## DEMONSTRATION GUIDE

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# TRIMBLE® S7 TOTAL STATION

Version 2015.10
Trimble® Access™ software
April 2015

Trimble

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## Release Notice

This is the April 2015 release (Revision A) of the Trimble S7 Total Station Demonstration Guide. It applies to version H1.0.18 of the total station firmware, version 2015.10 of Trimble Access, and version 3.50 of Trimble Business Center.

The following limited warranties give you specific legal rights. You may have others, which vary from state/jurisdiction to state/jurisdiction.

## Product Limited Warranty Information

For applicable product Limited Warranty information, please refer to Legal Notices in the Trimble Access online help or consult your local Trimble authorized dealer.

## Contents

# Introduction to the S7 Total Station

Welcome to the *Demonstration Guide* for the Trimble® S7 total station using Trimble Access™ field software. This document provides a complete, easy-to-use description of how to demonstrate the benefits and capabilities of this system.

## Key messages and features

***"Trusted today, designed for tomorrow"***

- Trimble Locate2Protect™ technology
- Trimble VISION™ technology
- Trimble SureScan™ technology

"Pair with Trimble Access, Trimble Business Center, and Trimble InSphere for the most powerful total solution on the market."

### Trimble Locate2Protect™ technology

Know where your total stations are 24 hours a day with Trimble Locate2Protect technology.

- Secure your investment
- Know where your equipment is to maximize efficiency, ensure that your equipment is always working
- Locate lost or stolen equipment
- Track usage or potential damage to better maintain your fleet

### Trimble VISION™ technology

Trimble VISION technology gives you the power to direct your survey with live video images as well as create a wide variety of deliverables from collected imagery.

- Live streaming video enables the instrument to be aimed by simply tapping the location on the image, reducing aiming time and operator fatigue
- Avoid unnecessary rework by using video data overlay to visually confirm that all points have been measured before moving to the next point
- High Dynamic Range (HDR) image processing improves image capture quality in high-contrast scenes
- Measure inaccessible points in the office with terrestrial photogrammetry workflows in Trimble Business Center
- Annotate captured images with notes in Trimble Access to communicate information with meaningful context
- Enrich your end deliverables with traditional survey data overlaid on images, providing additional value to your customers

### Trimble SureScan™ technology

Trimble SureScan technology enables you to collect and process data faster by focusing on collecting the right points, not just more points.

- Capture a uniform scan grid as distance from the instrument increases – quality, usable results
- Desired result achieved in minimal time – improved efficiency
- Minimize unwanted data – reduced waste, reduced time in the field
- Ideal for civil applications, such as road and general topography

## S Series legacy features

In addition to the new technology which has gone into the S7, there are several features which have been carried forward from the previous S Series instruments. These exclusive features have made Trimble robotic total stations the most innovative optical surveying solution choice on the market for over a decade and will continue to provide real productivity gains for S7 users.

### MagDrive™

The S7 incorporates Trimble's exclusive MagDrive servo/angle system. Trimble MagDrive™ Servo Technology provides for exceptional speed and accuracy with smooth, silent operation.

### SurePoint™

Trimble SurePoint™ Technology ensures accurate measurements by automatically correcting for unwanted movement due to wind, sinkage, and other factors.

### MultiTrack™

With exclusive MultiTrack™ technology and Target ID capabilities, surveyors can choose the type of target – passive or active – that best suits the jobsite conditions and be confident that they will find and lock to the correct target. Every S7 includes a Trimble ActiveTrack 360 active surveying target as a standard accessory.

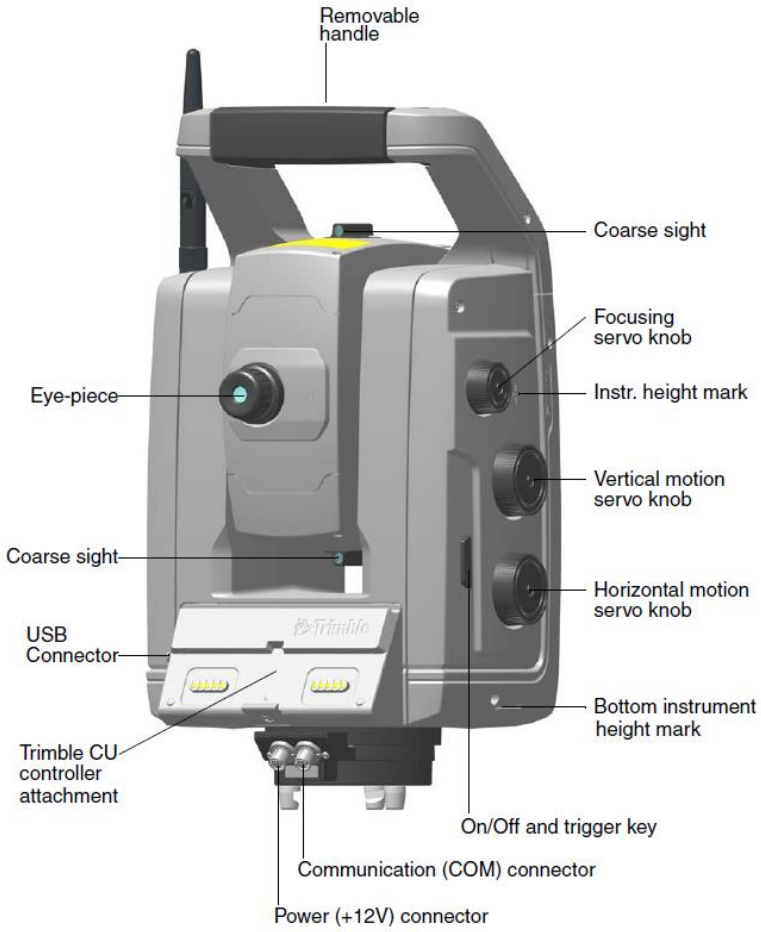
### FineLock™

Detect targets without interference from surrounding prisms for high precision applications in close quarters such as rail alignment, deformation monitoring, and tunneling applications.

# S7 Total Station Overview

The main physical features of the S7 total station are shown below.

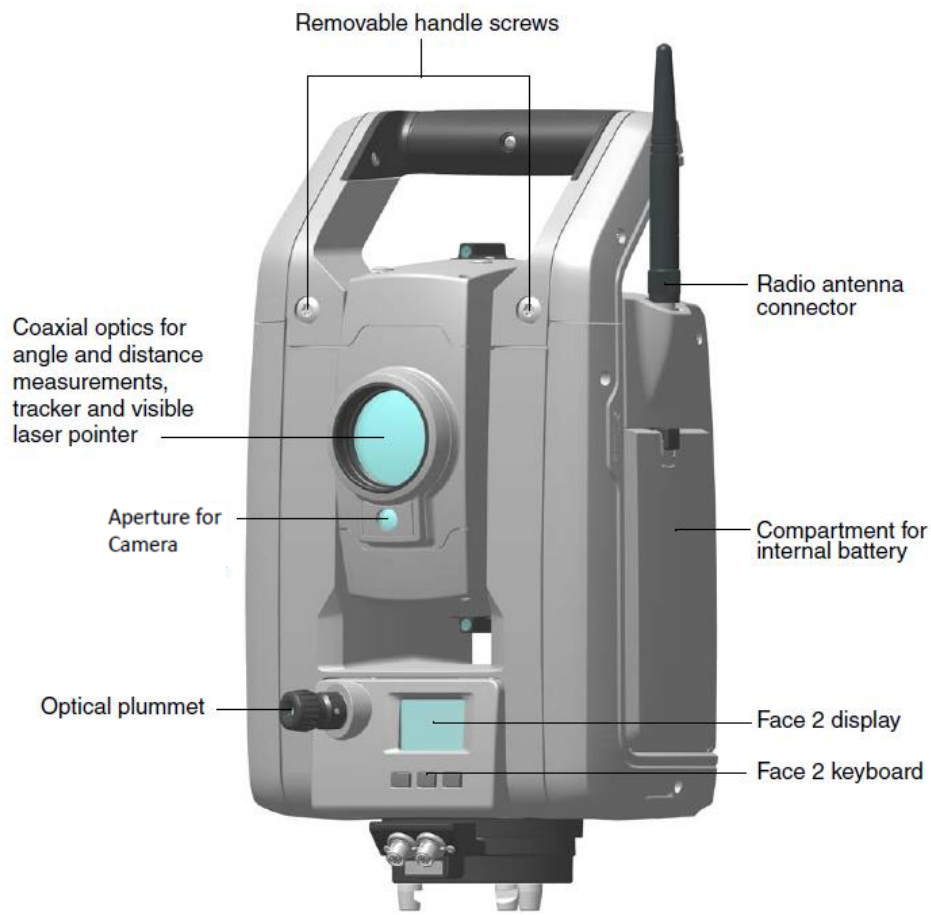
## Face 1 position




Physical features of the S7 total station that you should describe include:

- Integrated MagDrive™ servo and angle sensor technology providing exceptional speed and accuracy with silent operation
- Endless fine adjustment horizontal and vertical motion servo knobs
- Removable handle
- Dual on/off key and trigger key
- Standardized height instrument measurement points for easy use with Trimble prisms

## Face 2 position




Physical features of the S7 total station that you should describe include:

- Fully coaxial telescope including optics, DR Plus™ EDM, Autolock® technology and class 2 laser pointer
- Offset digital camera located below the telescope
- Internal optical plummet allowing for high-accuracy instrument centering
- Easy access battery bay
- Battery with power indicator
- Internal 2.4 GHz license-free, frequency-hopping, spread-spectrum robotic radio – environmentally-sealed for all weather usage
- Radio antenna connection for internal radio

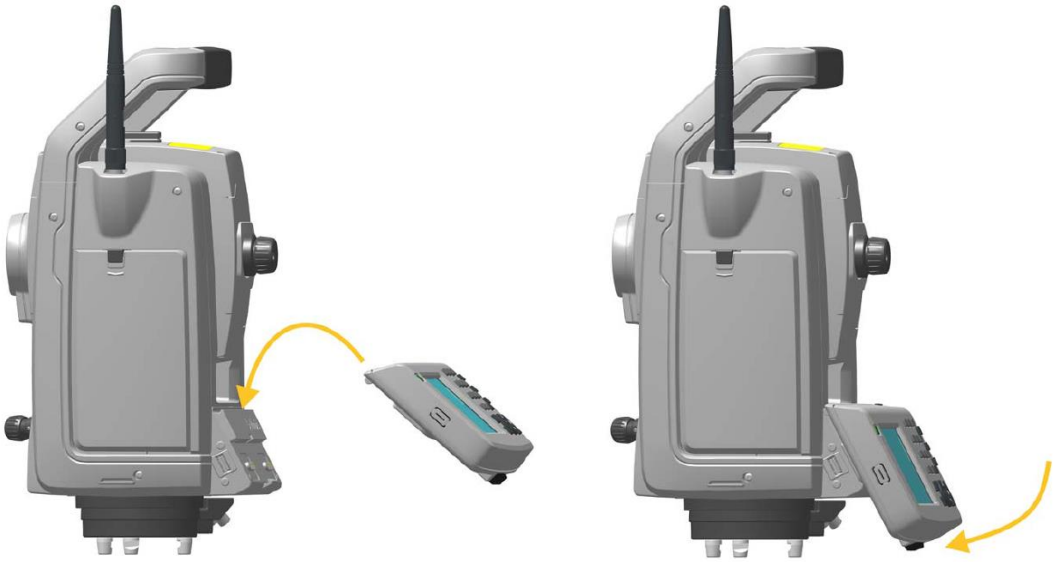
## Connections

Physical features of the S7 total station that you should describe include:

- 6-pin Hirose to USB/serial connector for wired communication (COM)
- 6-pin Hirose 12V power (PWR) connector

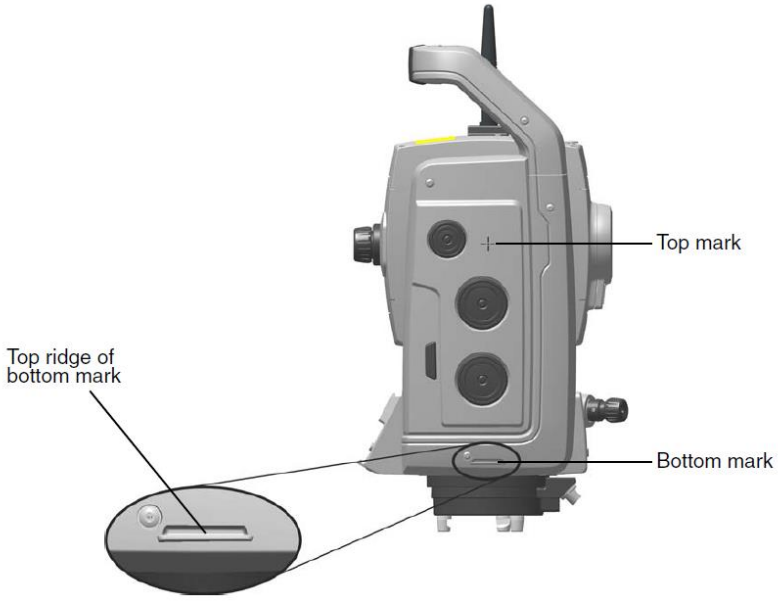
## Trimble CU attachment

Describe that the instrument can be controlled with a Trimble CU attached to the instrument or with the TSC3® controller or Trimble Tablet Rugged PC connected through cable or radio. The Trimble CU attachment is shown in the following figure.



## Height measurement points

For the S7 total station, there are two locations to indicate the instrument height:



# Preparing for a Demonstration

There are several new features incorporated into the Trimble S7. This guide outlines the steps that must be considered to ensure a successful demonstration of the key features of the Trimble S7 total station.

Before starting your demonstration, make sure that all of your demonstration equipment is ready and in good condition. This includes:

- Charging the batteries
- Loading data to the controller
- Checking that the instrument is properly collimated and adjusted
- Setting up the robotic connection between the instrument and the controller

For details on checking instrument collimation and adjustment, see the S7 User Guide and the latest Trimble Access documentation.

## Tailoring the demonstration to your customer's business

On top of the technical preparation required for your demonstration, take some time to consider the following questions about your customer:

- Who is the demonstration for, e.g. business owner, crew chief, equipment manager?
- Have we asked what is important to them?
- What type of work do they do?
- How do they get paid for their work, i.e. hourly billing, project bid?
- What are their deliverables?
- What problems do they face which we can potentially address with this solution?

By answering these questions, you can develop an individualized approach to your demonstration in which you focus on the features and benefits of the S7 which will resonate with your customer and convey the value of the complete Trimble solution.

## Selecting a site

Consider the following when selecting a site for your demo:

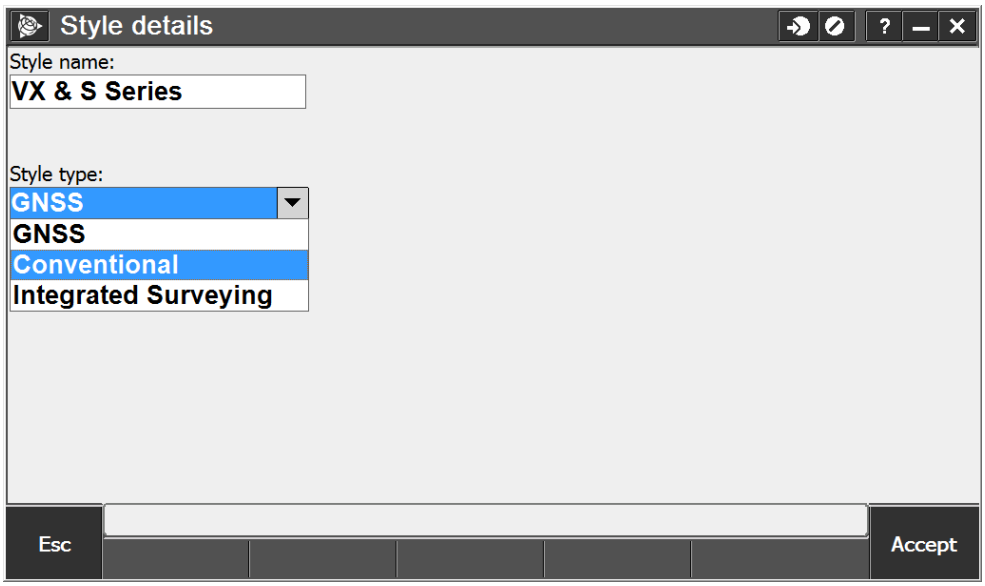
- Avoid noisy, distracting, or unsafe locations
- Choose a site with interesting visual features to demonstrate the imaging capabilities of the S7
- A surface that is roughly planar is necessary to demonstrate Trimble SureScan – this can be a horizontal, vertical, or tilted surface, e.g. a flat parking lot
- To the extent possible, select a site which will allow you to simulate a typical work environment for your customer

## Editing the VX & S Series survey style in Trimble Access

1. In the Trimble Access main menu, tap *Settings*, then select *Survey Styles*

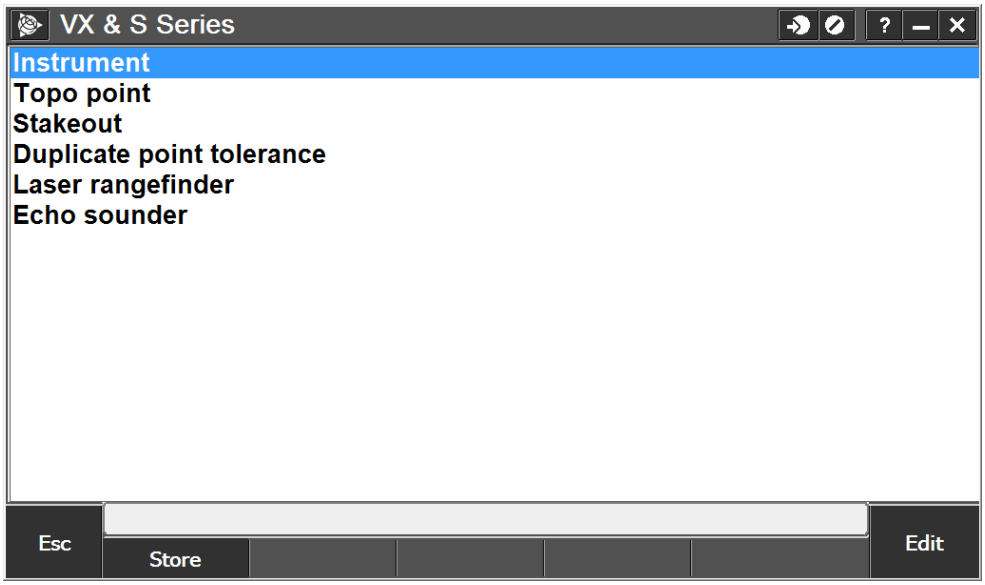
2. The VX & S Series survey style should exist by default. If it does not appear in the list of survey styles, tap the *New* soft key at the bottom of the screen. Otherwise, select the VX & S Series survey style from the list and proceed to step 3.

   Selecting *New* will bring you to the Style details screen. Give the survey style a descriptive name, e.g. "VX & S Series" and select *Conventional* from the Style type dropdown list. Tap *Accept* or press Enter.




3. After creating or selecting the VX & S Series survey style, you will see a list of features with attributes that can be edited by selecting the feature and making any desired changes. For this demonstration you are not required to modify any of the default settings.

   In the VX & S Series survey style page, tap the *Store* soft key at the bottom of the page to finish editing the survey style and save any changes.



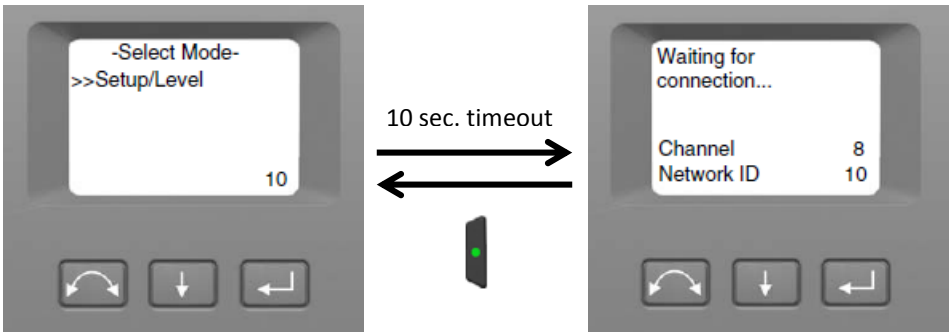

## Starting the instrument and setting up the robotic connection

1. Turn on the total station by pressing the power/trigger key on the servo control side.

   Once the instrument has powered up you will see the Select Mode screen on the face 2 display, which has a counter in the lower right corner. From here you can select *Setup/Level* if you would like to set the radio channel and network ID. See the S7 User Guide for complete details on how to do this.

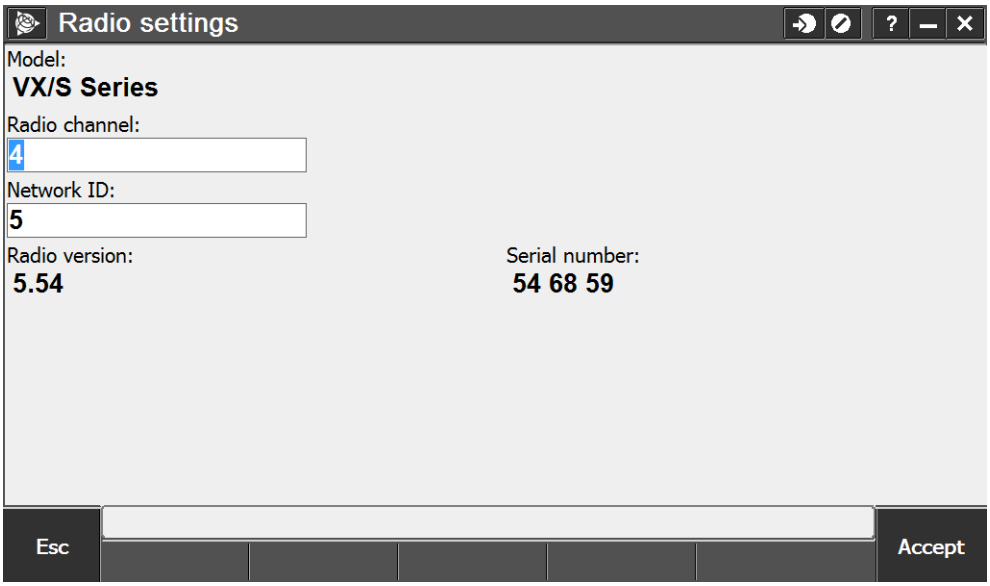
   *Tip:* If the Select Mode screen times out before you are able to set the radio channel and network ID, you can press the power/trigger button on the servo control side of the instrument once to return to the Select Mode screen.

   After the ten second timeout, the face 2 display will show the current radio channel and network ID.



2. Next, launch Trimble Access on your data collector. In the Trimble Access main menu, select *Settings* → *Connect* → *Radio settings*.

   In the Radio settings screen, enter the values for the radio channel and network ID such that they match the settings in the total station, then tap *Accept*.




   Now, if you return to the Trimble Access main menu and launch General Survey you will see the message “Starting robotic connection” on the bottom status line.


   Your total station and data collector will now connect automatically via radio on start-up as long as the radio settings are not altered.

# Field Demonstration

In this portion of the demonstration you will take an instrument and data collector into the field in order to demonstrate two of the key features of the S7 total station. The Trimble Locate2Protect functionality will be presented in the office component of this demonstration.

## Creating a job

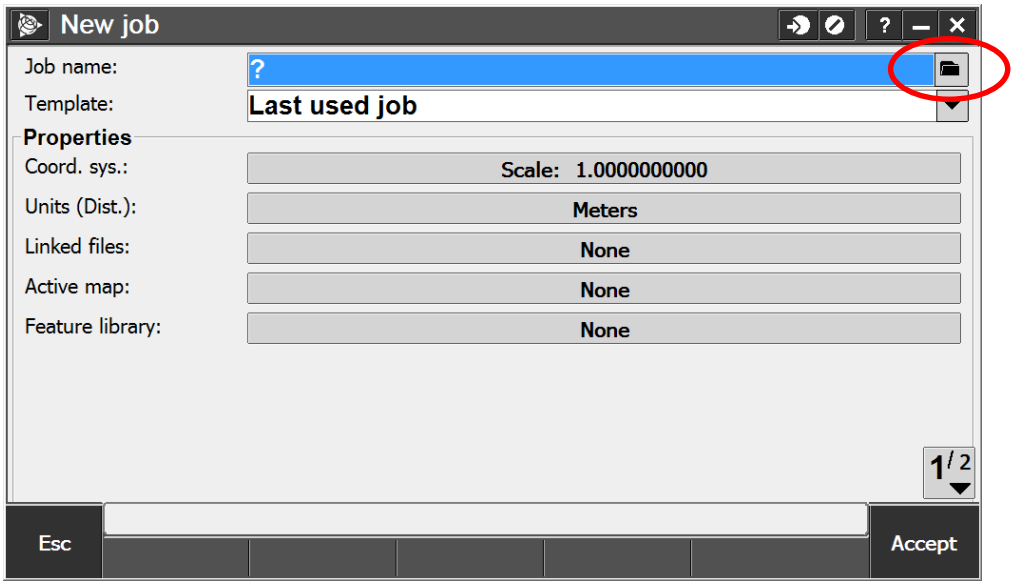
The first step in your field demonstration will be to start a new job in Trimble Access. A job file stores all of your survey data together for a particular project. This includes imported data as well as data from total stations, GNSS, V10 imaging rover, and other sensors.

In this guide we will work in an arbitrary coordinate system and orientation with a scale of 1. If you have existing control points related to a known coordinate datum and projection you may use these, e.g. to incorporate GNSS data into your demonstration. Similarly, if you have other data such as DXF files or feature code libraries you may associate these with your job at this point.

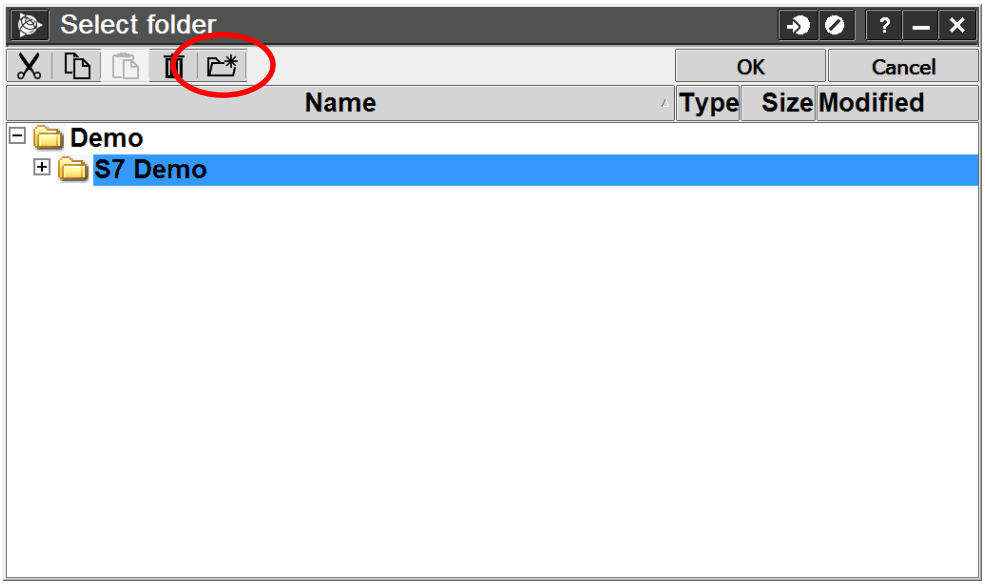
1. From the Trimble Access main menu, launch General Survey.

   Select *Jobs* → *New job*.

2. In order to store all of your demonstration data in one folder, tap the  icon next to the Job name field.




   To create a new subfolder, tap the  icon at the top of the screen. Give the subfolder a name and then tap *OK* in the top right.




3. Back in the *New job* screen, give your job a descriptive name.

4. Under *Properties*, tap the button next to *Coord. sys.*

   i. Select the *Scale factor only* radio button and then tap *Next*.

   ii. In the *Scale factor* field, enter a value of 1.

   iii. Tap *Store.*

5. Tap *Accept* to complete the job setup.

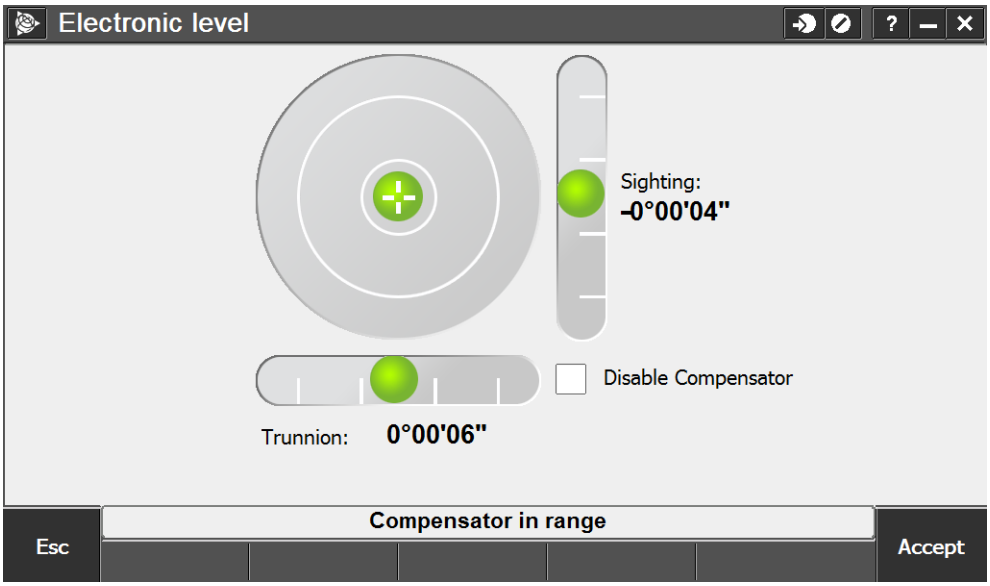
## Station setup

In this step you will perform a station setup using a single backsight. You will require two points for this: one for the instrument and one for the backsight. The coordinates of the points need not be known. Choose a point for the instrument from which interesting features can be observed in order to demonstrate the Trimble VISION and SureScan capabilities of the S7.

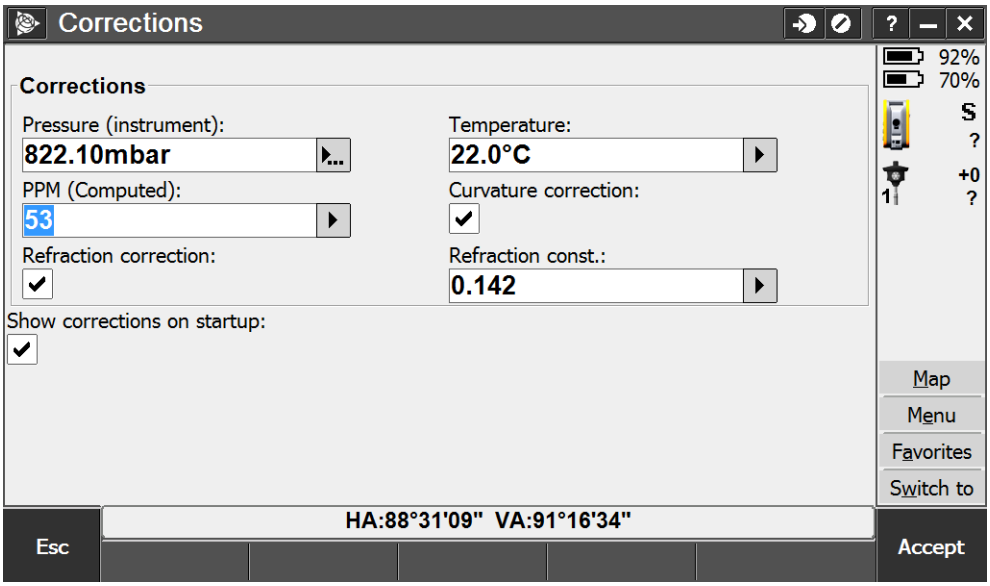
1. Launch General Survey and connect to the total station via radio.

2. From the General Survey menu, select *Measure* → *VX & S Series* → *Station setup*.

3. The *Electronic level* screen appears. Position and level the instrument over the setup point and then tap *Accept*.




4. The *Corrections* screen appears.




i. Enter the approximate ambient temperature in the *Temperature* field.

By default, the instrument's integrated pressure sensor is used to measure the ambient air pressure and the *Pressure* field is populated automatically. Trimble Access will use these temperature and pressure values to compute an atmospheric correction to apply to electronic distance measurements.

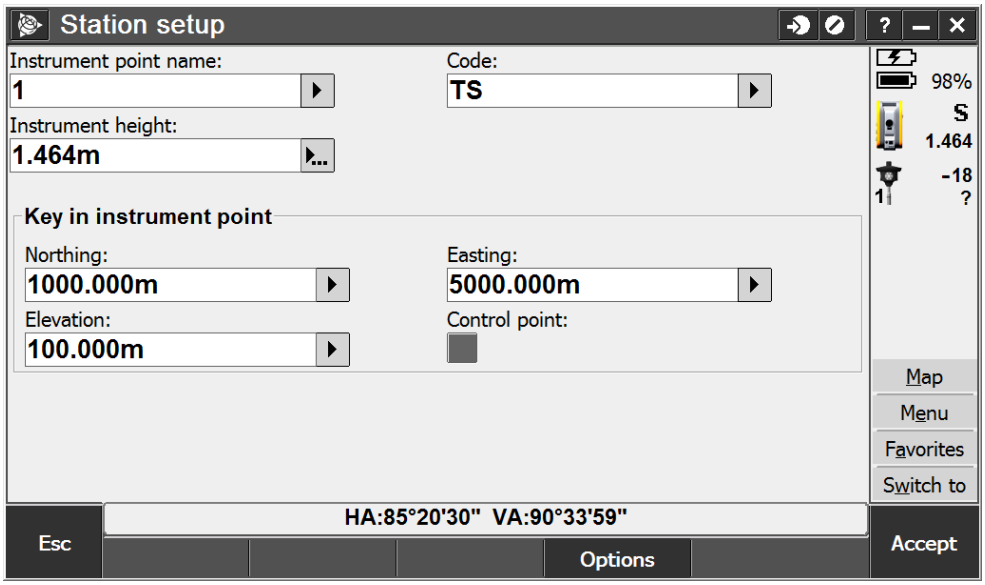
ii. Tap *Accept*.

5. You are prompted to provide the *Instrument point* details.

   i. Give the instrument point a name and code and enter the instrument height.

   The instrument height can be defined as measured to the *True Height* or to the *Bottom Notch*. Use *True Height* when measuring to the cross that corresponds to the centre of the trunnion axis. Use *Bottom Notch* when measuring to the bottom notch of the instrument. Use the advanced pop-up menu to select the measurement method (*True Height* is used by default).

   ii. Enter grid coordinates and an elevation for the instrument point. These values can be arbitrary, but should be large enough to avoid later having points with negative coordinates.

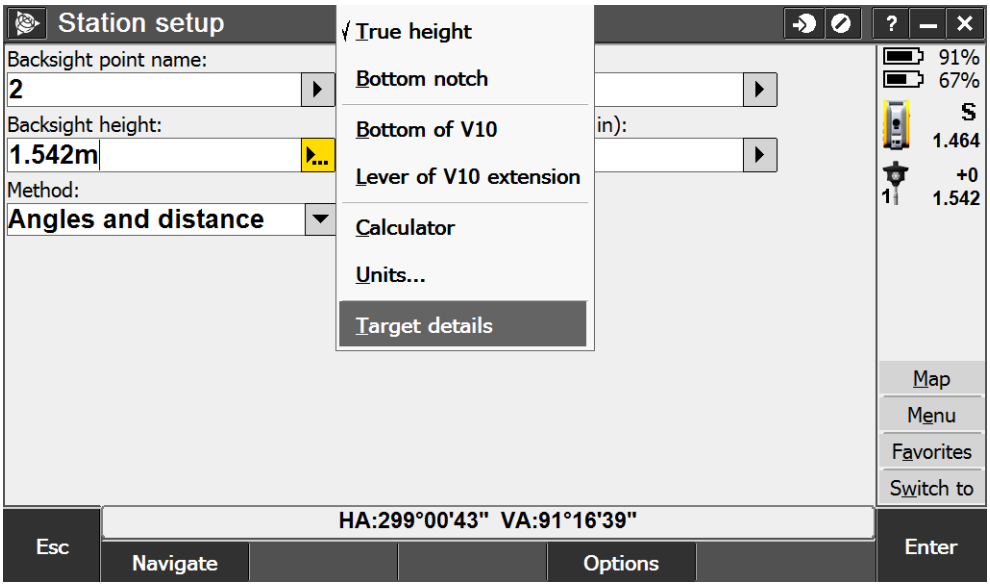



   iii. Tap *Accept.*

6. Next you are prompted to provide the *Backsight point* details.

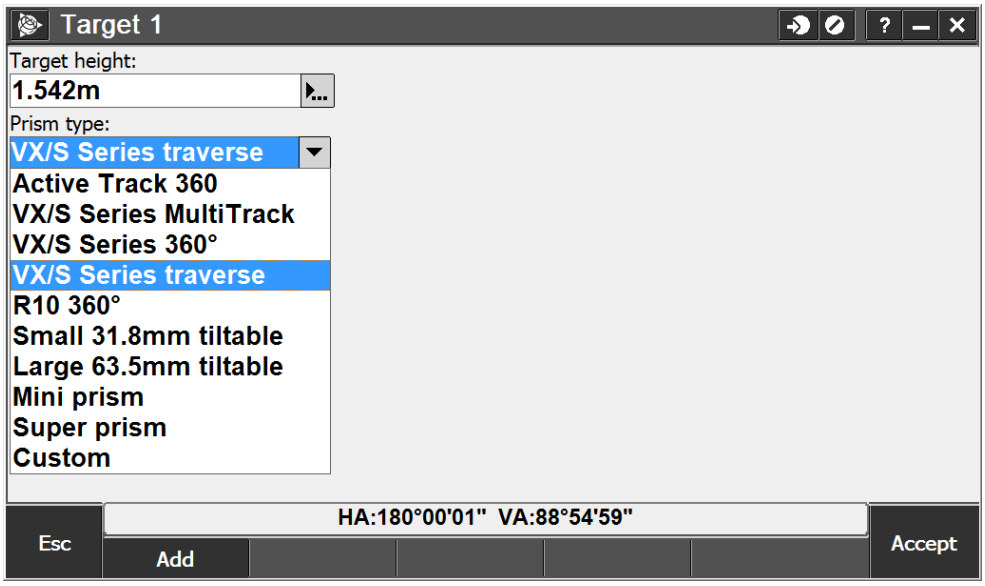
   You will not provide coordinates for the backsight point. Instead, give the backsight point a name and code and enter the backsight height (again, True Height is used by default).

7. Bring up the target details for your backsight prism using the advanced pop-up menu by tapping the  button next to the *Backsight height* field and then selecting *Target details*.




i. The target height should be populated from the previous screen. If not you may enter it now.

ii. Select the appropriate prism type from the dropdown menu. There are a number of prism types with defined prism constants and height offsets. If you are not using one of these prism types, you can manually define the prism constant by selecting a custom prism type and entering the correction value.

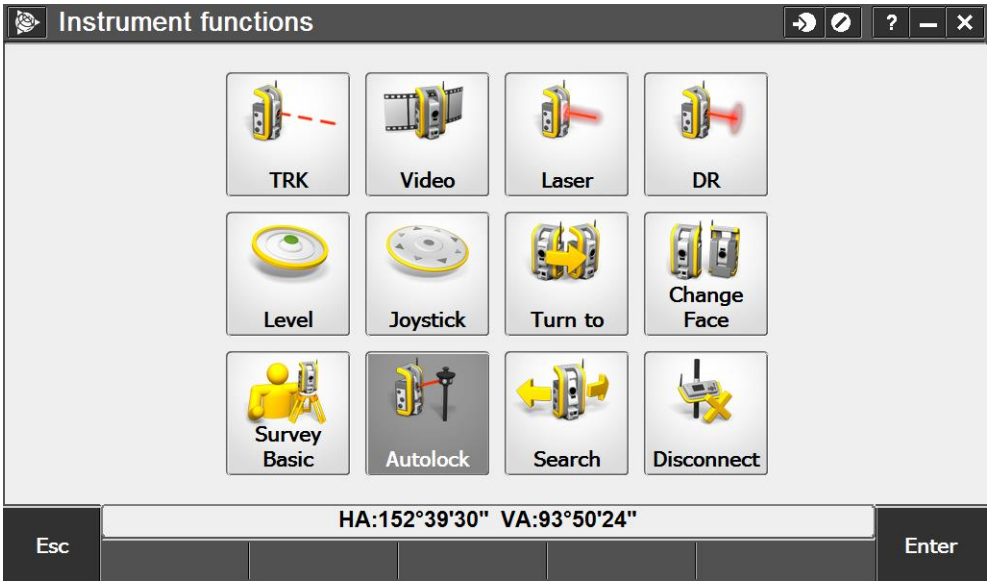



You may add another target, e.g. your rover, by pressing the *Add* soft key at the bottom of the screen and following the same steps.

iii. When you have finished, tap *Accept.*

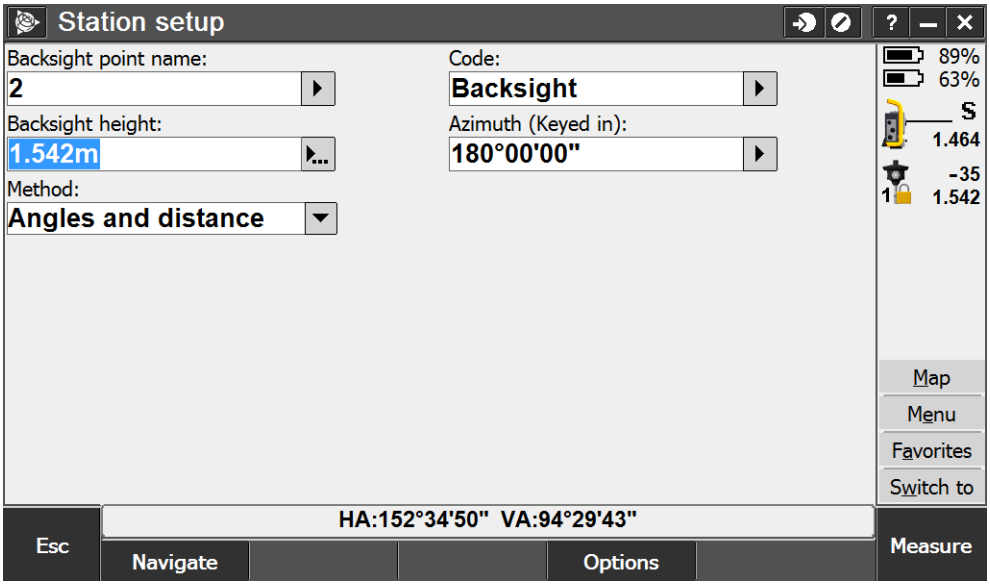
8. Bring up the *Instrument functions* menu by tapping the  icon in the quick menu on the right hand side of the screen.

   i. Enable Autolock by tapping the icon in the bottom row.




   ii. Tap *Esc* when done.

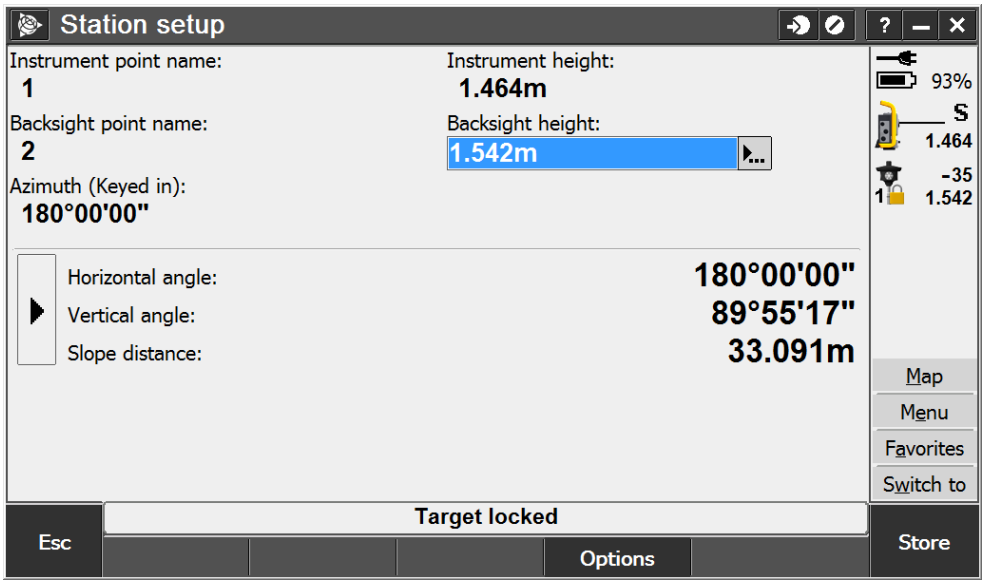
9. In the *Station setup* screen, enter an azimuth to your backsight (it is helpful if this is somewhat close to truth) and set the *Method* field to *Angles and distance* in the dropdown menu.



i. Aim the telescope toward the backsight prism. The instrument should automatically lock onto the prism, at which point the message “Target locked” will appear in the status line and the target icon in the quick menu will appear as such:  .

ii. Tap *Measure*.

iii. Review the measurement results and tap *Store.* You will be returned to the General Survey menu.



## Demonstrating Trimble VISION™

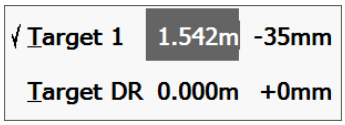
- Objective: To demonstrate the uses of the S7 integrated camera for aiming and measuring points and for scene documentation using both individual still images and panoramas
- Applications: Control, topographic, and stakeout surveys
- Features: Autolock, camera options, snapshot and panorama capture
- Benefits: Video instrument aiming, spatially-referenced imagery, site condition documentation

Before following the steps below, ensure that the S7 is not locked on to your rover target. Move 30-40 meters (100-130 ft.) away from the instrument to a spot that is not in view of the instrument telescope. Doing so will demonstrate to the customer that part of the survey can be conducted remotely once the instrument is set up and the robotic connection established.

1. You will first demonstrate the process of aiming the instrument at the rover target using the Trimble VISION live streaming video and Autolock functionality.

    i. Begin by adding your rover target to the list of available targets.

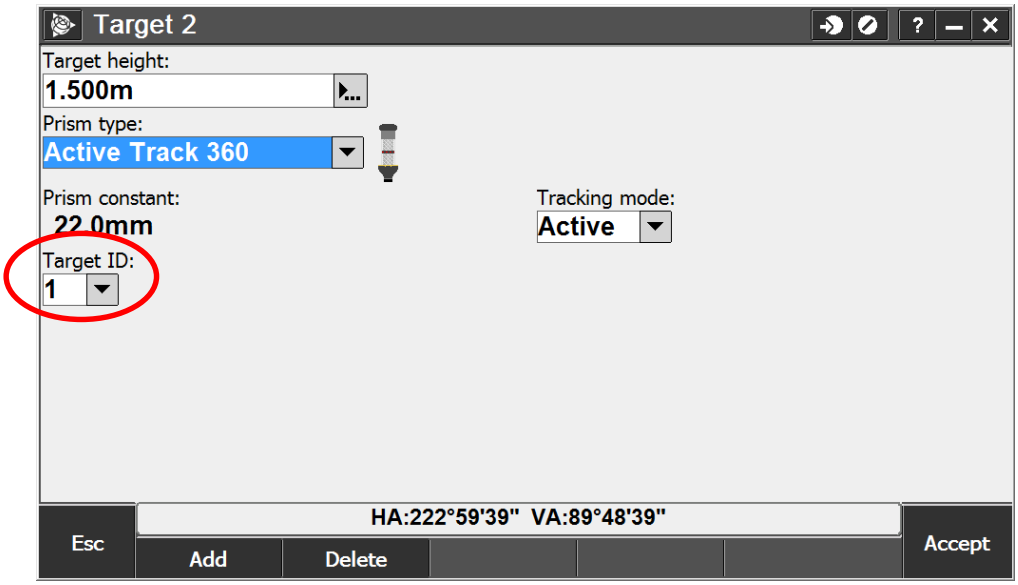
    a. Tap the  icon in the quick menu and then tap either the height or prism constant of your existing backsight target to bring up the target details screen.




    b. Press the *Add* soft key at the bottom of the screen to add another target to your survey.

    c. The *Target* 2 screen appears. Enter the target height and choose a prism type.

    It is recommended that you use the included Active Track 360 target. If you are using an active target you will need to ensure that the *Target ID* value in Trimble Access matches the ID on the target itself.




d. When you have finished, tap *Accept*.

ii. Open the *Instrument functions* menu by tapping the  icon in the quick menu and then tap the *Video* icon in the top row to start the live video stream from the instrument.

a. Using the live video, rotate the total station either by using the arrow keys on your data collector or by tapping on the video screen.

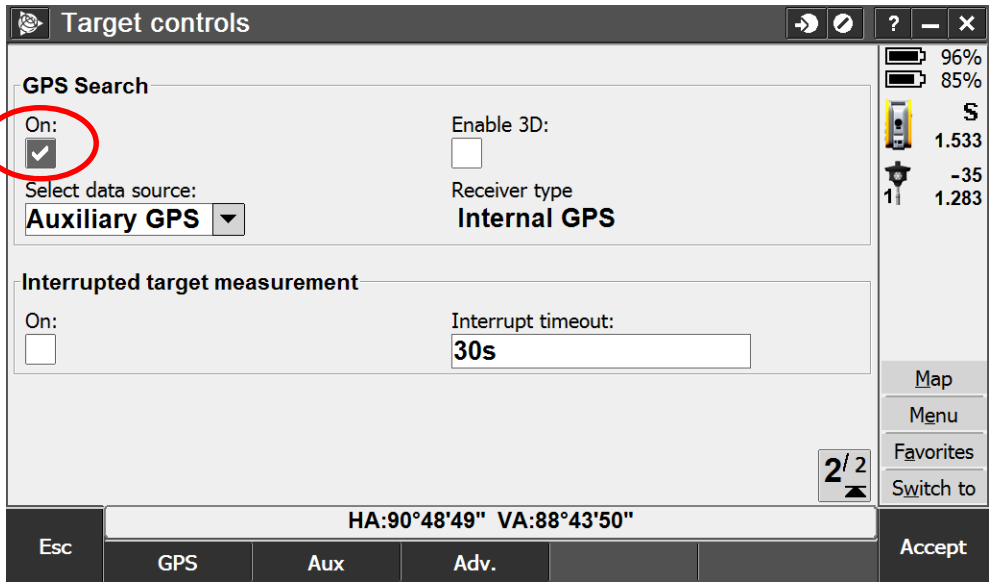
b. Once the rover is in sight, tap on the target on the screen. This will cause the instrument to aim at the target and lock on provided that Autolock is enabled. The message "Target locked" will appear in the status line.

iii. This is an ideal time to demonstrate the GPS Search functionality within Trimble Access, which uses the GPS receiver embedded in your Trimble TSC3 or Tablet Rugged PC to determine the location of the rover unit in relation to the instrument. Once Trimble Access has determined this relationship, the system will be able to use the position from the data collector's internal GPS receiver to quickly find the rover unit if lock is lost.

Explain that, unlike search technologies which emit a signal from the instrument or target, the GPS Search capability provided via Trimble Access is only limited by the Autolock or tracking range of the instrument-target combination, which is generally greater than the range of active target search systems.

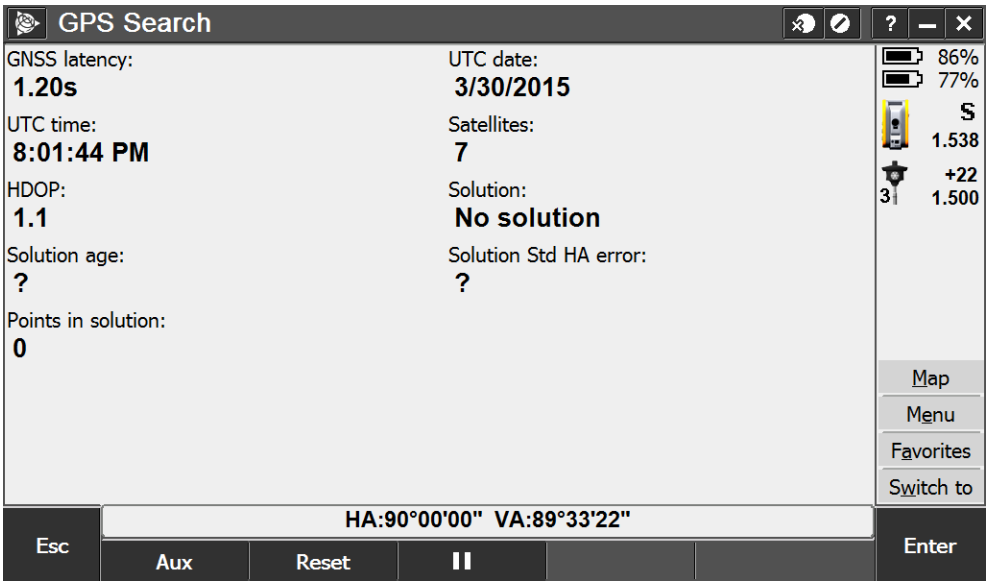
a. From the General Survey menu, select *Instrument → Target controls.*

b. The *Target controls* screen appears. Tap the 1/2 button to continue to the second page and then check the *On* box under *GPS Search*.




c. Tap the *GPS* soft key at the bottom of the screen.

d. The *GPS Search* screen appears.

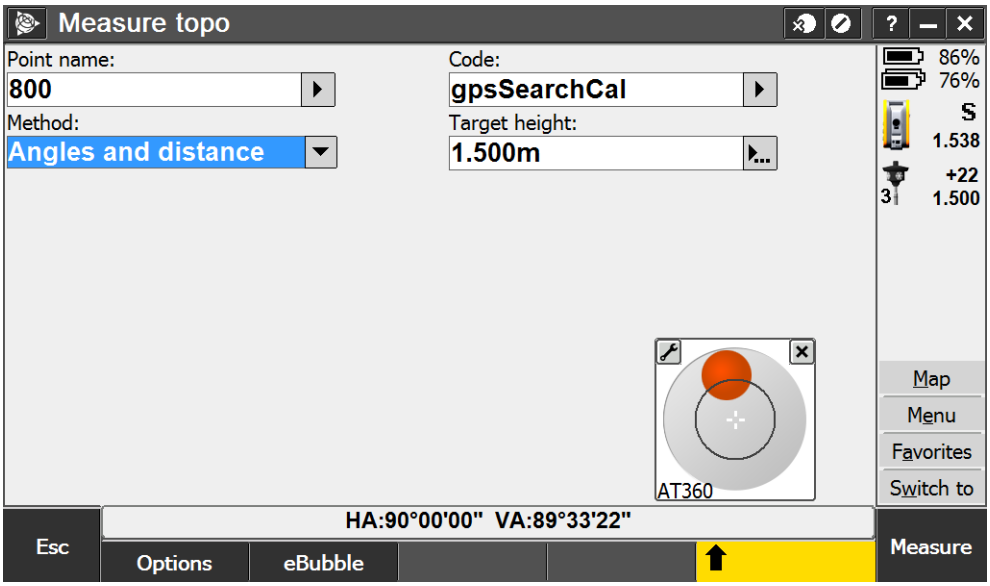



Initially the *Solution* field will show "No solution." This is because Trimble Access needs additional information to establish the relationship between your arbitrary coordinate frame and the global reference frame used by GPS, similar to performing a site calibration.

The *Points in solution* field initially shows a value of zero. You will next need to collect a number of points in order for Trimble Access to compute a solution and make GPS search available.

Note that if you have elected to work in a published coordinate system and occupy a known point then you will not have to collect points in order to establish a solution. In this case the GPS search capability should become available as soon as the receiver in the data collector is able to establish its location. You may proceed to step *i* (page 25) if this applies to you.

e. From the General Survey menu, select *Measure* → *Measure topo.*

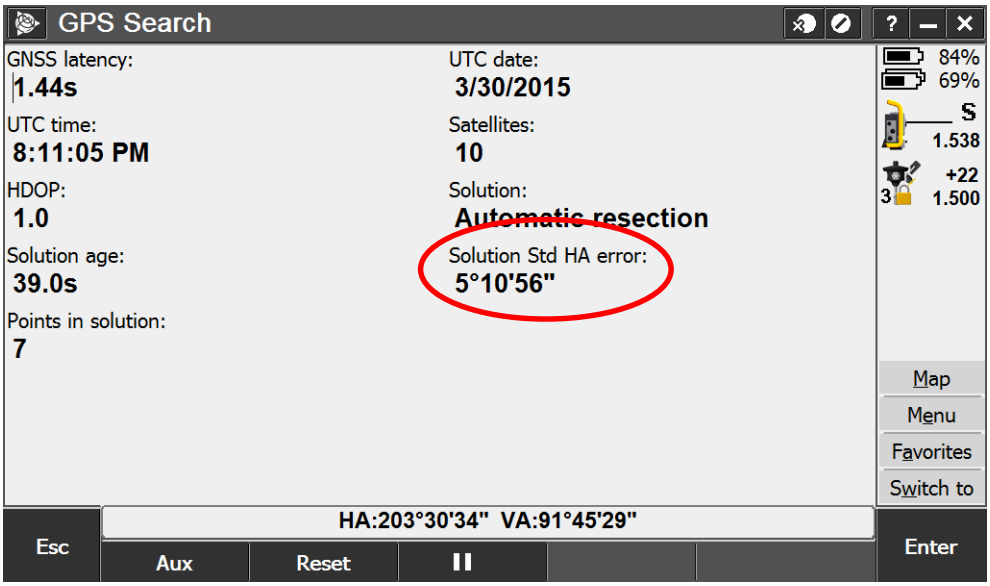



The quickest way to establish a GPS search solution is to capture a series of "calibration" points. To do this, measure 10-12 evenly-spaced topo points in a circle around the instrument at a distance of 30-40 meters (100-130 ft.). Give these points a descriptive code, e.g. gpsSearchCal, to indicate that they don't represent features of interest.

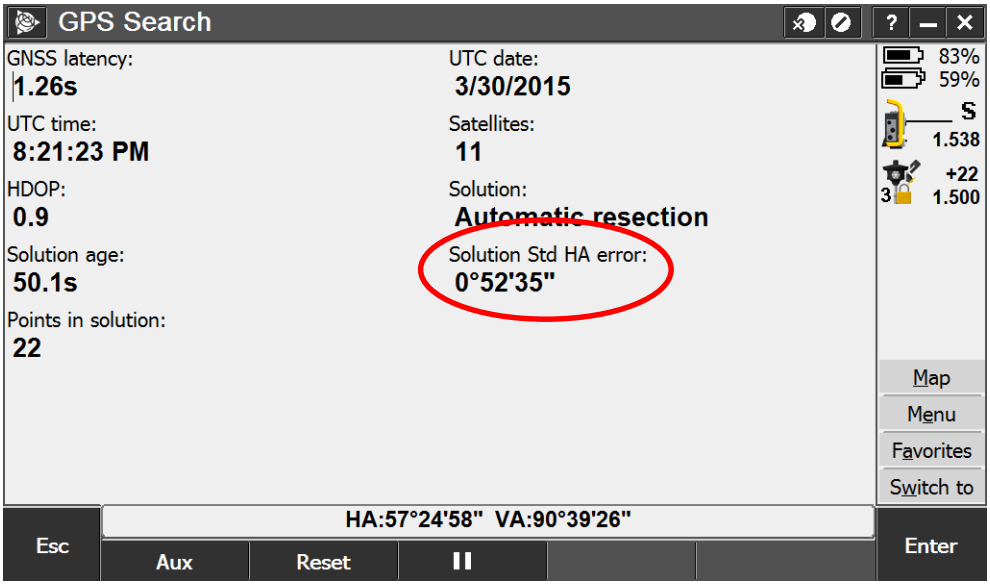
While collecting points, demonstrate the tracking ability of the S7 total station by walking behind small obstacles to show how the predictive tracking works to predict where a target will be in order to regain lock if tracking is interrupted. The tracking performance can easily be seen by watching the live video feed from the total station.

f. When you have measured the minimum number points, the message "GPS Search ready" will display on the status line.

Return to the *GPS Search* screen to view your solution. The *Solution Std HA error* value may initially be several degrees. This will decrease as you add points to your solution, typically to less than one degree.

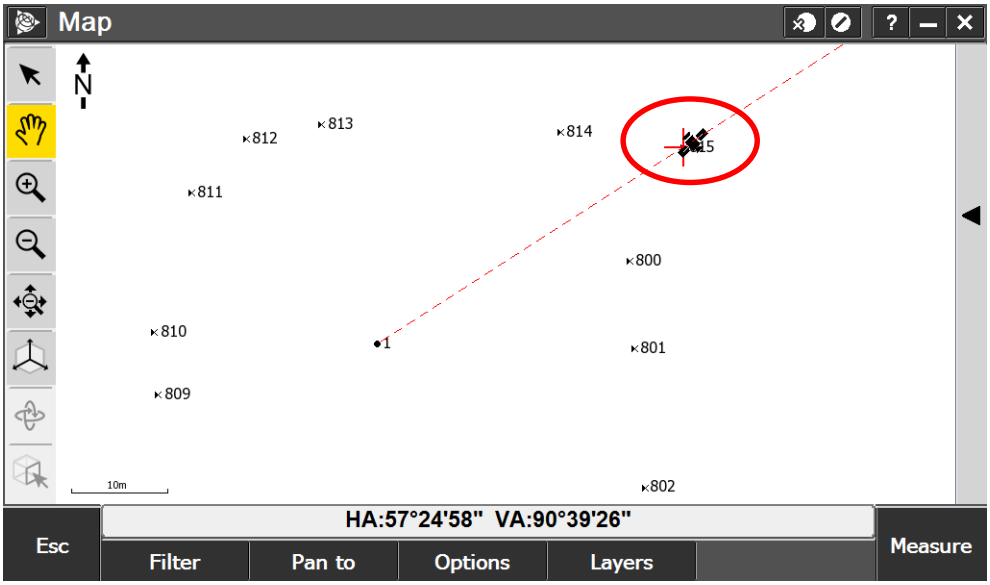



g. Continue to add points until you have 10-12 calibration points and your horizontal error has decreased somewhat.




h. When you are satisfied with your result, open the *Map* screen by tapping the soft key in the quick menu.

Show how the  icon matches closely with the red dashed line – which indicates the line of sight of the total station – when you are locked on to the rover unit target.



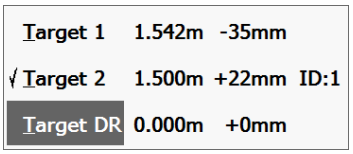

i. In order to demonstrate the effectiveness of GPS search, turn off the Active Track 360 target. This will cause the instrument to immediately lose lock on the target. Walk off of the line of sight or rotate the instrument such that it is facing away from you.

Turn on the ActiveTrack 360 target and initiate a target search by tapping the  icon to open the *Instrument functions* menu and selecting the *Search* button in the bottom row (note the satellite in the icon, indicating that this is a GPS search).

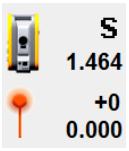
The instrument should rotate toward the rover unit and lock on to the target. Note that the instrument may need to search briefly before finding the target. Ensure that you have Autolock enabled for this step.

2. The live instrument video stream can be used to conveniently aim to objects for the purpose of taking Direct Reflex (DR) measurements, i.e. measurements without reflective targets or prisms.

   i. In the quick menu, tap the  icon to bring up your target list. The last option in the list is *Target DR*.




   Select Target *DR* to put the instrument into DR mode. Note that the target height and prism constant are both zero by default.




   Alternatively, the instrument can be toggled between Standard and DR mode from the *Instrument functions* menu by tapping the icon in the top right.

   ii. Identify a feature of interest to measure using direct reflex. Ideally you should identify a feature in an area with high light contrast. This will aid in demonstrating the video image controls.

   From the *Video* screen, aim the instrument toward the point. You may use the 

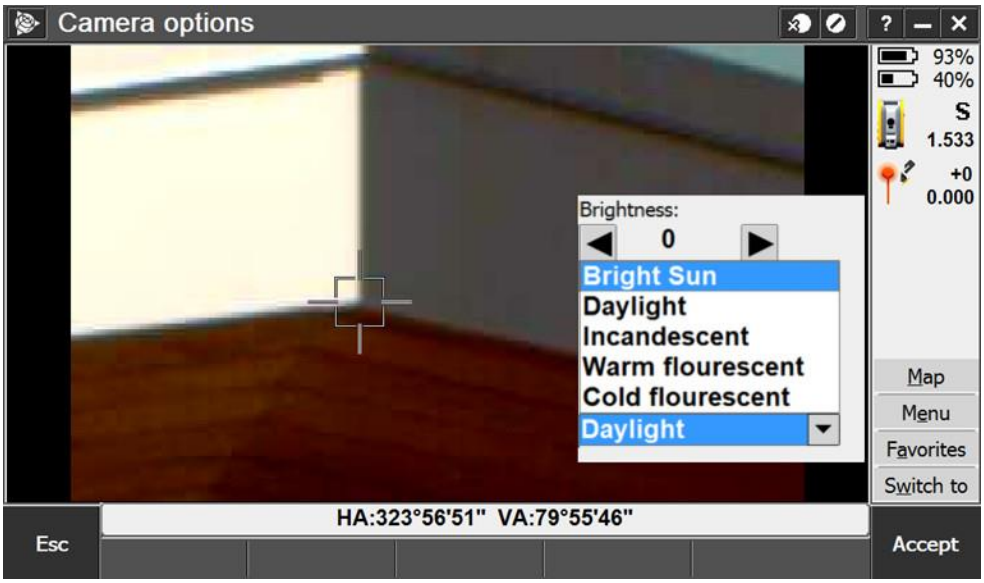
and 

soft keys, respectively, to zoom in and out.

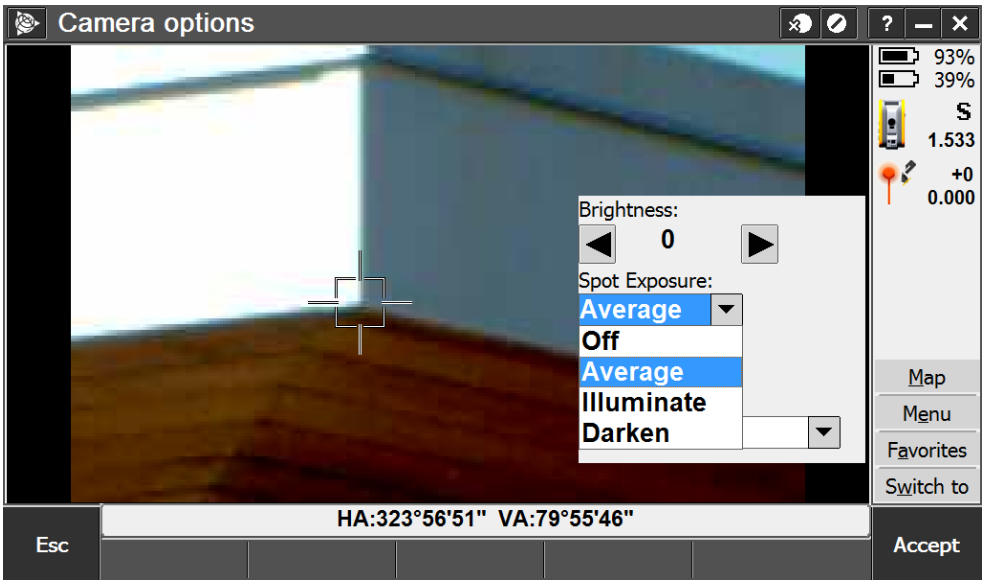
   iii. Depending on the feature you have chosen to measure, you may want to adjust the video image to lighten or darken the scene to aid in aiming.

      a. Bring up the *Video configuration* menu by tapping the  soft key at the bottom of the screen

      b. First, set the appropriate *Scene Mode* from the dropdown list. Note that this option is only visible with the *White balance* control set to *Auto.*




c. Next, set the *Spot Exposure* based on the feature you are measuring.



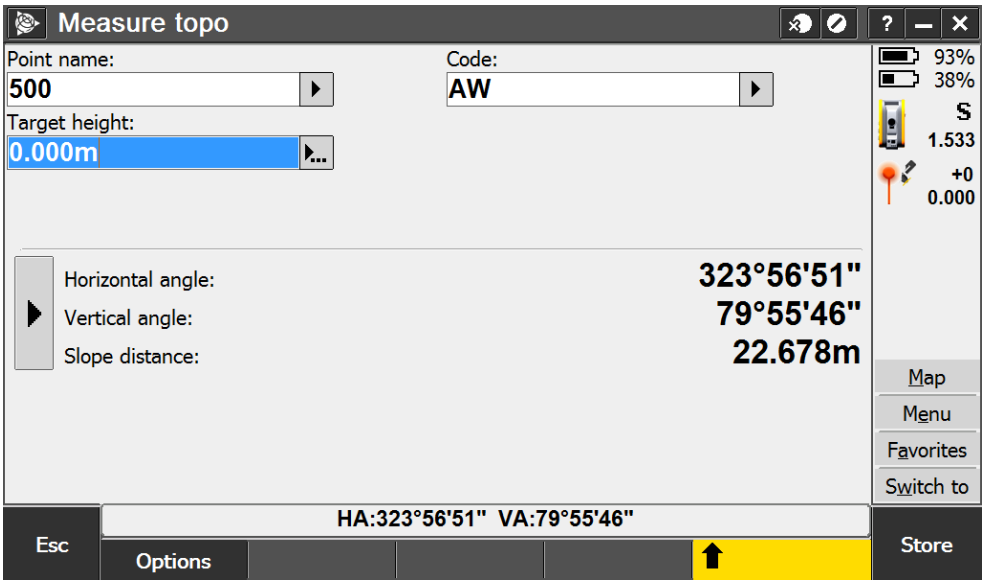

- *Off* disables the *Spot Exposure* setting and sets the exposure based on the entire image frame – this is primarily used for image capture
- *Average* sets the exposure based on the entire target area
- *Illuminate* sets the exposure such that the darkest part of the target area is illuminated
- *Darken* sets the exposure such that the brightest part of the target area is darkened

d. When you have optimized the contrast for accurate video aiming, tap *Accept.*

iv. When you are confident that you have the target accurately sighted, tap *Measure*.

v. The Measure *topo* screen appears. Enter a point name and code and tap *Measure.*

vi. Review the measurement results and tap *Store* to store the point.




After storing the point you will return to the *Video* screen. By default you should see a point marker and name displayed on the image for the point you just measured. Highlight the benefit of being able to review your work visually in this manner. By visually checking the completeness of the survey the customer can avoid repeated instrument setups or visits to the field, saving time and money.

3. You will next demonstrate how to capture a snapshot and annotate an image.

i. Using the streaming video, aim the instrument toward an area of interest at the lowest zoom setting.

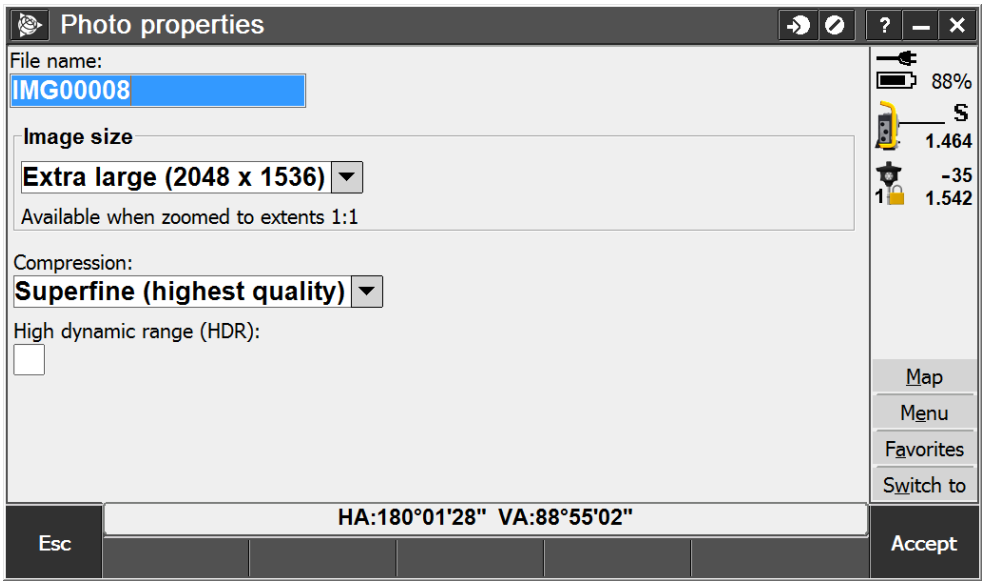
ii. In the Video screen, tap the  soft key to bring up the *Video configuration* menu.

a. For image capture, it is preferable to use frame exposure rather than spot exposure. To do this, select *Off* in the *Spot Exposure* dropdown menu.

b. Tap Accept to save your changes.

iii. Tap the  soft key at the bottom of the screen to bring up additional menu items and then tap the  soft key.

iv. The *Photo properties* screen appears.




a. The *File name* field is populated by default. You may change this if desired.

b. The *Image size* is automatically set to the maximum size for the current camera zoom level. For example, extra large images can only be captured when zoomed to extents (1:1), as indicated by the message below the dropdown list. Image sizes which are smaller than the current maximum can also be selected.

   Leave the *Image size* set to *Extra large*.

c. The *Compression* field is automatically set to *Superfine (highest quality)*. Selecting one of the other options will reduce the image file size. Note that reducing the compression will also reduce the image quality, which may be acceptable depending on the application or job requirement.

   Leave the *Compression* set to *Superfine*.

d. Leave the *High dynamic range (HDR)* box unchecked – you will demonstrate HDR image capture in the next task.

e. Tap *Accept*.

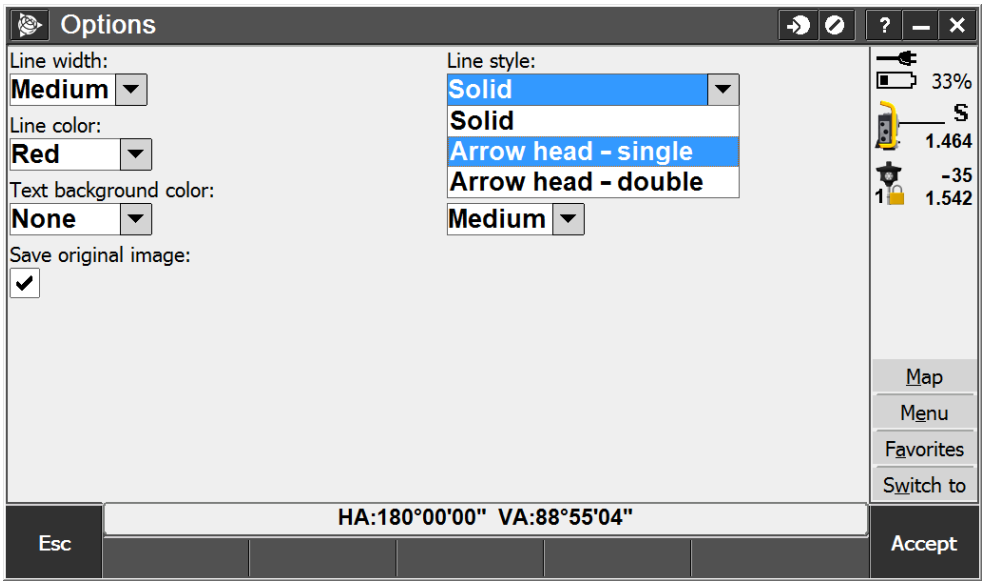
v. Tap the  soft key at the bottom of the screen to capture an image. When the snapshot has finished loading the image will appear.

vi. Tap the *Draw* soft key at the bottom of the screen.


There are a number of annotation tools in the menu on the left side of the screen. These are:

- – *Free hand* draw tool
- – *Line* tool
- – *Rectangle* tool
- – *Ellipse* tool
- T – *Text* tool
- – *Undo* tool

a. Tap the *Options* soft key at the bottom of the screen.

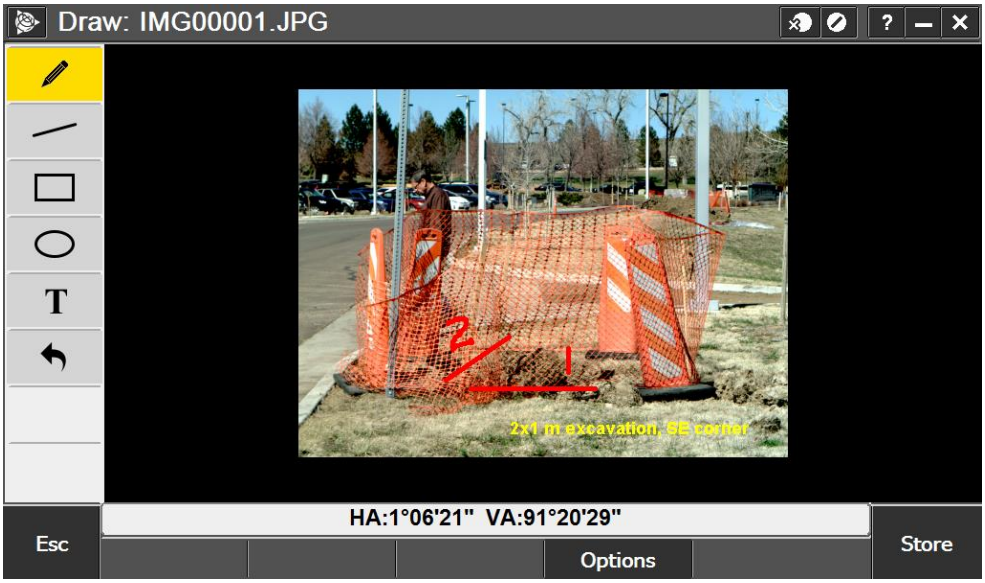


The appearance of the annotations may be customized. For instance, you may change the *Line style* to *Arrow head - single* or the *Text size* to *Large.*

Note that the *Save original image* box is checked by default. This means that when annotations are added to an image two image files will be saved: one with the added annotations and the original, unaltered image. It is important to note that the original image will be utilized by TBC for Trimble VISION workflows. Working with the unaltered image will allow for the greatest level of usability. The annotated image is provided for project notes and documentation.

b. After you have made any changes, tap *Accept*.

c. In the *Draw* screen, add some annotations to the image and demonstrate the *Undo* function.



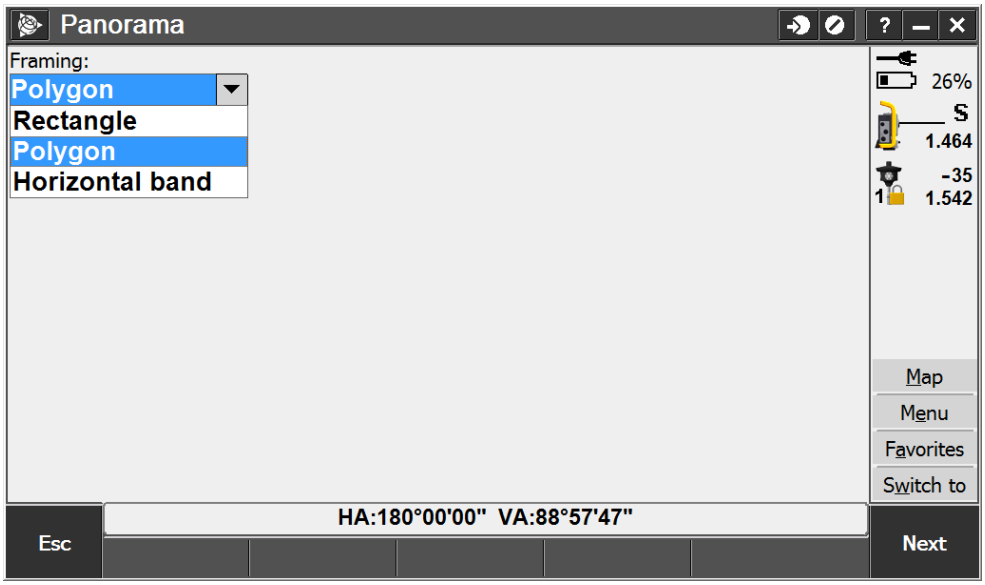

d. Tap *Accept* to save your changes.

Explain that the original image can be viewed and that additional changes can be made by opening the image in the *Review job* screen.

4. In addition to capturing individual snapshot images, the S7 can be used to capture panoramas covering larger areas. To demonstrate this functionality, choose a larger area or feature to capture with a panorama that will be comprised of several images.

   i. From the General Survey menu, select *Measure* → *Panorama.*

   ii. In the *Framing* dropdown menu there are a number of options for framing the panorama using the live streaming video from the instrument; select the *Polygon* method and then tap *Next*.




   iii. You will see a screen with the live video feed from the instrument along with a number of controls for setting up your panorama.

   First, you will want to optimize the light and contrast settings for image capture.

   a. Tap the  soft key to bring up the *Video configuration* menu.

   b. Ensure that the *Spot Exposure* control is set to *Off*.

   c. Select the appropriate *Scene Mode* from the dropdown list. Note that this option is only visible with the *White balance* control set to *Auto.*

   d. Tap *Accept*.

iv. The *Define region* control is enabled by default. The  soft key is highlighted yellow to indicate this. Tapping on the video screen will add a vertex to the polygon region which will define your panorama area.

In order to aim the instrument by tapping on the screen you will need to select the  soft key to enable the *Pan* control. Alternatively, the instrument can be aimed using the arrow keys on the data collector.

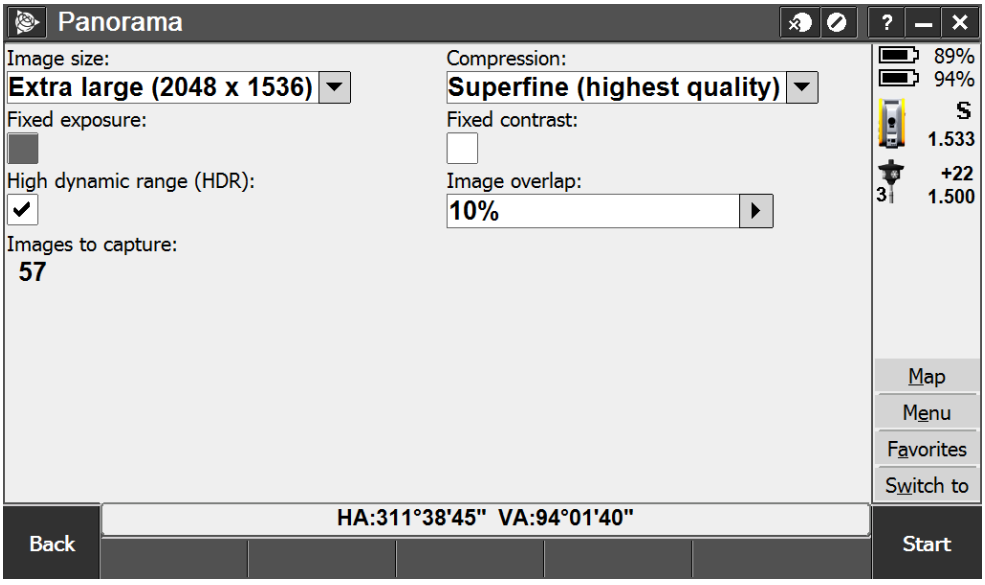
a. Select points to define your polygon region.

A vertex can be deleted by tapping the  soft key. Tapping the  soft key will delete the entire current region.

If the area of your panorama is larger than the camera's field of view, tap the  soft key on the left side of the screen to enable the *Hatch polygons* option. With this option enabled, Trimble Access will display red horizontal lines within the polygon area, making it easy to see exactly what will be captured.

b. When you have defined your polygon, tap *Next*.

v. Next you will define your panorama settings.




a. Leave the *Image size* set to *Extra large* and the *Compression* set to *Superfine*.

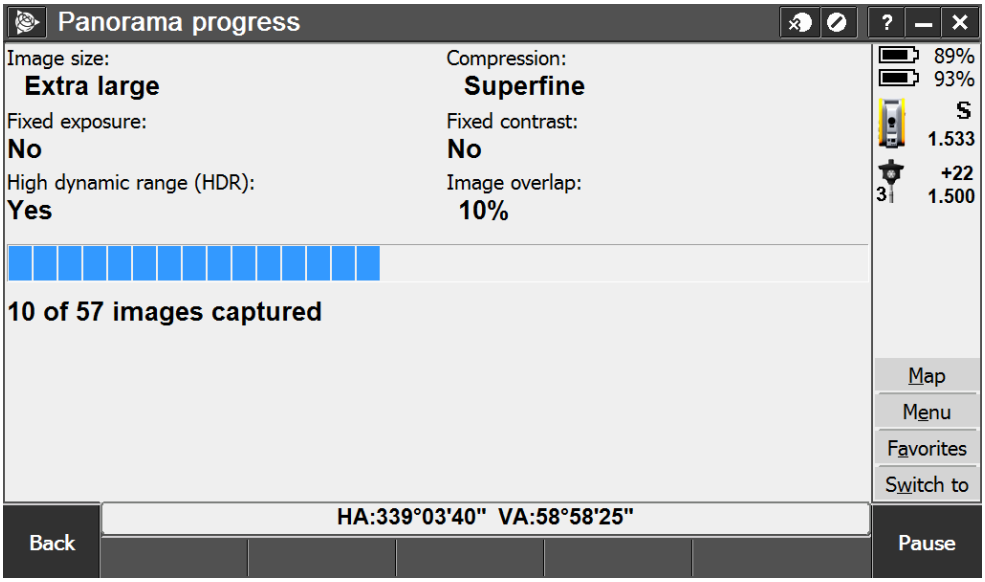
b. In order to capture the highest level of detail, which is useful for making terrestrial photogrammetry measurements in Trimble Business Center, uncheck the *Fixed exposure* and *Fixed contrast* boxes and check the *High dynamic range (HDR)* box.

Explain that HDR image processing improves the resulting image by making a composite of three images: one underexposed image, one image at normal exposure levels, and one overexposed image. Also note that the capture time increases due the fact that the number of images collected is tripled. For demonstration purposes, it is better to keep the area of interest small and it is preferred to connect to the instrument via cable if possible, as it is much faster than transferring images via the 2.4 GHz radio link.

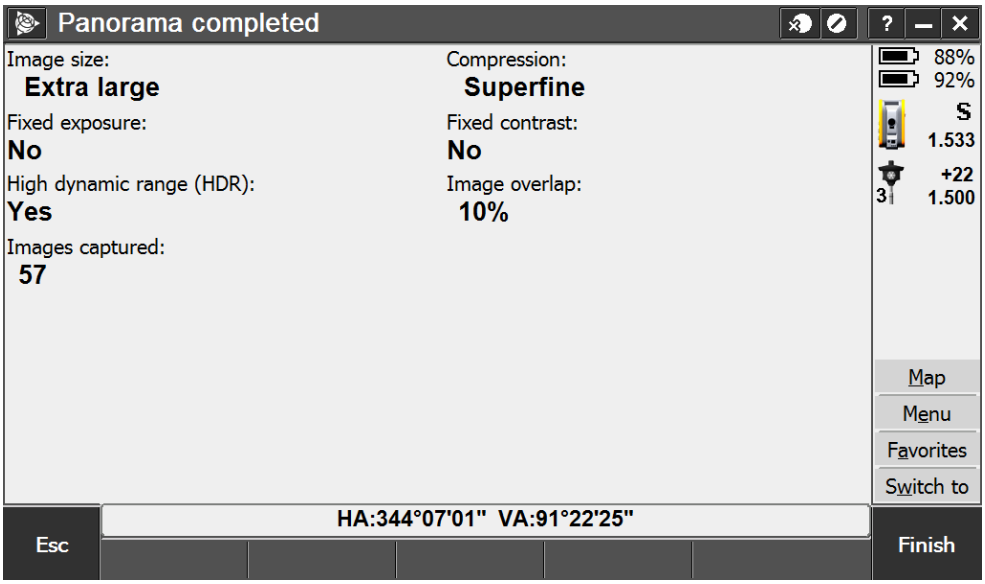
Explain that if the desired outcome is a panorama for documentation purposes only, then the *Fixed exposure* and *Fixed contrast* boxes should be left checked in order to achieve the best blending between the different images in the panorama. Whether or not to use HDR processing is then a choice based on the lighting on the feature of interest as well as time and file size considerations. Note that HDR imaging may be less beneficial in scenes with little lighting contrast.

c. When you are ready to start the panorama capture, tap *Start.*

Note that the panorama capture may be paused at any time by tapping *Pause* and then resumed by tapping *Continue.*



d. When all of the images have finished loading, tap *Finish* to store the images.




Explain that in order to make use of the terrestrial photogrammetry functionality in Trimble Business Center, any features to be measured using photo points must be visible in two or more panoramas or snapshots taken from different instrument points (referred to as a stereo pair). If your customer would like to walk through this workflow and if time allows, you will have to set a second instrument point from which your area of interest is visible (keeping good photogrammetric intersection geometry in mind) in order to capture a second panorama to complete a stereo pair.

## Demonstrating Trimble SureScan™

- Objective: To demonstrate the ability of the S7 to produce evenly-spaced point clouds over planar surfaces
- Applications: Topographic and as-built surveys, volume surveys, monitoring
- Features: Scan methods and framing, 3D map view
- Benefits: Even scan point spacing, unwanted data minimized, minimal time to achieve desired result

In this component of the demonstration you will show the scanning capability of the S7. Specifically, you will demonstrate how Trimble's SureScan functionality uses a real-time algorithm to achieve a regular scan grid on planar surfaces over increasing distance by predicting point locations along a line and adjusting the instrument servos to maintain even point spacing, rather than even angular resolution. Contrast this with traditional angular and spatial resolution scanning methods, which produce point clouds with decreasing density as distance from the instrument increases.

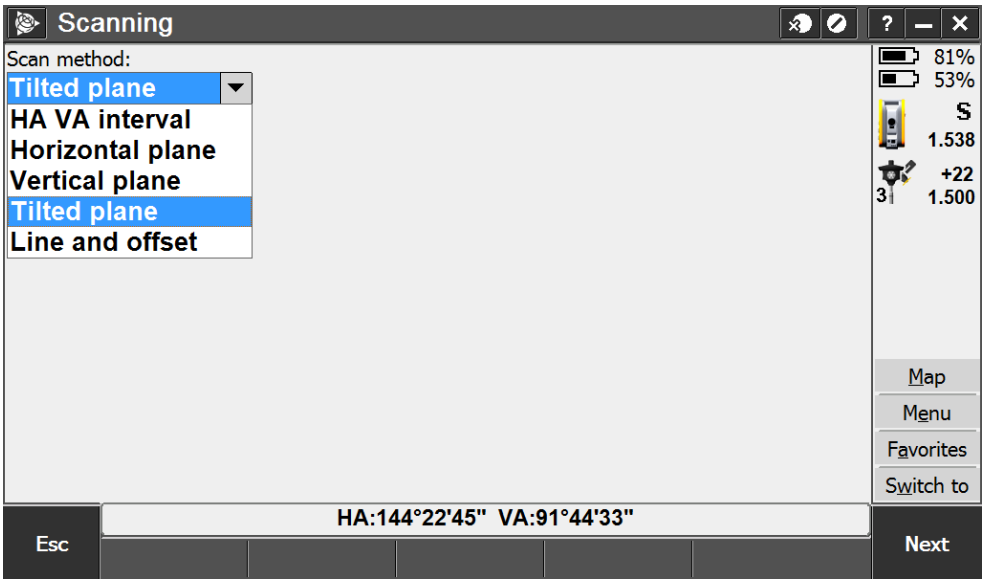
1. In the General Survey menu, select *Measure* → *Scanning*.

2. The *Scanning* screen appears.

    i. There are a number of options in the *Scan method* dropdown menu. These are:

    - *HA VA interval* – scan complex surfaces when you cannot use a plane to approximate the surface you are scanning
    - *Horizontal plane* – use Trimble SureScan technology to scan a horizontal plane surface where you need a regular grid interval
    - *Vertical plane* – use Trimble SureScan technology to scan a vertical plane surface where you need a regular grid interval
    - *Tilted plane* – use Trimble SureScan technology to scan a tilted plane surface where you need a regular grid interval
    - *Line and offset* – scan from a center line that has offsets to the left and/or right

    In the *Scan method* dropdown list, select *Horizontal plane*, *Tilted plane,* or *Vertical plane*, depending on the surface you are planning to scan. In the following steps we will use the *Tilted plane* method.




ii. In the *Framing* dropdown menu, select *Rectangle.*

iii. Tap *Next*.

3. The *Scanning* screen appears showing the live video feed from the instrument.


i. Adjust the image for accurate aiming if desired using the *Video configuration* menu, which can be brought up by tapping the icon.

ii. The message in the upper part of the video feed directs you to measure a point to define the plane to be scanned.

By default, the *Pan* control is enabled to allow the instrument to be aimed by tapping in the video area. The  soft key is highlighted yellow to indicate that the pan control is enabled.

Aim the instrument to a point on the surface you wish to scan and tap *Meas A* in the lower right corner. The instrument will measure a DR point and a yellow x will appear in the image at the center of the crosshairs.

iii. Aim toward another point on the surface to be scanned and tap *Meas B*. Likewise, select a third point and tap *Meas C*.

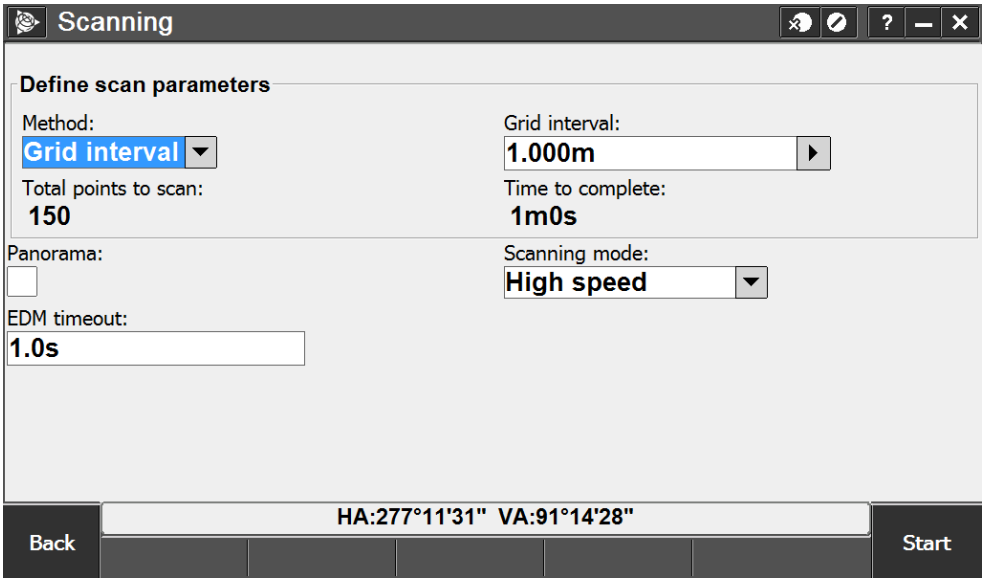
iv. The message in the upper part of the video feed directs you to tap to define the scan region. The *Define region* control is enabled automatically.

Tap two points to define the first edge of the rectangle and then a third point on the opposite edge. The scan boundary will appear as a yellow rectangle in the plane defined in the previous step.

As with defining the boundary of a panorama, the last vertex added can be deleted by tapping the  soft key, while tapping the  soft key will delete the entire current region as well as any measured points used to define the plane.


v. Tap *Next*.

4. You are prompted to define the scan parameters.




   i. The *Grid interval* radio button is selected by default. Take this opportunity to ask the customer what grid spacing they would typically use for this type of topography pick up. Enter the grid spacing given by your customer or enter an appropriate value, such as 1 meter.

      The *Total points to scan* and *Time to complete* values will populate automatically, providing an estimate of what the result will be. Likewise, if the user defines the scan either by the total number of points or the time to complete the scan then the remaining two parameters will be automatically computed by the software.

   ii. Leave the *Panorama* box unchecked. Checking this box will cause Trimble Access to initiate a panorama capture of the scan area before the scan.

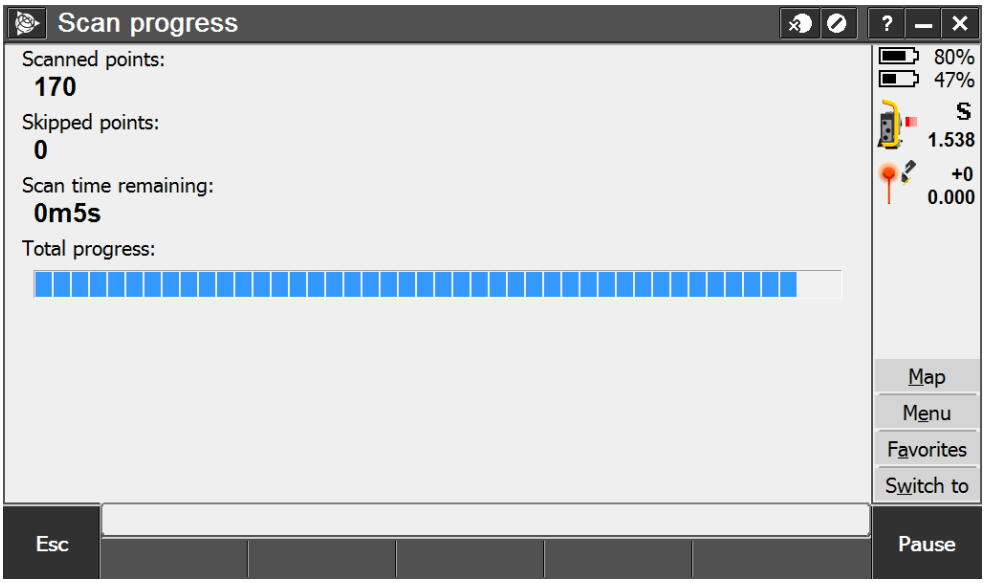
   iii. Leave the *Scanning mode* setting to *High speed*.

   iv. Leave the *EDM timeout* set to 1.0s.

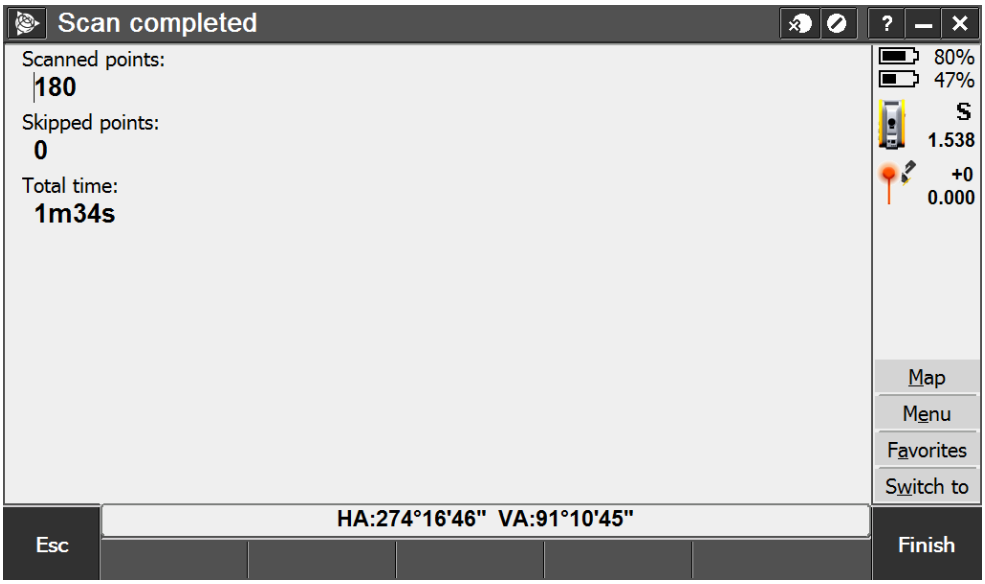
   v. When you are ready to initiate the scan, tap *Start*.

5. The *Scan* progress screen appears.

   Explain that the scan can be canceled at any time by tapping *Esc* or paused and then resumed by tapping *Pause* → *Continue.*




6. The *Scan completed* screen appears showing the total number of points in the scan, the number of points skipped, and the total time to complete the scan.



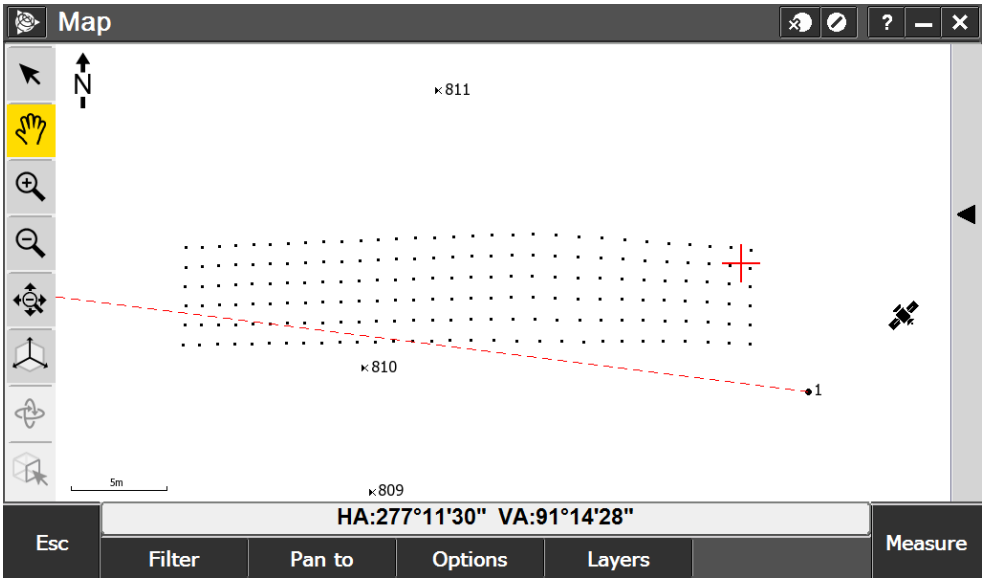

Emphasize the productivity gains that can be realized using Trimble SureScan technology. For instance, a regular grid of ground measurements over a large area can be collected in a much shorter period of time using scanning than with the traditional method of walking the entire area and measuring each point individually with the rover unit. During the time it takes the instrument to complete the scan, the operator is free to work on other tasks.

When you have finished reviewing the results, tap *Finish*.

7. In the quick menu, select *Favorites* → *Review job*. The last item in the list is the .TSF file for the scan you have just competed. Trimble Access automatically names scan files in the format "SCAN####.TSF." Note that the scan points will not appear as discrete survey points in the *Review job* screen.

   Tap the scan to bring up a complete summary of the scan parameters and results.

8. Open the *Map* screen from the General Survey menu or by using the shortcut in the quick menu.




   i. Pan to the area of your scan by selecting the  icon and then dragging the scan into the center of the map. Use the zoom controls to bring the scan into view such that the individual points can be distinguished.

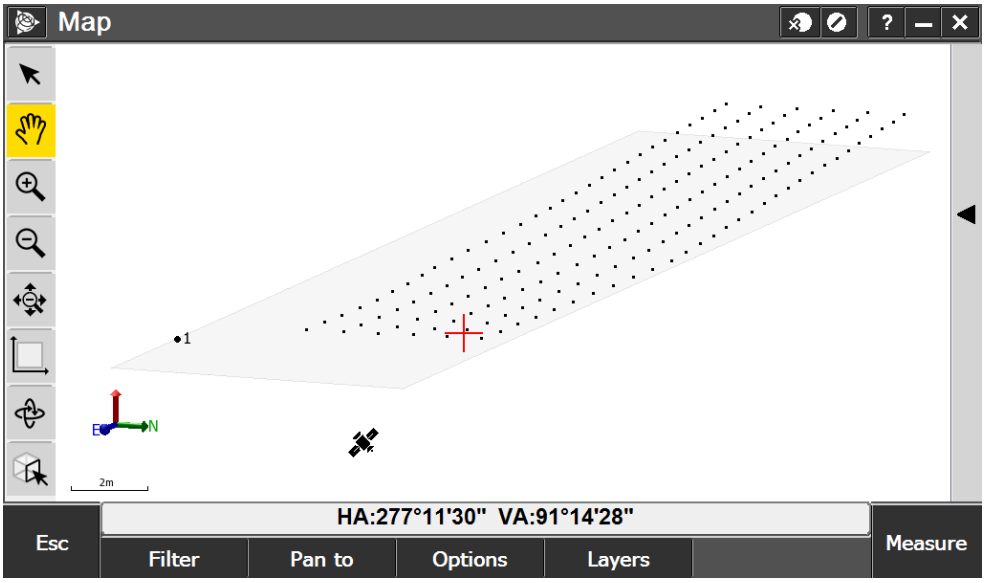
   ii. If you are using a Trimble Yuma 2 tablet for your demonstration then you have the ability to use the 3D map. If you are using another data collector, skip to step *iii* below.

      a. Tap the  icon in the menu on the left side of the screen to activate the *3D map*.

         A set of colored 3D axes showing north, east, and up appears in the lower left corner of the map screen.

      b. Tap the  icon to activate the *Orbit* control.

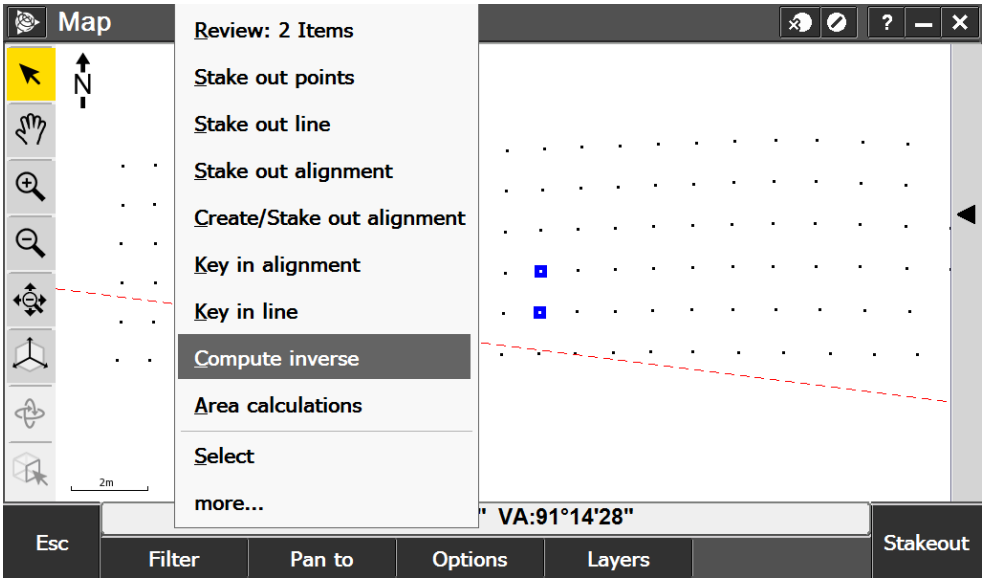
c. Tap and hold a point on the screen. Drag to orbit the view about that point in 3D.




iii. Whether you are viewing your point cloud in 2D or 3D, zoom in close enough that you can select individual points from within the point cloud.

a. Switch to the *Select* tool by tapping the  icon.

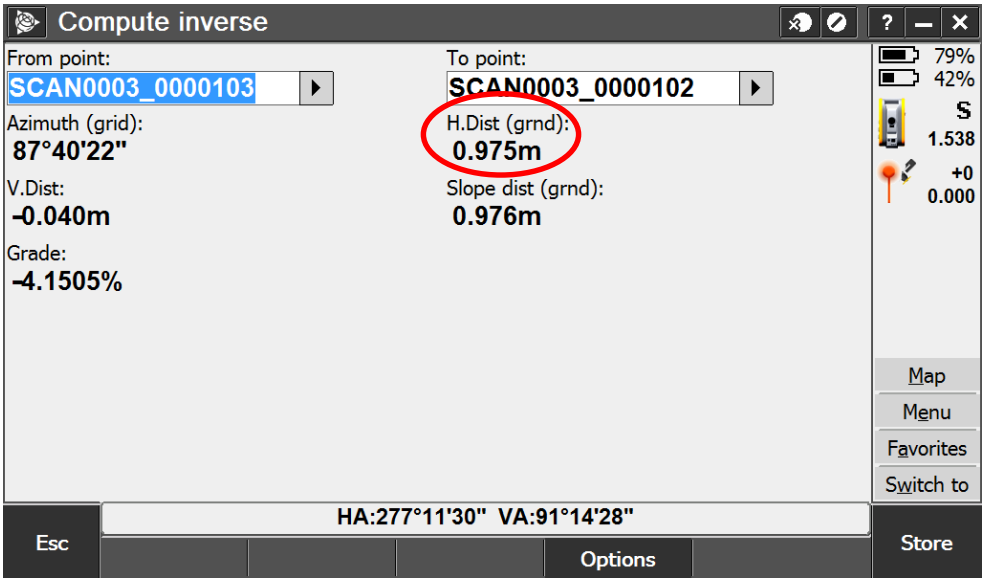
b. Select two adjacent points and then tap and hold in the map area to bring up an advanced menu.



c. Select *Compute inverse* from the advanced menu to perform an inverse calculation between the two points.

d. The *Compute inverse* screen appears.

Highlight the *H.Dist (grnd)* value. This should approximately match the grid interval you specified when defining your scan parameters.



# Office Demonstration

In this section we will only cover the Locate2Protect technology functionality in Trimble InSphere Equipment Manager. In order to demonstrate office processing in Trimble Business Center and Trimble SketchUp there are a number of available tutorials which cover relevant topics, including:

- Importing total station data
- Creating and adjusting traverses
- Adjusting the network
- Measuring points using photogrammetry
- Working with Trimble VX scanned data
- Creating SketchUp models from Trimble VISION images

## Demonstrating Trimble InSphere Equipment Manager with Locate2Protect™ Technology

- Objective: To demonstrate the Locate2Protect instrument track and trace functionality accessed via Trimble InSphere Equipment Manager
- Applications: Asset management, project planning, equipment maintenance tracking
- Features: Real time instrument location tracking, archived instrument locations, geo-fence alerts, G-force alerts, airplane mode
- Benefits: Satisfy equipment insurance requirements, potentially reduce premiums for existing insurance policies, manage assets in real time, keep equipment maintenance up to date, recover lost or stolen equipment

The final feature of the S7 which you will demonstrate is the Trimble Locate2Protect track and trace technology. This system consists of two components: an embedded GPS and cellular module located inside the instrument, and software functionality within Trimble InSphere Equipment Manager.

In order to demonstrate this feature, a certified level 3 service provider will first need to activate the internal locator module inside the total station. The locator module will then need to be registered via the Locate2Protect online portal at l2p.trimble.com. Lastly, you will need to setup Trimble InSphere Equipment Manager by entering your Locate2Protect account ID and password and adding the total station device. Step by step instructions for configuring Locate2Protect can be found with your service provider

Trimble Locate2Protect technology allows the customer to track an instrument's location in real time via Trimble InSphere Equipment Manager and to receive alerts if the instrument enters or exits a geofenced area or if it sustains a shock. In addition, archived location updates can be queried to trace an instrument's movements. Every customer that purchases the Locate2Protect

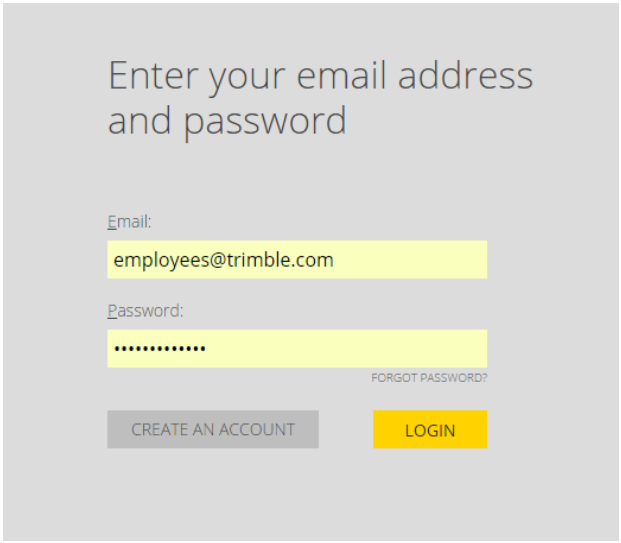
Plan with their S5, S7, or S9 total station will be able to take advantage of these functions within Equipment Manager. This guide serves as an overview of the entire equipment manager functionality. For the most comprehensive and up-to-date information on InSphere Equipment manager please visit the website below.

1. First, launch Equipment Manager.

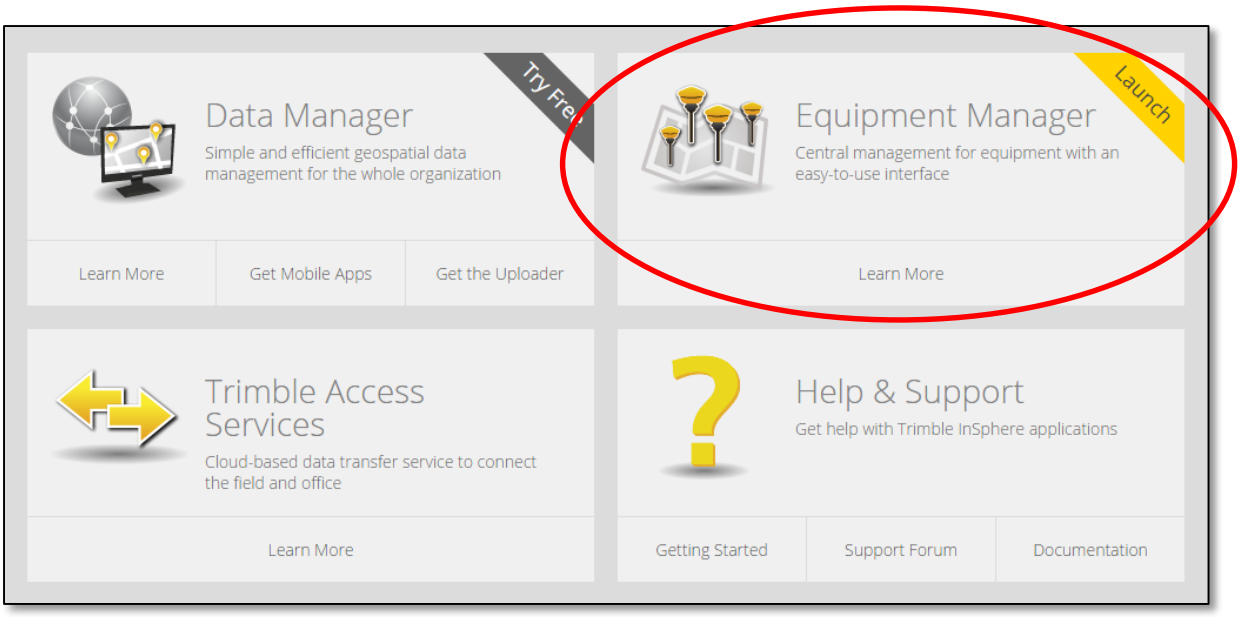
    i. Go to [www.trimbleinsphere.com](http://www.trimbleinsphere.com).

    ii. Click on the *Log in* button.


    iii. Enter your InSphere login credentials and click *Login*.




    iv. On the next page, select the Equipment Manager Icon to launch the application.



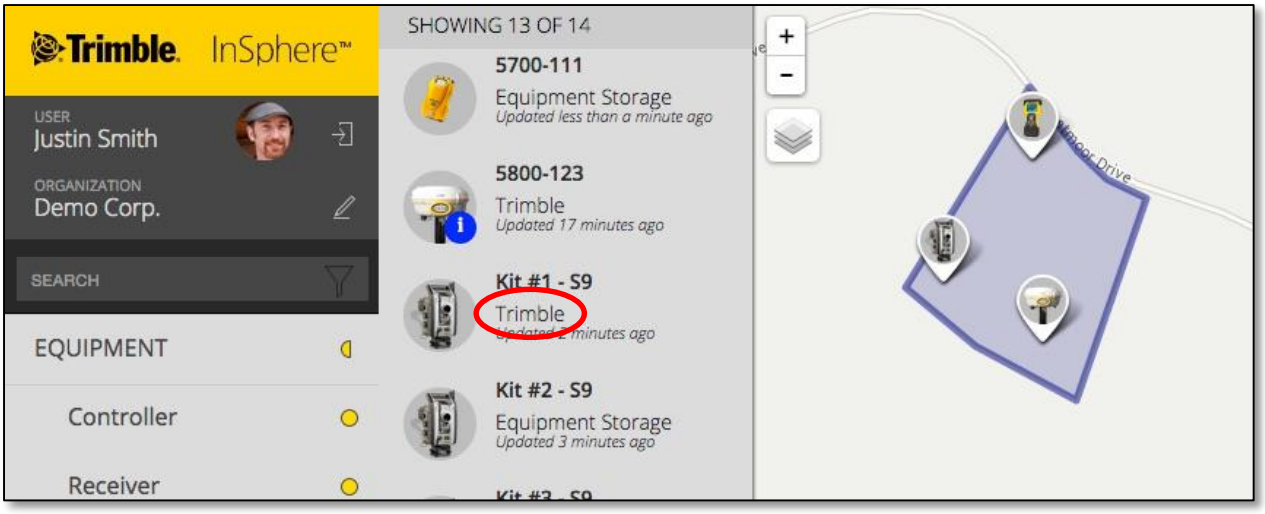

2. You will first demonstrate how customers can use Equipment Manager to track the location of their assets enabled with Locate2Protect technology.

    i. The *Spatial View* displays when Equipment Manager is launched

        a. Show the equipment list and corresponding icons on the map in their present or last reported location.

        Explain that real time positions are received from the Locate2Protect module, so the customer is always seeing the most recent asset location on the map.

        b. Click the location (defined location or lat/long) below the friendly name of a piece of equipment in the list to center the map on the last reported position of that instrument.



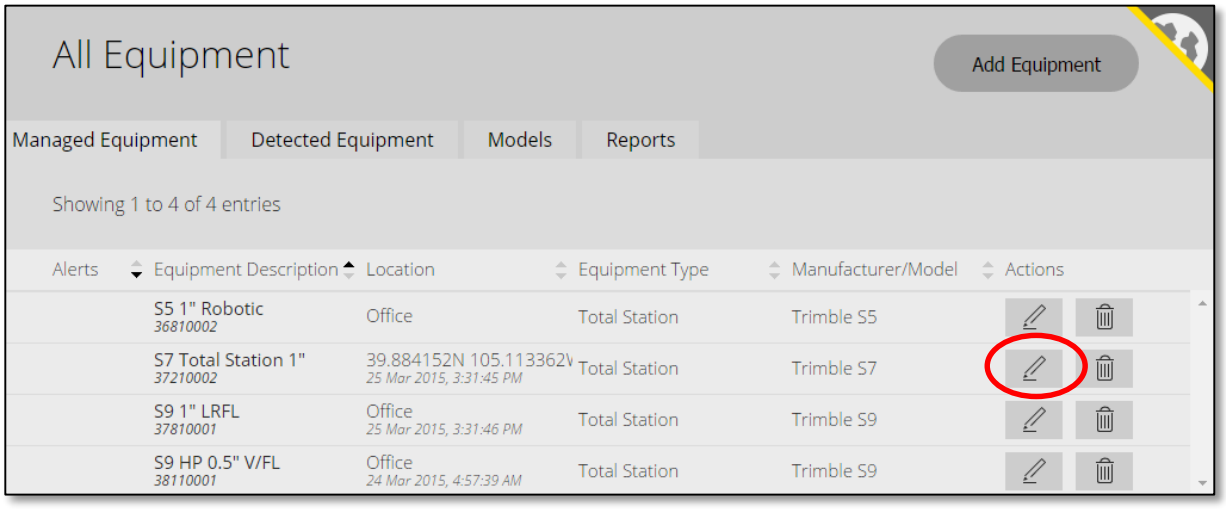

ii. Next you will demonstrate how to search an individual device's position history.

Ask: "Have you ever had a client dispute where your crew was on the job site at a specific time?" The usefulness of this feature will become apparent as you work through the next steps.

a. Switch from the *Spatial View* to the *Analytic View* by clicking the  icon in the upper right corner.

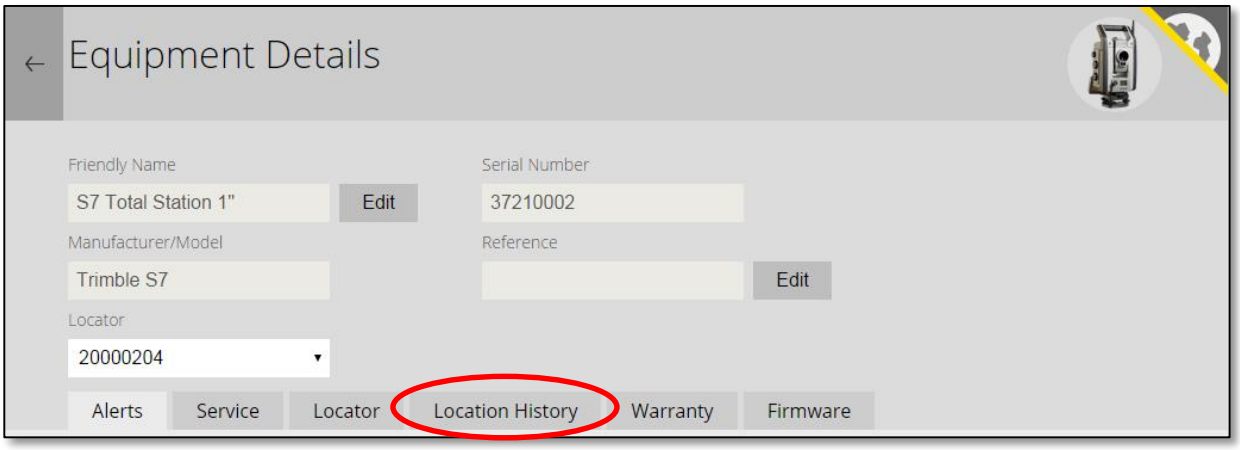
b. The *Managed Equipment* tab shows all of the devices associated with your account along with their last reported positions.

c. Select the device you're interested in from the equipment list and click on the *View/Edit Equipment Details* button.



d. The *Equipment* Details page displays for the selected instrument.

   There are a number of tabs below the equipment information fields which give additional information or allow the user to perform certain actions. The alerts tab is shown by default.




e. Select the *Location History* tab.

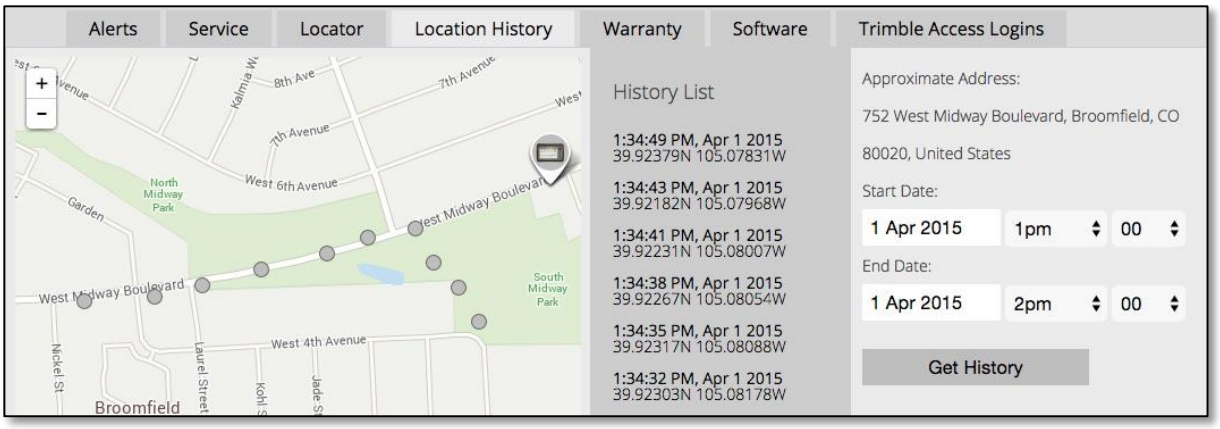
f. To the right of the map, enter the date and time range for the positions you are interested in the *Start Date* and *End* Date fields.

g. Select the *Get History* button.

   The map will show a series of breadcrumb points representing reported instrument positions. Each of these points corresponds to an entry in the *History* List to the right of the map.

h. Click on a breadcrumb point on the map to find out details about a specific position. Conversely, click on entries in the *History List* to find the corresponding breadcrumb on the map.

   Point out that the customer can find out exactly where their devices were at specific times if they need to settle disputes or track a stolen piece of equipment.




3. Equipment Manager also allows users to take advantage of Trimble Locate2Protect technology by setting up customizable alerts for their instruments.

    i. The first type of alert you will set up is a geofence alert. Geofence alerts are generated when a Locate2Protect device enters or leaves a geofenced area. A geofence can be made out of any of the Locations defined in Equipment Manager.

    Ask: “Have you ever had a piece of equipment stolen, or wanted an insurance rate reduction because you have theft prevention practices in place?”

    a. Select *LOCATIONS* in the menu on the left side of the window.

    b. If you are still in the analytic view, click the  button in the upper right.

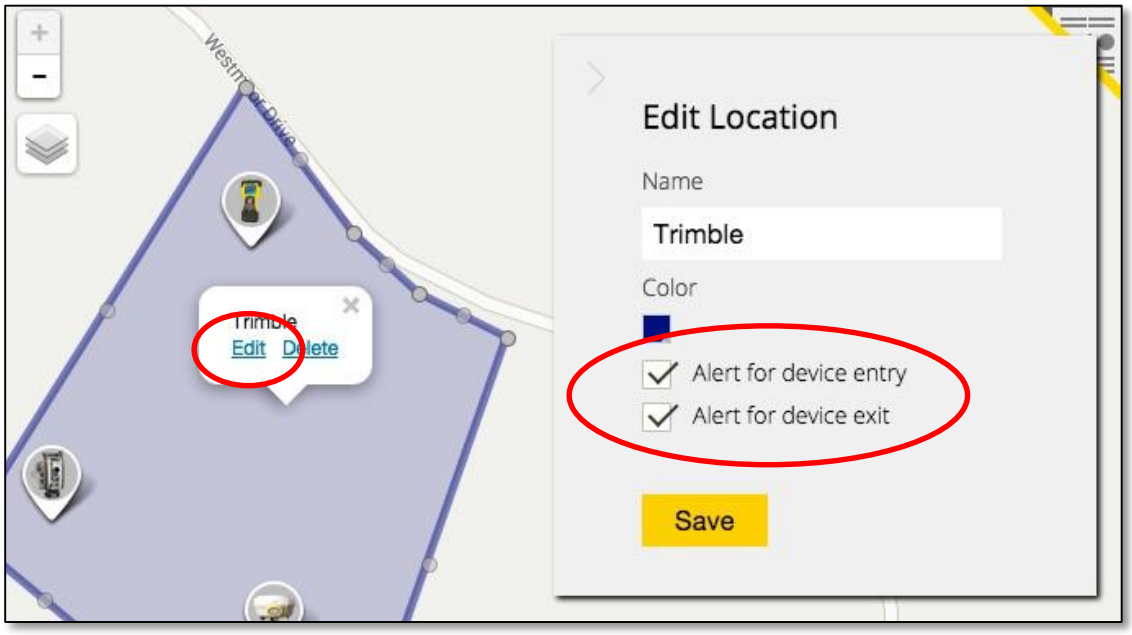
    c. You will see a list of your existing locations to the left of the map. Select a location from the list to center the map on the location. Explain that locations can be any area that is important to the customer, e.g. a job site or a place where equipment is stored.

    If you do not have any existing locations you may create one by selecting the  icon in the upper left area of the map and then drawing a polygon on the map to define the boundary of the location. Give the location a name and change the display color if desired and click *Save.*

    d. In the map area, click on a location. This will bring up a callout menu.

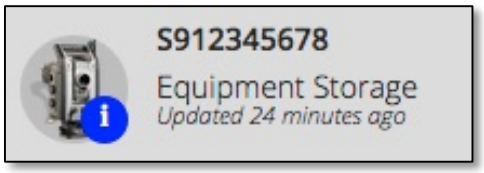
    e. Click *Edit* to bring up an *Edit Location* menu in the upper right of the map area.

f. There are two boxes, *Alert for device entry* and *Alert for device exit*. Explain that checking these boxes will cause an alert to be generated when a device enters and exits the location, respectively. The customer can choose to enable either or both alerts.

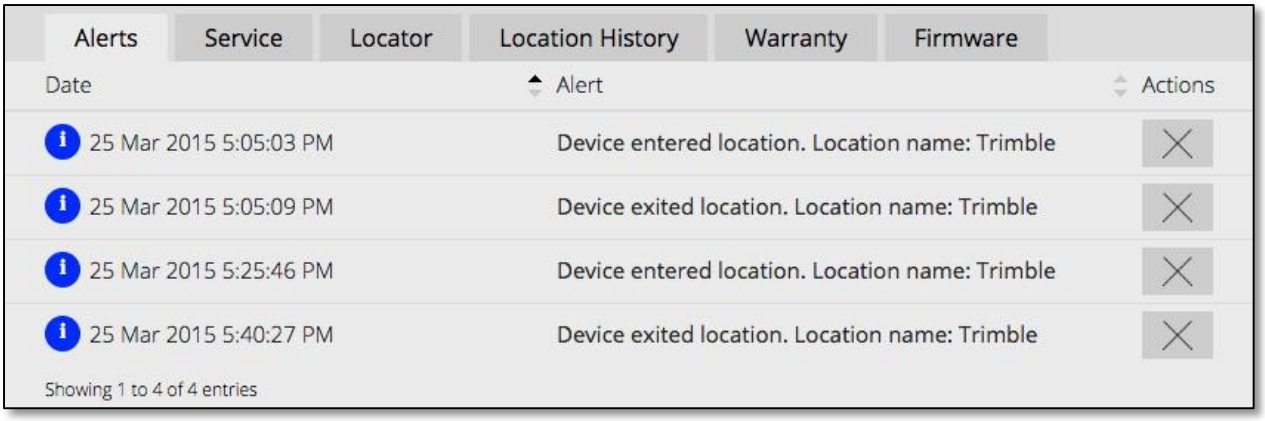



g. Click *Save* to save your changes when you have finished.

h. When devices enter or leave a geofenced area, an alert is generated and an alert icon is superimposed on the device icon in the equipment list.




Alert details can also be viewed on the *Alerts* tab in the *Equipment Details* view.




ii. The other type of alert that can be generated by a Locate2Protect device is an impact alert, which alerts the customer if an instrument experiences a fall or shock greater than a specified threshold.

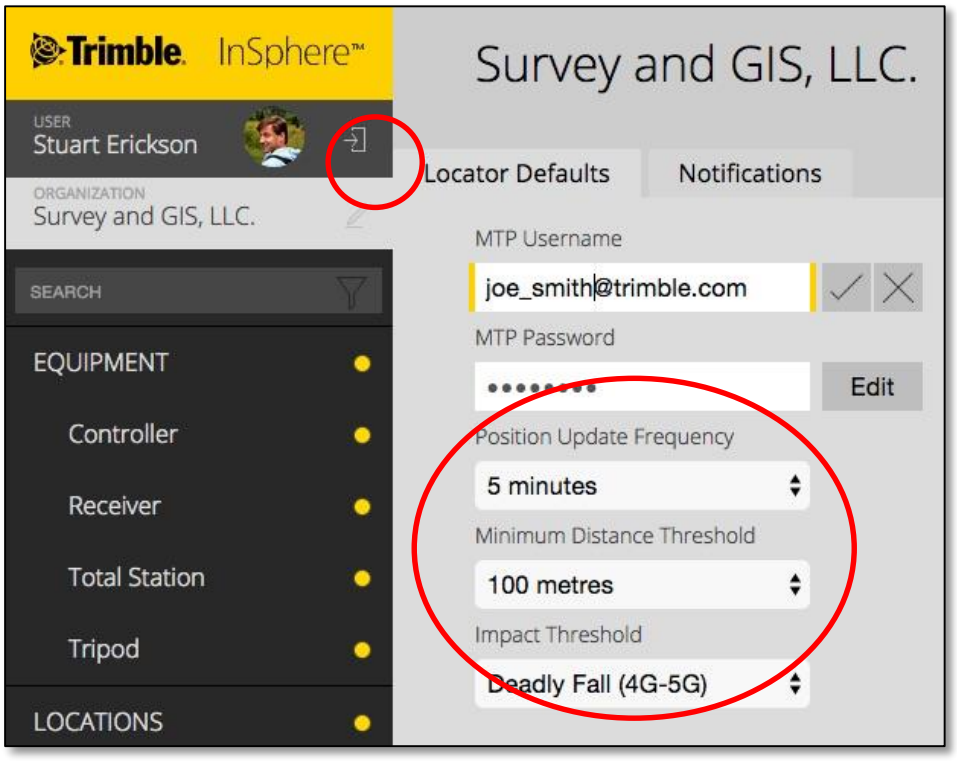
Ask: "Have you ever found out after the fact that a crew knocked an instrument over and didn't tell you?"

a. Click the *Edit* icon next to your organization name in the upper left of the window.

The *Locator Defaults* tab shows the global defaults for all Locate2Protect devices.

- *Position Update Frequency* – the frequency with which the device will automatically send a position update
- *Minimum Distance Threshold* – the distance the device can travel before a position update is automatically sent
- *Impact Alert* – the amount of force required to trigger a G-force alert

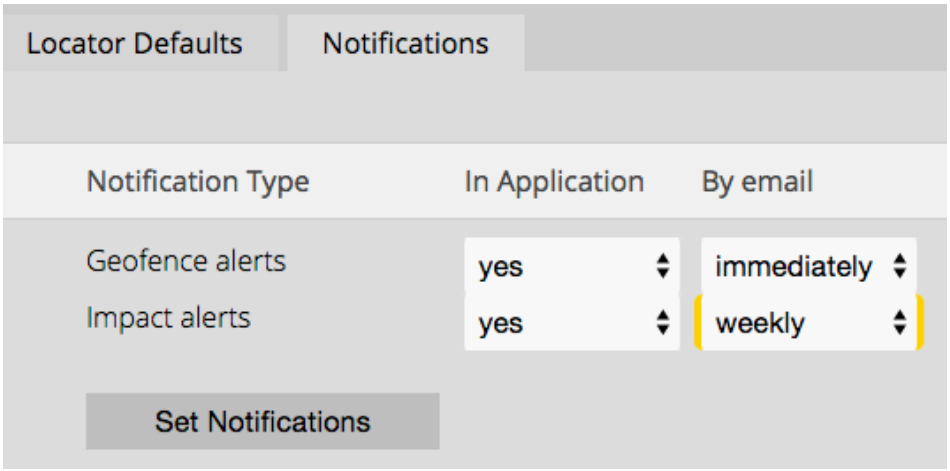
b. Set the *Impact Threshold* to a suitable value, e.g. *Strong Fall (2G-3G)*.




Point out that knowing if an instrument has suffered a major impact, and therefore likely needs to be calibrated, saves that crew from continuing to collect data and then having to go back later and re-measure. This could also help the customer avoid potential liability issues by avoiding costly errors.

iii. Notifications can be configured under the *Notifications* tab.

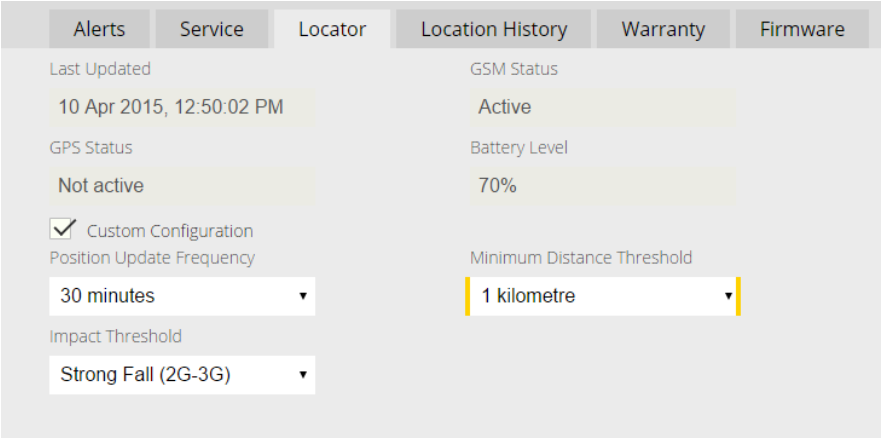
For each type of alert, the customer can select the when to be notified by email and within Equipment Manager.



iv. In addition to the global locator settings, the customer can select custom settings for each individual instrument which will override the global settings.

a. Select a Locate2Protect-enabled instrument from the equipment analytic view list.

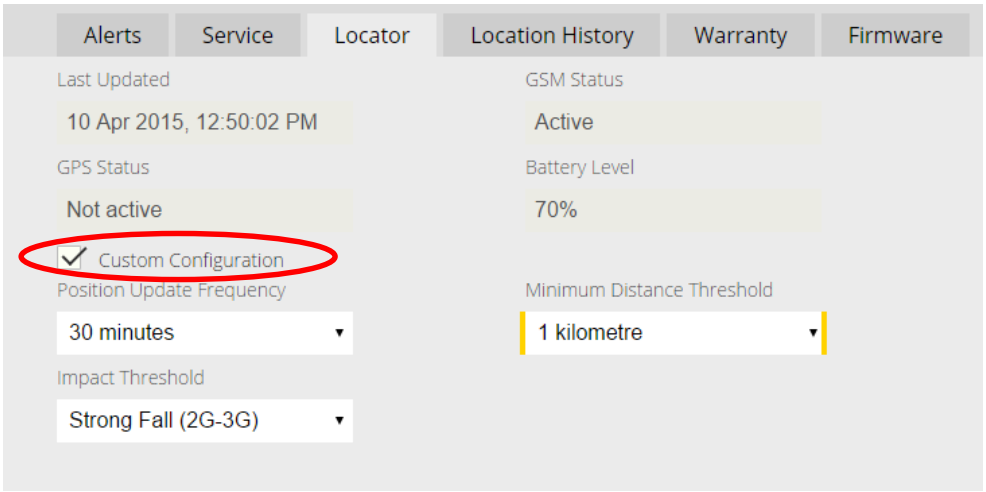
b. Select the *Locator* tab.




Here the user can see the last position update for the instrument as well as the status of the GSM (cellular) module, the GPS module, and the locator battery level.

c. Check the *Custom Configuration* box.

The customer can now specify the position update frequency, minimum distance threshold, and impact threshold and override the global settings for that particular instrument.



# Conclusion

This concludes the Trimble S7 Total Station Demonstration Guide. After working through the different sections of this guide, your customer should have a solid understanding of the new features that have gone into the Trimble S7 and supporting software and how those features can help them improve their workflows and results.

At the end of your demonstration, take the time to review the three key features which were covered in this guide:

1. Trimble Locate2Protect technology
    - GSM/GPS module embedded within the total station
    - Real-time and archived instrument locations
    - Geofence and impact alerts
    - Web-based asset management via Trimble InSphere Equipment manager
2. Trimble VISION technology
    - Live video survey control
    - Snapshot and panorama capture
    - High Dynamic Range (HDR) processing for improved results high-contrast scenes
    - Custom image annotations in Trimble Access field software
    - Terrestrial photogrammetry workflows in Trimble Business Center
3. Trimble SureScan technology
    - Achieve even grid scan point spacing on planar surfaces
    - Options for horizontal, vertical, and tilted planes
    - Desired scan density obtained in minimal time compared to traditional scanning methods

Bear in mind that this is only a guide, and that you may adapt the steps in this guide to suit your customer's needs. You may also choose to integrate the essential components of this guide into a broader demonstration of the complete Trimble solution, including GNSS, V10 imaging rover, Trimble Access field software, Trimble Business Center geospatial data processing software, Trimble InSphere cloud software, and SketchUp Pro modeling software.

If you have further questions, please refer to the S7 User Guide or applicable help documents or contact your local Trimble sales representative.

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