LaserSoft®
Conductor Clearance
for Android™ 1.x
User's Guide

LASER TECH

Conductor Clearance

📞 1.303.649.1000

✉ ServiceCenter@LaserTech.com

📍 6912 S. Quentin St, Suite A
Centennial, CO 80112

@LaserTechnologyInc 📷

@LaserTechnologyInc f

@LaserTechInc_ 🐦

@LaserTechPro ▶

@Laser-Technology in

LTI LaserSoft Conductor Clearance
for Android 1.x User's Guide
Part Number 3204757-E

Trademarks:

TruPulse and MapStar are registered trademarks of Laser Technology,
Inc. All other trademarks are the property of their respective owner.

Patents:

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

How to Contact LTI: Street Address: 6912 S. Quentin Street Suite A
Centennial, CO 80112 USA
Phone: 1-303-649-1000
1-800-790-7364 (USA and Canada)
Fax: 1-649-9710
Web Site: www.lasertech.com
Email: servicecenter@lasertech.com

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Section 1 - Introducing Conductor Clearance for Android

Thank you for purchasing LaserSoft® Conductor Clearance for Android from Laser Technology, Inc. (LTI). Conductor Clearance is a field data collection program that Electric Utility professionals use to measure the clearance and height of conductor wires. Measurements are made directly to conductors and to any obstructions or ground shots that are necessary. A specific measurement routine is selected, the appropriate measurements made with the laser and a solution is calculated and displayed on the screen. The user can take photos and enter descriptions for the measurements that will be stored with the data.

LTI surveying instruments automatically send data to Conductor Clearance, which uses it to perform the calculation for each routine. If desired, GPS can be used to geo-reference the data so it will match up with existing maps and satellite imagery.

Conductor Clearance Report files can be downloaded to a computer and imported into desktop programs capable of reading a TXT or CSV file. Report files can also be opened in many GPS visualization programs capable of reading a GPX or KML format.

Technical Specifications

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

Specification	Description
Operating Systems	Android version 8+
Supported Devices	Most smart devices running Android 8 or later* * Please check Google Play for current compatibility
Connectivity	Bluetooth®
Compatible Lasers	• TruPulse 200*** with Bluetooth • TruPulse 200X • TruPulse 360R** • TruPulse 360** with Bluetooth ** 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. *** 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.
Hardware	• Optional - 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.

Main Features

LaserSoft Conductor Clearance is an updated and segmented version of Laser Technology's T&D Pro program for devices running Windows Mobile. 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 Conductor Clearance is still supported by Laser Technology, Conductor Clearance for Android provides many feature enhancements including:

- Enhanced user experience with Android OS
- Support for GNSS so data can be geo-referenced
- New measurement scenarios for increased flexibility in the field
- Send to Email function for Reports and data files
- GPX & KML output format for overlay on satellite imagery

Instrument Configurations

Conductor Clearance is designed to work with any Bluetooth enabled TruPulse laser, either alone or combined with a TruAngle device:

| TruPulse 360R | TruPulse 200X with TruAngle | TruPulse 200X | TruPulse 200 |

Figure 1

Section 2 - Get Started with Conductor Clearance

This section describes the download and installation procedure necessary to get started with Conductor Clearance. 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 Conductor Clearance from Google Play

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

1. Use the Google Play search function to find "LaserSoft Conductor Clearance."

2. Tap the Conductor Clearance icon to install the app as you would any other Google Play application (Figure 2).
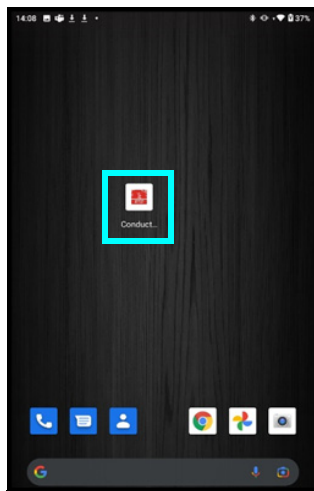
    NOTE Conductor Clearance will need permission to take pictures, access location information and to access photos and files.

Figure 2

Launch Conductor Clearance
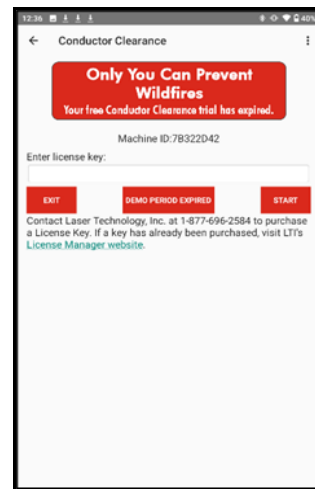
To launch the Conductor Clearance app:

1. Find the Conductor Clearance icon on the smart device (Figure 3A).

2. Tap the Conductor Clearance icon (Figure 3B). The licensing screen will display (Figure 3C).

(A)

(B)

(C)

Figure 3

Program Licensing

Upon any purchase of Conductor Clearance, 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 Conductor Clearance is started, a short video will play before the licensing screen is displayed. Conductor Clearance can be used for 30 days from the date of download before a license key is required (Figure 4A). Tap the Demo button to proceed past the licensing screen and use the program. At the end of 30 days, Conductor Clearance 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 may days are left in the trial. In Figure 4A the status is "DEMO PERIOD EXPIRED"
> - Conductor Clearance 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. Notate 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 Conductor Clearance 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 4B). 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 4C).

   - Machine ID: If you followed the link from your smart device (Figure 4A), tap and hold the Machine ID field to paste the value. Or, enter the Machine ID manually (Figure 4C).

   - Purchase ID: Copy, tap and hold the "Purchase ID" in the Purchases Table (Figure 4C) and select the "Copy" option. Paste, tap and hold the "Purchase ID" field (Figure 4D) and select the "Paste" option (Figure 4E).

(A)
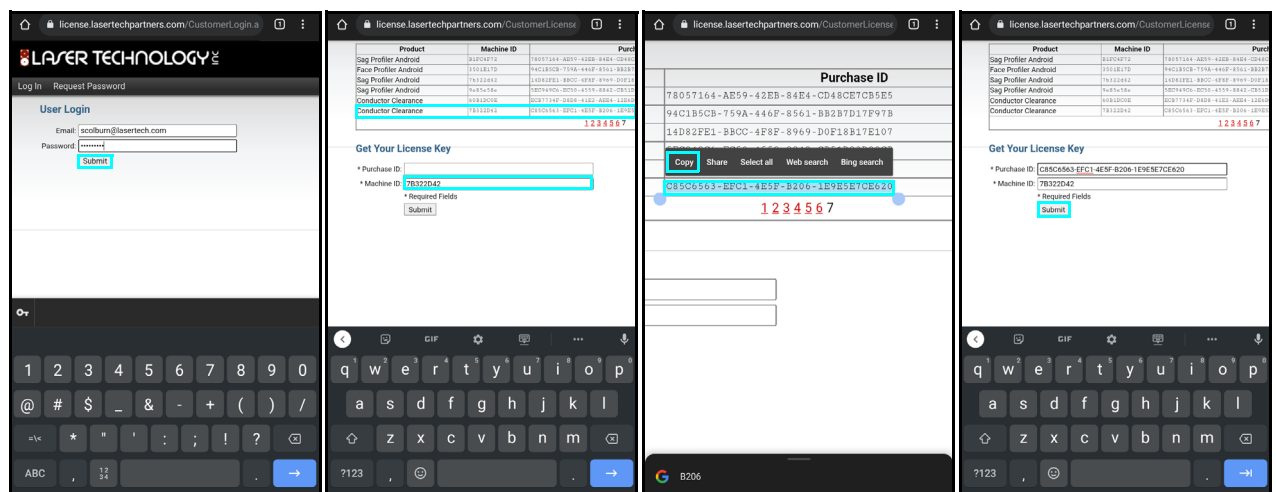
| (B) | (C) | (D) | (E) |

Figure 4

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 5A) and return to Conductor Clearance.
6.   **Paste** or enter the key in the "Enter License Key" field and tap "Start" (Figure 5B). Tap and hold the "Enter License Key" file to display a prompt for pasting, then tap [Start].
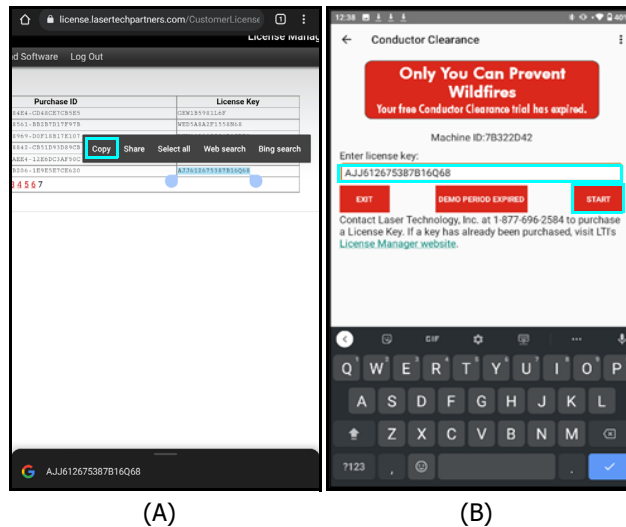

(A)   (B)

Figure 5

If an incorrect key is entered, the Conductor Clearance 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.

About the Main Menu
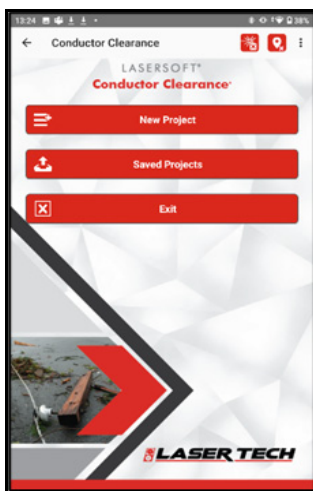
Figure 6 shows the Conductor Clearance Main menu.

Figure 6

Tap the:

•   Back arrow (←) at the top of the screen to leave Conductor Clearance.

•   Laser Connection icon to connect a laser

•   GPS Connection icon to configure and enable GPS

•   Menu button in the upper right corner of the screen to access:
    •   Help
    •   Conductor Clearance Settings
    •   About Conductor Clearance

•   [New Project] button to begin a new project (Page 14).

•   [Saved Projects] button to select an existing project and:
    •   Open it
    •   Delete it
    •   Send the data via email.

•   [Exit] button to close Conductor Clearance and return to the Android device main screen.

Laser Connection

1. Tap the Connection icon ![icon] from the Main menu, and a configuration screen will appear (Figure 7A).
2. Choose your laser from the list of connected devices (Figure 7B) and tap CONNECT (Figure 7C).
   NOTE If a PIN is required, enter it and continue.
3. Note the Connection icon turns green (Figure 7D). If it is colored yellow, replace the laser batteries and restart this process.
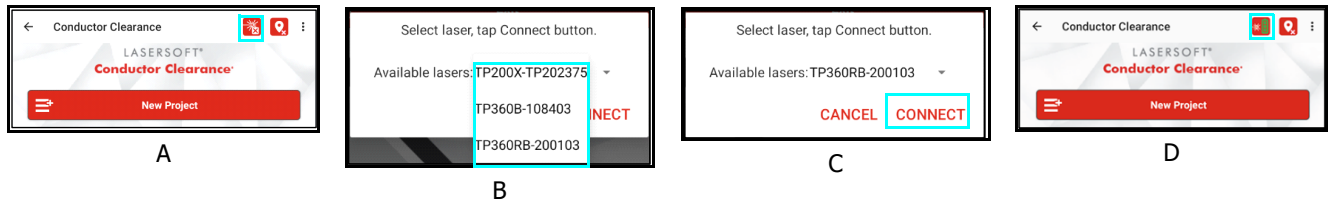

Figure 7

GPS Connection

1. Tap the GPS Connection icon ![icon] from the Main menu (Figure 8A) and a configuration screen will appear (Figure 8B).
   - **NOTE** Location Services will supply information by default and the number of satellites will display.
2. To select a different Source, pull down the list and select your device.
3. Wait for coordinates to display and note the HRMS value, which is an accuracy indicator for the position. The lower the number the better; and it will automatically update and improve with time.
4. Enter a default Antenna height that will be used.
5. Check the DMS box to store coordinates in Degrees, Minutes and Seconds instead of the default Decimal Degrees.
6. Tap CLOSE to save settings and return to the Main menu.
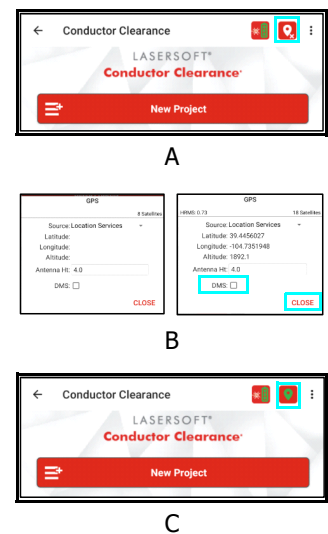   Note the GPS icon has turned green (Figure 8C).

Figure 8

Help Menu

Conductor Clearance 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 Conductor Clearance screen at any time the program is open (Figure 9A). Tap [Help] from the menu to display the Conductor Clearance Help Menu (Figure 9B).


(A)

Connections
- **Pairing Bluetooth Devices**
- **Laser Connection**
- **GPS Connection**

Measurement Routines
- **Measurement Screen** - overview of data fields and icons
- **Conductor Clearance** - description of clearance routines
- **Conductor Height** - description of height routines
- **Point Distances** - description of Pt-Pt and Pt-Line routines

Utilities
- **Convert Feet to Inches** - 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 Conductor Clearance** - find the software version number and Laser Technology contact information.
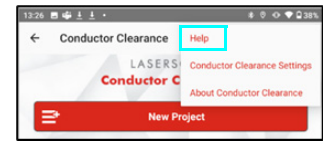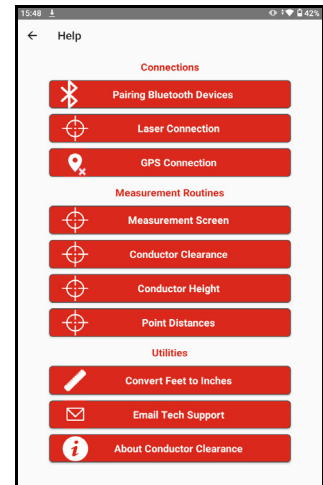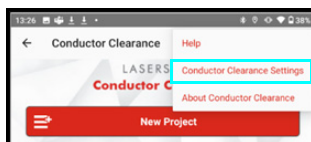

(B)

Figure 9

Conductor Clearance Settings

Conductor Clearance Settings can be found by tapping [⋮] from any menu. When selected, the configuration screen will display (Figure 10B).

(A)

(B)

Figure 10

Ambient Temperature and Pressure
- Recorded at time of measurement, in English or Metric units

Instrument Height
- Measured from the ground to the center of the sighting scope.

Beep
- Check for the Android device to emit a beep when it receives measurement data.

Email Address for Reports
- Enter an email address that will automatically be used when sending Conductor Clearance reports.

NOTE Tap [SAVE] to record any changes that have been made and return to the previous menu.

About Conductor Clearance

The About screen displays the product name and version number, as well as LTI contact info and links to the user's manual and privacy statement.

Figure 11

Section 3 - 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 Conductor Clearance to resume data collection. Data is automatically saved after each measurement to allow data collection to continue seamlessly.

Laser Setup Notes

TruPulse 200 / 360/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.

Calibrate the compass in a TruPulse 360/R

1. Stand outdoors facing +/-15 of North; ensure there are no large metal objects in close vicinity.
   See Appendix D (Page 33) 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 12), press Fire and wait about one second before shifting the laser to the next position:
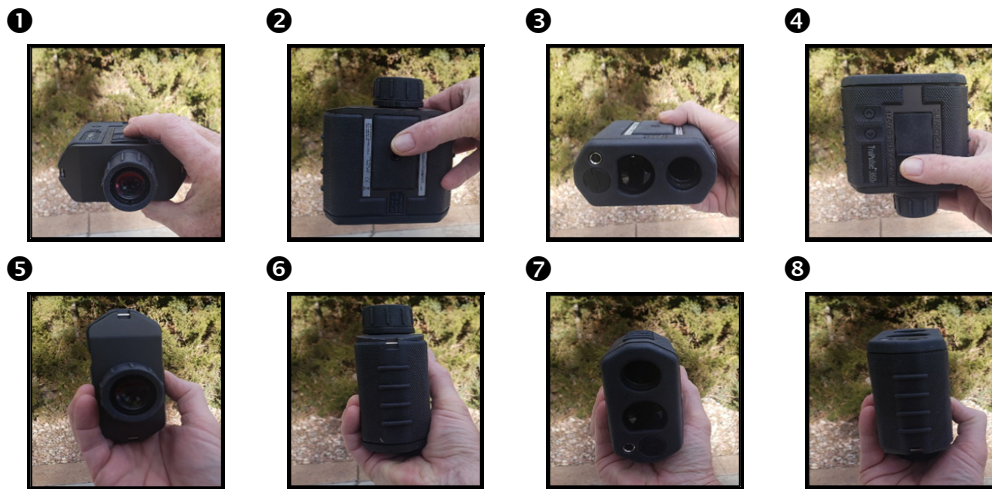
Figure 12

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 360/R user's manual for further assistance with compass calibration.

MapStar TruAngle

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:
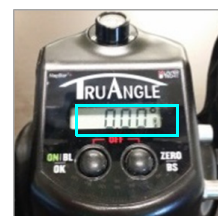
- Connect the laser to the TruAngle with the 4-pin cable included in the mapping package.
- Ensure the laser Bluetooth option is set for BT_Enc.

A

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 13A).
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 13B). Loosen the brake on the TruAngle.

B
Figure 13

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, 360/R, 200

1. Find and tap the Settings icon on the Android Device (Figure 14).

2. Tap [Bluetooth] on the Settings list (Figure 15A).
    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 15B). 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.

Bluetooth PIN Information:	TruPulse 200X PIN =	1234
	TruPulse 200/360/360R PIN =	1111

4. Accept any Passkey by tapping [OK] (Figure 15C).

5. Once successfully paired, the laser serial number will display in the Connected or Previously Connected Devices section (Figure 15D).

Figure 14

| (A) | (B) | (C) | (D) |

Figure 15

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.

Start a New Project

From the Main Menu, tap [New Project] to collect new conductor clearance measurements.
The New Project Settings screen will display (Figure 16).
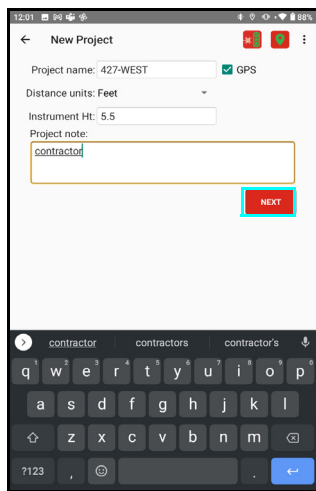
Figure 16

- **Project Name** 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** will be used when checked to set the coordinates for the Origin point of your measurements. This will allow you to plot the data on Google Earth or a similar program.

- **Distance units** Specify the same units the laser is set to, Feet or Meters.

- **Instrument Ht** is from the ground to the center of the sighting scope

- **Project note** is a general description for the work and may include any characters (1500 max).

Tap [NEXT] to save the New Project entries that have been made and advance to the Measurement List.

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 Conductor Clearance 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.
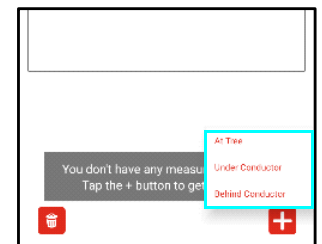
A
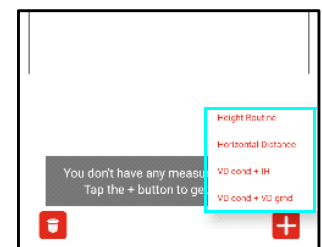
B

Figure 17

New Measurement

Tapping [Next] from the New Project Settings screen moves ahead to the Measurements List for the project (Figure 18A).
NOTE The Measurement List displays the stored records (Page 25).

Tap the ➕ button at the bottom right of the screen to display the different Measurement Types available (Figure 18B):

- **Conductor Clearance**
  - At Tree
  - Under Conductor
  - Behind Conductor
  - Off Line

- **Conductor Height**
  - Height Routine
  - Find HD (Horizontal Distance)
  - VD + IH
    (Vertical Distance + Instrument Height)
  - VD conductor + VD ground

- **Missing Line and Slope (Point to Point)**
- Point to Line

A   B
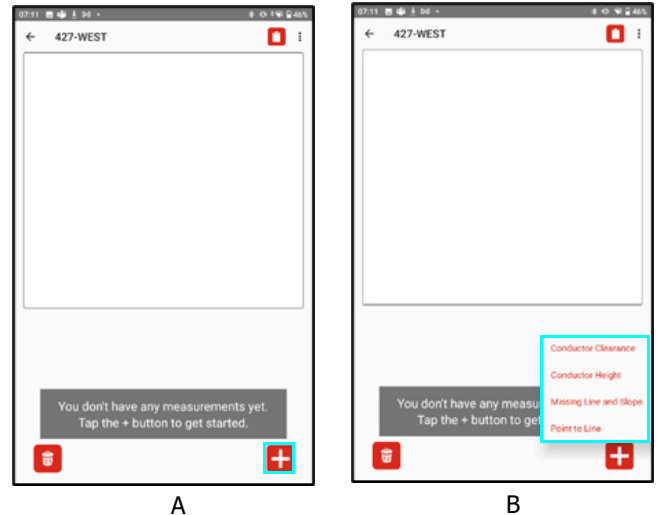
Figure 18

Data Collection Screen

After selecting the Measurement type (or after tapping Next at the GPS screen), the Data Collection screen will display for the type selected. The exact layout may vary and a typical one is shown below:

Measurement Number - shown at top left of display.

Raw Data - shown on the middle left margin.

② **Shot number** - red circle and diagram show where you are in the measurement sequence.

GPS **GPS** - button is shown when GPS is being used for a Project. A check mark will appear on it after the first laser measurement is made, to record the position. If an update is necessary, tap this button and select Yes.

Target Height - typically 0.0 when making measurements but if one is used, enter the value here.

Message line - prompting the operator which shot to take next.

⊕ **Remote Fire** - press to remotely fire the laser for added stability and precision.

PREV NEXT **Previous** and **Next** - tap to move between shot sequence screens.
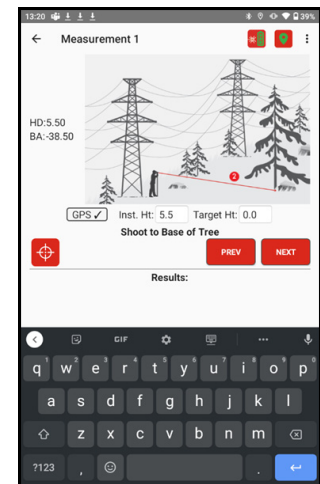
Figure 19

Results Area

After completing a Measurement routine, the Results for the type selected will display at the bottom of the screen. The exact layout may vary and Figure 20 shows a typical one.

Calculation Results - will be listed at the top of the section for review. If it looks like an error was made, tap the Previous button to return to the measurement sequence and repeat a shot(s).

STORE **Store** - if the Results are acceptable, tap this button to Store the record and return to the Measurement list.

NOTE **Photo & Note** - tap to take a Photo, enter a Note or change the Temp/Press values for the measurement.

STORE + NEW **Store & New** - tap to Store the record and start a New measurement routine of the same type.
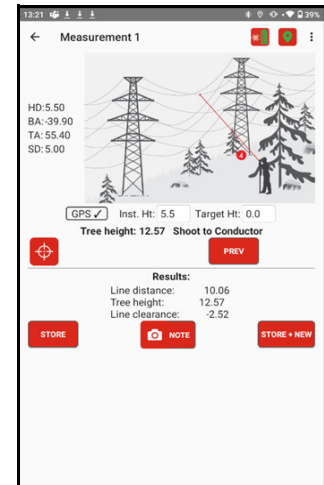
Figure 20

Conductor Clearance

Tap the **+** icon and select Conductor Clearance. These routines are used primarily for vegetation management practices where a tree along the edge of a right-of-way is in danger of hitting the line, if it were to fall directly towards it (the worst case). The first 3 assume the operator is standing in a direct line with this perpendicular direction; i.e. 90 deg. from the line to the tree. The Off Line routine requires a TruPulse 360/R or TruAngle device to perform and can be made from any convenient location and direction, so long as line-of-sight is maintained to all necessary targets.
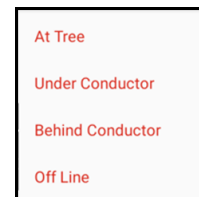
Figure 21

At Tree

This routine assumes that the area under or behind the conductor is inaccessible, so the tree height is measured from any convenient location and then the operator stands at the base of the tree and measures in a perpendicular direction to the conductor. Figure 22 shows the shot sequence screens for this routine and a display of the Results.

NOTE when measuring a Tree Height, the laser can be put into HD and/or INC mode to make the shots, or the 3-point Height routine.

A   B   C

D   E
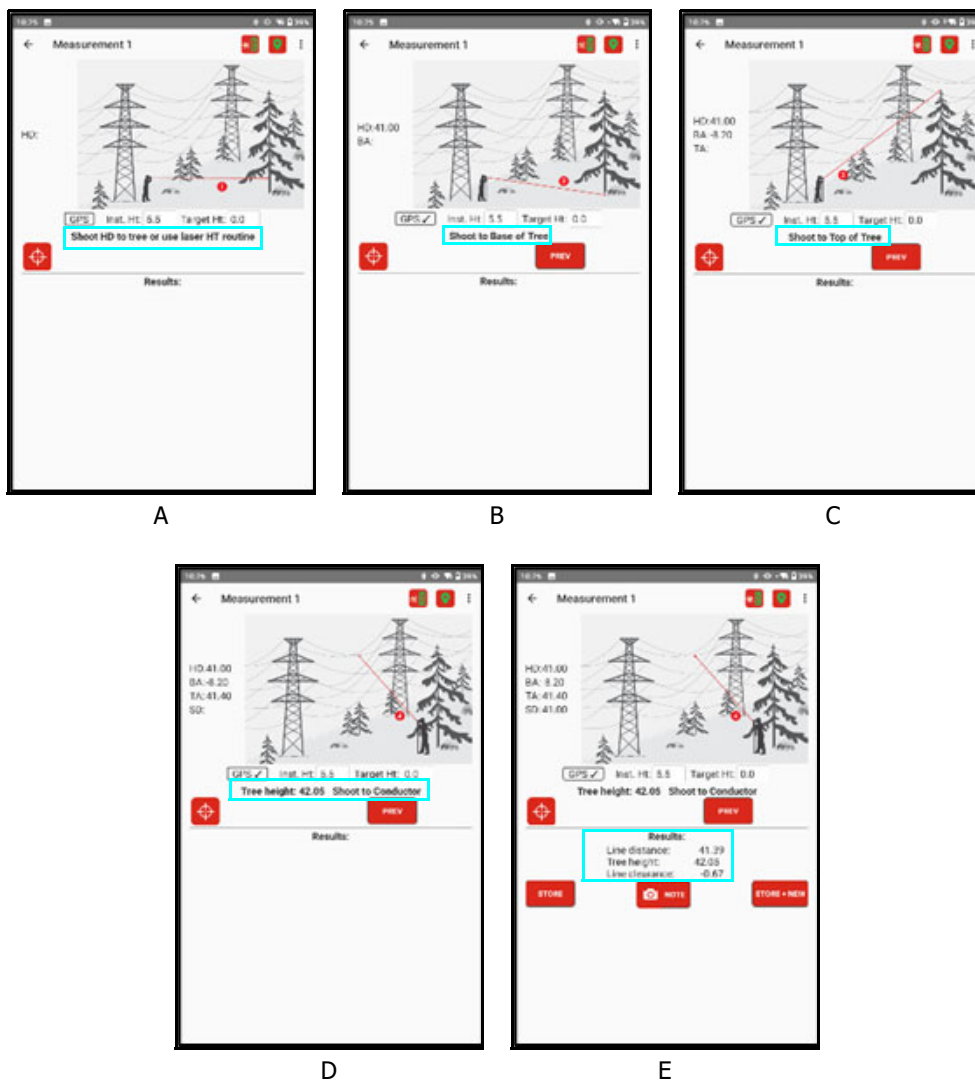
Figure 22

Under Conductor

This routine assumes that the area directly under the conductor is accessible, so the tree height and the shot to the wire are measured from this one location. Figure 23 shows the shot sequence screens for this routine and a display of the Results.

A   B   C


D   E
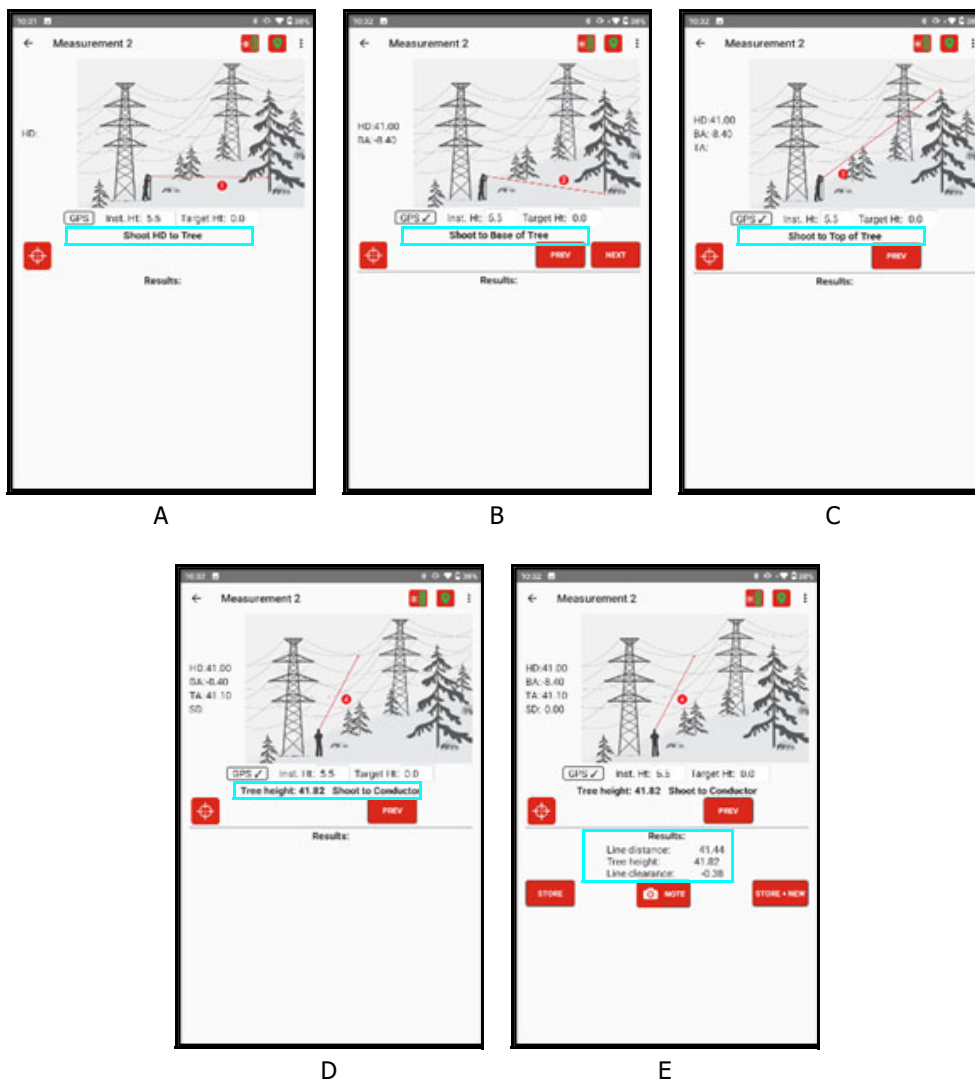
Figure 23

Behind Conductor

This routine assumes that the area directly behind the conductor is accessible, so the tree height and the shot to the wire are measured from this one location. Figure 24 shows the shot sequence screens for this routine and a display of the Results.

A

B

C

D

E
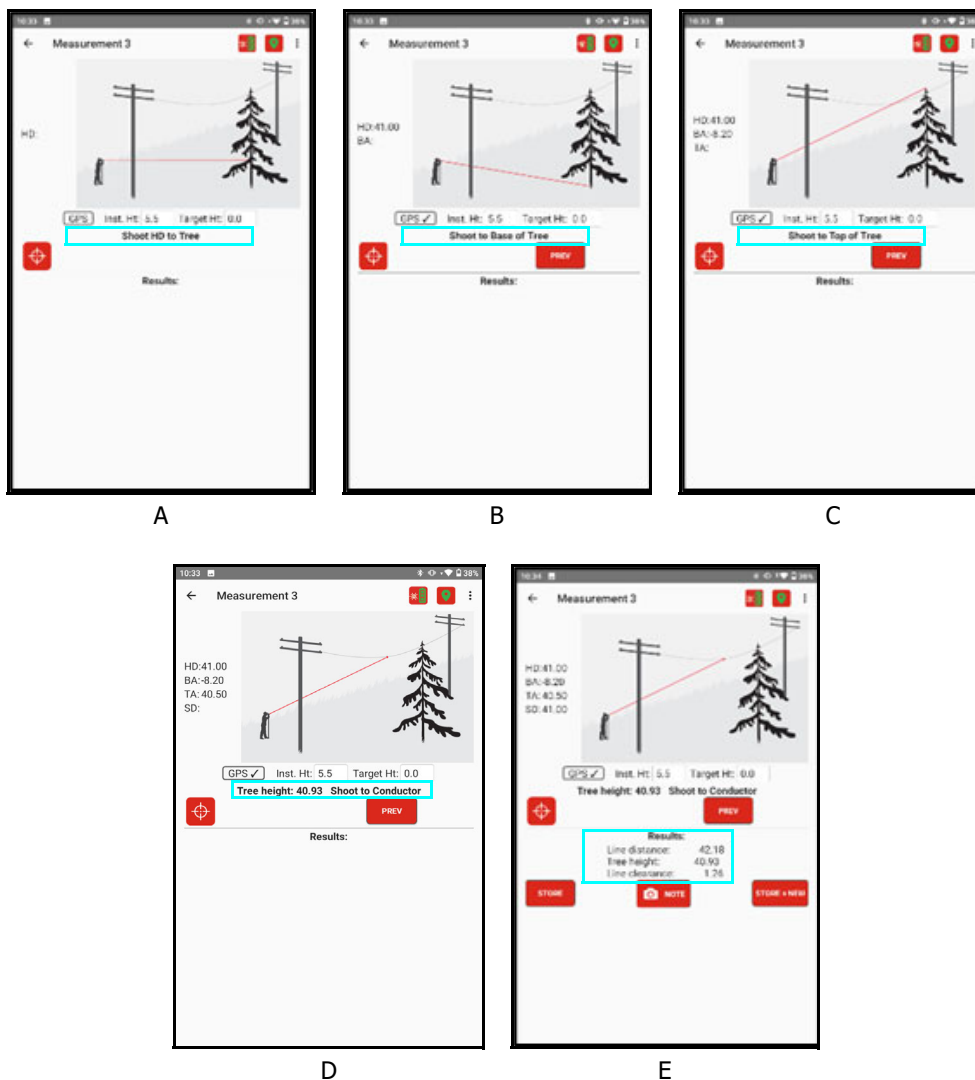
Figure 24

Off Line

This routine requires that a TruPulse 360/R or TruPulse/TruAngle system be used to make the measurements. They can be made from anywhere in the right-of-way between the tree and the conductor, where you have clear line-of-sight to all the target points from a single location. Figure 25 shows the shot sequence screens for this routine and a display of the Results.
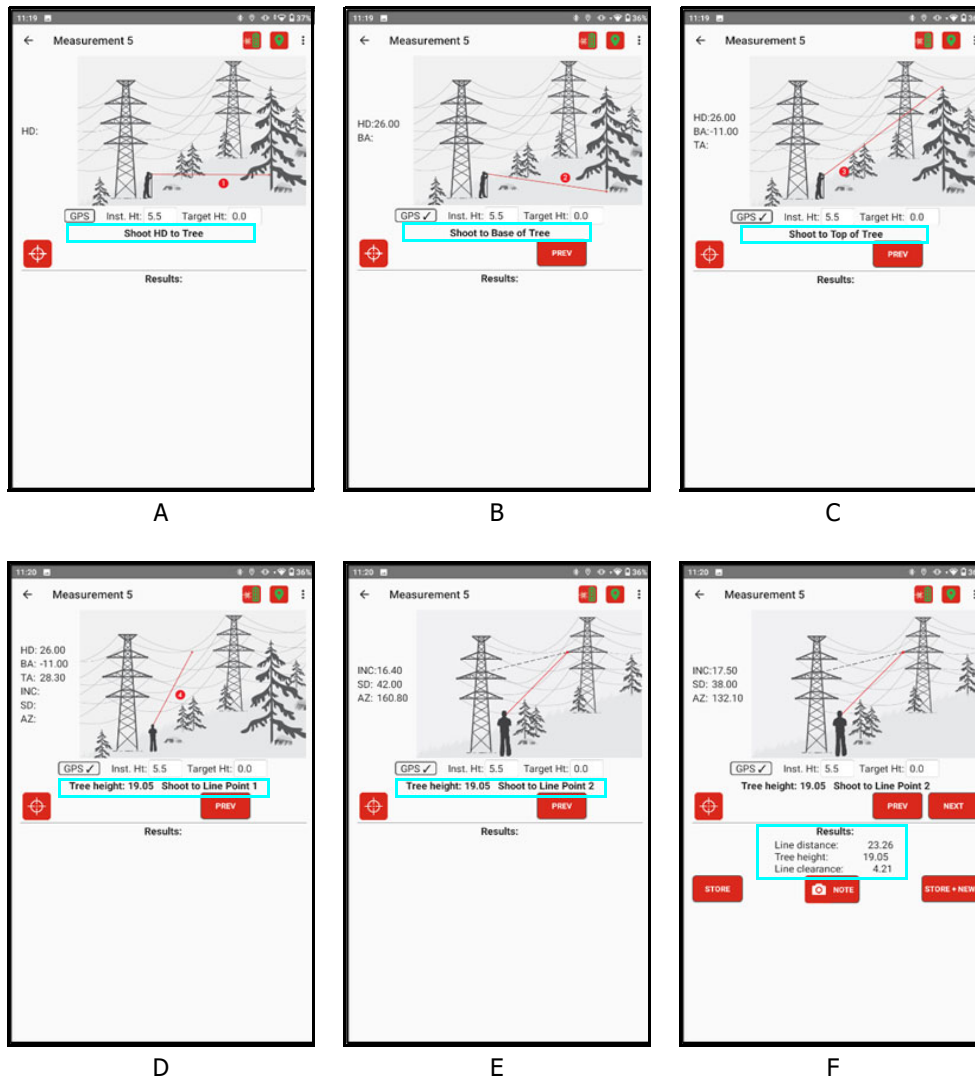
Figure 25

Conductor Height

Tap the [+] icon and select Conductor Height. These routines are used for vegetation management practices and at locations where power lines run across roadways, walkways or other facilities where clearance to the wire is of concern. Choose from several different methods that are tailored to common scenarios found in the field. Since the calculations assume the operator is moving with a vertical motion from shot to shot, TruPulse 200 and 200X models can be used for all the Conductor Height routines. Other models are compatible, they simply offer no particular advantage
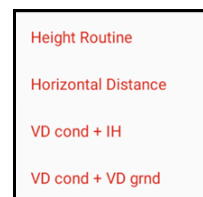
Figure 26

Height Routine

This routine assumes the operator can see a point on the vegetation or roadway, directly underneath the low point of the wire. The laser is put into the 3-pt Height routine and the first HD shot is taken to the low point on the wire. The two angle shots are then taken at this same point on the wire and the point directly below it on the brush or road surface. Make sure to measure in a vertical motion. The Height is calculated and sent to the app. Figure 27 shows the shot sequence screens for this routine and a display of the Results.

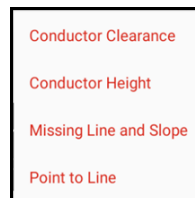**NOTE** this routine requires the laser to be put into the 3-pt Height mode.

A   B
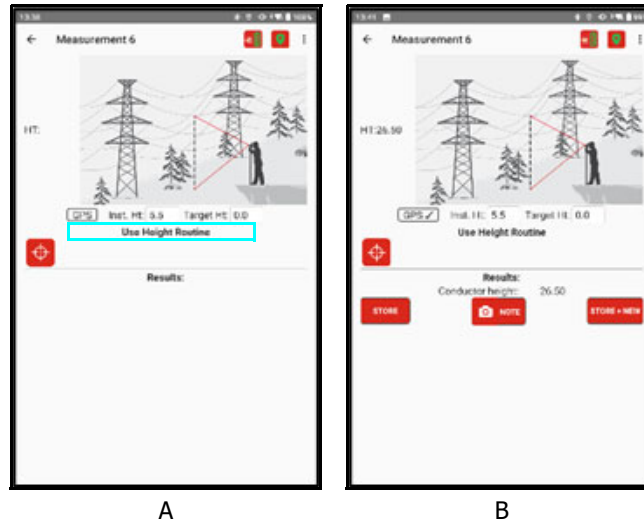
Figure 27

Find Horizontal Distance Routine

This routine assumes the operator can see the surface of the vegetation or roadway underneath the low point of the wire, and this surface is sloping. The laser is put into HD (Horizontal Distance) mode and the first HD shot is taken to the low point on the wire. Note the HD value is displayed. The next shot is taken directly below it on the brush or road surface. Make sure to measure in a vertical motion. Note the HD of the second shot and repeat it until the HD values match (within +/- 0.5'). The Vertical Distances from each shot are then added for the Conductor Height. Figure 28 shows the shot sequence screens for this routine and a display of the Results.

NOTE this routine requires the laser to be put into HD mode.
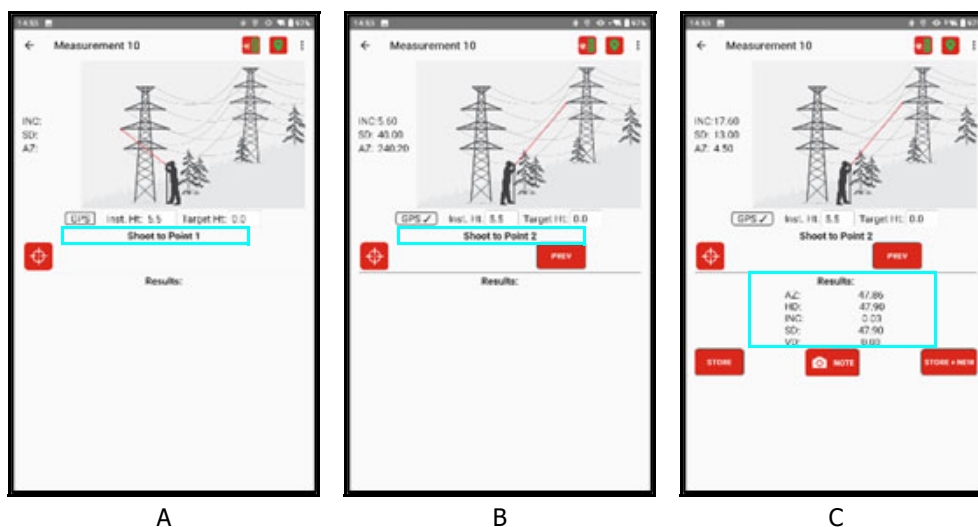

A   B   C
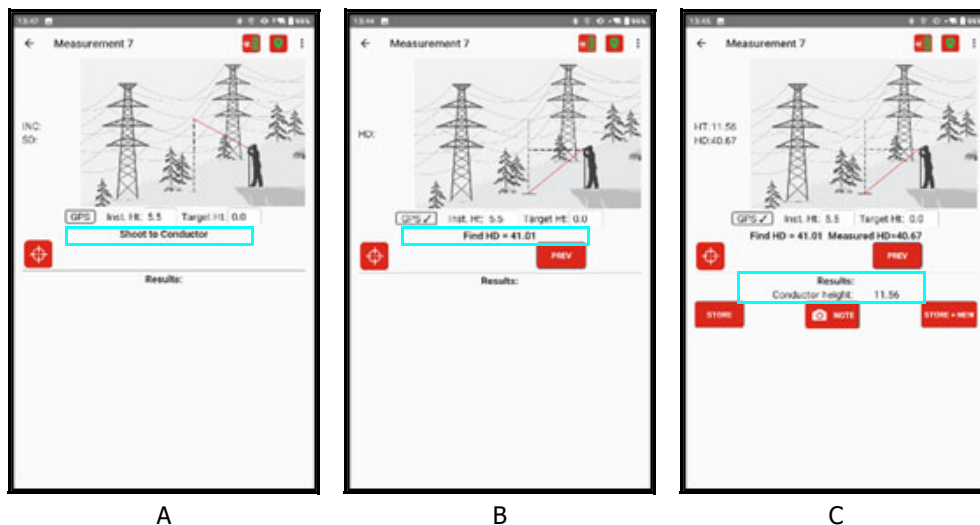
Figure 28

VD Conductor + Instrument Height

This routine assumes the operator is standing at the same elevation as the surface of the roadway (or vegetation) underneath the low point of the wire. The laser is put into HD (Horizontal Distance) mode and the first shot is taken to the low point on the wire. Make sure an accurate IH (Instrument Height) is entered. The Vertical Distance from the shot is added to the Instrument Height to yield the Conductor Height. Figure 29 shows the shot sequence screens for this routine and a display of the Results.
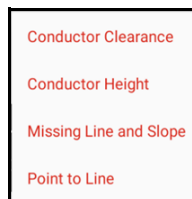
**NOTE** this routine requires the laser to be put into HD mode.

A   B
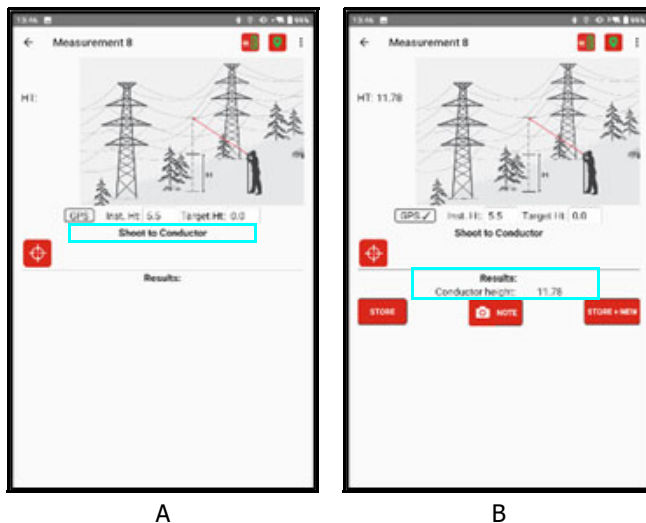
Figure 29

VD Conductor + VD Ground

This routine assumes the operator can see the surface of the vegetation or roadway underneath the low point of the wire, and this surface is flat. The laser is put into HD (Horizontal Distance) mode and the first shot is taken to the low point on the wire. The next shot is taken directly below it on the brush or road surface. Make sure to measure in a vertical motion. The Vertical Distances from each shot are then added for the Conductor Height. Figure 30 shows the shot sequence screens for this routine and a display of the Results.

NOTE this routine requires the laser to be put into HD mode.

A   B   C
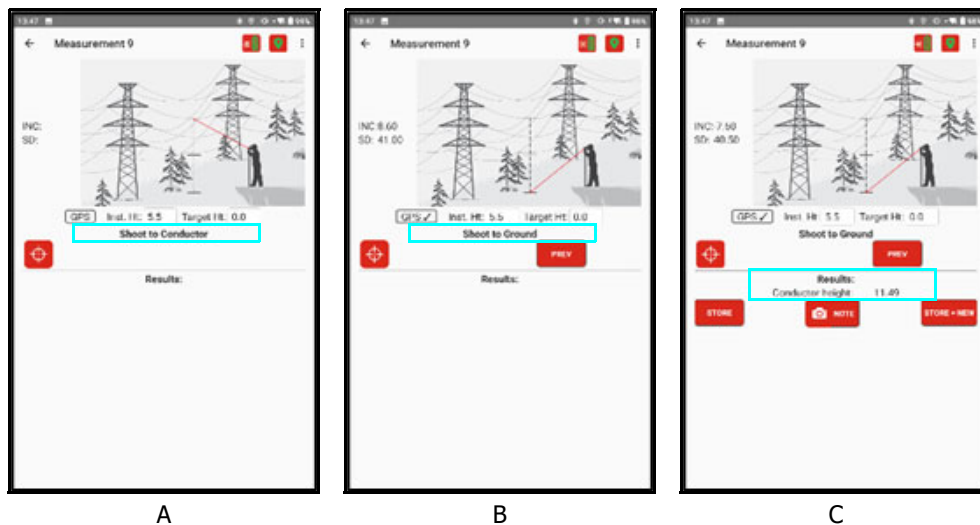
Figure 30

Missing Line and Slope

Tap the [+] icon and select Missing Line and Slope. This routine is useful for measuring the distance, inclination or azimuth between any two remote points. The operator must have clear line of sight to both targets from a fixed location. The work flow is to take Shot 1 and then Shot 2 and the Results are displayed. The values correspond to looking from target 1 to 2. If a TruPulse 360 or 200X/TruAngle system is used, the Azimuth value will be valid. If a TruPulse 200 model is used, only the Vertical Distance is valid - unless the operator moves in a strictly vertical motion from target 1 to 2, then all the distance and inclination results are valid. Figure 32 shows the shot sequence screens for this routine and a display of the Results.

NOTE this routine requires the laser to be put into HD mode.

| Conductor Clearance |
| Conductor Height |
| Missing Line and Slope |
| Point to Line |

Figure 31

A   B   C

Figure 32

Point to Line

Tap the [+] icon and select Point to Line. This routine is useful for measuring the distance, or clearance, between a point and any line segment. This same work flow is used in the Off Line routine of the Conductor Clearance menu, measuring from the base of the tree to the conductor. Here is it simply used to measure from any point to a line segment. This routine requires the use of a TruPulse 360 or 200X/TruAngle system and the operator must have clear line of sight to all targets from a fixed location. The work flow is to first measure the two shots to the Line, then take the third shot to the Point. The Results are displayed and correspond to looking from the Point to the Line. Below are the shot sequence screens for this routine and a display of the Results.

Conductor Clearance

Conductor Height

Missing Line and Slope

Point to Line

Figure 33

NOTE this routine requires the laser to be put into HD mode.

| A | B | C | D |
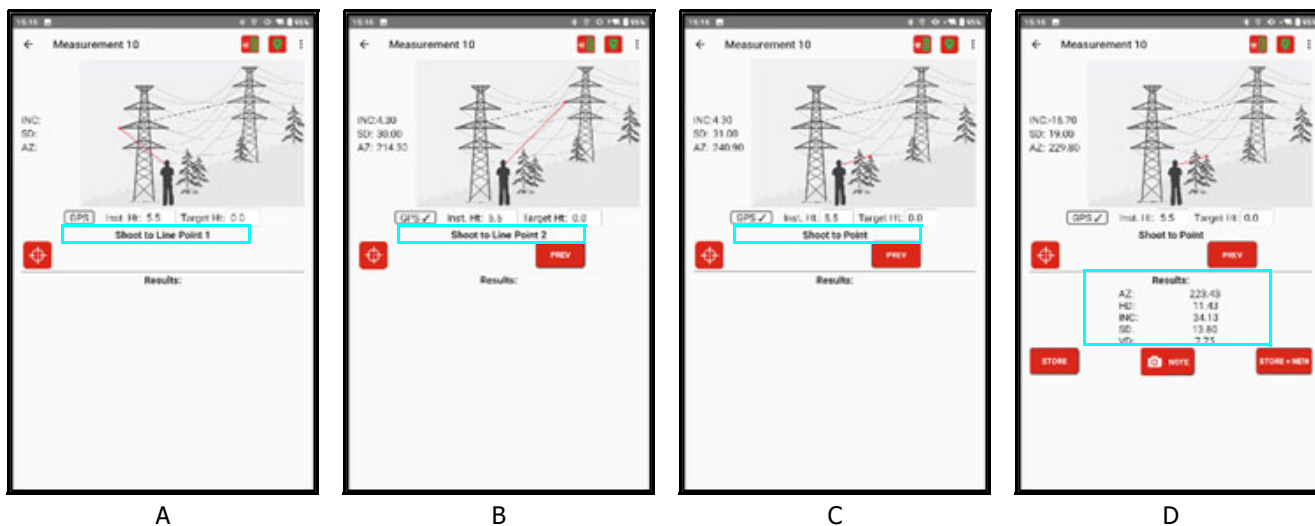
Figure 34

Add a Photo And Note

Once a measurement has been completed, use the Photo & Note screen to add an image and note for the result.

1. Tap the [camera icon] icon to bring up the device's camera

2. Tap the button on the device to take the image and the check mark to accept it.

3. When prompted, tap [YES] to add another picture to this record or tap [NO] to accept what you have and return to the Photo & Note screen.

4. Enter a Note for this result and update the temperature and pressure, if desired.

5. Tap [STORE] to save this result and return to the Measurement List or [STORE + NEW] to save and start a new measurement routine of the same type.

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

A   B   C
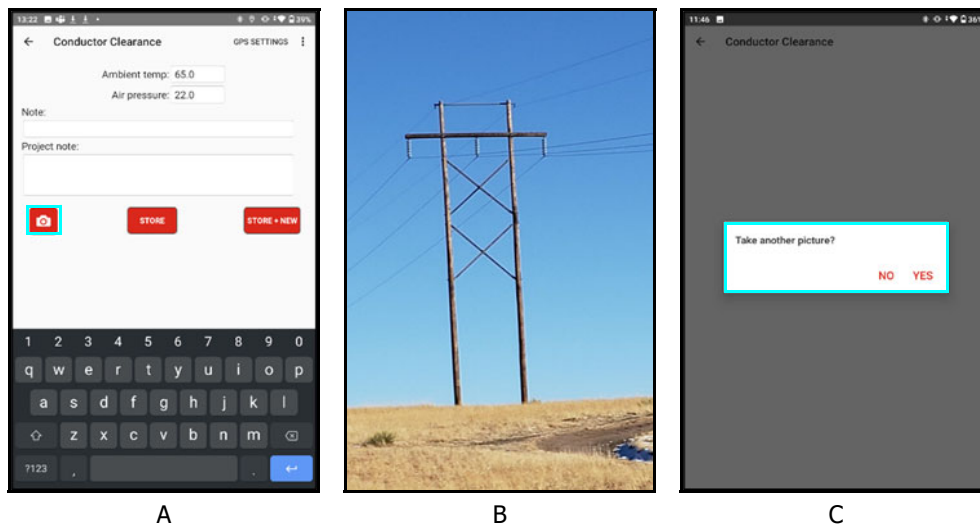
Figure 35

Measurement List

When leaving the measurement screen from your first record, or when opening a Saved Project, you will enter the Measurement List (Figure 36). Use this screen to Delete or Add a New Measurement. **NOTE** once a Measurement record has been stored, it cannot be re-opened.

Delete a Measurement

1. Tap on a Measurement record to highlight it on the list.

2. Tap [trash icon] to remove it. The user will be prompted to continue or cancel and the measurement will be removed from the project.

Add a New Measurement

1. Tap the [plus icon] icon and the Measurement Menu will display.

2. Select the Measurement type desired and proceed to take the necessary shot sequence

Figure 36

Generate a Report

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

1. At the Measurement, tap the   icon in the upper right portion of the screen. The Report Menu will display (Figure 37).

2. Pull down the list next to the Report format and select a type.

    • **PDF:** generates an Adobe Acrobat compatible file that will contain both text and the photos taken

    • **GPX:** creates a geo-referenced output file with descriptions that will open in GIS software such as ArcGIS - GPS ONLY

    • **KML:** creates a geo-referenced output file with descriptions that will open in Google Earth - GPS ONLY

    • **TXT:** produces a tab delimited text file with no images

    • **CSV**: generates a comma delimited text file (no images) that will open directly in Excel

    • **All Above Formats:** creates a copy of the Report in each of the formats listed.

NOTE The GPX and KML output files are only available on this list when GPS has been used to set measurement locations (Page 8).

Figure 37

3. Choose to Group the records by measurement number or type.

4. Select one of the Save buttons:

    • [icon] opens the email client and creates a message with the reports attached. If you have entered an address to send reports to in the Settings screen (Page 9) this will automatically be used. Otherwise, enter an address and send the message.

    • [icon] saves a copy of the selected file(s) and makes them available for transfer later.

    Once Reports have been generated, they will be listed at the bottom of the Report menu (Figure 38). 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 [icon] or [icon] sent via email.

5. Tap the back arrow to return to the Measurement list. Continue to add measurements to this project or tap the back arrow to return to the Main menu.
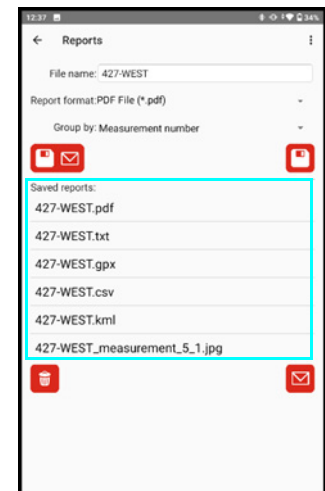
Figure 38

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 Conductor Clearance is installed on a Android device, it creates a folder called Conductor Clearance for storing program settings, reports, and *.lticc format project files. The *.lticc project files can only be opened within Conductor Clearance 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 *.lticc files over as well once all edits and changes to the project are complete. An *.lticc 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 39A).

3. Tap [Select USB Configuration].

4. Select MTP (Media Transfer Protocol) (Figure 39B).

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 Conductor Clearance folder (Figure 39C).

CFigure 39

A   B
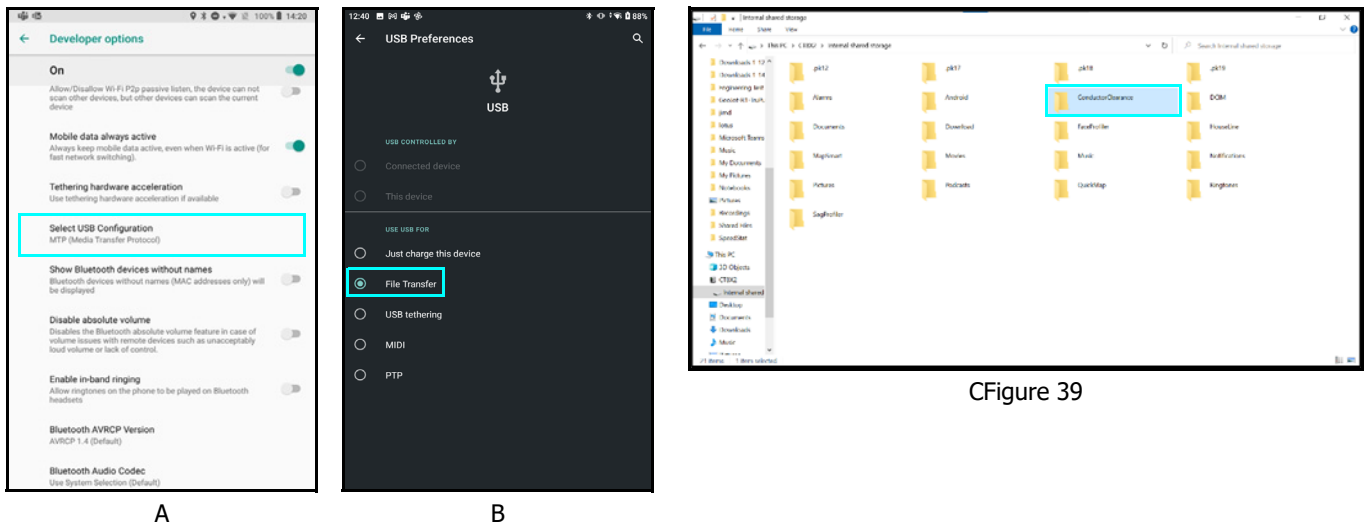
Figure 39

7. Double-click the folder that coincides with the project name and the saved reports will display (Figure 40). 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 Conductor Clearance reports and *.lticc files. Double-click the folder, and then right-click/paste with your mouse.
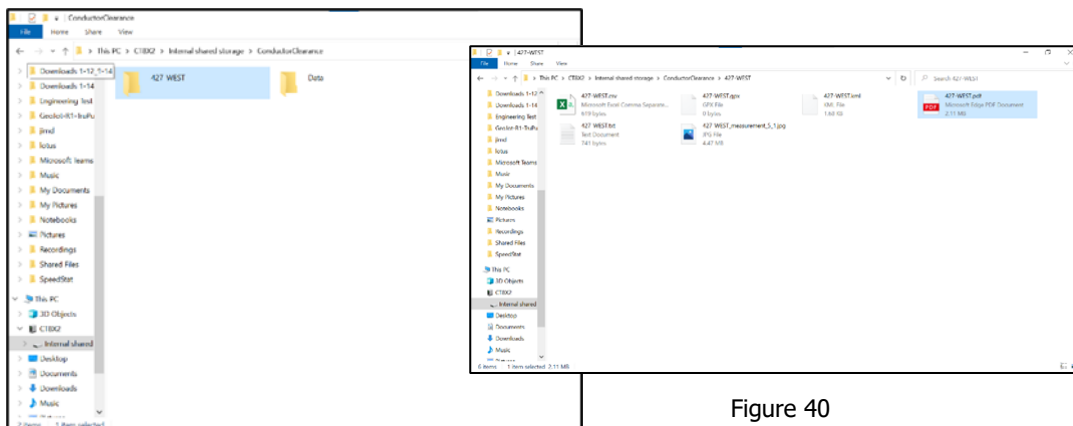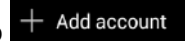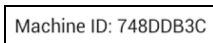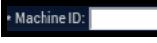
Figure 40

Appendix A - Conductor Clearance 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.
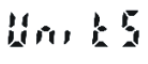
Step 1 for All Lasers - Install Conductor Clearance and Get Licensed

1. Turn on tablet, tap ⬛ **Settings**, tap **◐ Display** to set SLEEP to NEVER.

2. Tap ⬛ **Settings**, then tap **+ Add account** to add a Google account or get assistance from IT to set up a dedicated email account for your reports.

3. Tap 🏪 **Play Store**, then Search for: "LaserSoft Conductor Clearance" 🟥 and INSTALL the app.

4. From the Main screen, tap ⊕, then tap 🟥 to open app.

5. Tap and hold `Machine ID: 748DDB3C` 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 `▸ Machine ID:` .

8. From the Purchases Table, copy and paste or type in your purchase ID into `▸ Purchase ID:` .

9. Tap `Submit`, then copy or notate the License Key.

10. Tap 🟥, then paste or type in the License Key and then tap 🟥 **START**.

11. Charge the tablet.

12. Go to Step 2 for TruPulse 200, 360 or 360 R laser setup (below), or
to Step 2 for TruPulse 200X + TruAngle

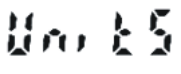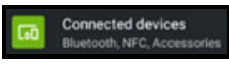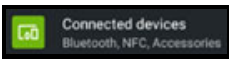## TruPulse 200/360/360R

Step 2 - Toggle On Bluetooth

1. Press 🔘 to power the unit on.

2. Long press 🔼 until **Units** .

3. Press 🔼 until **bt** .

4. Press 🔘 then press 🔼 until **bt on** .

5. Press 🔘 to confirm.

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

1. Long press ⌃ until **Units** .

2. Press 🔥 then press ⌃ until **Units** FEET .

3. Press 🔥 and then press 🔥 again to accept feet/degrees as units of measurement.

Step 4 - Connect Laser with Android Device via Bluetooth

1. Tap ⚙, then tap [Connected devices Bluetooth, NFC, Accessories] .
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.

TruPulse 200X + TruAngle

Step 2 - Toggle On Bluetooth

1. Press 🔥 to power the unit on.

2. Press MODE until (bt SETUP oFF) .

3. Press ⌃ until (bt SETUP EnC) .
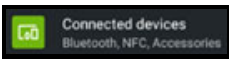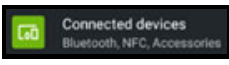
4. Press 🔥 to accept.

Step 3 - Change Units of Measure to Feet

1. Press MODE until (Unit M SETUP dEg°CM) .

2. Press ⌃ to scroll through unit options (Unit M SETUP PEr CM) , (Unit F SETUP dEg° IN) .

3. Press 🔥 to accept the units of measurement (HD - - - - F -- IN) .

Step 4 - Sync Android Device with TruPulse 200X via Bluetooth

1. Tap ⚙, then tap [Connected devices Bluetooth, NFC, Accessories] .
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.

Final Step for All Lasers - Start a Project and Store a Result

*For standard projects without GPS.

1. Power ON all components.

2. Tap [Conductor Clearance] and then tap [≡⁺ New Project].

3. Enter file name for the project.

4. Tap Distance units that match the laser.

5. Measure from the center of laser to the ground and enter value [Instrument Ht: 5.5].

6. Enter a Project note, and then tap [NEXT].

7. From the List view, tap [+] and select the measurement routine to use.

8. At the top of the Measurement screen, wait for [⧗] to become [※].

9. Aim at target for the first shot, press [FIRE] on the laser, and confirm the data came through.

10. Complete the measuring sequence for this routine and tap [STORE] to save the result.

Appendix B - Conversion Table (Inches to Decimal Feet)

The chart below converts fractions of inches into decimal equivalents. Conversions are also available in Conductor Clearance's built-in Help

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 Conductor Clearance for Android does not support Android devices running Android operating systems older than 8.0. 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.	• 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 13). 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.
Conductor Clearance or Height measurements do not look right.	• Tap the PREV button to return to the shot sequence screens and retake any suspect measurements. They can be repeated until the operator is satisfied (Page 16).
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 Conductor Clearance.	Error messages are often self-explanatory. Clear the message and correct the error before proceeding. If the error continues, restart Conductor Clearance. If the error persists, reset the Android device (see above). Go to Conductor Clearance Help and select Email Tech Support to send a diagnostic file to support@lasertech.com
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 Ban
- 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 Conductor Clearance

To completely uninstall Conductor Clearance and all related files/reports:

1. Transfer any needed files/reports to a computer (Page 27).

2. Uninstall the Conductor Clearance app.

3. Delete remaining files.

   NOTE Save any needed files by generating reports and transferring them to a computer with *.lticc data files (Page 27).

Uninstall Conductor Clearance

This example is based on an Android tablet. 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 41A)

3. Scroll down and select Conductor Clearance from the list of apps (Figure 41B).

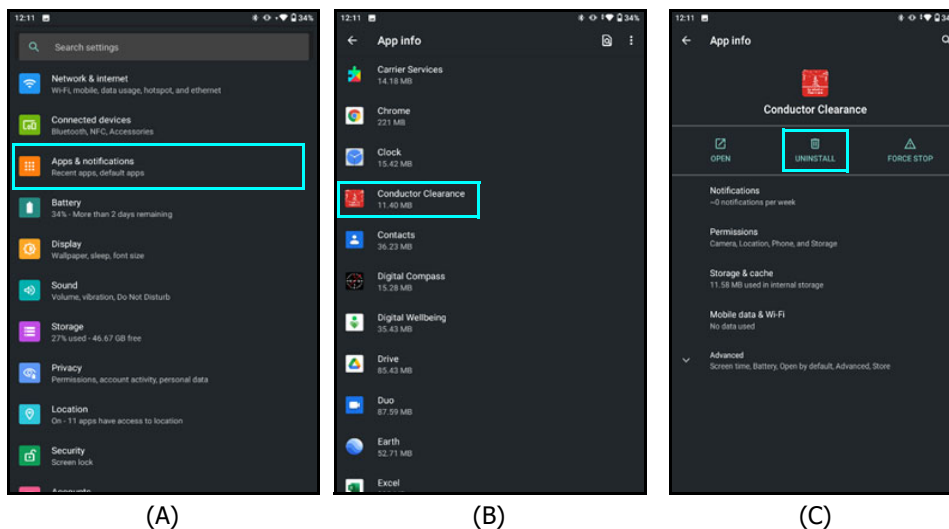4. Tap [Uninstall] to remove the program (Figure 41C).

(A)　　　　　　　　　　(B)　　　　　　　　　　(C)

Figure 41

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.
   "My Files" in this example.

2. Tap the [SD card] option (Figure 42A).

3. Scroll until the Conductor Clearance folder is displayed (Figure 42B).

4. Tap and hold the Conductor Clearance folder to add a checkmark before
   the Conductor Clearance name (Figure 42C).

5. Tap the Delete icon.

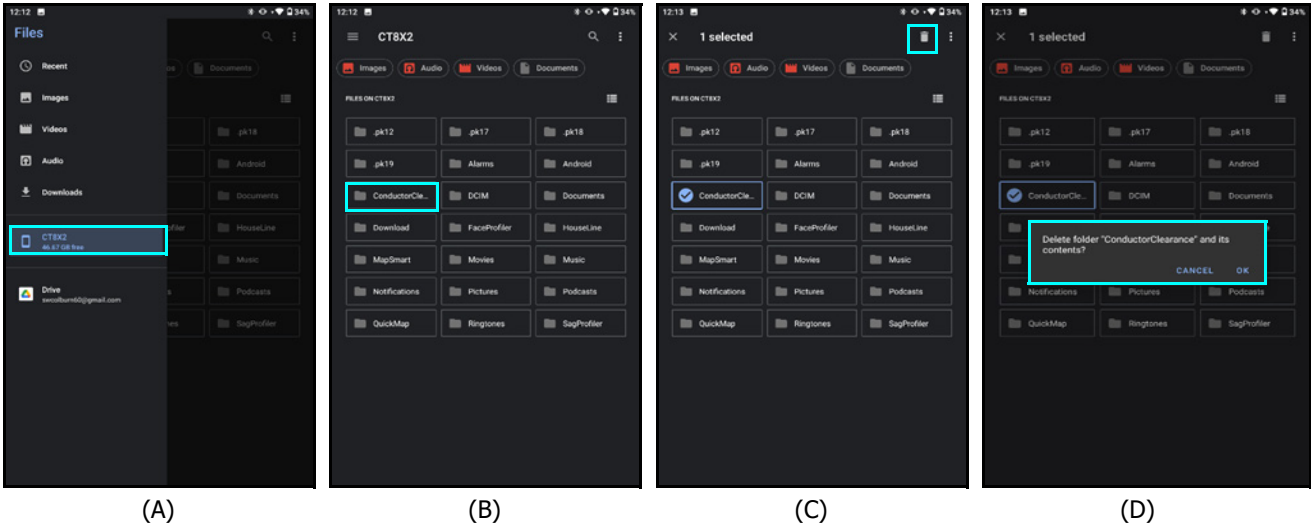6. Tap [Delete] to confirm the deletion, or [Cancel] to abandon the operation (Figure 42D).

| (A) | (B) | (C) | (D) |

Figure 42