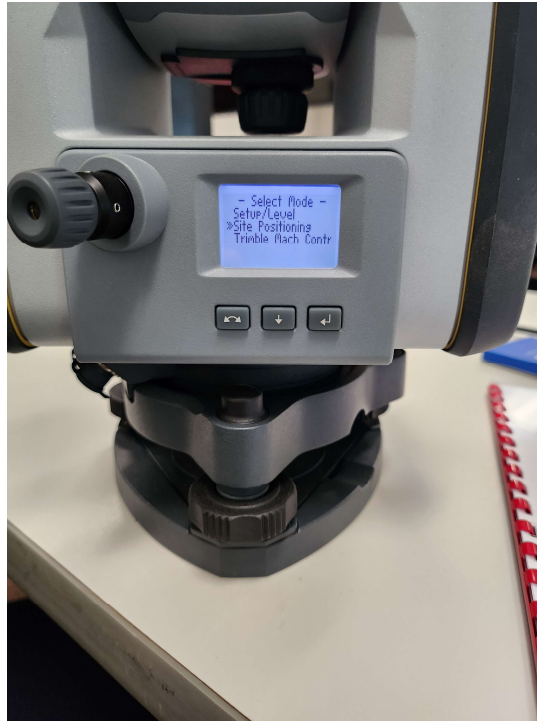
8. **Waiting for connection screen opens and displaying the Instrument current "Channel" & "Network ID"**
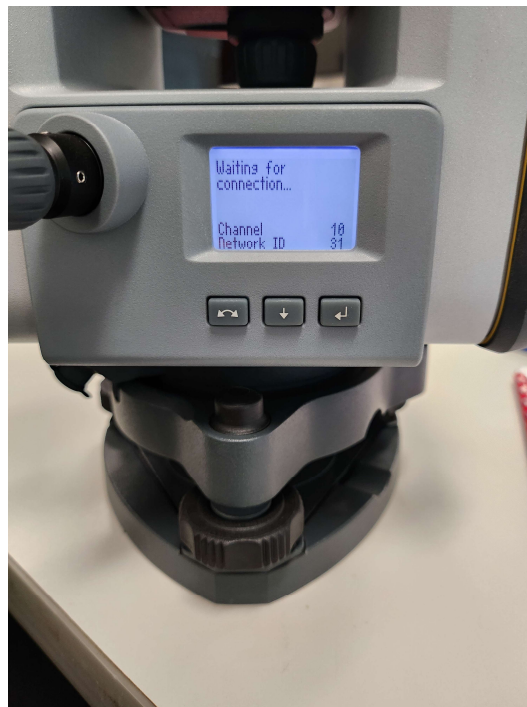
9. To change the Instruments "Channel" and/or "Network ID", when the Instrument is displaying "Waiting for connection…"
   a. Press the "Power" button
   b. Press the middle down arrow button until the double arrow is pointing at "Setup/Level", then press the "Enter" button
10. It will bring you back to the Instruments digital level, press the "Enter" button to the go into the Instruments "Setup"
11. Using the middle down arrow, press until the double arrow is pointing at "Radio settings", Tap "Enter" see below

12. This brings you into the Radio Settings screen. Using the middle down arrow, to move the double arrow to "Set radio channel" or "Set Network ID" and Tap "Enter" to change values for each.

Rod Height & Target Measuring

1. Unlike GPS where we rely on clear view of the sky to have acceptable tolerances, Robotic Instruments rely upon line of sight. Obstacles can impede line of sight. This is when we can raise the Rod height up or down to go over or below obstacles. When you make these changes, the new Rod height value must be entered into the Data Collector for it to output correct elevations or cuts/fills.

   a. Start by screwing your Target onto your Rod, shown below is a "MULTITRACK TARGET"

   b. Using the lock pin on your adjustable rod, set it at a predetermined height, make sure its resting on the pin and "snuggly" tighten the knob. Shown in the picture below is 6.562' (2 meters)

c. **Next, measure your rod to confirm. From the bottom of the point or topo boot to the center of the Target/Prism. The measurements should be exactly the same, 6.562', see images**


d. **Once your rod height is confirmed and matches, you can confidently raise or lower your rod to go above or below objects. Remember, if you move your rod up or down in the field, the new value needs to be input into your Data Collector for correct elevations and correct Cuts/Fills.**

Instrument Control Panel

1. Before continuing, you must have either:
    a. Connected and completed Instrument setup on "Arbitrary Location", OR
    b. Connected and completed Instrument setup on "Known Control Point"
2. From the Main Screen, Tap the Instrument or Target Image, see below
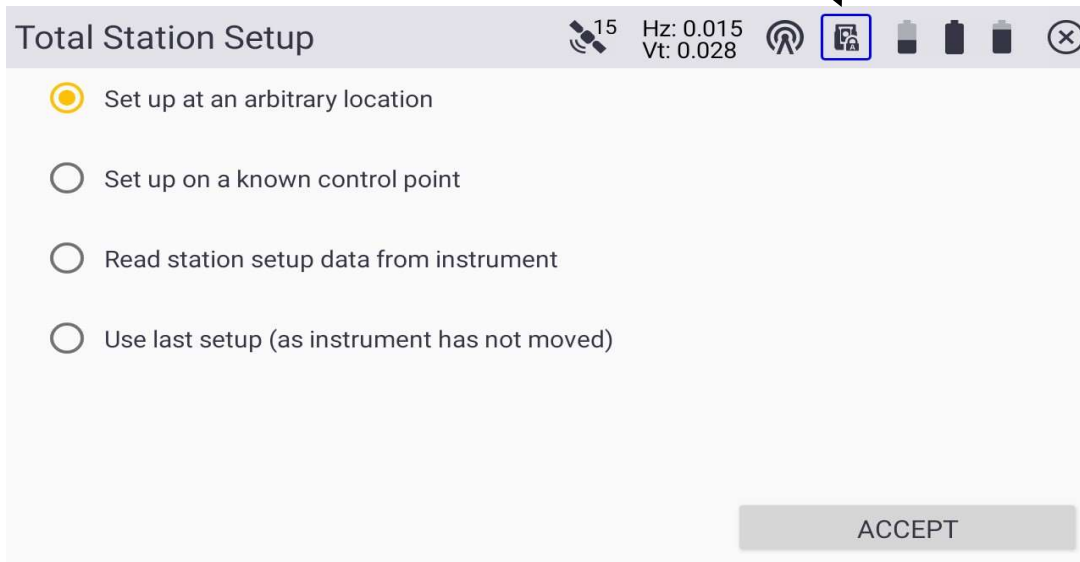
3. Control Panel page opens, see below.
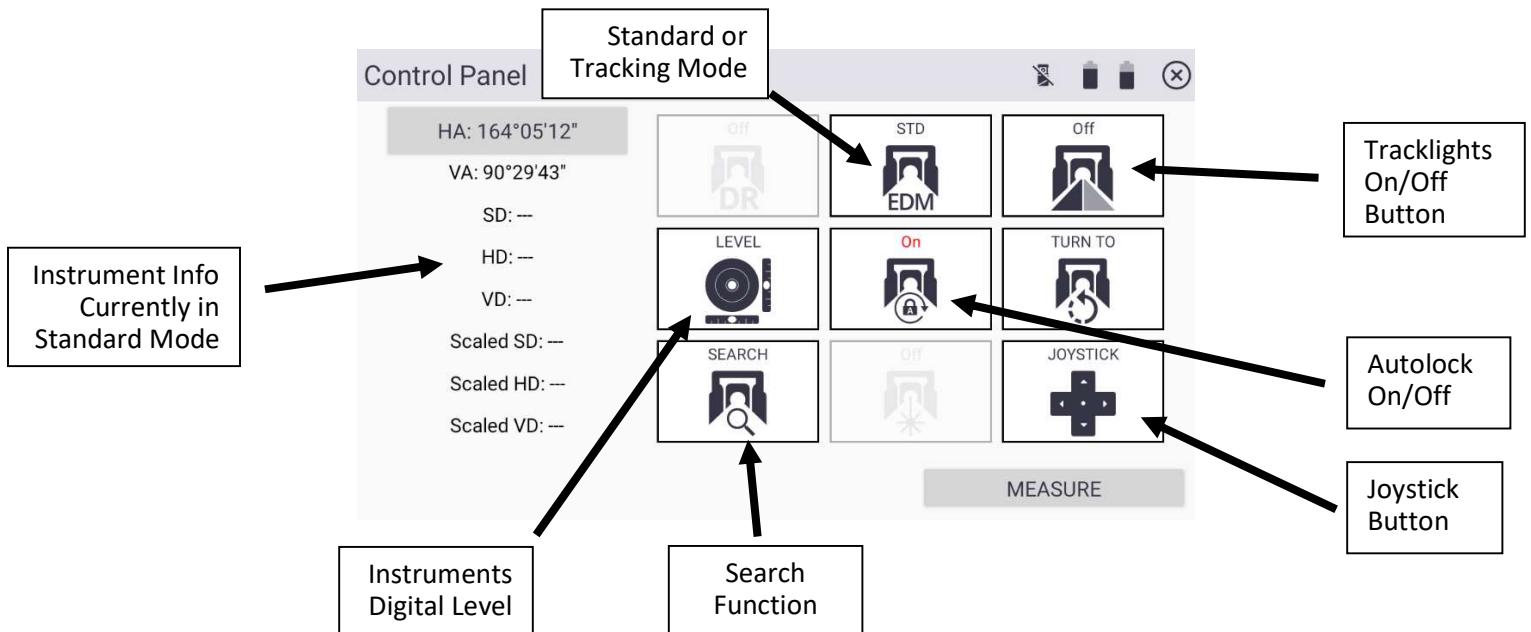
4. **Standard (STD) or Tracking (TRK) Mode Button (Above image, the Instrument is in Standard Mode)**
   a. When in Standard Mode, with the Instrument locked onto the Target, it will only display the current HA (Horizontal Angle) and VA (Vertical Angle). By tapping the "Measure" in the bottom right-hand corner of the above image, it will then display SD (Slope Distance), HD (Horizontal Distance) and VD (Vertical Difference).
   b. If you tap on the Standard or Tracking Mode button, it will switch to Tracking Mode (TRK).
   c. When in Tracking Mode, with the Instrument locked onto the Target, it will constantly give your HA, VA, SD, HD & VD, <u>WITHOUT</u> having to hit the "Measure" button in the bottom right-hand corner of the screen.
      i. ==Tracking mode is the most common setting, it is similar to GPS Rover, where its constantly "Tracking" your position.== See below
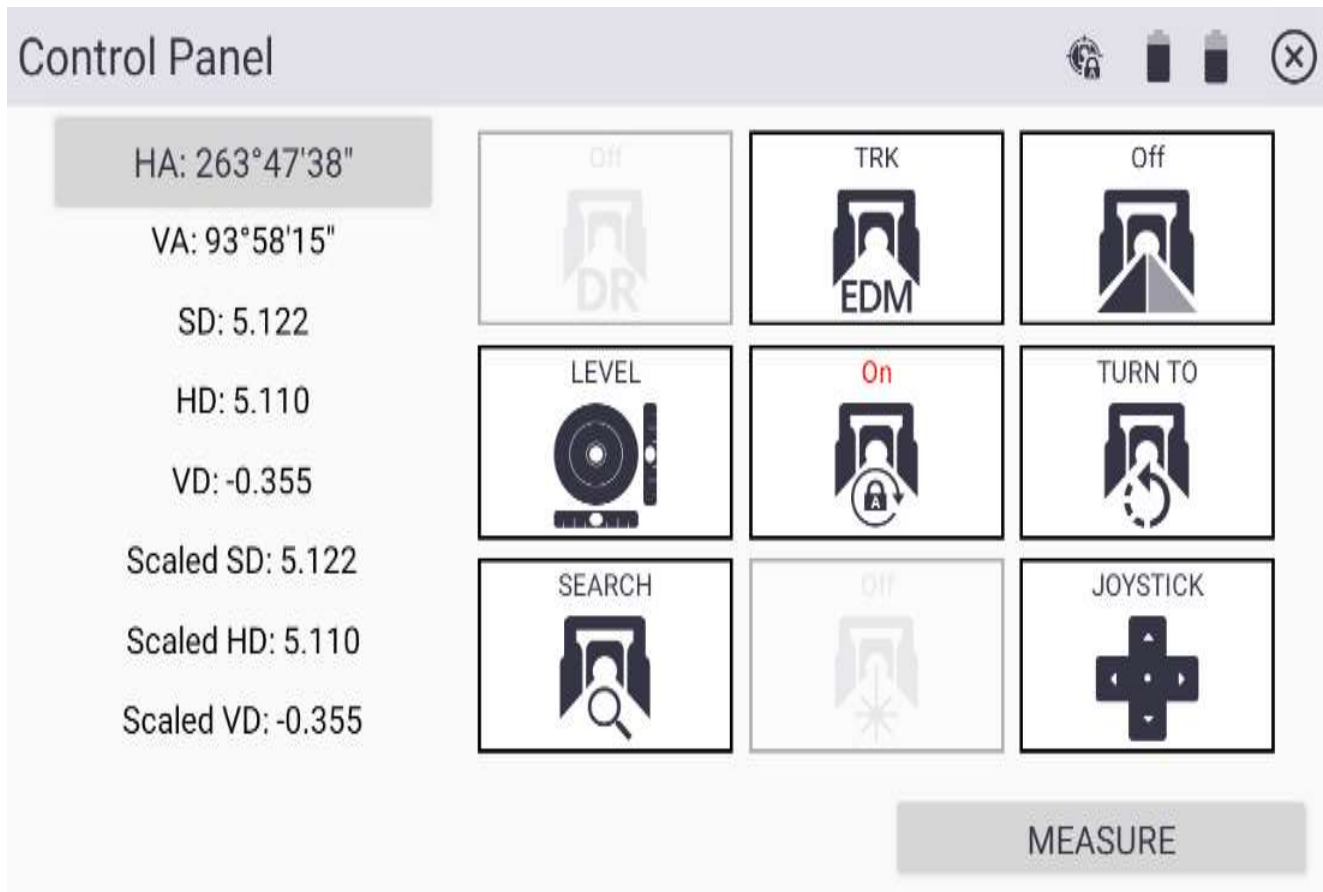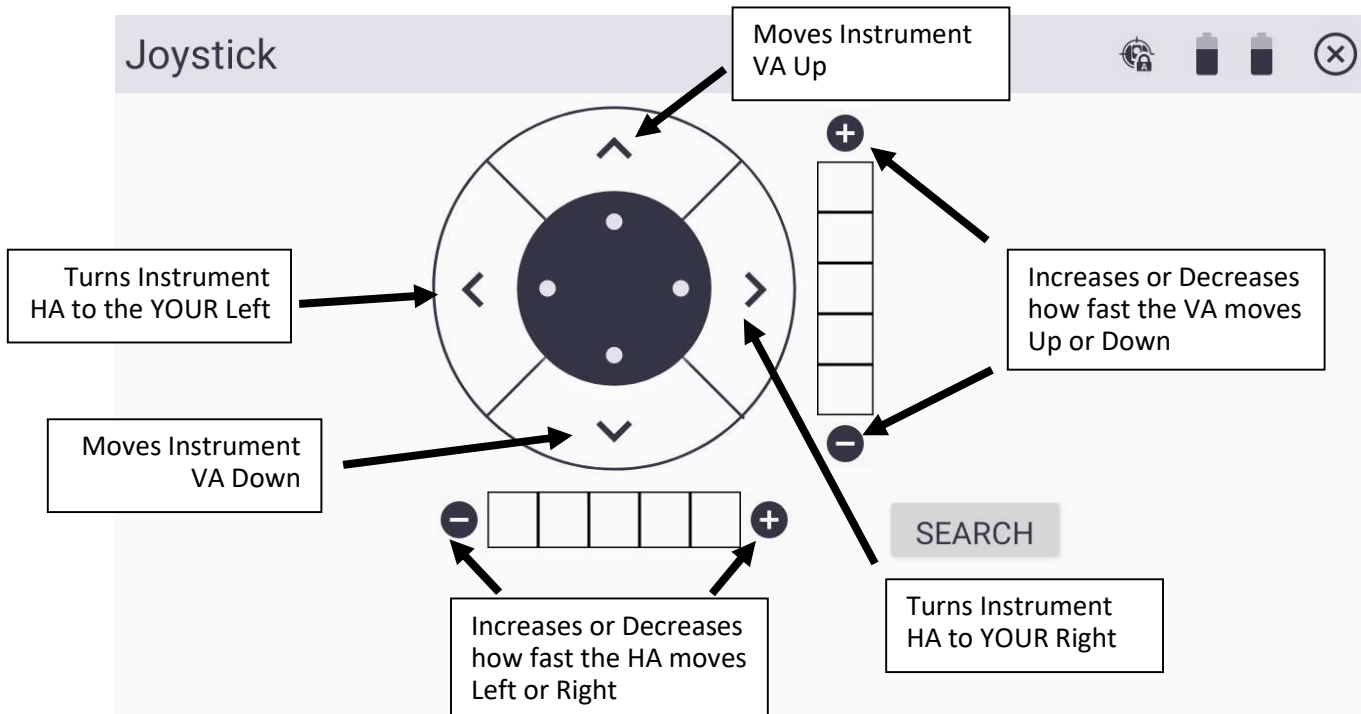

5. **Autolock On/Off**
   a. You want Autolock set to On. When the Instrument loses sight of the Target, whether standing behind the Instrument or away from the Instrument, when the Instrument is pointing close to the Target, it will "Automatically Lock" (Autolock) onto your Target.

6. **Tracklights On/Off & Joystick**
   a. **When turned on, they illuminate here, see below**

Instrument Tracklight

   b. **Tracklights are very useful when the Instrument stops following the Target because of an obstacle.**
   c. **Start by standing in a position where the Target is in front of you and have a clear line of sight to the Instrument. Toggle Tracklights to "ON"**
   d. **Next, Tap the "JOYSTICK" button, the Joystick page opens, see below**

Joystick

Moves Instrument VA Up

Turns Instrument HA to the YOUR Left

Increases or Decreases how fast the VA moves Up or Down

Moves Instrument VA Down

SEARCH

Increases or Decreases how fast the HA moves Left or Right

Turns Instrument HA to YOUR Right

   e. **With the top of the Data Collector pointing towards the Instrument and with the Tracklights ON, we can remotely move the Instrument to find our Target, see above image**
   f. **Using the Joystick arrows, turn the Instrument until you see either Blinking Green or Red lights**

i. **Blinking Red light means to press the Left Button until you see both a Blinking Red & Green light then Tap "SEARCH"**

ii. **Blinking Green light means press the Right Button until you see both a Blinking Red & Green light then Tap "SEARCH"**

iii. **The Instrument will search a defined window and should Lock onto your Target. If not, continue using the Joystick until you see the Blinking Red & Green lights, Tap "SEARCH"**

iv. **Once the Instrument Locks onto your Target, you can turn OFF the Tracklights or leave them ON.**

v. **Tap the "Circled X" in the upper right-hand corner to exit back to the Main Screen.**

Creating a New Project with or without Surveyor Control

1. **Open Siteworks, when the Open Project page opens, Tap the "Circled +" button to the far right of Project, see below**

Open Project		🔋 ⊗
Project	2019 Training Center Road ⌄	⊕
Work Order	49ers Topo 230710 ⌄	⊕
Design	2019 Local 49-FG_Staging-190923 ⌄	⊕

ACCEPT

2. **New project page opens.**
   a. **To the right of Project, type in a job specific Name**
   b. **Confirm your settings match the image below**
   c. **Tap "Next"**

New Project		🔋 ⊗
Project		
Distances	US Survey Feet	⌄
Angles	Degrees	⌄
Coordinate order	P, N, E, Z, D	⌄
Grid coordinate	North and East	⌄
Azimuth	North	⌄
Stationing	0+00.000	⌄

NEXT

3. **Project Creation Options page opens. check the boxes that apply if you have:**
   a. **A project map, then browse to the location**
   b. **A calibration file, then browse to the location**
   c. **Control point file, then browse to the location**
   d. **FXL file, then browse to the location**
   e. ==**If your Project will not have Control Points from a Surveyor**==**, leave the "Select Coordinate System" box** ==**UNCHECKED**==**, Tap "FINISH" then Skip to Step 4**
      i. ==**If your Project will have Control Points from a Surveyor, CHECK**== **the "Select Coordinate file" box, then:**
         1. **Tap "COORDINATE SYSTEM"**
         2. **Coordinate system is "United States/NAD83/MN"**
         3. **Zone is the County in which your project is located within, select that County**
         4. **Geoid file, if you have one, choose it or (No geoid file)**
         5. **Tap "ACCEPT", see below**

Select Coordinate System		
Coordinate system	United States/NAD83/MN	
Zone	Pine	
Geoid file	(No geoid model)	

ACCEPT

4. **Project Creation Options pages opens, Tap "FINISH"**
5. **Open Project pages opens, you MUST create a Work Order. Tap the "Circled +" to the far right of Work Order**
   a. **New Work Order page opens, type in a name for the Work Order**
   b. **Tap "FINISH"**
6. **Open Project page opens, if you have a Design, select it. If not, choose (No design needed). Tap "ACCEPT"**
7. **If Connect to Total Station page opens and you have or will have Control Points from a Surveyor, refer to:**
   a. **"Setting up on Arbitrary Location" OR**
   b. **"Setting up on a Known Control Point"**

8. **If Receiver Setup page opens, Tap the "Circled X" in the upper right-hand corner of the screen.**
   a. **Tap the "Hamburger" button in the upper left-hand corner of the screen (the three stacked lines)**
   b. **Tap "Project Setup" then Tap "Connect Device"**
   c. **When the pop up appears, Tap "Total Station"**
   d. <mark>**If you will not have Control Points from a Surveyor,**</mark> **refer to "Set Up with No Control Point"**
      i. **IF you will have Control Points from a Surveyor, Refer to:**
         1. **"Setting up on Arbitrary Location" OR**
   2. **"Setting up on a Known Control Point"**

Instrument Setup over Known Control Point or Arbitrary Location

1. **Scan the image below and click on "UTS Setup" video**

Setting up on Arbitrary Location

1. Below is a reference image of what Arbitrary Location looks like, you want:
   a. An Instrument location that can visibly see 2 or more control points
   b. The interior angle to be 90 degrees, or as close as possible
   c. The distance between the Instrument and control points to be similar in lengths, or as close as possible.
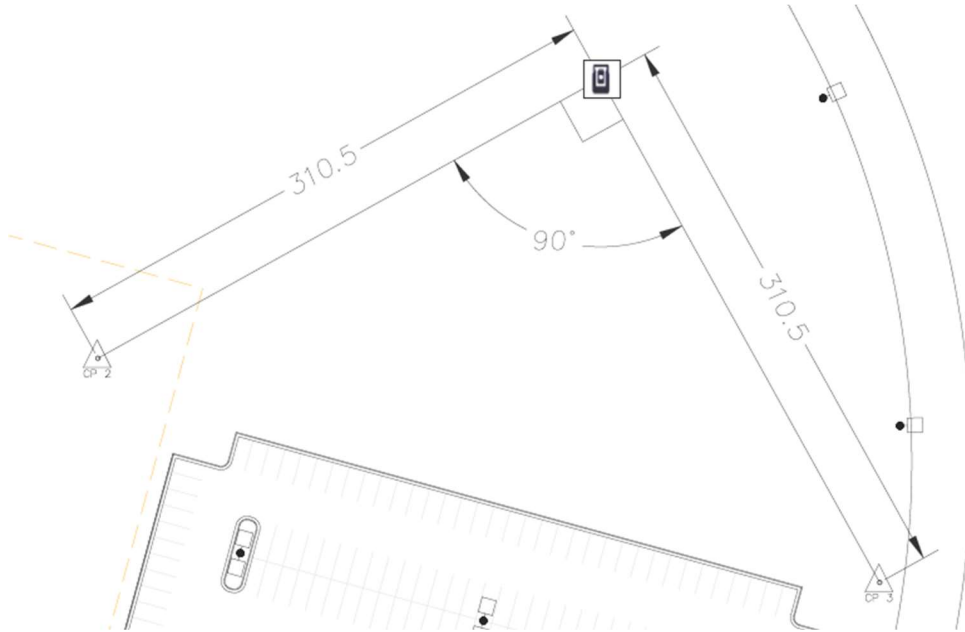
2. Before continuing, have your Instrument set up and level in an Arbitrary Location.
3. The Instruments display screen should be showing "Channel" & "Network ID". See picture below (if not sure about how to do this, please refer to "Instrument Digital Leveling & Settings")
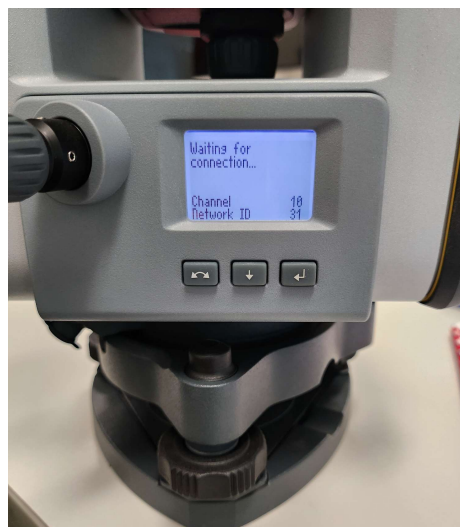
4. Open Siteworks and select your Project, Work Order, Design, then Tap "ACCEPT"
5. If "Connect to Total Station" page opens, skip to step 6c
6. If the "Receiver Setup" page opens, Tap the circled "X" in the upper right-hand corner of the screen.
   a. Tap the "Hamburger" button in the upper left-hand corner of the screen (the three stacked lines), then Tap "Project Setup" then Tap "Connect Device"
   b. On the pop up, Tap on "Total Station", see below
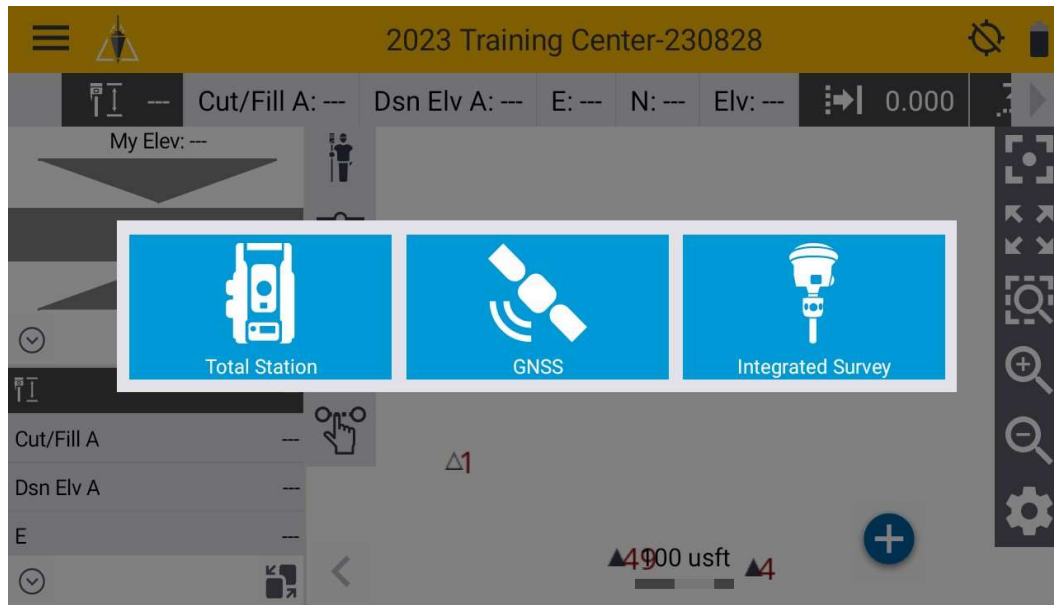
   c. Connect to Total Station page opens, the Radio Channel & Network ID must match your instrument display screen to Connect. Look at your Instruments display and match up the settings, Tap "ACCEPT", see below

7. **The Level Compensator page pops up.**
   a. **Make sure "Enable compensator" is on in the upper left hand corner**
   b. **It also displays the "Sighting & Trunnion" values. <mark>NOTE: If you make adjustments to the tribrach to level the instrument while set up over a known control point, check to make sure you are still centered over the control point.</mark> Tap "ACCEPT" to continue.**
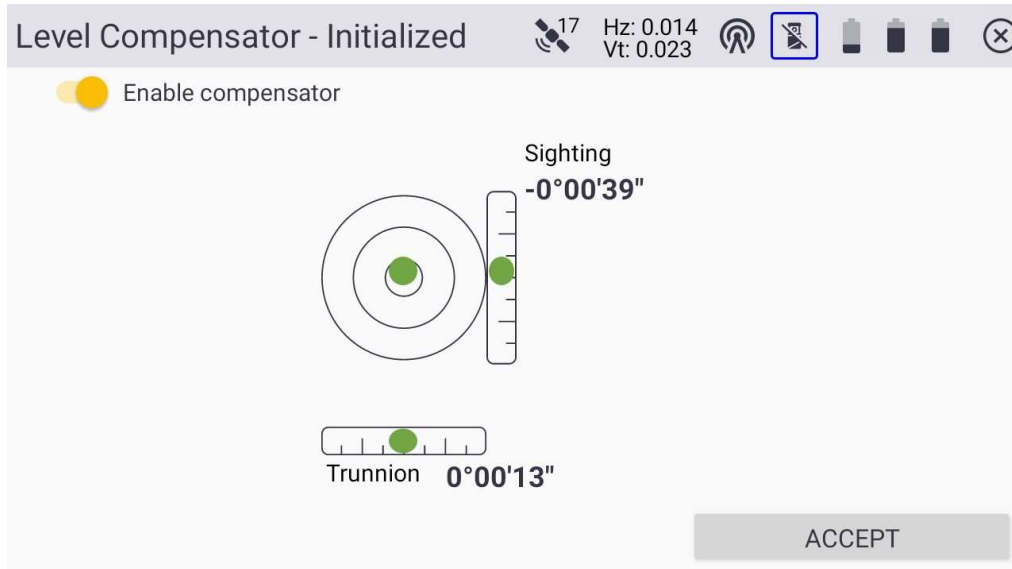
8. **The Atmospheric Corrections page opens**
   a. **Confirm "Read pressure from instrument" is on**
   b. **You need to manually enter the current outside temperature.**
   c. **Make sure "Show corrections on startup" is On**
   d. **Tap "ACCEPT" to continue**
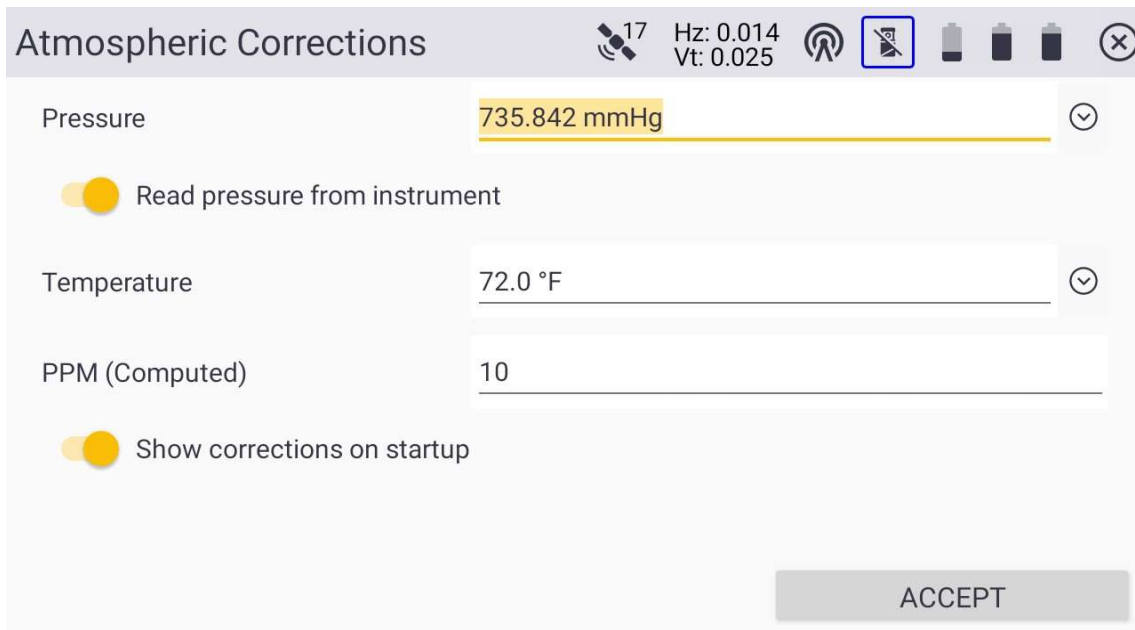
9. **The Corrections page opens, confirm settings below and Tap "ACCEPT"**

Corrections

Choose the corrections you want to apply to the measured distance:

☑ Curvature and refraction

☐ Mean sea level correction

Scale factor

◯ Entered

⦿ Computed

☑ Show corrections on startup

ACCEPT

10. **Total Station Setup page opens. Tap "Set up at an arbitrary location" and then Tap "ACCEPT"**

Total Station Setup   15   Hz: 0.015   Vt: 0.028

⦿ Set up at an arbitrary location

◯ Set up on a known control point

◯ Read station setup data from instrument

◯ Use last setup (as instrument has not moved)

ACCEPT

11. **Unknown Station Setup page opens. 2 or more control points are needed, within tolerance.**
    a. **Make sure the Instrument is tracking your Rod and Target.**
        i. **If not, refer to "Instrument Control Panel" to Search for your Target**
    b. **Tap "ADD POINT"**
    c. **Choose or Type the name of the first point you want to observe and then Tap "SELECT"**
    d. **Walk to that point in the field. Set your Rod on top of that point**
    e. **Level the rod using the bi pods.**
    f. **Confirm setting below, then Tap "MEASURE"**


12. **Unknown Station Setup page opens.**
    a. **Tap "ADD POINT"**
    b. **Select the next point you want to shoot and walk to that point**
    c. **Set the rod on the point, level up the rod using the bi-pods**
    d. **Confirm settings from above picture, then Tap "Measure"**
    e. **The Unknown Station Setup page opens, showing the tolerances of the measurements. If acceptable tolerances, there will be a <mark>"Green Checkmark"</mark> near the upper left-hand corner. You can either:**
        i. **Tap "ADD POINT" to shoot another point, OR**
        ii. **If you are within tolerance, Tap "ACCEPT"**
        iii. **A Question will pop up, asking if you want to save the instrument point as a control point for future use?**
            1. **Most of the time, you would Tap "NO" for Arbitrary.**
            2. **Only Tap "YES" if:**
                a. **You set up the instrument over a control point you pounded into the ground and measured the Instruments height, OR**
                b. **Secured a permanent fixture that is immobile for the Instrument to be set up on multiple times and has a fixed height.**
13. **You have successfully set up the Instrument on an Arbitrary location**

Setting up on Known Control Point

1. **Have your Instrument set up, leveled, and perfectly centered over the Known Control Point, before continuing. The Instruments screen should be showing "Channel" & "Network ID". See picture below**
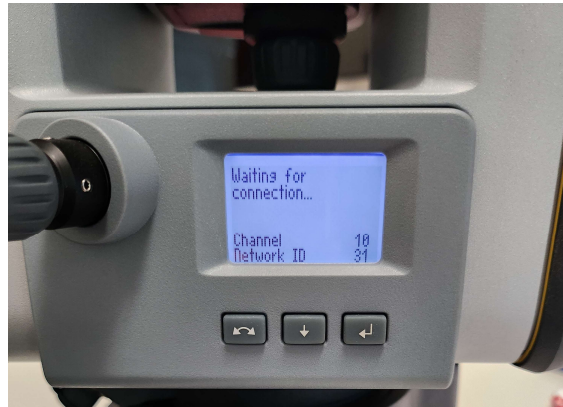

2. **Open Siteworks and select your project, work order and design (if needed), then Tap "ACCEPT"**
3. **If "Connect to Total Station" page opens, skip to step 7**
4. **If the "Receiver Setup" page opens, Tap the circled "X" in the upper right-hand corner of the screen.**
5. **Tap the "Hamburger" in the upper left-hand corner of the screen (the stacked three lines), then Tap "Project Setup → Connect Device" and this will pop-up**
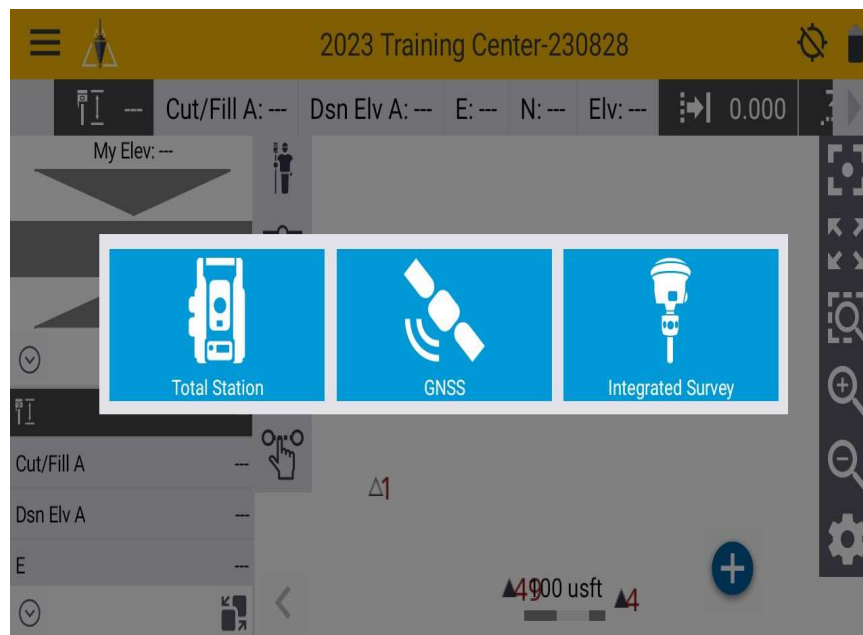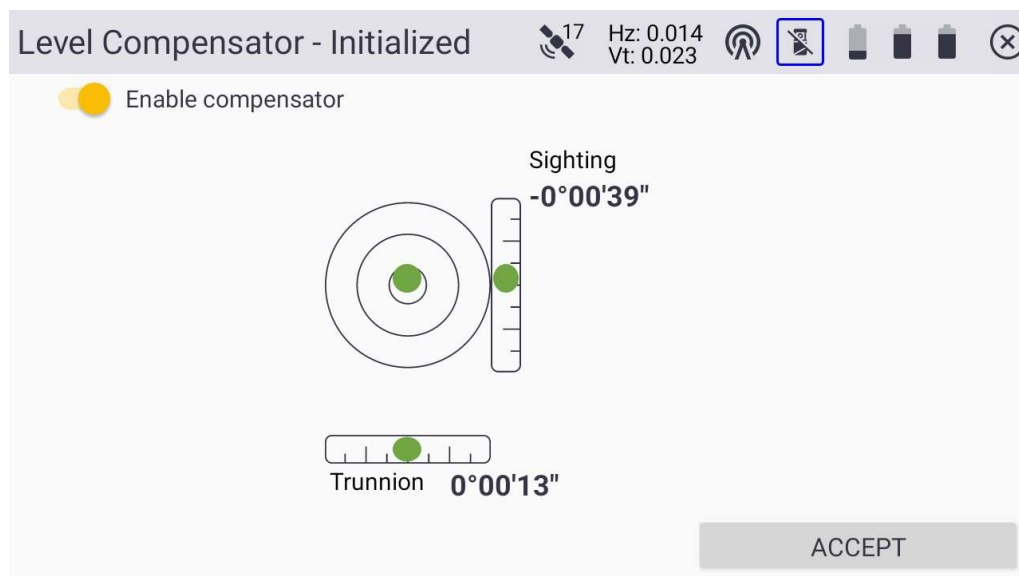

6. **Tap on "Total Station"**

7. **The Connect to Total Station page opens, confirm:**
   a. **"Radio Channel" & "Network ID" match your Instrument display screen to Connect**
   b. **Tap "ACCEPT" see below**
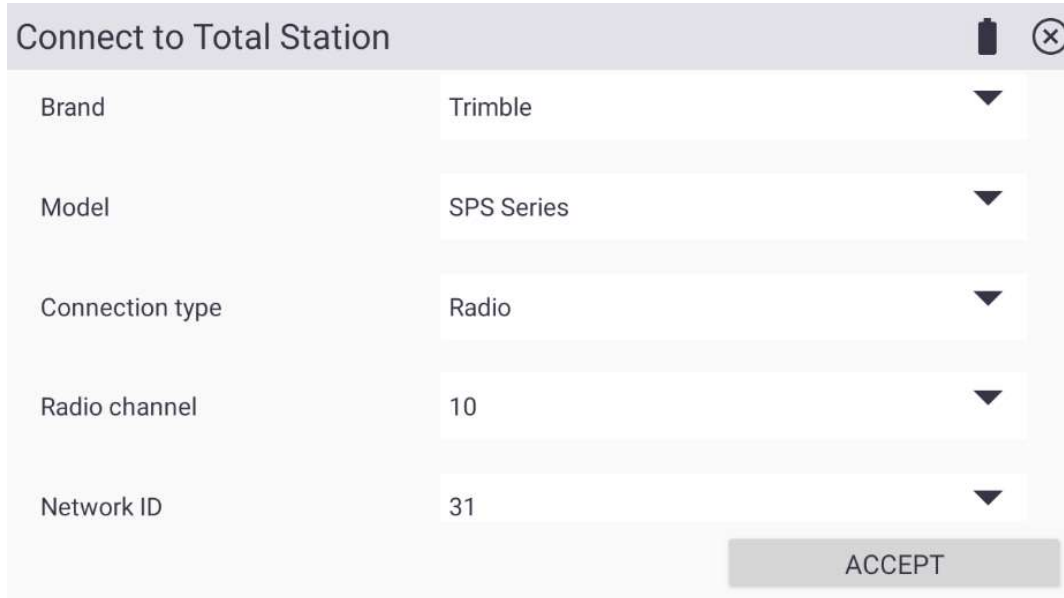
8. **The Level Compensator page pops up.**
   a. **Make sure "Enable compensator" is on in the upper left hand corner**
   b. **It also displays the "Sighting & Trunnion" values.**
      i. **NOTE: If you adjust the tribrach to level the instrument while on this screen, and are set up over a Known Control Point, check to make sure you are still centered over the control point through the site glass on the Instrument.**
   c. **Tap "ACCEPT" to continue.**

9. **The Atmospheric Corrections page opens,**
    d. **Confirm "Read pressure from instrument" is On**
    e. **You need to manually enter the current outside temperature.**
    f. **Make sure "Show corrections on startup" in On**
    g. **Tap "ACCEPT" to continue**

10. **The Corrections page opens, confirm settings below and Tap "ACCEPT"**

11. **Total Station Setup page opens. Select "Set up on a known control point" and then Tap "ACCEPT", see below**

12. **Select Instrument Point page opens**
    a. **Choose or type the name of the control the Instrument is currently occupying, Tap "ACCEPT"**
13. **Enter Instrument Height page opens, there are 2 measurement types:**
    a. **Slope Height or Vertical Height.**
    b. **Slope Height is most common. Using a decimal feet tape, measure up from the top of the control point to "Crosshair" on the side of the Instrument. This measurement is entered as the "Instrument Slope Height" Tap "ACCEPT"**

14. Known Station Setup pages opens, Tap "ADD POINT"
    a. **Select or type the name of the control point you want to shoot with the Rod, then Tap "SELECT"**
    b. **Before walking to that control point, make sure the Instrument is locked onto your Rod with Target**
    c. **Walk to the control point, place the rod on top of the control point**
    d. **Using bi-pods, level the rod. Once leveled, confirm these settings**

⊙ Take Measurement	🔖 🔋 🔋 ⊗
☐ Angle only	
Measure mode	Averaging ⌄
Target height	6.562 usft
Target type	MultiTrack Target
Measurement sets	3
Angle tolerance	0.00.05
Distance tolerance	0.082 usft
☑ Use Autolock	
	MEASURE

    e. **Tap "Measure"**
    f. **Known Station Setup page opens. If the values are within tolerances, there will be a <mark>"Green Checkmark"</mark>, near the upper left-hand corner of the screen. If there is a green checkmark, Tap "ACCEPT"**
15. You have successfully set up the Instrument over a Known Control Point.

SPS930 Workflow for Machine Control

1. **Before continuing, you must have either:**
   a. <mark>**Your Machine and Target must have been Setup and Calibrated by Ziegler**</mark>
   b. **Connected and completed Instrument setup on "Arbitrary Location", OR**
   c. **Connected and completed Instrument setup on "Known Control Point"**
   d. **Have the Instrument tracking your Rod and Target**
   e. **The Machines Target installed and wires plugged in to the correct locations**
2. **Tap the "Hamburger" button in the upper left-hand corner (the three stacked lines)**
   a. **Tap "Project Setup"**
   b. **Tap "Machine Control Setup"**
   c. **Define Search Window page opens. You need to define a search window for the Instrument to find the "Machines Target" within your work area**
      i. **Shown below, using the Rod to "Set" the upper left-hand corner and the lower right-hand corner.**
      ii. **With the rod help up the air, above machines Target, you would need to Tap "SET" on the Data Collector for the upper left-hand corner**
      iii. **With the rod set on the ground near the lower right-hand corner, Tap "SET" on Data Collector for the lower right-hand corner.**
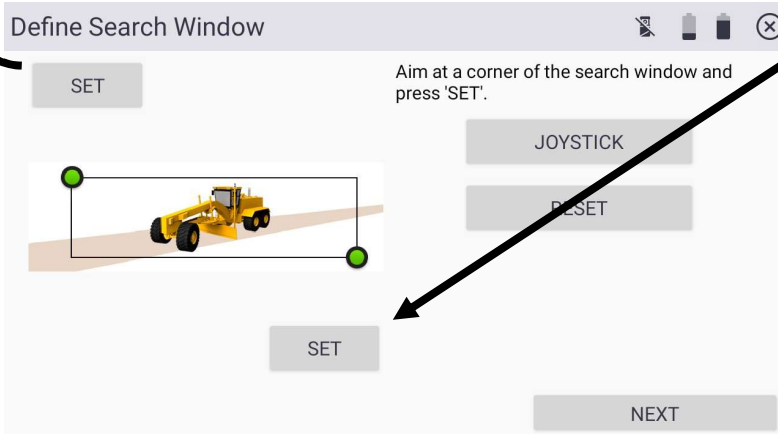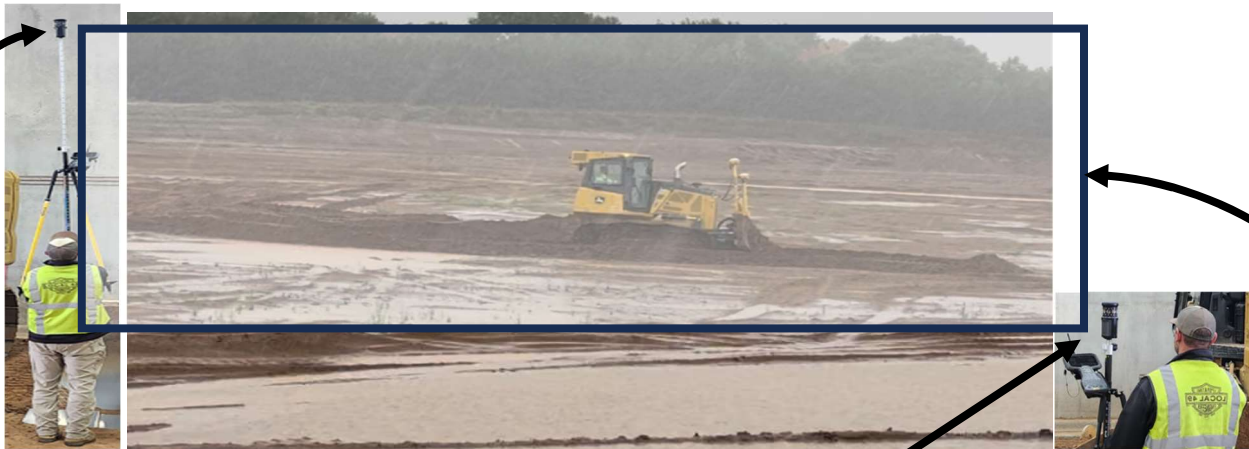

Defines a "Window" for the Instrument to "Search" for the "Machines Target" within your current "Work Area", when it loses sight of the "Machines Target"

iiii. **Tap "NEXT"**

3. **Edit Machine List page opens. If your machine appears in the list, Tap on it to highlight it, then Tap "NEXT"**
   a. **If no machines appear, Tap the "Pencil" to create one**
   b. **Machine Name – make it specific for your Machine – easily identified**
   c. **Radio Channel – choose a channel.**
   d. **Tap "FINISH" see image below**
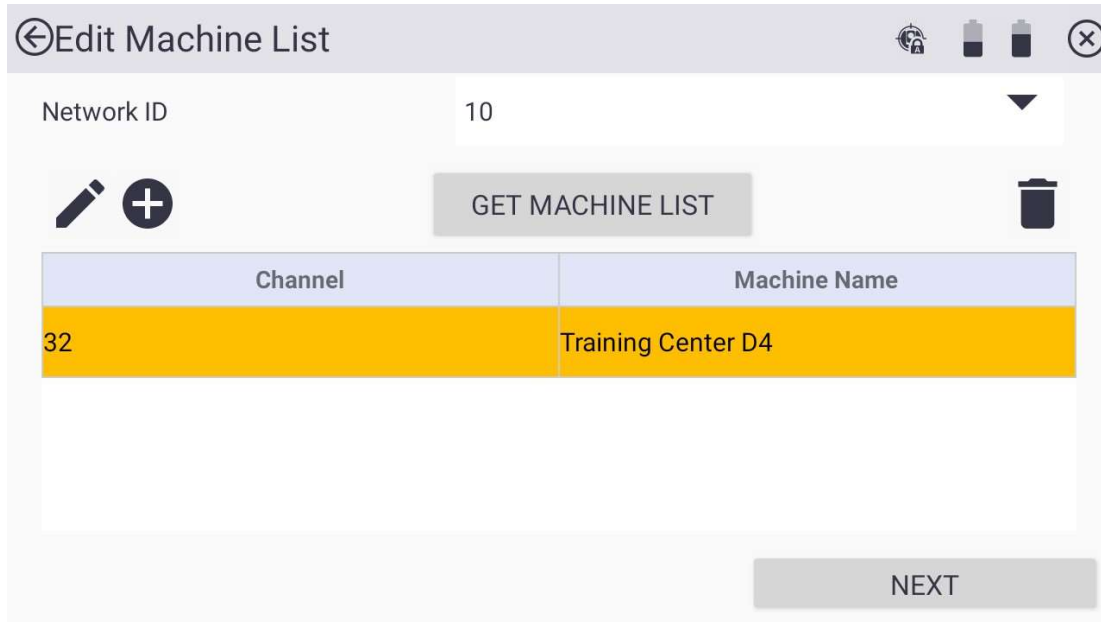
4. **Edit Machine List opens, take a picture of this screen with your phone. These settings will also need to be set inside the Machine in a later step**
   a. **Tap on your "Machine" to highlight it, Tap "NEXT"**
5. **Machine Control Setup page appears. When you Tap Finish, the Instrument will now switch over to Machine Control mode**
   a. **Tap "Finish"**
6. **Jump into the Machine. Open Earthworks. Make sure you are in the correct Design on the Dashboard.**
7. **From the Dashboard, Tap "Machine Setup" tile.**
8. **Change Positioning Source to "UTS Center"**
9. **Then Tap the "Blue Box" to the right of "Setup UTS"**
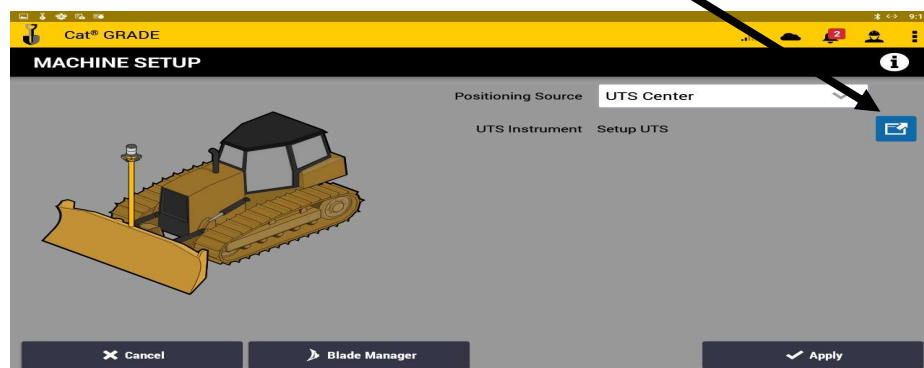
10. **UTS SETTINGS page opens. From the picture you took on Step 4**
    a. **Set the Channel to 32**
    b. **Set the Network ID to 10**
    c. **Target ID – does not matter on the Machine**
    d. **Make sure "Auto Search" is on, see image below**
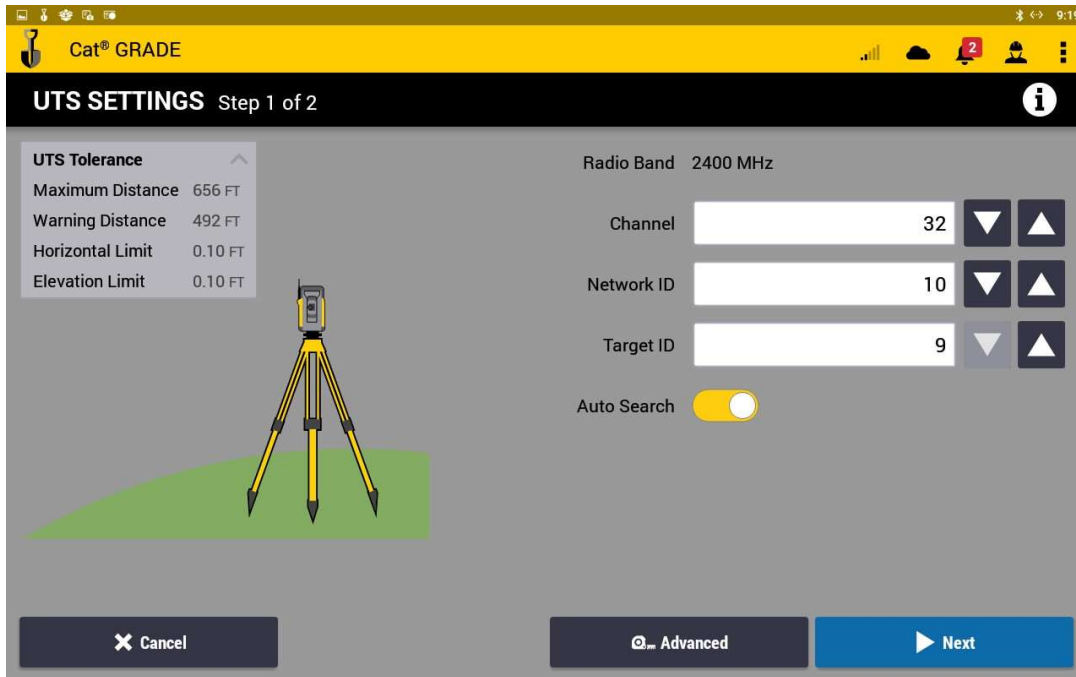
    e. **Tap "Next"**
    f. **UTS MANAGEMENT page opens. Your Instrument should start scanning for the Machines Target, as set in Step 2c, see image**
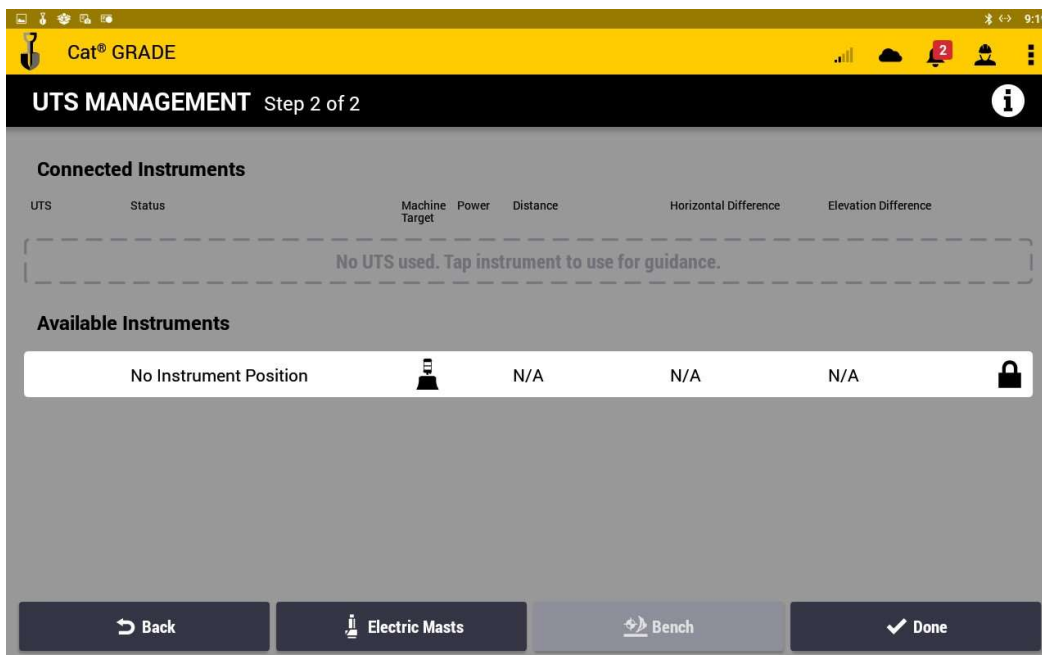
g. **When the Instrument locks onto the Machines Target, the UTS MANAGEMENT screen will now show this, Press "Tap to start", see below**
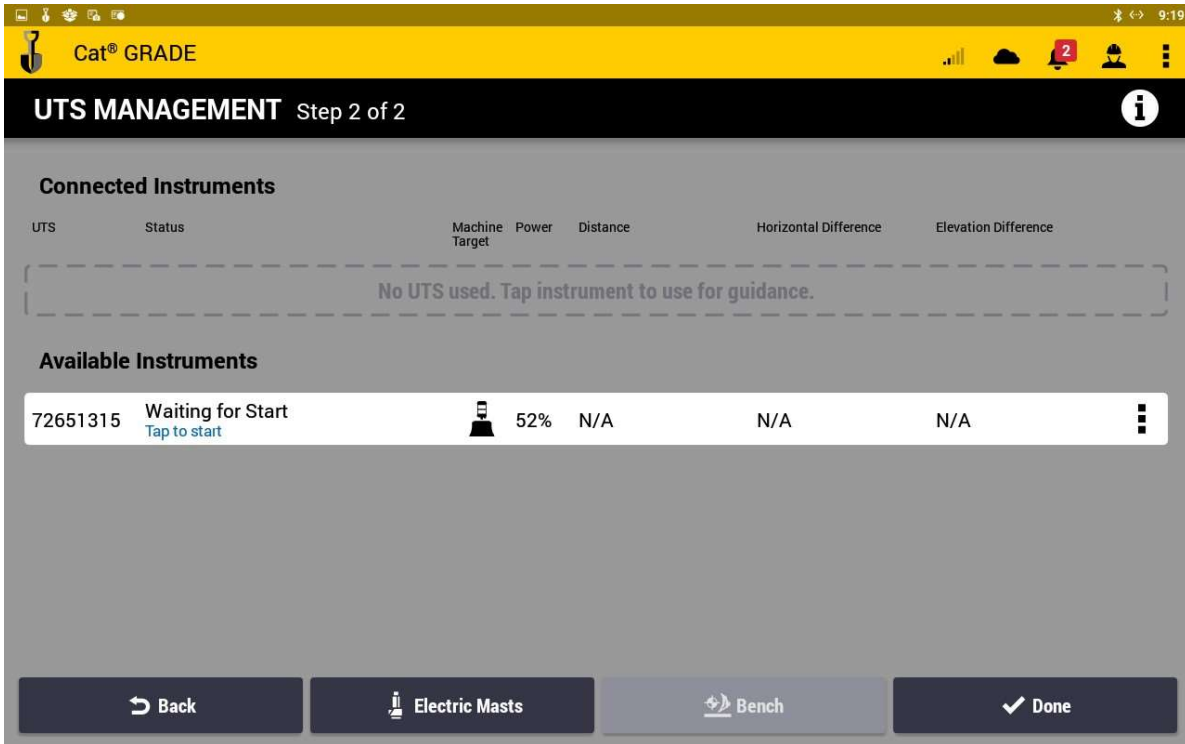
h. **When connected and tracking, Press "Tap to use for guidance", see below**
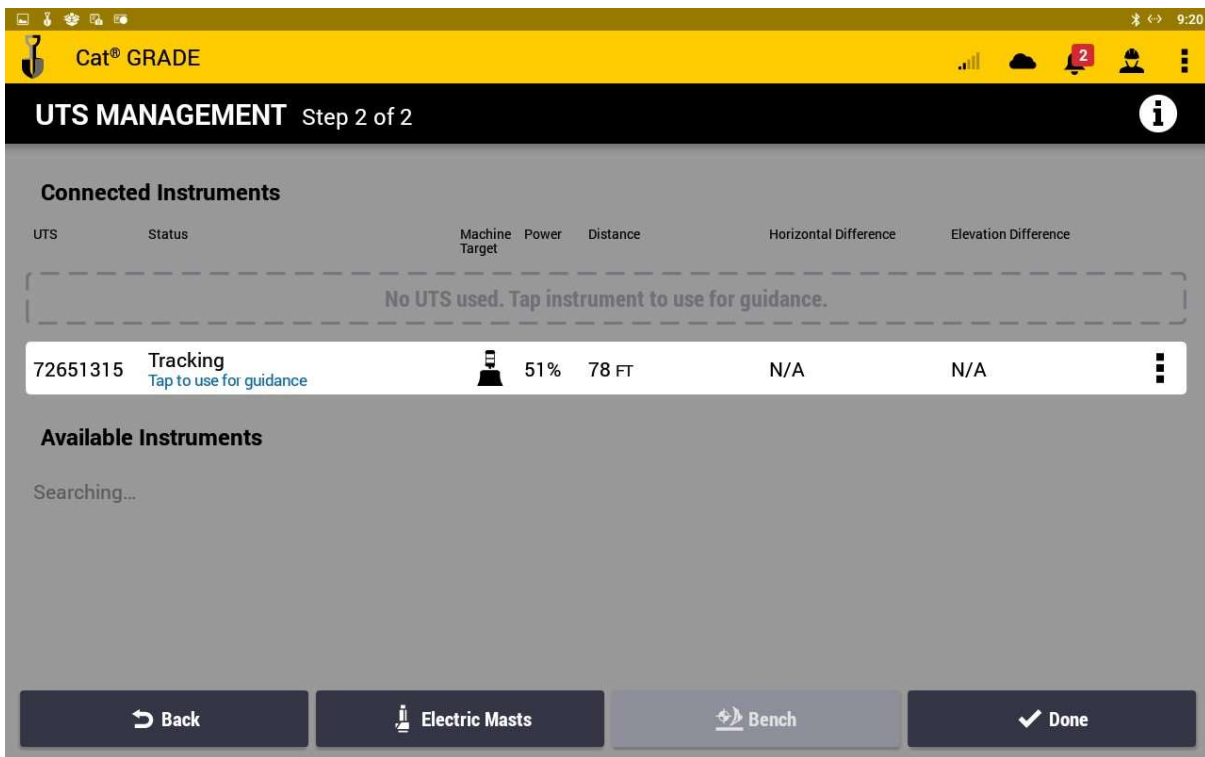
i. When it is ready for guidance, the white bar will switch to a ==highlighted color== and now say "Used for Guidance", Tap "Done" see below
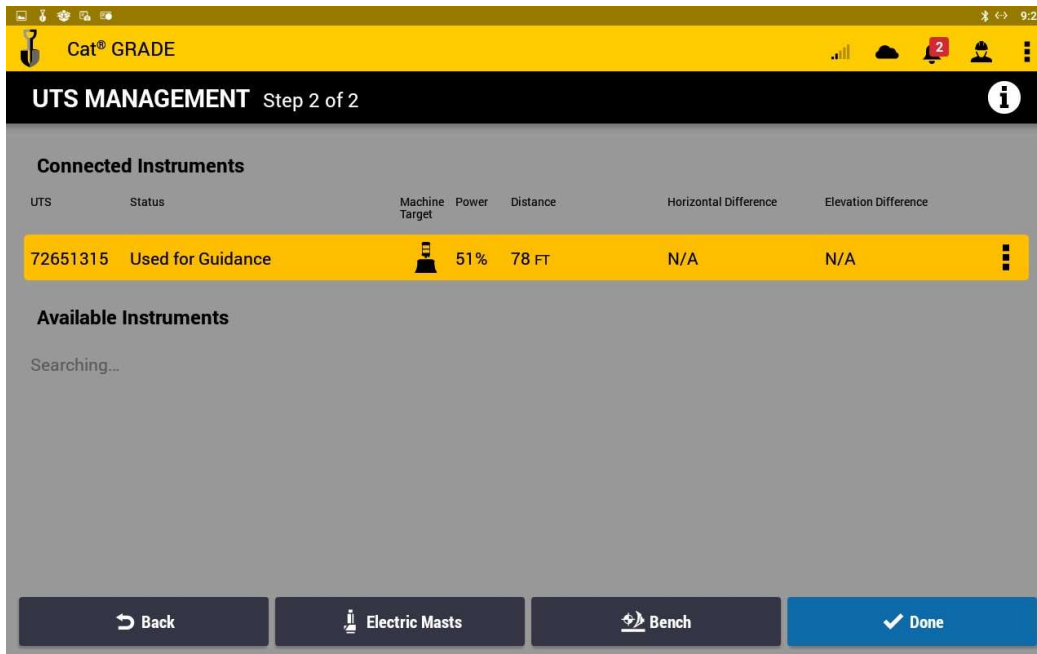
j. When the MACHINE SETUP page opens, Tap "Apply"
k. It will bring you back to the DASHBOARD page, the ==**"Start"**== button should now be YELLOW. If it is not, raise the attachment up and then back down. Confirm you are in right Job, Tap the yellow ==**"Start"**== button
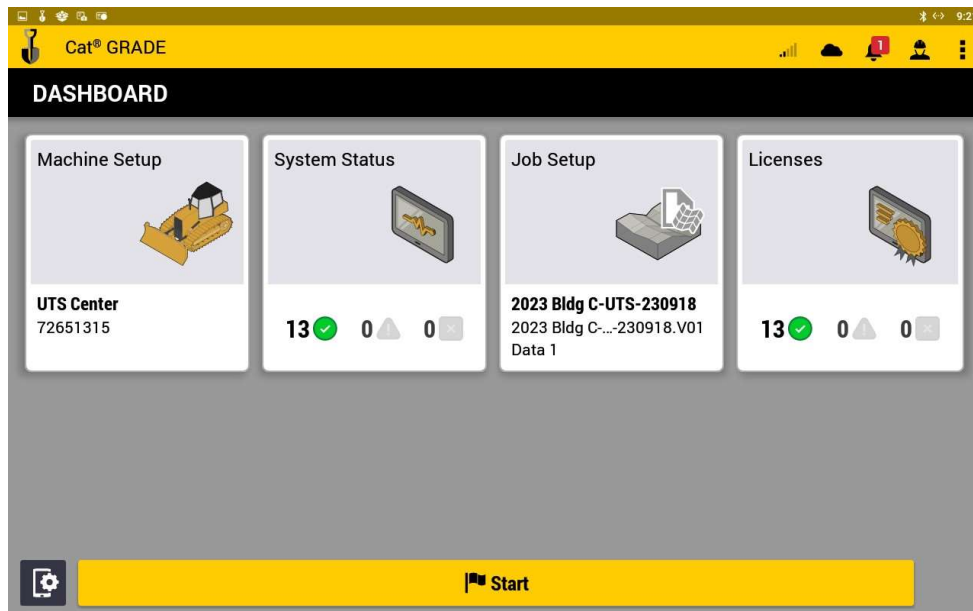
l. It will want you to "Move Machine" before it gives you guidance. Drive forward until that message goes away. For Auto Guidance on a Design, engage the Autos just like you would with GPS Guidance.

Integrated Surveying – Siteworks Version 1.7 or higher

1. Before continuing, make sure that:
   a. The Instrument is setup and level either:
      i. At an Arbitrary location, OR
      ii. Over a Known Control Point
   b. Siteworks is open and you are in the current Project, Work Order and Design (if needed)
   c. Have your Rover head screwed on top of your Target, without Quick Release, and your Rover turned ON, see below

2. After accepting Project, Work Order and Design, if either:
   a. Receiver Setup, OR
   b. Connect to Total Station page opens,
   c. Tap the "Circled X" in the upper-right hand corner, to close out
3. Hit the "Hamburger" button in the upper left-hand corner (the three stacked lines)
   a. Tap "Project Setup"
   b. Tap "Connect Device" and this pops, Tap "Integrated Survey"
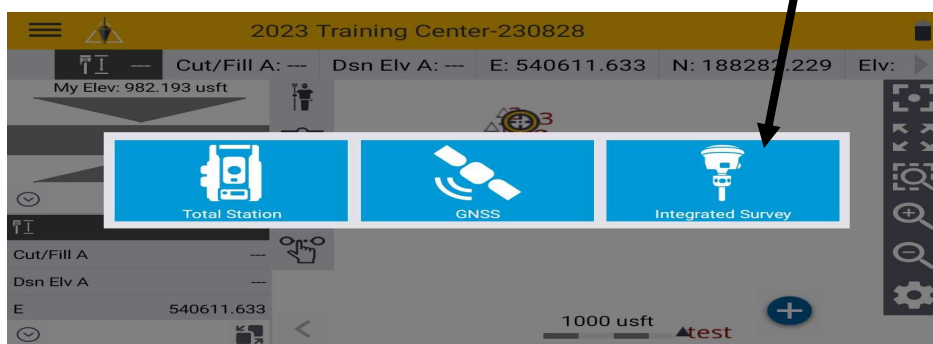
4. **It first Connects to your Rover, confirm settings below. (NOTE: We are NOT "Using Quick Release" for Integrated Surveying. Make sure "Use target height plus offset to receiver" is On.** Tap "ACCEPT"

Receiver Setup

Connection type	Bluetooth ▼
Bluetooth device	R780 6240F00075 Trimble ▼
Correction method	Radio in Receiver ▼
Network ID	4 ▼
Connected to base	49 ▼
Using Quick Release	No ▼ ?
Enable Tilt Compensation	No ▼
Target height	6.562 usft

🔘 Use target height plus offset to receiver

ACCEPT

5. **Connect to Total Station page opens, confirm the "Radio" & "Network ID" settings match what is being displayed on your Instrument, Tap "ACCEPT"**
6. **Level Compensator – Initialized page opens. Make sure Enable Compensator is on. NOTE: if your Instrument is set up over a Known Control Point and if you make adjustments to level the Instrument, it can move the Instrument from being centered over that point. If at an Arbitrary location, leveling the Instrument is OK.** Tap "ACCEPT"
7. **Atmospheric Corrections page opens, make sure "Read pressure from instrument" is on, you need to manually enter the current temperature and make sure "Show corrections on startup is checked, Tap "ACCEPT"**

8. **Corrections page opens, make sure:**
   a. **"Curvature and refraction" is on**
   b. **Scale factor is "Computed"**
   c. **"Show corrections on startup" is on**
   d. **Tap "ACCEPT"**
9. **Total Station Setup page opens,**
   a. **For Arbitrary location, refer to "Set Up on Arbitrary Location"**
   b. **For Known Control Point, refer to "Set Up on Known Control Point"**
   c. **Make your selection, then Tap "ACCEPT"**
10. **After completing Arbitrary location or Known Control Point and back on Main Screen, near the upper right-hand corner, you will see a "Toggle Switch". This allows you to be in either Rover or Instrument mode, see below**
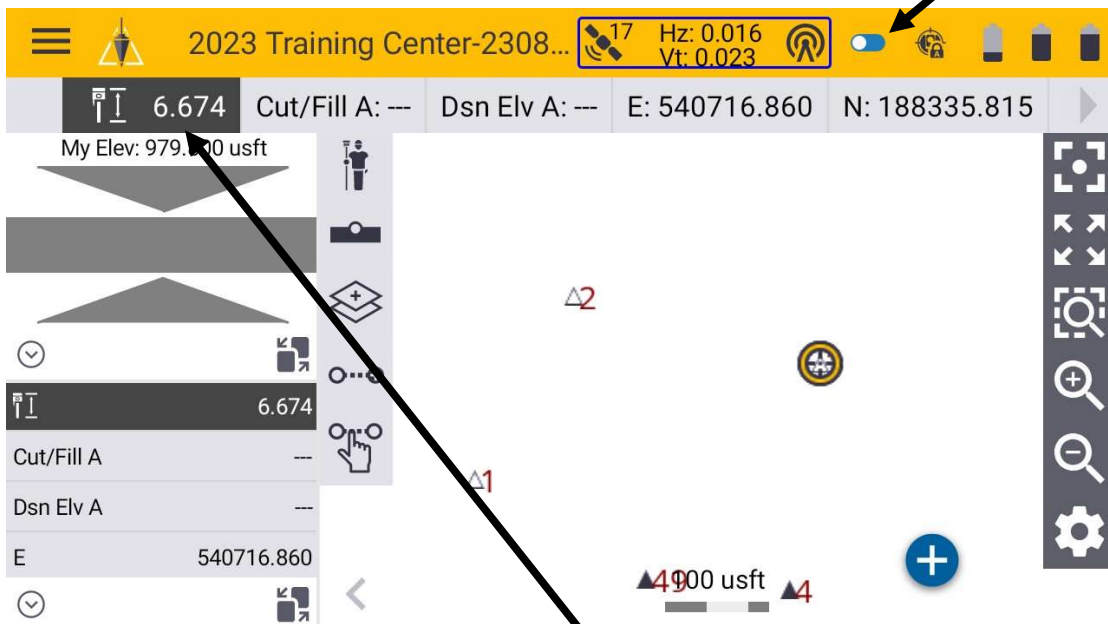
11. **On the image above, it is currently in ⌖ Rover Mode. If your Rod is currently pinned and locked at 6.562', click the "Rod Height" button, just below the "Hamburger" button near the upper left-hand corner, see below**
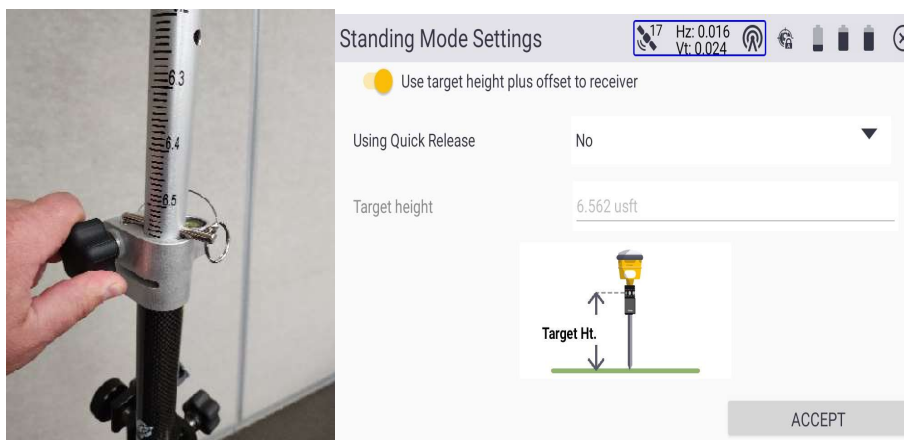
12. In Step 4 above, we turned on "<mark>Use target height plus offset to receiver</mark>".

    a. **When toggled to "Instrument Mode" and we adjust our Rod in the field to go above or below obstacles and enter that value into the Data Collector, it automatically reflects the correct height of our Rover.**

    b. **If you were to toggle back into "Rover Mode", you cannot change the Rod Height value in "Rover Mode"**

    c. **Simply toggle back into "Instrument Mode", physically move your rod up or down, pin and lock it, then enter the correct height into the Data Collector**

    d. **When you toggle back to "Rover Mode", it will automatically give you the corrected Rover height based on the Rod Height entered in "Instrument Mode".**

Project Set Up with No Surveyor Control Points

1. Setup and Level the Instrument at an Arbitrary Location, keeping in mind where you want to "Set" new Control Points, that will not be affected by Construction activities, while also keeping in mind the Instrument being able to see your work area will be for that Setup. Have your Instrument facing Northerly.
2. From the Main Screen in Siteworks, Tap the "Hamburger" button in the upper left-hand corner of the screen (the three stacked lines)
   a. Tap "Project Setup", then Tap "Connect Device"
   b. On the pop-up, Tap "Total Station"
3. Connect to Total Station page opens, confirm:
   a. Brand of Instrument is "Trimble"
   b. Model is either "SPS" or "RTS"
   c. Connection type is "Radio"
   d. "Radio channel" & "Network ID" matches the Instruments display screen
   e. Tap "ACCEPT"
4. Level Compensator pages opens, confirm
   a. Your Sighting & Trunnion are within tolerances
      i. NOTE: you can make tribrach adjustments if you are at an Arbitrary location. **IF you make tribrach adjustments while Setup over a Control Point**, it will move the Instrument off the Control Point, recheck to confirm you are centered on the point.
   b. Make sure "Enable compensator is checked On
      i. Tap "ACCEPT"
5. Atmospheric Corrections page opens, confirm:
   a. "Read pressure from instrument" is checked
   b. Manually enter the current outside temperature
   c. Show corrections from startup is on
   d. Tap "ACCEPT"
6. Corrections page opens, confirm:
   a. Curvature and refraction is checked On
   b. Scales factor is "Computed"
   c. Show corrections on startup is checked
   d. Tap "ACCEPT"

2. **Set Up with No Control Point page opens. Since this is a Project with no Control Points given by a Surveyor, we are going to use assumed Coordinates. See below**
   a. <mark>NOTE: Before tapping accept, make sure your Instrument is pointing Northerly.</mark>
   b. **Tap "ACCEPT"**

3. **With the Target/Prism on   your Rod, get your Instrument to lock onto your Target OR Tap the "Target" symbol and refer to "Instrument Control Panel"**
4. **We now want to Measure some control points for the Project. To do so:**
   a. **Tap "Hamburger" button (the three lines in the upper left-hand corner)**
   b. **Tap "Measure" then Tap "Measure Control Point"**
   c. **On the pop up, Tap "New Control Points"**
   d. **Walk to where you want the new control point to be, you can either:**
      i. **Pound a PK nail, hub, rebar, etc, into the ground for control, OR**
      ii. **Using a marker or sharpie, draw an "X" onto a hard surface**
   e. **From the Main Screen, Tap "Measure Method",**
      i. **On the pop up,   Tap "Averaging"**
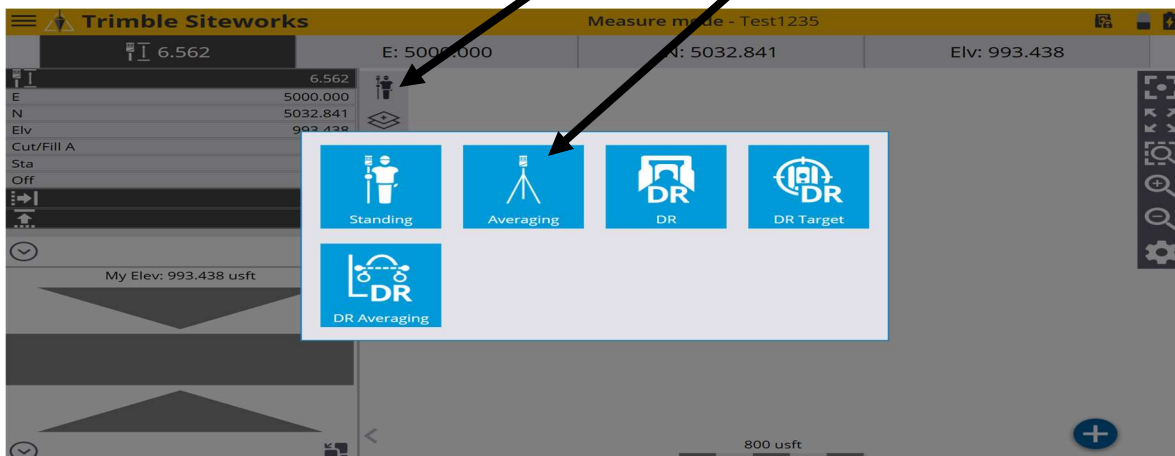
f. **Averaging Mode Settings page opens, confirm:**
   i. **Your Rod height matches your Target height**
   ii. **Target Type is set to the correct Target you are using**
   iii. **Measurement sets – 3 (is the most common for averaging)**
   iv. **Angle tolerance by default is 0.00.05**
   v. **Distance tolerance by default is 0.082**
   vi. **MAKE SURE "Use Autolock" is checked On**
   vii. **Tap "ACCEPT"**
g. **Using the bi-pods, level your Rod on top of your Control Point**
h. **Tap "+" symbol near the bottom right-hand corner of the screen**
   i. **Measure Control Point page opens, confirm:**
      1. **Point Name – should always be numeric values**
      2. **Point Code – describes what it is (Example – "CP X on Concrete or Hub, etc")**
      3. **Tap "ACCEPT"**
         a. **The Instrument will now shoot the Target multiple times**
      4. **Take Averaging Measurement page opens**
         a. **Near the upper left-hand corner of the screen, it will let you know if you are within tolerance**
         b. **If within tolerance, Tap "ACCEPT"**
         c. **If NOT within tolerances, tap the "Circled X" in the upper right-hand corner to start the process over**
      5. **After accepting the first control point, you need to store at least one more Control Point (keep in mind, storing more than 2 Control Points is advised). Walk to where you want the next Control Point, and "Set" a Control Point described in Step 9d above.**
      6. **Starting at Step 9g above, "Measure" more Control Points.**
i. **Once finished storing your Control Points:**
   i. **Tap "Hamburger" in the upper left-hand corner (the three stacked lines)**
   ii. **Then Tap "Measure"**

Design Surface from Field Topo Shots

1. Before continuing, make sure you have:
   a. Connected and completed Instrument setup on "Arbitrary Location", OR
   b. Connected and completed Instrument setup on "Known Control Point", OR
   c. Connected and completed Instrument setup with "No Control Points"
2. From the Main Screen, Tap the "Hamburger" button in the upper left-hand corner of the screen (the three stacked lines)
   a. Tap "Project Setup" then Tap "Change Project"
   b. On the Open Project page, create a New Work Order by tapping on the "Circled +" on the far-right side of Work Order
   c. New Work Order pages opens, make your work orders specific like job name-Topo-todays date (Ex- Bear Creek Topo 231004), Tap "FINISH"
   d. If you have a Design, choose one or (No Design Needed), Tap "ACCEPT"
3. From the Main Screen, Tap the "Hamburger" button in the upper left-hand corner of the screen (the three stacked lines)
   a. Tap "Measure"
4. Start by Defining an Outer Boundary for your Design, to do so:
   a. Tap "Measure Method", on the pop up Tap "Standing"
   b. Tap "Measure Type" button
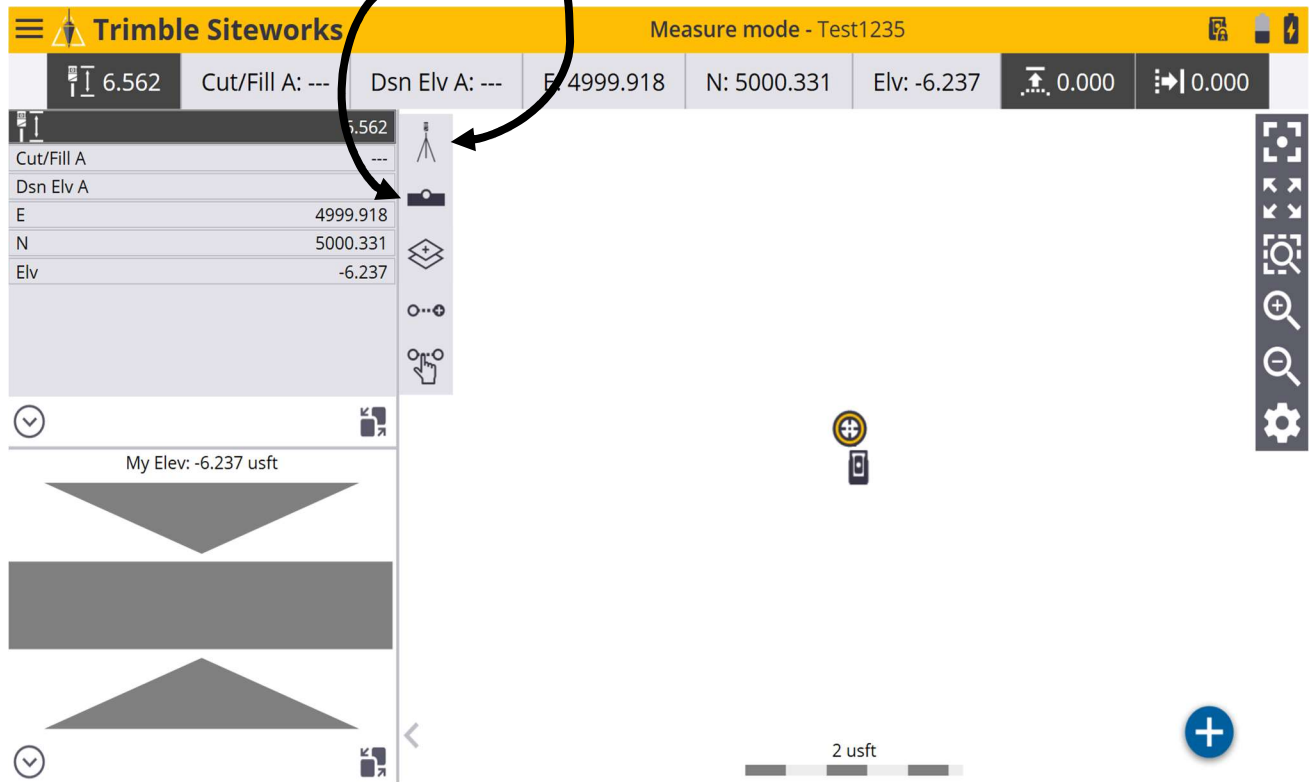
c. **Measure Type pages opens, Tap "New Line" tab near the upper right-hand corner, see below**
   i. **Line Name you can change or leave as the default "Line1" name**
   ii. **Line Type – choose "Outer Boundary", Tap "ACCEPT" see below**

Measure Type		🗠 🔋 🗙
Point	**Existing Line**	**New Line**
Line name	Line1	
Line type	Outer boundary ⌄	
		ACCEPT

d. **Walk to where you want to start defining your Outer Boundary, level the rod and Tap the "Circled +" button near the bottom right-hand corner of screen.**
   i. **It stores the point location and starts to draw a Boundary Line.**
   ii. **Continue storing points around your Projects Outer Boundary by leveling your Rod and Tap the "Circled +" in the bottom right-hand corner of screen.**
       1. **When topoing projects and outer boundaries, make sure to account for the high and low points, angles and corners for best accuracies.**
   iii. **Stop short of where you began the Outer Boundary line and store a point**
       1. **Tap "Measure Type" button**
       2. **Tap on the "Point" tab**
          a. **Point name should be numeric values (Ex-1000)**
          b. **Point code is a description of what you are shooting**
          c. **Point type should be Surface**
          d. **Show every time choose either:**
             i. **"Yes" if you want change point descriptions individually per point taken, OR**
             ii. **"No" if the point description will not change**
          e. **Tap "ACCEPT"**

3. **Start storing points within your Outer Boundary.**
   a. **Make sure your Rod is level before Tapping the "Circled X" in bottom right-hand corner**

e. **When finished storing points inside the Outer Boundary:**
   i. **Tap the "Hamburger" button**
   ii. **Tap "Data Management" then Tap "Surface As Design"**
      1. **Save Surface as Design page opens**
      2. **Name the Design (EX – FG Parking lot-231004)**
      3. **Linework choose "Include Measured Linework"**
      4. **Tap "ACCEPT"**

f. **The surface has been created, we now need to select it, go to:**
   i. **Tap "Hamburger"**
   ii. **Tap "Project Setup" then Tap "Change Project"**
   iii. **For Design, select the Design you just created**
   iv. **Tap "ACCEPT"**

Export Data for Machine or Rover Files

1. Whether you created a Design from Topo Points or have a Surface on your Data Collector and want to create files for Machines, we can do this in the field, from your Data Collector
2. Before continuing, make sure you are in the correct Project, Work Order and Design.
3. Tap the "Hamburger" button in the upper left-hand corner of the screen (the three stacked lines)
   a. Tap "Data Management" then Tap "Export to Machine"
   b. Export to Machine page opens, confirm:
      i. Export data type can be multiple types:
         1. Surface – a surface that was created in the office
         2. Measured Linework – linework from field topo
         3. Design – created from points & lines in the field
         4. Calibration – sends just the calibration file
         5. Measured Points – just points taken in the field
      ii. Machine control device can be multiple types
         1. CB430/CD700 – older GCS900 machine file creation (does not work very good)
         2. CB450/CB460 – newer GCS900 file creation
         3. Earthworks – Touchscreen Tablet file creation
      iii. Project
         1. Choose the Project that contains the files to be exported
      iv. Select Design
         1. If the Project has multiple designs, choose the correct one
      v. File location is either:
         1. USB Drive - most common option chosen, OR
         2. Device – saves to Data Collector
      vi. Once your settings are correct:
         1. If output is USB Drive, make sure it is in the Data Collector
         2. If output is Device, make sure you remember where you are storing the files
         3. Tap "ACCEPT"