

LaserSoft®

LASER TECH


Sag Profiler® for Android™ 1.x

User's Guide



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First Edition: July 2021

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Patents:

This product is covered by pending patent applications and the following issued patents: 5,696,705
5,859,693

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Section 1 - Introducing Sag Profiler for Android

Thank you for purchasing LaserSoft® Sag Profiler® for Android from Laser Technology, Inc. (LTI). Sag Profiler is a field data collection program that Electric Utility professionals use to measure the Span, Sag and Tension of conductor wires. Measurements are made directly to conductors hanging between two attachment points (Spans) and to any obstructions or ground shots that are necessary. Each shot is recorded as a specific type and a list is updated on the screen. Calculations are then performed to yield parameters such as Span, Sag and Tension for each conductor span measured.

LTI surveying instruments can automatically enter data into Sag Profiler, which will create three-dimensional XYZ coordinates for each point measured. If desired, GPS can be used to geo-reference the data so it will match up with existing maps and satellite imagery.

Sag Profiler Report files can be downloaded to a computer and imported into most CAD-based programs capable of reading a *.TXT file. Reports can also be opened in Microsoft® Excel and many GPS visualization programs capable of reading a *.GPX or *.KML.

Technical Specifications

LaserSoft Sag Profiler has been designed to run on Android operating platforms for use in conjunction with Laser Technology surveying instruments.

Specification	Description
Operating Systems	Android version 6.0 to 10
Supported Devices	Most smart devices running Android 6.0 to 10* * Please check LTI web site for current compatibility (http://www.lasertech.com/Sag_Profiler-Software.aspx)
Connectivity	Bluetooth®
Compatible Lasers	<ul style="list-style-type: none"> • TruPulse 200X and TruAngle • TruPulse 360R** • TruPulse 360** with Bluetooth • TruPulse 200*** with Bluetooth and TruAngle <p>** Only TruPulse 360, 360R, and 200 Bluetooth-enabled lasers displaying the menu option "BT_Enc" in the heads-up display are compatible for use with a TruAngle. Older models of these lasers may not display this option and are not compatible for use with a TruAngle.</p> <p>*** To send commands from the Android device to TruPulse 200 Bluetooth-enabled lasers (i.e. utilize remote fire), the laser firmware version must be A 2.26 B 2.51 or newer.</p>
Hardware	<ul style="list-style-type: none"> • Required - MapStar TruAngle for use with TruPulse 200/360/200X laser • Recommended X-Grip & Mounting Claw for phones/tablets if using with a tripod, 7" version available via LTI, other sizes available here: http://www.rammount.com/search?search_type=search&query=xgrip
Supported Languages	English; template is available for translation

Warranty Information

For purchases including lasers, a copy of the LTI Limited Warranty should have shipped with the order. If needed, please contact LTI to obtain a copy of the LTI Limited Warranty. See the inside front cover for LTI contact information.

NOTE The Data Collector/Tablet package includes the associated product literature, such as manuals and warranties. It is your responsibility to contact the manufacturing company to register the Data Collector.

What's New

LaserSoft Sag Profiler is an updated and segmented version of Laser Technology's T&D Pro program for devices running Windows Mobile 6 or newer. When combined with a Laser Tech measurement system, this laser-based data collection app can be used to capture measurements of anything anywhere. While the Windows Mobile version of Sag Profiler is still supported by Laser Technology, Sag Profiler for Android provides many feature enhancements including:

- Enhanced user experience with Android OS.
- Add support for GNSS so data can be geo-referenced.
- Add Conductor shot selection for increased accuracy.
- Add Diagram of Span.
- Enable Send to Email function for Reports.
- Add GPX output format.

Instrument Configurations

Sag Profiler Android is designed to work with 5 different instrument configurations:

- TruPulse 360B/R with or without TruAngle (Figure 1A)
- TruPulse 200X with TruAngle (Figure 1B)
- TruPulse 200B with TruAngle (not pictured)

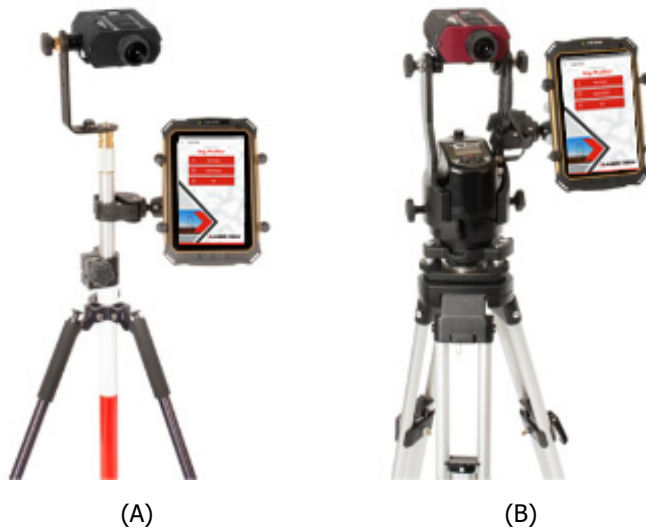


Figure 1

Laser Setup Notes

TruPulse 200B/360B/R:

Ensure that the laser's measurement mode is set to HD (Horizontal Distance) or SD (Slope Distance). When using a reflector, ensure the electronic filter is turned on AND that the mechanical foliage filter is affixed to the laser lens. The laser Bluetooth function needs to be turned on with "BT_On" selected. If using a TruAngle, select the Bluetooth options "BT_Enc" instead. Set the desired measurement units in the laser to feet or meter. Refer to the TruPulse 200B, 360B or TruPulse 360R manual for further instruction.

TruPulse 200X:

Ensure that the laser's measurement mode is set to HD (Horizontal Distance) or SD (Slope Distance). When using a reflector, ensure the electronic filter is turned on AND that the mechanical foliage filter is affixed to the laser lens. The laser Bluetooth function needs to be turned on with "BT_Enc" selected if using a TruAngle, and "BT_On" selected if not. Set the desired measurement units in the laser to feet/in or meter/cm. Refer to the TruPulse 200X manual for further instruction.

NOTE When mapping with a retro reflector, ensure that the electronic filter is turned on AND that the mechanical filter is affixed to the laser's receive lens. If these filters are not used, close range measurements (10 ft or less) may permanently damage the laser. Please see the hardware manual for further details.

MapStar TruAngle Setup Notes

The MapStar TruAngle provides the horizontal angle necessary for 3D mapping from one position using the Radial with Angle mapping method. A user-defined zero is set and all angle measurements from that specific position are based upon that zero. To operate this device:

- Connect the laser to the TruAngle with the 4-pin cable included in the mapping package.
- Ensure the laser Bluetooth option is set for BT_Enc.
- Refer to the guide on [Page 19](#) and the hardware user's guide for operation instructions.

Section 2 - Get Started with Sag Profiler

This section describes the download and installation procedure necessary to get started with Sag Profiler. It explains how to get the app from Google Play and then launch it. Once the application has been successfully launched, follow the instructions in this section to understand the main menu and configure the settings.

Get Sag Profiler from Google Play

Sag Profiler downloads free from the Google Play Store, but requires a license key purchased from Laser Technology to access full functionality. Sag Profiler will work unlicensed for a 30-day trial period from the date of initial download. To get the Sag Profiler app from Google Play:

1. Use the Google Play search function to find "LaserSoft Sag Profiler."
2. Tap the Sag Profiler icon to install the app as you would any other Google Play application (Figure 2).



Figure 2

NOTE Sag Profiler will need permission to take pictures, access location information and to access photos and files.

Pair a Laser with an Android Device

For data to be received from the laser to an Android Device, the two must be paired via Bluetooth. Once the laser has been paired to a Android device via Bluetooth, the pairing process described here does not have to be done again unless the laser is intentionally unpaired or the Android device is reformatted.

Bluetooth Setup - TruPulse 200X, 360B, 360R, 200B

1. Find and tap the Settings icon on the Android Device (Figure 3).
2. Tap [Bluetooth] on the Settings list (Figure 4A). If Bluetooth is listed as "OFF," toggle it to "ON."
3. Tap the laser device's serial number which should be listed in the AVAILABLE DEVICES section (Figure 4B). If it is not listed, tap search (or scan) for devices and/or ensure that the laser's Bluetooth is set to "BT_Enc" for Radial with Angle surveys and "BT_On" for Radial with Azimuth, Range Triangulation or Baseline Offset surveys.

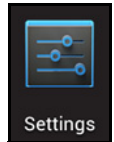


Figure 3

Bluetooth PIN Information:

TruPulse 200X PIN =	1234
TruPulse 200B/360B/360R PIN =	1111

4. Accept any Passkey by tapping [Pair], if prompted (Figure 4C).
5. Once successfully paired, the laser serial number will display in the Paired Devices section (Figure 4D).

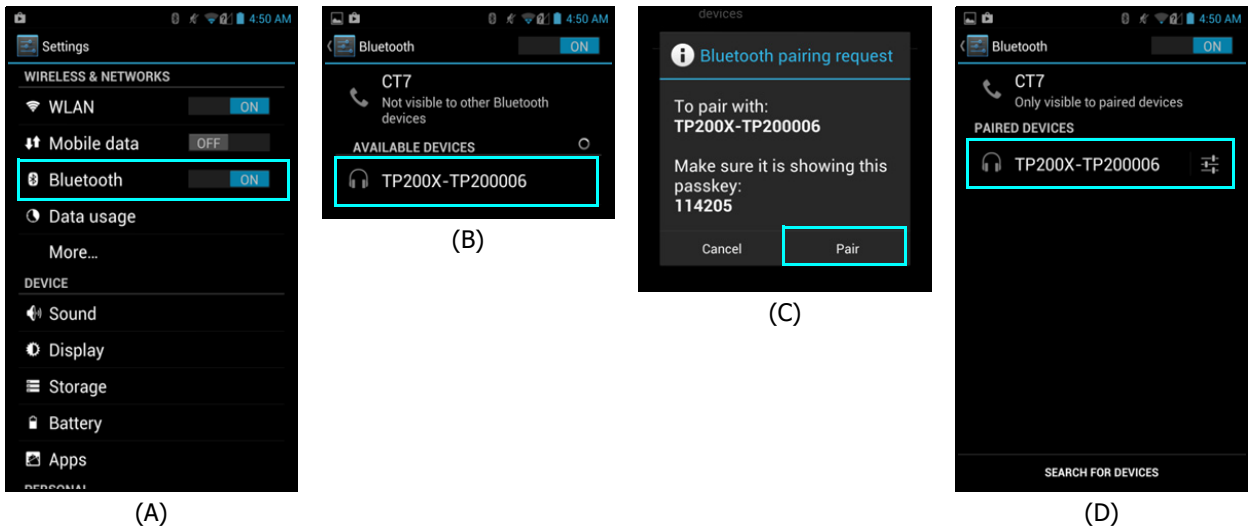


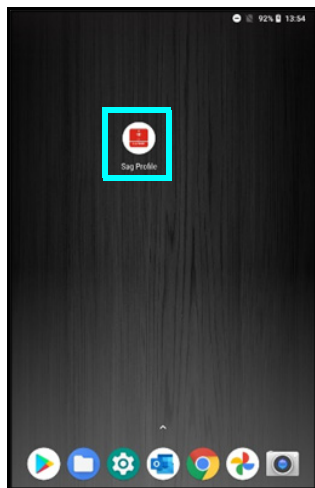
Figure 4

NOTE If the laser is powered off when viewing the current or available Bluetooth devices in range of the Android device, the laser may be described as "Not Connected" even if the two have already been paired. Power the laser on and the device should then display as a paired device.

Launch Sag Profiler

To launch the Sag Profiler app:

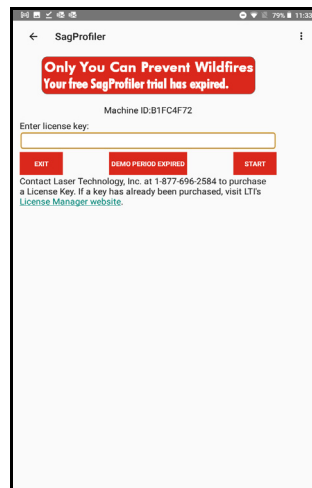
1. Find the Sag Profiler icon on the smart device (Figure 5A).
2. Tap the Sag Profiler icon (Figure 5B). The licensing screen will display (Figure 5C).



(A)



(B)



(C)

Figure 5

Program Licensing

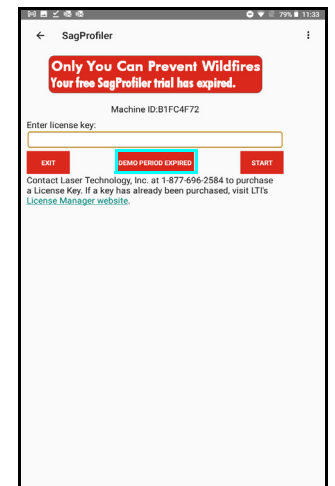
Upon any purchase of Sag Profiler, Laser Technology generates a customer account on its License Manager website (<http://license.lasertechpartners.com/CustomerLogin.aspx>) that allows you to generate license keys. The first time Sag Profiler is started, a short video will play before the licensing screen is displayed. Sag Profiler can be used for 30 days from the date of download before a license key is required (Figure 6A). Tap the Demo button to proceed past the licensing screen and use the program. At the end of 30 days, Sag Profiler cannot be used without a license key.

About the 30-day Trial:

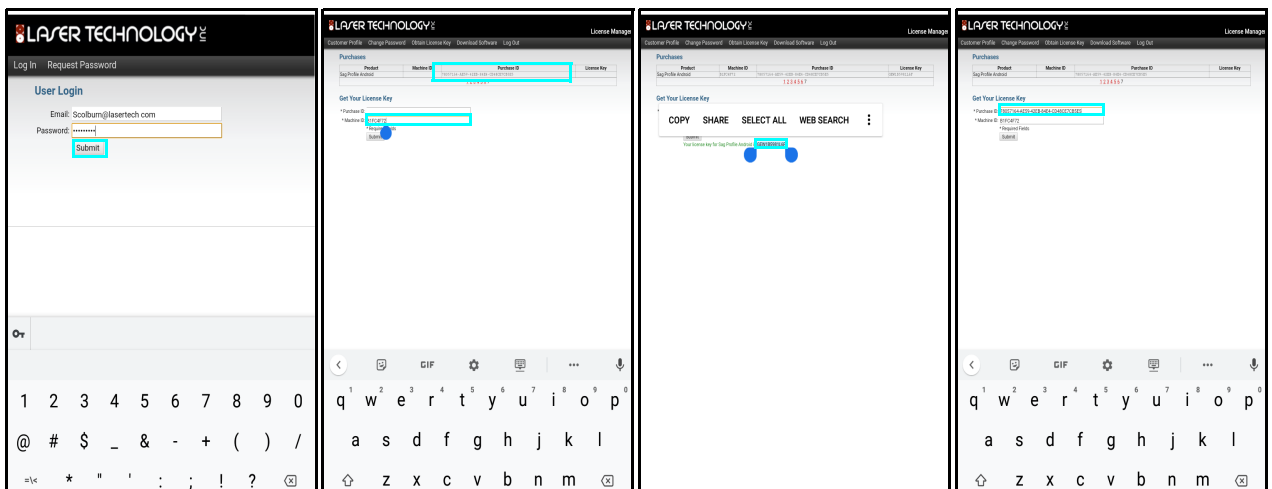
- The Demo Status is located in the box below the App title. The status changes depending on how many days are left in the trial. In Figure 6A the status is "DEMO PERIOD EXPIRED"
- Sag Profiler is fully functional during the trial period. Surveys made during this time are accessible during the trial and can be re-accessed when the program is licensed.
- Contact an authorized dealer near you to purchase a license key or call LTI for more information (1-800-790-7364 or 1-303-649-1000).

To generate a license key:

1. Note the temporary password you received from licensing@lasertechpartners.com and open License Manager, <http://license.lasertechpartners.com/CustomerLogin.aspx>. If you follow the "License Manager website" link from Sag Profiler licensing screen on your smart device, **your Machine ID was automatically copied to the clipboard**.
2. Tap the "Email" field to bring up the keyboard. Enter the email address associated with your purchase and the temporary password. Click [Submit] to log in (Figure 6B). If you do not have your temporary password, click the [Request Password] link at the top of the screen. Once successfully logged in, the "Obtain License Key" page displays.
3. Upon logging in, your purchase is displayed (Figure 6C).
 - Machine ID: If you followed the link from your smart device (Figure 6A), tap and hold the Machine ID field to paste the value. Or, enter the Machine ID manually (Figure 6C).
 - Purchase ID: Copy, tap and hold the "Purchase ID" in the Purchases Table (Figure 6C) and select the "Copy" option. Paste, tap and hold the "Purchase ID" field (Figure 6D) and select the "Paste" option (Figure 6E).



(A)



(B)

(C)

(D)

(E)

Figure 6

4. Click [Submit] and your license key will display below the entry fields, as well as in the Purchases Table.
5. **Copy**, tap and hold, or notate the License Key (Figure 7A) and return to Sag Profiler.
6. **Paste** or enter the key in the "Enter License Key" field and tap "Start" (Figure 7B). Tap and hold the "Enter License Key" file to display a prompt for pasting, then tap [Start].

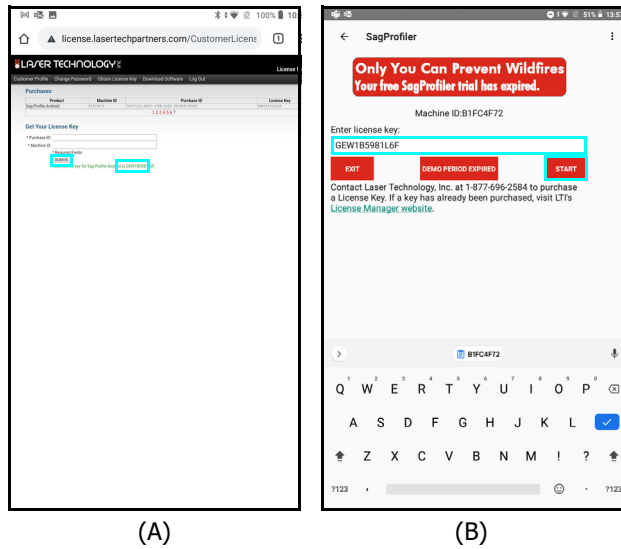


Figure 7

If an incorrect key is entered, the Sag Profiler Main Menu will not be displayed. Instead, the display will return to the device home screen.

For assistance contact: Licensing@lasertechpartners.com or call 1-877-696-2584.

Please provide your name, company name, purchase ID (if known) as well as the Machine ID displayed on the Android device.

Section 3 - Data Collection Methods

Sag Profiler offers two data collection methods that enable users with various equipment combinations and accuracy requirements to measure successfully. This section provides an overview of the two methods. Professional training on mapping methods in combination with the use of LTI measurement devices is encouraged. Contact LTI for training options.

When deciding which method to use, you will need to consider:

- The equipment that will be used. For example, will a Compass or TruAngle be used in combination with the laser?
- The accuracy required. A laser paired with the TruAngle will yield the best results. A TruPulse 360 alone is only recommended for short spans and lower accuracy requirements.

Overview of Mapping Methods

Method	Requirements	Compatible Hardware
Radial with Angle	Clear line of sight from the Origin point to a reference point and to each feature being mapped.	TruPulse 200/360/200X + MapStar TruAngle
Radial with Azimuth	Clear line of sight from the Origin point to each feature being mapped. Proper care and procedure when using a compass in the vicinity of magnetic objects such as cars, utilities, buildings, etc.	TruPulse 360B TruPulse 360R

Radial with Azimuth Method

This method requires the use of the TruPulse 360 Series laser.

NOTE Magnetic objects on or near the site may compromise the accuracy of your measurements. See Appendix D ([Page 38](#)) for a chart describing best practices for avoiding magnetic interference.

In this method, the user pivots about an Origin point and shoots to any features in view. Sag Profiler uses the distance and azimuth (heading in degrees referenced to North) measurements to calculate X, Y, and Z coordinates for each point on the span. If GPS is used Latitude, Longitude and Altitude will be generated ([Page 23](#)).

The Origin point, also referred to as an instrument point, defines where to begin collecting data. It can be located anywhere but it is a good idea to start from near the middle of the span, with visibility to most, if not all, of the points to be targeted.

When choosing an Origin:

- Make sure you have clear line of sight to all the attachments points you will need to measure and at least two points on each conductor.
- If actual X, Y, Z coordinates are not needed, the reference point may be any identifiable, permanent object visible from the Origin. As an example, you could use a telephone pole, street sign, or building corner as your reference point. You will not need to shoot the reference point, just site it with the laser and zero the MapStar TruAngle.
- Remember, if every point on the span cannot be seen, the Shoot Traverse function ([Page 24](#)) can be used to move and continue measuring.

Radial with Angle Method

This method is similar to the Radial with Azimuth method but requires the use of a MapStar TruAngle with a TruPulse laser (see table on [Page 10](#)). The use of the TruAngle is preferred for most Sag Profiler work and is necessary in areas where there may be too much magnetic interference for a TruPulse 360 model laser.

In this method, the user first references, or "zeroes", the TruAngle on a known Azimuth and then pivots about the Origin point while measuring to the span. Sag Profiler uses the distance and angle measured (in degrees from the reference Azimuth, or zero) to calculate coordinates for each feature. If GPS is used Latitude, Longitude and Altitude will be generated ([Page 22](#)).

As before, the Origin point defines where to begin collecting data and it is a good idea to start from near the middle of the span, with visibility to most, if not all, of the points to be targeted.

When choosing an Origin and reference point:

- Make sure you have clear line of sight along the reference azimuth, to all the attachments points you will need to measure and at least two points on each conductor.
- If actual X, Y, Z coordinates are not needed, the reference point may be any identifiable, permanent object visible from the Origin. As an example, you could use a telephone pole, street sign, or building corner as your reference point. You will not need to shoot the reference point, just site it with the laser and zero the MapStar TruAngle.
- Remember, if every point on the span cannot be seen, the Shoot Traverse function ([Page 24](#)) can be used to move and continue measuring.

Section 4 - Collect Data

Once the equipment has been configured, the software has been installed and licensed, and the measurement method has been determined, it is time to begin collecting data. Ensure all equipment is powered on.

If at any time the smart device shuts down or locks up during the data collection process, power the device back on and re-open Sag Profiler to resume data collection. Data is automatically saved after each measurement to allow data collection to continue seamlessly.

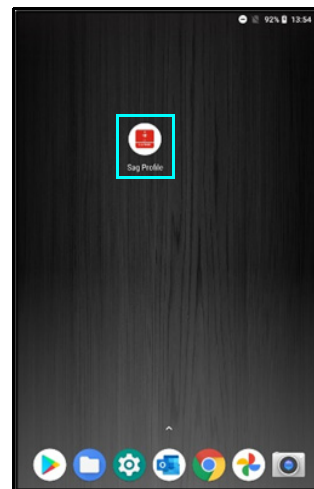
Launch Sag Profiler

To launch the Sag Profiler app:

1. Find the Sag Profiler icon on the smart device (Figure 8A).
2. Tap the Sag Profiler icon (Figure 8B).
If licensed, the Main Menu will display (Figure 9).



(A)



(B)


Figure 8

About the Main Menu


Figure 9 shows the Sag Profiler Main menu.



Figure 9

- Tap the back arrow (←) at the top of the screen to leave Sag Profiler.
- Tap the Menu button  in the upper right corner of the screen to access:
 - GPS Settings: Displays as an option when a project file is NOT open ([Page 16](#)).
 - Help: Displays as an option when a survey file is open ([Page 20](#)).
 - Sag Profiler Settings ([Page 21](#)).
 - About Sag Profiler: Lists the version number, contact information, and a link to the manual.
- Tap [New Project] to begin a new project.
- Tap [Saved Projects] to select an existing project and:
 - Open
 - Delete
 - Send Sag Profiler proprietary file via email.
- Tap [Exit] to close Sag Profiler and return to the Android device main screen.

GPS Settings

GPS Settings can be found by tapping  from the Main menu, and then select GPS Settings (Figure 10A). The current settings will display and adjustments can be made to them, if necessary (Figure 10B).

Sag Profiler automatically uses position information from Android location services for the project Origin (instrument position). Alternately, Location Services can be by-passed by tapping the Device drop-down list and selecting an external GPS device that is connected to the Android device via Bluetooth. After the Origin is captured, all subsequent GPS coordinates are mathematically calculated based on that initial position.

The GPS Settings screen contains options for projects that incorporate GPS. It includes the ability to review and capture incoming coordinate data and verify accuracy without having to create a project.

NOTE The GPS Settings option is only available from the Main menu when a Project is NOT open.

Start Fix

Tap this to begin searching for satellites. The number found will display along with an HRMS value. Data will update until the menu is exited or [Pause Fix] may be tapped to stop reporting position data.

What is HRMS?

HRMS is the horizontal distance from truth within which at least 63% of the recorded positions fall. Using a higher accuracy GPS device delivers a smaller HRMS. Smaller HRMS equals more accurate data.

Device

Select Location Services; or if there is an external GPS device connected to the Android device, select the device from the drop-down menu and Sag Profiler will receive position information directly from the GPS device. Sag Profiler supports most external GPS devices that connect to the Android device via Bluetooth.

Latitude/Longitude/Altitude

After [Start Fix] is initiated, these fields will continue to update with position information until [Submit] is tapped.

Antenna Ht

Enter the height of the antenna here. If using an Android device with no external antenna, enter the height of that device off the ground to get correct elevation information.

Start projects with GPS

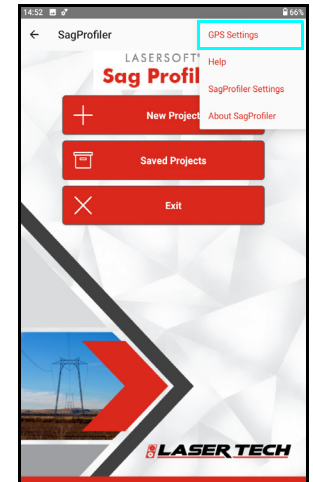
- Checked: Use GPS for all new Projects. The New Span screen will require the user to capture a GPS point for the Origin.
- Not Checked: The New Span screen will allow the user to enter XYZ coordinates for the Origin point.

DMS

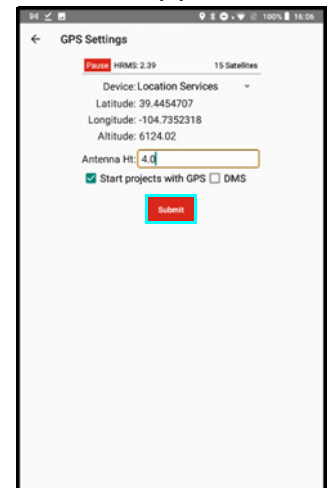
Degrees, Minutes, Seconds

- Checked: Position data is displayed using degrees, minutes, and seconds format.
- Not Checked: Position data is displayed using decimal degrees format.

To save any changes that have been made, tap  to return to the Main menu.



(A)



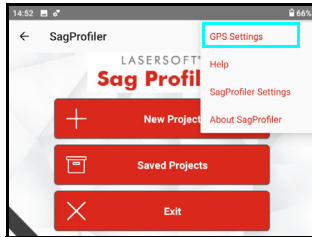
(B)

Figure 10

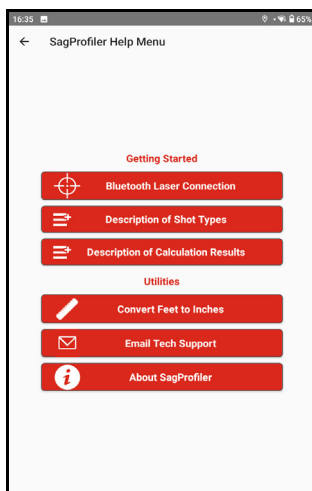
Help Menu

Sag Profiler Help includes information about connecting lasers to devices, the meaning of each shot type and calculation result; and the ability to send data and diagnostic files to LTI Tech Support. Help is located as a menu option in the upper right corner of the Sag Profiler screen at any time the program is open (Figure 11A).

Tap [Help] from the menu to display the Sag Profiler Help Menu (Figure 11B).



(A)



(B)

Figure 11

Help Menu Options:


Getting Started

- Bluetooth Laser Connection
 - Correct the laser connection
- Description of Shot Types
 - Each Shot Type is discussed
 - Some tips for measuring each are given
- **Description of Calculation Results**
 - See definitions for all the calculated results

Utilities

- **Conversion Table** - Find decimal feet conversions for entry fields such as Target/Instrument Heights.
- **Email Tech Support** - If a crash happens, re-open the project and use this feature to send a diagnostics file and/or the data file to technical support for assistance.
- **About Sag Profiler** - find the software version number and Laser Technology contact information.

Sag Profiler Settings

Sag Profiler Settings can be found by tapping  from either the Main menu or the Span Measurement screen. Select Sag Profiler Settings (Figure 12A) to view the current settings and make any necessary adjustments (Figure 12B).

Instrument Height

- Measured from the ground to the center of the sighting scope (Page 17).

Beep

- Checked: The Android device emits a beep when it receives measurement data.
- Not checked: Device does not emit a beep when it receives a measurement.

DeltaZ RMS level


- Enabled: if the value entered is exceeded, the user will receive a warning. Suggested value of 1.0 ft or 0.3 m.
- Not checked: the level value is retained but no warning is given when it is exceeded.

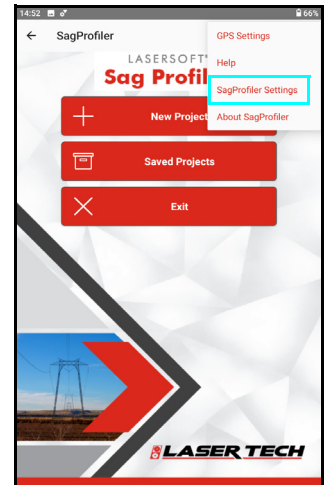
Project note

Enter a description or note for the entire project, which will be written to the Report files. Entered first on the New Project screen (Page 16) and then available on the Settings screen only when a Project is open.

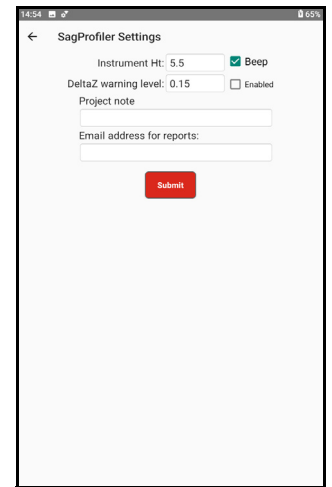
Email Address for Reports

Enter an email address that will automatically be used when sending Sag Profiler reports.

To save any changes that have been made, tap  and return to the Main menu.



(A)



(B)

Figure 12

Start a New Project

From the Main Menu, tap [New Project] to collect new span measurements. The New Project Settings screen will display (Figure 13).

To fill out the New Project Settings screen:

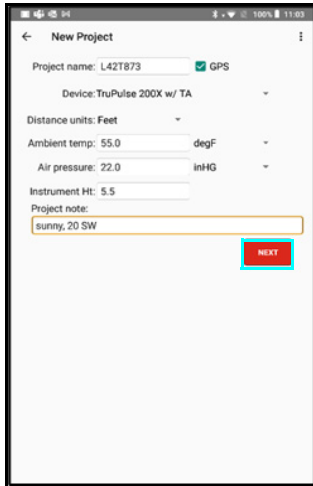


Figure 13

1. Enter/Select the following:
 - **Project name:** Enter a name unique to this project.
 - **GPS:** check box to use GPS for the Origin.
 - **Device:** Tap to select the laser equipment in use (Page 17).
 - **Distance Units:** Tap to select Feet or Meters.
 - **Ambient temp:** Enter the ambient air temperature.
 - **Air pressure:** Enter the ambient air pressure.
 - **Inst. Ht:** Enter instrument height (Page 17).
 - **Project note:** Enter a description of the project.
2. Tap [Next] to proceed to the New Span screen.

Project Name

Additional information regarding file name entry:

- Project names may include any combination of alphanumeric characters (1500 max).
- Four invalid characters include / \ & or space.
- An error message will be displayed if the file name includes invalid character(s).
- Clear the message by clicking [OK] and enter a name using valid characters.
- Duplicate project names are not allowed. If an existing name is entered, a prompt will appear indicating that a Duplicate Project Name was entered. To proceed, the name must be changed.

GPS

Check this box if you want to use GPS to set the coordinates for the Origin point for your measurements. This will allow you to plot the data on Google Earth or a similar program.

Device

Tap the Device drop-down list to select one of the available LTI product(s) being used (Figure 14).

Device	Radial with Azimuth	Radial with Angle
TruPulse 200X with TruAngle		✓
TruPulse 200B with TruAngle		✓
TruPulse 360B	✓	
TruPulse 360R	✓	

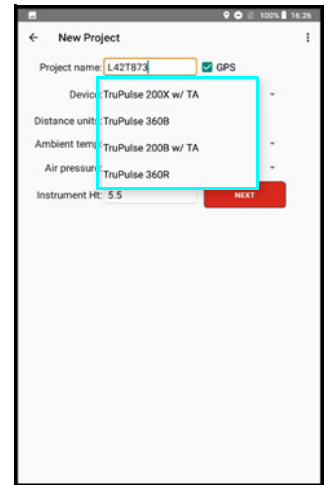


Figure 14

NOTE Only LTI Bluetooth mapping lasers work with Sag Profiler for Android. Units that require a cable are incompatible with the app.

Distance Units

Tap to select either Feet or Meters to match the units setting on the laser.

Ambient temperature

Enter the ambient air temperature when you begin your Project. Select the units of degree, F or C.

Air pressure

Enter the air pressure when you begin your project. Select units of inHG or Bar.

Instrument Height

Enter the distance from the ground to the center of the sighting scope on the laser, whether it is a 360R mounted in the L bracket (Figure 15) or a TruPulse 200X mounted on a TruAngle.

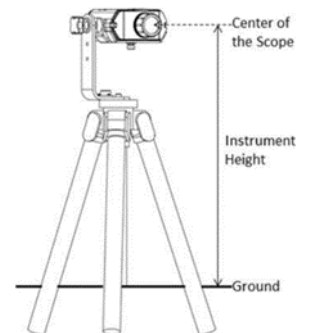


Figure 15

Additional Information

Localization

English is the default language for most Android devices; however, it can be changed.

To change the language:

1. Power on the Android device.
2. Tap the Settings icon on the device home screen.
3. Tap [Language & Input]
4. From the list of languages displayed, select the language to use for the text display on the device.
5. Press the Home button on the device to return to the device Home screen.

Serial Data Format

The Sag Profiler app accepts data from LTI instruments that use a data format which is based on the NMEA 0183 Standard for Marine Electronic Navigational Devices, Revision 2.0. For more detailed information about serial data format, refer to the user's manual that shipped with the LTI instrument.

New Span

Tapping [Next] from the New Project Settings screen moves ahead to the New Span screen for the project. The specific screen displayed depends upon whether or not GPS is utilized (Figure 16).

Sag Profiler does not require GPS or any known coordinate to set the Origin in a new project. If the instrument position is unknown, the project can be started with the default coordinates 0, 0, 0 and all the points will be related to each other based on that starting position. A known X, Y, Z coordinate can also be entered upon which all other measurements are based.

Device Selected

TruPulse 200/200X
with TruAngle

XYZ Span Screen

X: 0.00
Y: 0.00
Z: 0.00
Reference Azimuth: 0.00
Inst. Ht: 5.5
Ambient temp: 65.0
Air pressure: 22.0
Span note:
CANCEL Cables: 1 NEXT

GPS New Span Screen

Start Fix
Latitude:
Longitude:
Altitude:
Antenna Ht: 0.0
Reference Azimuth: 0.00
Inst. Ht: 5.5
Ambient temp: 65.0
Air pressure: 22.0
Span note:
CANCEL Cables: 1 NEXT

TruPulse 360B/R

X: 0.00
Y: 0.00
Z: 0.00
Inst. Ht: 5.5
Ambient temp: 65.0
Air pressure: 22.0
Span note:
CANCEL Cables: 1 NEXT

Start Fix
Latitude:
Longitude:
Altitude:
Antenna Ht: 0.0
Inst. Ht: 5.5
Ambient temp: 65.0
Air pressure: 22.0
Span note:
CANCEL Cables: 1 NEXT

Figure 16

Quick Start for TruPulse 200X + TruAngle System

1. Connect laser to TruAngle with 4-pin to 4-pin cable.
2. Power on the TruAngle, screen displays "ind" (index) (Figure 17A).
3. Rotate the TruAngle until screen displays flashing "0.00."
4. Turn on Bluetooth (BT_ENC) in the laser and pair it to the Android device (see [Page 6](#) for further explanation).
5. Aim the laser at desired reference (0°) point, tighten down the TruAngle so it cannot rotate or move off target, use the fine adjust if necessary and press the left-hand button (or fire the laser) to zero. The "0.00" will stop flashing (Figure 17B).



Figure 17

Calibrate the compass in a TruPulse 360B/R

1. Stand outdoors facing +/-15 of North; ensure there are no large metal objects in close vicinity. See Appendix D ([Page 38](#)) for more details on magnetic hygiene.
2. While looking through the scope of the laser, long press the down arrow button until "Units" displays.
3. Short press the down arrow until "H_Ang" displays and press Fire to select the option.
4. Short press the down arrow until "HACAL" displays and press Fire to select the option.
5. Short press the down arrow one time so the display rotates between "HACAL" and "Yes." Press fire to select the option ("C1_Fd" will display in the scope) and begin this routine:

NOTE At each laser position, starting with ❶ (shown in Figure 18), press Fire and wait about one second before shifting the laser to the next position:



Figure 18

6. Once the calibration is complete, look through the scope to see a message of "PASS" or "Fail." If the display reports a Fail, make sure you are aiming North and repeat the calibration making each rotation/fire press deliberate and one second each. If the unit continues to Fail perform the Tilt calibration and then repeat the Compass cal. See TruPulse 360B/R user's manual for further assistance with compass calibration.

Setting the Origin

When choosing a TruPulse laser with the TruAngle device in the New Project screen (Figure 13 on Page 16), the New Span screen for the project will display a field for Reference Azimuth. This is the direction the TruAngle will be Zeroed on and will orient the data properly. If one of the TruPulse 360 devices is selected, no field for Reference Azimuth will display. This device will output Azimuth directly and the user has only to make sure that Declination is applied for the data to be properly oriented.

To Set a GPS Origin for a Project

1. Position the Android device (or external GPS device) directly over the Origin point.
2. Tap [Start Fix] to begin searching for satellites (Figure 19A). Sag Profiler will begin searching for satellites, and reporting the number found and the HRMS value.
3. Enter an antenna height (the height above ground of your Android device or external antenna).
4. Enter a Reference Azimuth to a target that you will Zero the TruAngle on (not necessary for TruPulse 360 devices). Ensure that the reference target is at least 100 feet/30 meters away and that there is a clear line of sight to it from the Origin. Aim at the reference point and zero the TruAngle.

GPS coordinate information will continue to update every time a lower HRMS value is detected. When the displayed value is acceptable, tap [Next] to lock the position.

NOTE Tap [Pause Fix] at any time to stop reporting satellite data.

To Set an XYZ Origin

1. Enter a known XYZ coordinate and Reference Azimuth or accept the default values.

Complete the New Span Screen

1. Verify the Instrument Ht, Temperature and Pressure values are good.
2. Enter a Note for this Span.
3. Select how many Cables will be measured in this Span, from 1-16.
4. Tap [Next] to continue to the Data Collection screen (Figure 19B).

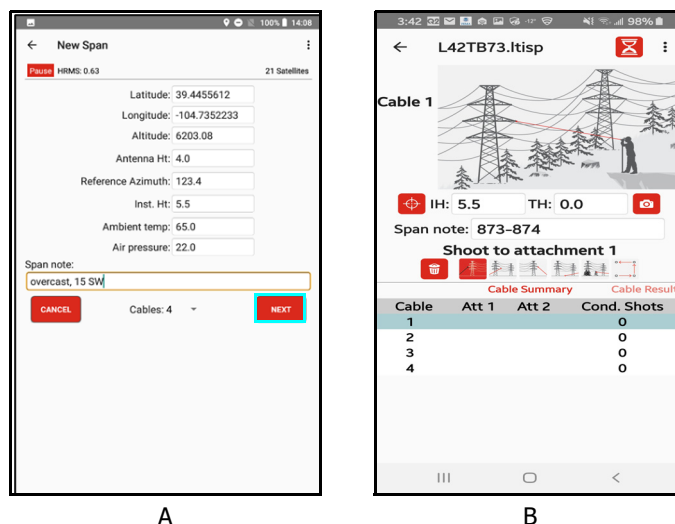


Figure 19

Data Collection Screen Overview Details

Figure 20 displays the Sag Profiler Data Collection screen.

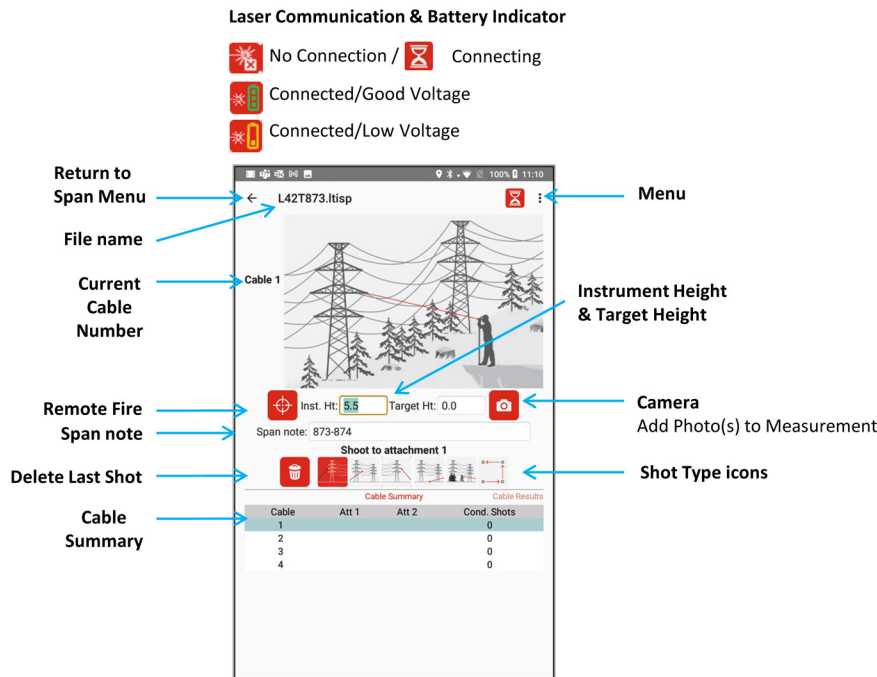















Figure 20

Item / Icon	Description
Laser Communication & Battery Indicator	Indicates Bluetooth laser connection and battery status. For TruPulse 200X, 200B, 360B and 360R lasers, Sag Profiler will automatically search for a connected laser to use upon arrival to the data collection screen. This indicator will display as an Hourglass during the time the app is attempting to connect - and it will change to green or yellow status once connected. If no connection is achieved, or if there is a disconnection, tap the icon to re-establish the connection. If no connection can be achieved, please reset the power on all devices and try again. If this fails, replace the laser battery.
Menu	Access Help, Settings, and About Sag Profiler.
Shot Type	Tapping an icon will turn it red, update the image and prompt the user where to shoot. Working from left to right, there is Shoot to Attachment 1, Shoot to Conductor, Shoot to Attachment 2, Shoot to Ground, Shoot to Obstacle and Shoot Traverse.
Delete	Deletes the last shot measured.
Remote Fire	Use to fire the laser without physically pressing the fire button on the device.
Cable Number	Displays the current Cable number that is being measured. To change the cable number, tap on the corresponding line in the Cable Summary
Span note	Enter a note or description for the Span
Cable Summary	Shows a list containing the number of Cables designated, if Attachment shots have been taken for that cable and the number of shots measured to the Conductor. To select a Cable for measurement, tap on it in the list to highlight it and then take the shots.

Icon Description Table

Icon	Description
	<p>Laser Connection Indicator - Indicates that a laser is connected laser battery is good/sufficient. This icon will change from No Laser to Green or Yellow upon the first measurement taken.</p>
	<p>- Change laser batteries as soon as possible.</p>
	<p>- No laser is connected/communicating.</p>
	<p>- The app is working to connect to the laser.</p>
	<p>Fire - Tap to fire the laser remotely.</p>
	<p>Delete - Tap to delete a data point from the project.</p>
	<p>Camera - Tap this button at any time to take images, which will be associated with the current Cable and Span</p>
	<p>Shoot Attachment 1 - Select when shooting to the first attachment point in the span, where the conductor is attached to the tower.</p>
	<p>Shoot to Conductor - Select when measuring to the conductor itself, that hangs between the two attachment points.</p>
	<p>Shoot to Attachment 2 - Select when shooting to the second attachment point in the span.</p>
	<p>Shoot to Ground - Select when shooting to points on the ground underneath the span.</p>
	<p>Shoot to Obstacle - Select when shooting to the top of vegetation or structures underneath the span.</p>
	<p>Shoot Traverse - If an entire span cannot be measured from one location, select when measuring to the next instrument station.</p>

Measuring a Span


When starting a New Project, the first Span will be created and the Measurement screen will display (Figure 21A). The default Cable number is 1 and the active Shot type is Shoot to Attachment 1.

Before beginning to measure the first Cable in the Span:

1. Make sure connection with the laser is established and the icon is green.
2. Measure the Instrument Height to the center of the laser scope and enter that value.
3. Enter the Target Height which will be 0.0 for most shots.
4. Tap on the desired Cable number in the list at the bottom to highlight it (defaults to 1).

In addition to the Shot type and image, the Cable Summary page (see Page 26) is displayed at the bottom of the screen.

Shoot to Attachment 1

1. Aim at the first attachment point and press the Fire button or tap . An audio alert will sound when the shot is received. A check mark is now shown below Att 1 on Cable 1 (Figure 21B).

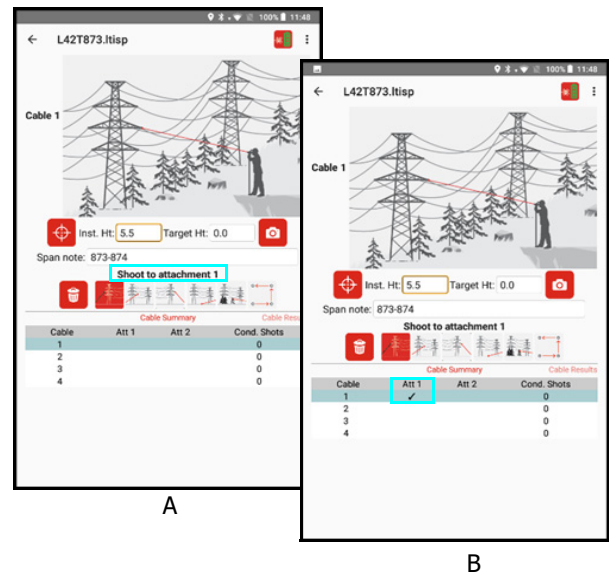




Figure 21

Shoot to Conductor

1. Tap the Shoot to Conductor icon , it will turn red and the image will change (Figure 22A).
2. Aim at the first point on the conductor and press the Fire button or tap . An audio alert will sound when the shot is received.
3. A numeric counter is started under Cond. Shots at the bottom of the screen (Figure 22B).
4. Continue taking shots to the Conductor, a minimum of 2 is required.

NOTE If a distance cannot be acquired to the conductor, Angles Only mode may be used. This mode is only available for Conductor shots and requires that distances have been measured to both Attachment points.

1. If using a TruPulse 360/R, put it into AZ measurement mode; if using a TruPulse laser with the TruAngle, put the laser into INC measurement mode.
2. Take a shot to the conductor and accept the warning message about Angles Only mode. Note that the shot is listed in the Summary screen below.
3. Continue taking at least one more shot to the conductor to reach the minimum.
4. When finished, tap the next Shot type icon and/or Cable # and return the laser to the HD measurement mode.

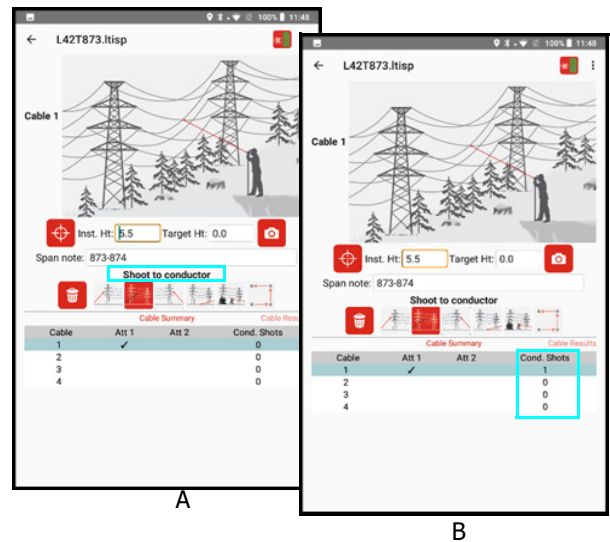




Figure 22

Shoot to Attachment 2

1. Tap the Shoot to Attachment 2 icon , it will turn red and the image will change (Figure 23A).
2. Aim at the second attachment point and press the Fire button or tap . An audio alert will sound when the shot is received

A check mark is now shown below Att 2 on Cable 1 (Figure 23B).

NOTE once both attachments have been measured and at least 2 conductor shots taken, the cable is termed "complete".

Calculation results showing the quality of the laser measurements are displayed under the Cable number at the top left of the screen and the entire set is now available on the Cable Results screen (Page 26).

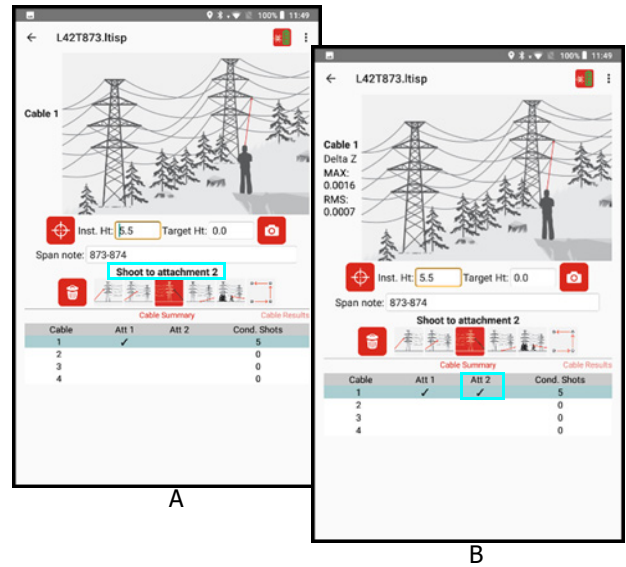





Figure 23


Shoot to Ground and Obstacle

These shots are optional and may be collected to enrich the data set. They do not have any effect on the calculation results.


1. Tap the desired icon  or , it will turn red and the image will change.
2. Aim at the target and press the Fire button or tap . An audio alert will sound when the shot is received and the points are stored in the file and will be included in the reports.

Shoot Traverse

This shot type is optional and only necessary when the entire span cannot be measured from one location.


1. Tap the Traverse icon , it will turn red and the image will change.
2. Make sure to enter an accurate Target Height for this shot.


NOTE It is not recommended to shoot to the ground for a Traverse but rather to a target positioned over the point to be occupied.

3. Aim at the target and press the Fire button or tap . An audio alert will sound when the shot is received. A reminder screen will display to move to the new position, measure the Instrument Height and enter it in the field.
4. Tap the next Shot type icon needed and continue measuring the Span as above until it is complete.

Add a Photo

One or more photos may be added to each Cable as it is measured. At any point while measuring the cable,

use the Camera icon  to take a photo(s). Photos are stored in the folder with the Project reports and named to match the Span and Cable. If more than one is taken, a (2), (3), etc. is placed after the photo description.

1. Tap the Camera icon  on the Data Collection screen (Figure 24A).
2. Aim/zoom to evidence (Figure 24B), and press the button at the bottom of the screen to capture an image.
3. Tap the button on the device to accept the image. If necessary, the image can be retaken.
4. When prompted, tap [OK] to add another picture associated with the most recent measurement taken or tap [Cancel] to return to the Data Collection screen and continue measuring (Figure 24C).

NOTE Some Android devices may take photos in a slightly different manner, follow the procedure for your device.

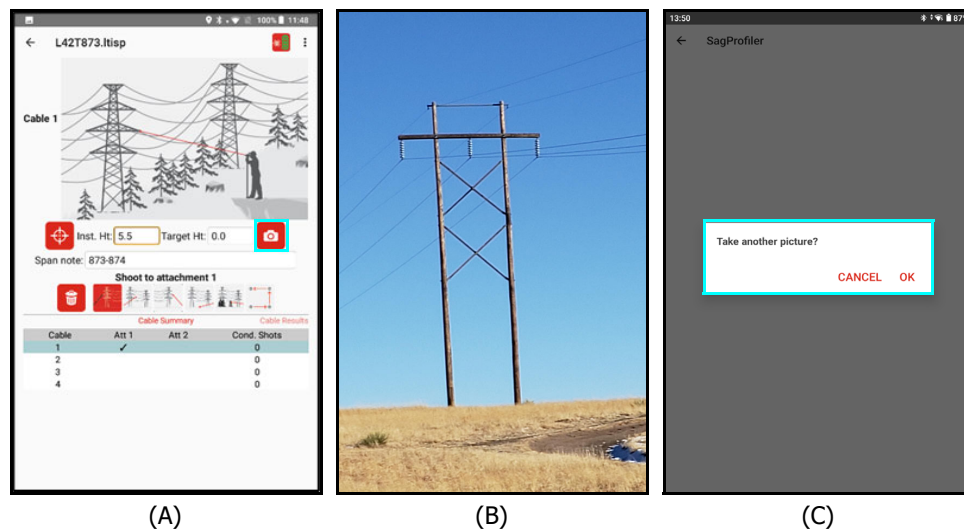


Figure 24

Viewing the Results

After each Cable has been completed, the results are now available for viewing at the bottom of the screen. It is important that the quality of the data gathered for each cable is checked before moving the instrument to measure a new Span. With the options available in the app, correcting an issue is easy to do while in the field.

Cable Summary

The Cable Summary page is displayed by default at the bottom of the screen while taking measurements to each Cable in the Span (Figure 25). This allows the user to keep track of which cable number they are measuring to and the critical shots that have been taken on each towards completion. The number of cables designated in the New Project screen will be shown in the table. Tap on a row to select that Cable number for measurement with the laser. When a cable has both attachment points and at least two shots to the conductor taken, it is termed "complete" and the results may be viewed. However, this is just the minimum and if more shots to the conductor are desired, they may be taken. If necessary, one of the Attachment points may be re-shot at this time also.

Cable	Att 1	Att 2	Cond. Shots
1	✓	✓	5
2			0
3			0
4			0

Figure 25

When a particular Cable number is completed to the satisfaction of the user, swipe the lower section of the screen to the left to view the Cable Results page.

Cable Results

Once a Cable has been completed, the Results may be viewed on the Cable Results page (Figure 26). If this page is accessed before a cable has been completed, it will be labeled "Incomplete" and no results will display. In this case, return to the Cable Summary page, select the cable and complete the minimum number of measurements needed.

Linear Weight - this is a known value for the conductor, typically in lb/ft or kg/m (matching the units for distance selected on the New Project screen). Enter this value in the field and tap the red check mark beside it. The results will re-calculate based on this value. Each cable may have a unique Linear Weight value entered for it but it must stay in the same units as the Project.

Tension 1 - the force acting on the conductor at attachment point 1, represented in either lb or kg of force.

Tension 2 - the force acting on the conductor at attachment point 2, represented in either lb or kg of force.

Horizontal Tension - horizontal component of the force acting on the conductor at the Low point, shown in either lb or kg of force.

DeltaZ RMS - an average of all the Delta Z values (how far a conductor shot is away from the best-fit curve). This is the prime indicator for the quality of the laser measurements taken by the user. For best results, this value should be as small as possible, < 1.0 ft (0.3 m). If it is not, swipe left again to the Conductor Shots page and see the next section on editing the data.

DeltaZ Max - the largest of all the DeltaZ values. Shows the worst shot taken with the laser and will assist the user in eliminating it, if necessary, from the data set using the Conductor Shots page.

NOTE the Delta Z quality indicators will also display on the upper left section of the measurement screen as soon as a cable is complete. The operator can immediately use them to improve the solution. These values will turn RED when the warning level in the Settings menu has been exceeded (Page 15).

Span - the Horizontal Distance between the two attachment points.

Arc Length - the length of the conductor along its curve.

MidSpan Sag - the sag of the conductor at the midpoint of the span.

Height at Low Point - the elevation (Z coordinate) of the Low point on the conductor.

Distance to Low Point - the horizontal distance from Attachment 1 to the Low point on the conductor.

UP/Down Arrows - use the red Up/Down navigation arrows at the top left of this page to easily scroll through data for each completed cable. This navigation is also present on the Conductor Shots and Cable Diagram pages.

Metric	Value
Tension 1	16435.56
Tension 2	16244.31
Horizontal Tension	16220.3310
DeltaZ RMS	0.0775
DeltaZ Max	0.1454
Span	880.29
Arc Length	883.32
MidSpan Sag	23.95
Height at Low Point	23.05
Distance to Low Point	659.86

Figure 26

Conductor Shots

If the Delta Z values are not within an acceptable range, swipe left to view the Conductor Shots page (Figure 27A). By tapping the box in the Exclude column for each shot individually, the user may determine if excluding one or more shots greatly improves the Delta Z values. In this case, the first shot has been excluded and the resulting Delta Z values have been almost cut in half (Figure 27B). This change will be reflected also in minor, yet important, changes in the calculation results for Sag and Tension on the Cable Results page.

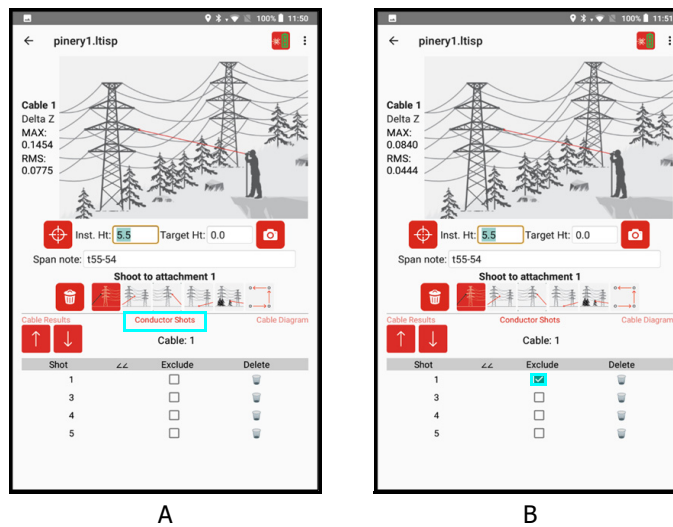


Figure 27

Cable Diagram

To further quality check the selected Cable, swipe left again to view the Cable Diagram (Figure 28). This is a visual illustration of the span in profile, showing all the points measured with the laser and an accurate representation of elevation change.

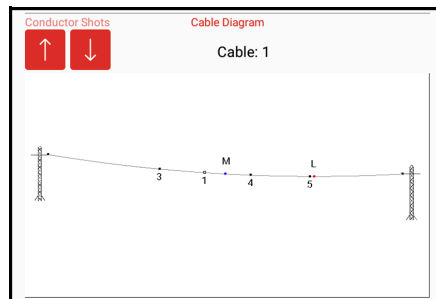


Figure 28

- **Point on tower to the left** is Attachment 1.
- **Point on tower to the right** is Attachment 2.
- **Numeric points** are Conductor shots, where a solid symbol is included and an outlined symbol is excluded.
- **M** is the midpoint of the cable (blue).
- **L** is the low point on the cable (red). This point will only coincide with the Midpoint of the cable if the two attachments points are at the same elevation.

Continue Measuring the Span


Once each cable has been checked for quality, return to the Cable Summary page. Select the next cable to be measured by tapping on its row in the table at the bottom of the screen. Shoot in all the critical points on this cable and review the results as described above. Continue measuring to each cable in the span until all of them have been completed and checked for quality.

Tap the arrow in the upper left corner of the screen to exit this span and return to the Span menu.


Span Menu

When leaving the measurement screen from your first Span, or when opening a Saved Project, you will enter the Span menu (Figure 29). Use this screen to Delete, Open or Start a New Span.


Delete a Span

1. Tap on a Span name to highlight it on the list.
2. Tap  to remove it. The user will be prompted to continue or cancel and the span may be removed from the project.

Open a Span

1. Tap on a Span name to highlight it on the list.
2. Tap  to open it. The measurement screen will open on the default cable number and shot type.
3. Select the cable to work on and begin taking measurements.

Start a New Span

1. Tap the  icon and the New Span screen will display (Page 18).
2. Make any changes necessary to these values.
3. Tap Next and the Measurement screen will display.
4. Select the Cable number and Shot type, and take measurements to the Span as described in previous section.

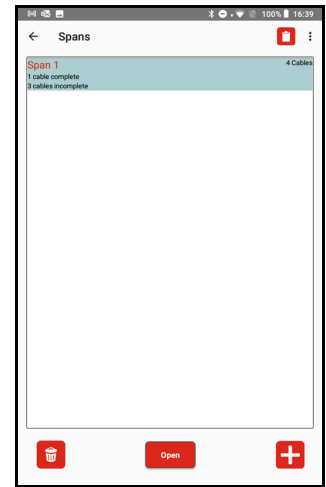



Figure 29

Generate a Report

When a Project has been completed and all the Spans checked for quality in the field, reports of several different types can be generated from the app. They will contain Project and Span information, any images taken and all calculation results.

- At the Span menu, tap the  icon in the upper right portion of the screen. The Report Menu will display (Figure 30).
- Pull down the list next to the Report format and select a type.
 - PDF (*.pdf):** generates an Adobe Acrobat compatible file that will contain both text and the cable diagrams
 - GPX (*.gpx):** creates a geo-referenced output file with descriptions that will open in GIS software such as ArcGIS - GPS ONLY
 - KML (*.kml):** creates a geo-referenced output file with descriptions that will open in Google Earth - GPS ONLY
 - TXT (*.txt):** will produce a tab delimited text file with no images
 - CSV (*.csv):** generates a comma delimited text file (no images) that will open directly in Excel
 - All Above Formats:** will create a copy of the Report in each of the formats listed.

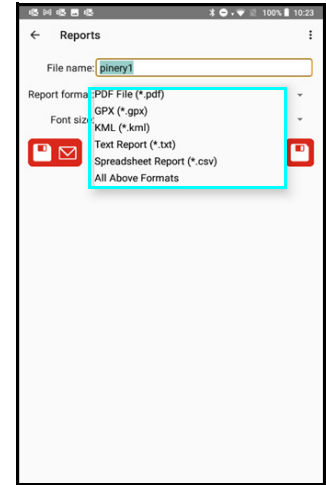








Figure 30

NOTE The GPX and KML output files are only available on this list when GPS has been used to set the Origin (Page 16).

- Select the report type needed and then tap either  on the left or  on the right .
 -  will open the email client and create a message with the reports attached. If you have entered an address to send reports to in the Settings screen (Page 15) this will automatically be used. Otherwise, enter an address and send the message.
 -  will save a copy of the selected file(s) and make them available for transfer later.

Once Reports have been generated, they will be listed at the bottom of the Report menu (Figure 31). All images that were taken for the project will be listed here also. Any of these files may be selected by tapping on

them to highlight, and then either deleted  or sent via email .

- Tap the back arrow to return to the Span menu. From the Span menu, continue to add spans to this project or tap the back arrow to return to the Main menu.

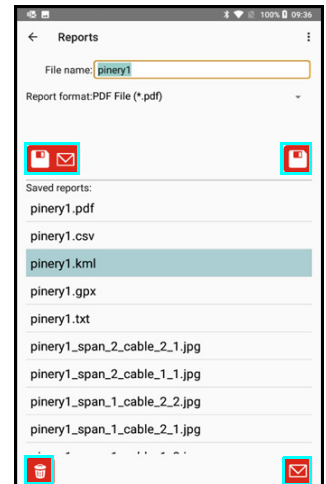


Figure 31

Transfer Reports/Data to a PC

In addition to email, saved reports can also be transferred to a PC via the USB cable that accompanies the Android device. When Sag Profiler is installed on a Android device, it creates a folder called Sag Profiler for storing program settings, reports, and *.Itisp format project files. The *.Itisp project files can only be opened within Sag Profiler and are located in a sub-folder named "Data". In addition to transferring project reports to a PC, it is also a good idea to copy *.Itisp files over as well once all edits and changes to the project are complete. An *.Itisp file can always be copied back over to the Android device if it becomes necessary to add more data points to a project or make any other changes - and then reports can be re-created based on the updated file.

1. Connect the Android device to a PC with the USB cable that accompanies the device. Android devices typically connect as if they are a "Removable Disk" or external hard drive. Please refer to the manual that shipped with your device to understand how it connects to a PC.
2. Swipe down from the top of the Android device screen, select Settings, and search for the USB Configuration option (Figure 32A).
3. Tap [Select USB Configuration].
4. Select MTP (Media Transfer Protocol) (Figure 32B).
5. On the PC, open File Explorer and then navigate to, select the Android device. In this example, it is "Phone". When the drive is selected, its contents display on the right side of the File Explorer screen.
6. Double-click the Sag Profiler folder (Figure 32C).

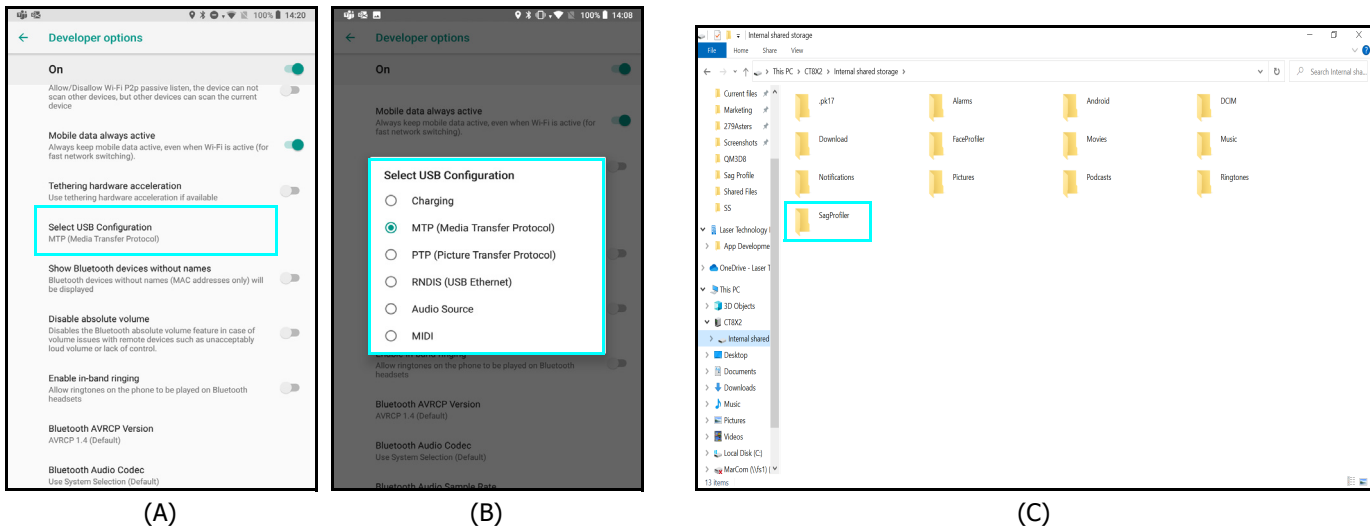


Figure 32

Continued on Next Page

7. Double-click the folder that coincides with the project name and the saved reports will display (Figure 33). Copy any of the individual reports or copy the entire folder to transfer all the reports for the project by highlighting them and then right-click/copy with your mouse.
8. Create a folder on your PC for storing your Sag Profiler reports and *.Itisp files. Double-click the folder, and then right-click/paste with your mouse.

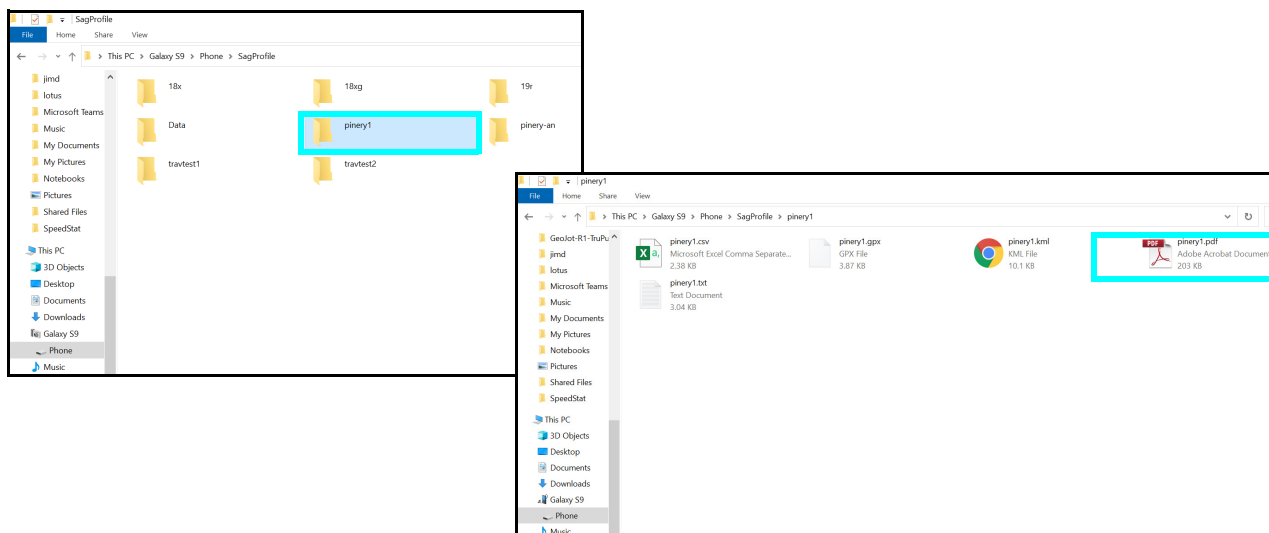



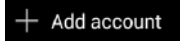












Figure 33

Appendix A - Sag Profiler for Android Quick Start Guide

This quick reference guide is divided up by specific LTI lasers used with a ruggedized Android tablet. If using an Android device not purchased from LTI, the steps referencing tablet set up will be similar but may have some variances. Refer to the Android device's manual for information on setting up Wi-Fi, email accounts, and connecting Bluetooth devices if necessary.










Step 1 for All Lasers - Install Sag Profiler and Get Licensed

1. Turn on tablet, tap , tap  to set SLEEP to NEVER.
2. Tap , then tap  to add a Google account or get assistance from IT to set up a dedicated email account for your reports.
3. Tap , then Search for: "LaserSoft Sag Profiler"  and INSTALL the app.
4. From the Main screen, tap , then tap  to open app.
5. Tap and hold  to copy or notate Machine ID on paper.
6. Tap [License Manager website](#) link, then log in with your Email and temporary password sent from LTI.
7. Paste or type the Machine ID into .
8. From the Purchases Table, copy and paste or type in your purchase ID into .
9. Tap , then copy or notate the License Key.
10. Tap , then paste or type in the License Key and then tap .
11. Charge the tablet.
12. Go to Step 2 for TruPulse 360R/B for laser setup (below), or to Step 2 for TruPulse 200X + TruAngle ([Page 34](#))








TruPulse 360B/R

Step 2 - Toggle On Bluetooth





1. Press  to power the unit on.
2. Long press  until .
3. Press  until .
4. Press  then press  until .
5. Press  to confirm.

Step 3 - Change Units of Measure to Feet (if necessary)










1. Long press  until .
2. Press  then press  until .
3. Press  and then press  again to accept feet/degrees as units of measurement.

Step 4 - Connect TruPulse 360B/R with Android Device via Bluetooth

1. Tap , then tap .
2. Turn on tablet Bluetooth.
3. Tap the laser model/serial number under AVAILABLE DEVICES.
4. Enter PIN number: 1111 or accept any passkey.
5. Exit to the Main screen.

Final Step TruPulse 360B/R - Set Up & Get a Shot In







**For standard projects without GPS.

1. Power ON all components.
2. Calibrate the compass in the laser and enter compass declination.
3. Tap  and then tap .
4. Enter file name, then select the device and equipment .
5. Tap Distance units that match the laser.
6. Measure from center of laser to ground and enter value .
7. Select units for Temperature and Pressure, enter a Project note, and then tap .
8. Enter Origin XYZ values (or accept the defaults), enter a Span note, select the Number of Cables to measure and then tap .
9. At the top of the Data Collection screen, wait for  to become .
10. Tap the Shot Type icon desired, aim at target, and press  on the laser to add the first data point to the project.
11. Complete measuring the cable.








TruPulse 200X + TruAngle

Step 2 - Toggle On Bluetooth









1. Press  to power the unit on.
2. Press  until .
3. Press  until .
4. Press  to accept.


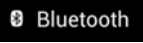
Step 3 - Change Units of Measure to Feet

1. Press  until .
2. Press  to scroll through unit options , .
3. Press  to accept the units of measurement .

Step 4 - Toggle On Electronic Filter (if using a reflective target)

1. Press  until .
2. Press  to choose .
3. Press  to accept selection.
4. Apply the mechanical filter  to the front lens on the TruPulse 200X.

Step 5 - Sync Android Device with TruPulse 200X via Bluetooth



1. Tap , then tap .
2. Turn on the tablet's Bluetooth.
3. Tap the laser model/serial number under AVAILABLE DEVICES.
4. Enter the PIN number: 1234 or accept any passkey.
5. Exit to the Main screen.


[Continued on Next Page](#)

Final Step TruPulse 200X - Set Up & Get a Shot In


*For standard projects without GPS.

1. Power ON all components.


2. Tap  and then tap .


3. Enter file name, select the device and equipment .

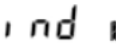

4. Tap Distance units that match the laser.



5. Measure from the center of laser to the ground and enter value .

6. Enter the Reference Azimuth.

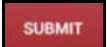

7. Select units for Temperature and Pressure, enter a Project note, and then tap .


8. Leave all Origin values at zero and tap .

9. On the TruAngle, rotate 360 degrees until  becomes flashing .

10. Aim laser at desired reference point, then tighten the TruAngle brake  and press .

on the laser and  stops flashing.

11. Enter the Span note and tap . Notice that  turns into  at the top of the Data Collection screen. Tap to refresh connection if necessary.

12. Tap the Shot Type icon desired, aim at target, and press  on the laser to add the first data point to the project.

13. Complete measuring the cable.

Appendix B - Conversion Table (Inches to Decimal Feet)

The chart below converts fractions of inches into decimal equivalents. Conversions are also available in Sag Profiler's built-in Help ([Page 20](#)).

Inches	Feet	Inches	Feet	Inches	Feet	Inches	Feet
1/8"	0.0104	3 1/8"	0.2604	6 1/8"	0.5104	9 1/8"	0.7604
1/4"	0.0208	3 1/4"	0.2708	6 1/4"	0.5208	9 1/4"	0.7708
3/8"	0.0313	3 3/8"	0.2813	6 3/8"	0.5313	9 3/8"	0.7813
1/2"	0.0417	3 1/2"	0.2917	6 1/2"	0.5417	9 1/2"	0.7917
5/8"	0.0521	3 5/8"	0.3021	6 5/8"	0.5521	9 5/8"	0.8021
3/4"	0.0625	3 3/4"	0.3125	6 3/4"	0.5625	9 3/4"	0.8125
7/8"	0.0729	3 7/8"	0.3230	6 7/8"	0.5729	9 7/8"	0.8229
1"	0.0833	4"	0.3333	7"	0.5833	10"	0.8333
1 1/8"	0.0938	4 1/8"	0.3438	7 1/8"	0.5938	10 1/8"	0.8438
1 1/4"	0.1042	4 1/4"	0.3542	7 1/4"	0.6042	10 1/4"	0.8542
1 3/8"	0.1146	4 3/8"	0.3646	7 3/8"	0.6146	10 3/8"	0.8646
1 1/2"	0.1250	4 1/2"	0.3750	7 1/2"	0.6250	10 1/2"	0.8750
1 5/8"	0.1354	4 5/8"	0.3854	7 5/8"	0.6354	10 5/8"	0.8854
1 3/4"	0.1458	4 3/4"	0.3958	7 3/4"	0.6458	10 3/4"	0.8958
1 7/8"	0.1563	4 7/8"	0.4063	7 7/8"	0.6563	10 7/8"	0.9063
2"	0.1667	5"	0.4167	8"	0.6667	11"	0.9167
2 1/8"	0.1771	5 1/8"	0.4271	8 1/8"	0.6771	11 1/8"	0.9271
2 1/4"	0.1875	5 1/4"	0.4375	8 1/4"	0.6875	11 1/4"	0.9375
2 3/8"	0.1979	5 3/8"	0.4479	8 3/8"	0.6979	11 3/8"	0.9479
2 1/2"	0.2083	5 1/2"	0.4583	8 1/2"	0.7083	11 1/2"	0.9583
2 5/8"	0.2188	5 5/8"	0.4688	8 5/8"	0.7188	11 5/8"	0.9688
2 3/4"	0.2292	5 3/4"	0.4792	8 3/4"	0.7292	11 3/4"	0.9792
2 7/8"	0.2396	5 7/8"	0.4896	8 7/8"	0.7396	11 7/8"	0.9896
3"	0.2500	6"	0.5000	9"	0.7500	12"	1.000

Appendix C - Troubleshooting Tips

NOTE Sag Profiler for Android does not support Android devices running Android operating systems older than 5.0. To check the version of the operating system of the Android device, navigate to "Settings" and then "About." Remedy steps may vary slightly depending on the specific device used.

Problem	Remedy
No communication between laser and the Android device.	<ul style="list-style-type: none"> • Ensure all system components have adequate power levels. Replace laser batteries and/or re-charge the device if they are low. • Tap the Laser Connection Indicator icon at the top of the Data Collection screen and try to take another measurement. • Verify that the Bluetooth feature in the laser is set to BT_Enc (when using a TruAngle) or BT_On (without a TruAngle). • Ensure that the laser is paired to the Android device via Bluetooth (Page 6). Lasers can only be paired to one device at a time. • If using a TruAngle: ensure that the 4pin to 4pin cable connecting the laser to the TruAngle laser connector is securely in place. Also verify that the TruAngle firmware is version 1.17 or better. Refer to the TruAngle manual for more information.
Delta Z values are too high and the calculations do not look right.	<ul style="list-style-type: none"> • Swipe to the Conductor Shots screen and try eliminating one or more of the worst shots (Page 27). • Swipe to the Cable Summary screen and add more Conductor shots to the cable (Page 26). • If all else fails, reshoot the entire cable, including attachment points.
The Android device locked up or doesn't seem to be working properly.	Power the Android device off and back on again. Press and hold the power button to see the options for resetting the device. No matter what, each measurement is saved as it is taken, and no data will be lost.
An error message was displayed while working in Sag Profiler.	<p>Error messages are often self-explanatory. Clear the message and correct the error before proceeding. If the error continues, restart Sag Profiler. If the error persists, reset the Android device (see above).</p> <p>Go to Sag Profiler Help and select Email Tech Support to send a diagnostic file to support@lasertech.com</p>
A point was accidentally deleted.	Select the correct Shot Type icon and shoot the point in again. Point deletions cannot be undone.
Cannot see the Android device when connected to a PC with the USB cable.	When the Android device is connected with the USB cable, swipe down from the top of the Android device screen, select Settings and check the USB Connection. Ensure that you are allowing file transfer and not just charging or image transfer only.
Cannot save reports when trying to transfer them to a PC using a cable.	The Android device cannot be connected to the computer when reports are being saved. Unplug the cable, save the reports, and then plug the cable back in to access saved reports.

Appendix D - TruPulse 360 Magnetic Interference Guidelines

Minimum 6"

- Metal Rim Eyeglasses
- Pen/Pencil
- Metal Watch Band
- Pocket Knife
- Metal Zipper/Buttons
- Belt Buckle
- Batteries
- Binoculars
- Cell Phone
- Keys
- Camera
- Camcorder
- Survey Nails
- Metal Tape Measure

Minimum 18"

- Clipboard
- Data Collector
- Computer
- GPS Antenna
- 2-Way Radio
- Hand Gun
- Hatchet
- Cell Phone Case w/
Magnetic Closure

Minimum 6'

- Bicycle
- Fire Hydrant
- Road Sign
- Sewer Cap or Drain
- Steel Pole
- ATV
- Guy Wire
- Magnets
- Chain-Link Fence
- Barb-Wire Fence
- Trimble Nomad w/
Stylus Magnet

Minimum 15'

- Electrical Box
- Small Car/Truck
- Powerline
- Building
Concrete & Steel

Minimum 30'

- Large Truck
- Metal Building
- Heavy Machinery

Appendix E - Uninstall Sag Profiler

To completely uninstall Sag Profiler and all related files/reports:

1. Transfer any needed files/reports to a computer (Page 30).
2. Uninstall the Sag Profiler app.
3. Delete remaining files.

NOTE Save any needed files by generating reports and transferring them to a computer with *.Itisp files (Page 30).

Uninstall Sag Profiler

This example is based on a Samsung Android phone. Other Android devices may be very similar. Refer to the manual for the specific Android device used to find the process for uninstalling apps.

1. From the device home screen, tap Settings.
2. Scroll down and select [Apps & notifications] from the Settings list (Figure 34A)
3. Scroll down and select Sag Profiler from the list of apps (Figure 34B).
4. Tap [Uninstall] to remove the program (Figure 34C).

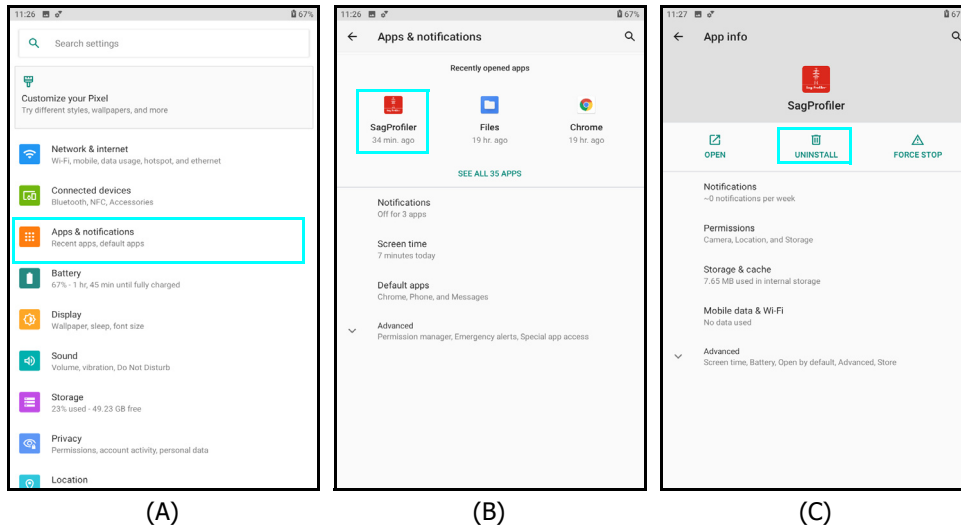


Figure 34

Delete Remaining Files

NOTE This will remove all previously saved files, reports and settings from the Android device - including the program licensing.

1. From the device home screen, tap the File Explorer icon. "Files" in this example.
2. Tap the [SD card] option (Figure 35A).
3. Scroll until the Sag Profiler folder is displayed (Figure 35B).
4. Tap and hold the Sag Profiler folder to add a checkmark before the Sag Profiler name (Figure 35C).
5. Tap the Delete icon.
6. Tap [Delete] to confirm the deletion, or [Cancel] to abandon the operation (Figure 35D).



Figure 35