TruPulse® 360i

User's Manual

2nd Edition

1.303.649.1000

ServiceCenter@LaserTech.com

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

@LaserTechnologyInc

@LaserTechnologyInc

@LaserTechInc_

@LaserTechPro

@Laser-Technology

LTI TruPulse 360i User's Manual
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Patents:
This product is covered by patents and pending patent applications,
refer to the following website for more details: https://lasertech.com/lti-legal/

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LTI Contact Information:

Customer Support / Service:
Phone: 1.303.649.1000
1.877.696.2584 (North America)
Fax: 1.303.649.9710
Email: servicecenter@lasertech.com

Corporate Address:
Laser Technology, Inc.
6912 South Quentin Street, Suite A
Centennial, CO 80112 USA

Support, FAQ & Tech Documents:
https://lasertech.com/software-solutions

RMA Request:
www.lasertech.com/customer-service

TruPulse 360i Reference Information:
Record information about your TruPulse 360i in the table below.

	You can find this value:	Value
Serial Number	On the serial number sticker affixed to the TruPulse 360i or on packaging.	
Firmware Revision Number	See Page 28 for information.	

Table of Contents

Precautions

- **Avoid staring directly at the laser beam for prolonged periods.**

  ⓘ CLASS 1 LASER PRODUCT: Product complies with IEC60825-1 Ed. 3:2014-5 and 21CFR1040.10/11 per Notice 50:2007.

  The TruPulse® 360i is designed to meet FDA eye safety requirements and is classified as eye-safe to Class 1 limits, which means that virtually no hazard is associated with directly viewing the laser output under normal conditions. As with any laser device, however, reasonable precautions should be taken in its operation. It is recommended that you avoid staring into the transmit aperture while firing the laser. The use of optical instruments with this product may increase eye hazard.

- **Never attempt to view the sun through the scope.**

  Looking at sun through the scope may permanently damage your eyes.

- **Never point the unit directly at the sun.**

  Exposing the lens system to direct sunlight, even for a brief period, may permanently damage the internal components.

- **Do not expose the instrument to extreme temperatures.**

  TruPulse® 360i components are rated for Operating temperature range of -20 to 60° C (-4 to 140° F). Do not expose the instrument to temperatures outside these ranges.

- **Calibrate the TruPulse 360i before use.**

  When you first receive your TruPulse 360i, the Inclination Sensor and Compass Sensor has been calibrated in the factory. Refer to the pages listed below for the User Calibration for the sensors if:

  - Inclination measurements are inaccurate (Page 38).
  - Compass Calibration Icon (Check Mark) is flashing (Page 39).

  For optimum performance, complete an on-site User Compass Calibration each time that you change location or accessories.

- **KEEP THE TRUPULSE 360i AWAY FROM MAGNETIC FIELDS.**

  The Compass is susceptible to magnetic interference. Keep away from all ferro-magnetic materials and strong magnetic fields.

Regulatory Certifications

- FCC
- CE
- IEC
- ROHS
- REACH
- WEEE

Bluetooth Regulatory Certificates

- USA (FCC): SQGBT900
- EU: N/A
- UK (UKCA): N/A
- Canada (ISED): 3147A-BT900
- Taiwan (NCC): CCAF20Y10110T8
- Japan (MIC): 201-140156

142150156/AA/00

This equipment contains specified radio equipment that has been certified to the Technical Regulation Conformity Certification under the Radio Law.

Introduction

- The safety instructions and the user manual should be read through carefully before the product is used for the first time.
- The person responsible for the product must ensure that all users understand these directions and adhere to them.

Section 1 - Introducing the LTI TruPulse 360i

TruPulse® 360i laser comes with new and improved enhancements offering users sophisticated cutting-edge technology along with the easy to operate and accuracy that LTI lasers are known for.

Measures slope distance, inclination & azimuth, and calculates horizontal distance, vertical distance, height, and missing line values. The TruPulse 360i offers higher levels of distance, inclination, and azimuth accuracy with Bluetooth wireless communication to any device. Take advantage of Laser Tech's Advanced Targeting Modes (Closest, Farthest, Continuous, and Filter) and TruTargeting technology to know exactly what accuracy level is being achieved. LTI's TruVector 360 Compass Technology integrated into this model allows users to calculate complete 3D missing line values for spans and clearances between two remote points. Produces accurate and repeatable Azimuth (AZ) results regardless of the tilt or pitch you use to aim the laser.

Features of the TruPulse 360i:

- Crystal clear optics with a 5X magnification; ultra-bright adjustable display for any lighting condition and 80% light transmission for greater clarity.
- "Thru-the-lens" viewing eliminates parallax issues, so you know the laser energy is traveling directly along your line of sight.
- The laser sensor and integrated tilt sensor measure slope distance, horizontal distance, vertical distance, inclination, or instantly calculate the height of any object.
- Compass sensor provides confidence in repeatable azimuth measurement that expands your options and abilities in the field.
- Target Modes allow you to select or eliminate targets; which help you take the most accurate measurement possible in a variety of field conditions.
- Adjustable eyepiece provides comfortable viewing for eye or sunglass wearers.
- Measurement data is available for download Bluetooth: Dual Mode module: BT Classic and BLE is compatible with a multitude of devices (iOS, Android, and Windows).
- Intuitive user interface and workflows with an icon-driven display and 7 on-board measurement solutions.

Operating Modes

Measurement Modes	System Setup Modes	Settings Modes
Slope Distance, Inclination & Azimuth	Bluetooth Options	Brightness Levels
Vertical Distance, Inclination & Azimuth	Reticle Options	Targeting Modes
Horizontal Distance, Inclination & Azimuth	Declination	Range Gate
3-Point Height Routine	Factory Reset	Units Of Measurement
Missing Line Routine	Code Version	User Calibration

Unpacking the TruPulse

When you unpack the TruPulse, check to make sure that you received everything that you ordered, and that it all arrived undamaged.d

Basic Package:

- TruPulse 360i
- Carrying Case
- Neck Strap
- 2 AA Batteries
- Inserts:
  - User Manual QR Code
  - Warranty Card
  - LaserSoft Apps

Compatible Accessories:

- Mechanical Receive Foliage Filter
- Mounting Bracket
- Tripod

ⓘ
- This manual is available for download from Laser Tech's Website.
- To learn more about any of the items listed above, please contact your LTI Sales Representative or an Authorized LTI Partner.

Understanding How the TruPulse 360i Works

The TruPulse 360i consists of a laser range sensor, an integrated accelerometer tilt sensor, compass sensor and a digital processor. The TruPulse 360i has five buttons that access the unit's internal firmware, which controls the integrated sensors.

Laser Range Sensor

The laser range sensor emits invisible, eye safe, infrared energy pulses. The TruPulse 360i determines distance by measuring the time it takes for each pulse to travel from the rangefinder to the target, and back. The laser indicator is displayed whenever the laser is being transmitted. The laser may be active for a maximum of 6 to 10 seconds depending on Targeting mode. Once the target is acquired or the laser has timed out, you can release the FIRE button. The TruPulse 360i has a broad spectrum of sensitivity and can work with both reflective and non-reflective targets.

TruTargeting

The TruPulse 360i automatically provides the best accuracy and acquisition distance to a given target. Maximum measurement distance varies with target quality and environmental conditions. When shooting to a target, the maximum measurement distance is approximately 2,500 Meters (8,202 Feet) to reflective targets. Target quality can be affected by atmospheric conditions, such as heat shimmer, dust, target reflectance, traverse angle to target and beam spread.

When selecting a target, you should consider the following:

- *Color*: The brighter the color, the longer the range.
- *Finish*: Shiny finishes provide longer range than dull finishes.
- *Angle*: Shooting perpendicular to a target provides better range than shooting to a target at a sharp angle.
- *Lighting Conditions*: Overcast skies will increase the unit's maximum range, and sunny skies will decrease the unit's maximum range.

Target quality influences the precision of measurements:

- A low quality target will result in a measurement that is in tenths (1 decimal place).
  Low Quality: 0.1
- A high quality target will result in a measurement that in hundredths (2 decimal places).
  High Quality: 0.01

To achieve best results when ranging to reflective targets:

- For distances up to 1500m (4921 ft), use only retroreflective material, such as reflectors or panels of retroreflective sheeting.
- For distances over 1500m (4921 ft), use a survey prism.
  - Use Standard Targeting Mode only.
  - LTI recommends use of the mechanical receive foliage filter accessory. Refer to the Foliage Filter instructions on Laser Tech's FAQ's web page.

Tilt Sensor

The integrated tilt sensor measures vertical angles that the TruPulse 360i uses to calculate height and elevation, and also to determine slope-reduced horizontal distances. The instrument is held level at 0°, and is rotated up through +90° and down through -90°.

Compass

The TruPulse 360i utilizes the latest in electronic compass technology. The internal circuitry provides 3-axis monitoring of the earth's magnetic field and uses proprietary calibration algorithms to produce the best possible azimuth accuracy while having a simple field calibration procedure. The TruPulse 360i evaluates the local magnetic environment during each field calibration and provides user feedback of the quality of the calibration. In addition, the instrument has built-in system tests, which continually monitor the integrity of the compass calibration and alert a user if a re-calibration is required. The TruPulse 360i helps you to produce quality field results by keeping a constant watch on its internal status.

TruVector™ Technology

Incorporated into the TruPulse 360i is LTI's TruVector technology. This produces accurate and repeatable range, inclination & azimuth measurement values. Also recognizes conditions that will affect the reliability of the compass accuracy and prompts you to recalibrate

The TruPulse 360i produces accurate and repeatable azimuth and inclination results. This is accomplished by combining a 3-axis magnetic sensor with a 3-axis tilt sensor - so the TruPulse 360i always knows its position in 3D space, and the direction of the Earth's magnetic field. TruVector technology allows you the ultimate freedom to "measure any angle." No tilt or roll limitations when taking a measurement.

When performing a measurement, the TruVector Technology:

- The system samples the battery voltage.
- The system monitors temperature.
- Range & tilt values are shown in real time.
- The tilt and compass sensors are sampled, the output is the average of the samples.
- The system measures an azimuth value at the optimum time to maximize accuracy (measured when there is less noise in the system).
- Panning feature warning has been implemented for the Azimuth values.

Section 2 - Getting Started

Parts of the TruPulse 360i

A. FIRE Button	E. Laser Transmit Lens	I. Attachment Point
B. Navigation Buttons	F. Laser Receive Lens	J. AA Battery Compartment
C. Menu button	G. Diopter Focus Ring	K. Battery Door
D. Select Button	H. Eyepiece Lens	L. 1/4-20 Mount

Figure 1

Powering On/Off

Once the batteries are installed (see Page 10), press and release the FIRE button.
The display will light up to show the unit is on and ready for ranging.

To conserve battery power, if no buttons are pressed, the Display will turn off (dormant) after 1 minute. The unit will completely powers OFF automatically if no button presses are detected after a specified length of time:

- Bluetooth Off = 2 minutes of non-use
- Bluetooth On (BLE/Classic) = 30 minutes of non use
- These shut down values can be changed with serial command messages. For detailed information on the serial command messages, refer to the Laser Tech's Professional Measurement FAQs technical documents website (https://lasertech.com/professional-measurement-faqs/).

Manually Power Off

The TruPulse 360i can be powered off by pressing and holding both Navigation buttons ("B" in Figure 1 above) at the same time for 3 seconds.

Focus

Adjust the Diopter Focus Ring ("G" in Figure 1 above) until the image is sharp.
See Page 13 for information about adjusting diopter focus.

Measurement Display Layout

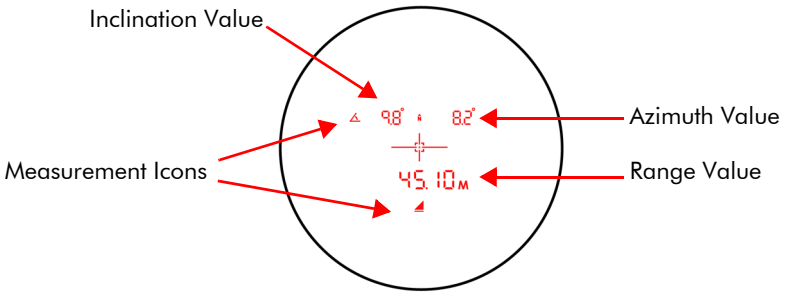


Figure 2

Section 3 - Basic Measurement

1. Press FIRE button to power ON the TruPulse 360i.
2. Select a target such as a tree or a building.
3. Look through the eyepiece and use the crosshair to aim to the target.
4. Press-and-hold the FIRE button. The Laser indicator is displayed while the laser is active measuring.
    - If a target is acquired, measurement results will be displayed, flash 2 times and laser indicator turns off.
    - If a target is not acquired immediately, the laser will remain active for a maximum of 6 seconds while acquiring data about the target.
    - If the target is not acquired, release the FIRE button and repeat steps.
5. Release the FIRE button once the measurement results are displayed.

NOTE The measurement will be displayed steady until you press a button or the unit powers OFF.

Slope Distance Basic Measurement Workflow

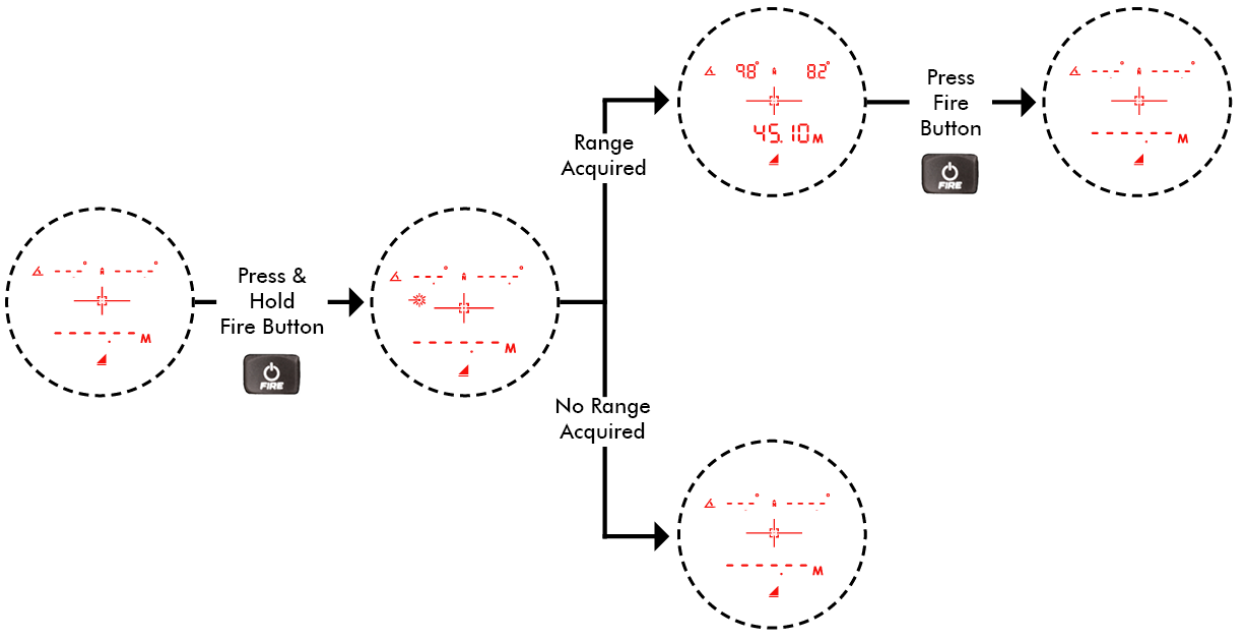


Figure 3

Section 4 - Basic Operations

Battery Installation

The TruPulse 360i is powered by two AA batteries.

1. Open the battery compartment cover by gently pressing and sliding the lever up (Figure 4).
2. Install the batteries with batteries oriented (+/-) on the indication sticker found inside the battery compartment.
3. Replace the battery compartment cover and slide the lever down until the tab locks into position.

A B

Figure 4

Low Battery Warning

The TruPulse 360i monitors the incoming battery voltage. Within the display, the Battery Life Indicator shows how much battery charge is remaining. The Battery Indicator will display when user enters either the Settings Menu or the System Setup Menu.

The Battery Indicator will display when the voltage changes levels. It displays for 3 seconds then turns off.

- Full
- 2/3
- 1/3
- Battery Lock Out Screen

Button Navigation

The TruPulse 360i has five buttons. With the TruPulse 360i in your right hand and looking through the eyepiece, the FIRE button and all other buttons are located on top of the instrument (Figure 5).

Figure 5

- **FIRE Button**
  - Powers ON the unit.
  - Fires the laser's sensors to measure values.
  - Short press in Settings or System Setup Menus to exit and not save the selected option.
- **Navigation Buttons**
  - Press to scroll to measurement modes.
  - Press to scroll to Settings and System Setup Menu options.
- **Menu button**
  - Short Press to enter the Settings Menu options.
  - Long Press to enter the System Setup Menu options.
- **Select Button**
  - Short Press to accept option selection.
  - Long Press to enter menu options.

TruPulse 360i Display

The TruPulse 360i is equipped with a Ultra Bright LED HUD. The TruPulse's internal software is organized into options. Each option represents a specific measurement or setup function and has a corresponding display indicator. Refer to the figure and table below for information about each indicator.

NOTE Within this manual, when the scope ring is represented by a dashed line, the display indicators have been enlarged to show detail and are used for illustration only.

Figure 6

Display Icons	Description	Definition
	Battery Status	Battery life indicator.
	Wireless Icon	Icon flashing is in pairing mode, solid icon is connected to device. The icon with circle is not used in the TruPulse 360i.
	Range Gate	When using the Range Gate option, it is possible to artificially extend the instrument's minimum range and restrict its maximum range.
	Inclination Measurement	The angle of inclination between the TruPulse 360i at level and the target.
	Upper Left Display	Displays messages and inclination measurement results.
	Compass	*Visible:* compass is active. *Not Visible:* compass is not active.
	Declination	Declination has been applied to Magnetic North.
	Upper Right Display	Displays messages and azimuth measurement results.
	Horizontal Angle Icon	Not used in the TruPulse 360i.
	Filter Mode	The laser's sensitivity is reduced so it only detects measurements returned from a reflector. The optional mechanical receive foliage filter must be used in conjunction with this mode.
	Laser Status	*Visible:* laser is firing. *Not Visible:* laser is not active.
	Reticle Crosshair	Serves as the aiming point reference, both horizontally and vertically.
	Calibration	Flashes when a User Calibration is required.
	Closest Target Mode	The unit logs multiple targets while the FIRE button is held down. The circle denotes that additional targets have been acquired. Of the targets acquired, the distance to the closest target displays.
	Continuous Target Mode	The unit continuously acquires targets and displays measurements while the FIRE button is held down.
	Farthest Target Mode	The unit logs multiple targets while the FIRE button is held down. The circle denotes that additional targets have been acquired. Of the targets acquired, the distance to the farthest target displays.

Display Icons	Description	Definition
8888.88 F M	Lower Main Display	Displays messages and distance measurement results.
%	Percent Slope	Inclination measurement units.
O	Degrees	
F	Feet	Distance measurement units. Selection available in the Settings Menu.
M	Meters	
	Height Measurement Routine	Three-step height routine. The final calculation represents the vertical distance between the points on the target represented by ANG_1 and ANG_2.
	Slope Distance Measurement	Straight line distance between the TruPulse 360i and the target.
	Horizontal Distance Measurement	The level distance between the TruPulse 360i and the plane of the target.
	Vertical Distance Measurement	The distance between the target and the perpendicular to the path of the horizontal distance.
	Missing Line Measurement Routine	Two-step Missing Line Routine finds the connecting vector (or missing line) between two points. The final calculation shows the SD, VD, HD, INC, and AZ associated with the missing line.

Display Indicator Test

To verify that all display indicators are working properly:

1. Start with the TruPulse 360i powered OFF, press-and-hold the FIRE button.
2. Compare the in-scope display to Figure 7 to verify that all indicators are working properly.
3. Release the FIRE button to start normal operation.

Figure 7

Eyepiece

The adjustable eyepiece is designed for comfort and to block extraneous light.

- To extend the eyepiece, turn the eyepiece counter-clockwise while pulling up.
- To return the eyepiece to its original position, turn the eyepiece clockwise and push down.

To match your personal preference, the eyepiece may be located in any position from fully up to fully down. If wearing eyeglasses or sunglasses, you will find that the fully down position brings the eyepiece lens closer to your eye and gives you a full field of view.

Closed Extended

Figure 8

Diopter Adjustment Ring

The diopter adjustment ring allows you to focus the in-scope display relative to the target for your eye. During assembly, optimum focus is set to infinity. To adjust the focus, turn the diopter adjustment ring in either direction to suit your personal preference.

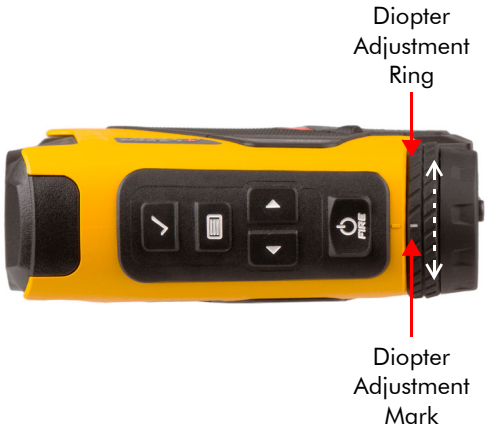


Figure 9

Neck Strap

To attach the neck strap:

1. Disconnect the anchor end of the strap using the buckle.

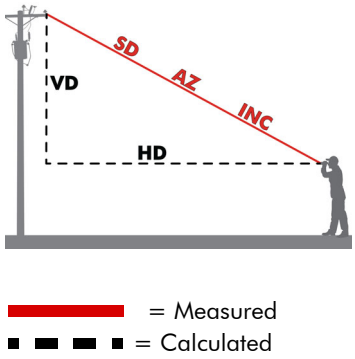
Figure 10

2. Feed loop around metal bar.
3. Thread the neckstrap through the loop.
4. Gently tighten to secure.
5. Reconnect anchor end of the strap using the buckle.

Figure 11

Section 5 - Measurement Modes

When you power ON the TruPulse 360i, the last used Measurement Mode will be active. Press the Navigation buttons to display other Measurement Modes. Figure 12 shows the five different types of measurements that the TruPulse 360i can take.



Abbreviation	Description	Display Icon
INC	Inclination	
AZ	Azimuth	
SD	Slope Distance	
HD	Horizontal Distance	
VD	Vertical Distance	

Figure 12

Distance, Inclination & Compass Measurements

The laser, inclinometer, and compass sensors will measure when the FIRE button is pressed in any measurement mode. In the Slope Distance Mode, the TruPulse 360i will automatically calculate Horizontal and Vertical Distance values. Measurements are from the ¼-20 tripod mount (center) of the laser to the target.

The basic steps for taking any distance measurement:

1. Look through the eyepiece and use the crosshair to aim to the target.
2. Press-and-hold FIRE button. The LASER status indicator is displayed while the laser is active. The laser will remain active for a maximum of 6 seconds while acquiring data about the target.
    - If the target is not acquired in the 6 second period, release FIRE button and repeat this step.
3. Once the measurement is displayed, release FIRE button. The measurement will flash two times indicating the measurement was acquired. If Bluetooth is ON and connected to a device, the value will download at this time. Then the measurement will be displayed steady until you press any button or the unit powers OFF.
4. Press Navigation buttons to scroll though the other measurement values calculated.
5. Press FIRE button to clear measurements and repeat steps 1 through 3 (or 4).
    - The last measurement does not need to be cleared before acquiring your next target.
    - Each time the TruPulse 360i is powered ON, it will return to the same measurement mode that was last used.

NOTE See Distance, Inclination, and Azimuth Measurements Workflow on Page 16.

Compass Measurements

Different from previous generations of product, the TruPulse 360i Azimuth reading is measured and displayed only after the fire button is released. The Azimuth value might be delayed in displaying, depending on the quality of the target and targeting mode activated.

This ensures the user gets an accurate and correct Azimuth value (following all tips with field user calibration and magnetic hygiene) when measuring to a target.

Refer to Targeting Mode for more details (Page 31).

Distance, Inclination, and Azimuth Measurements Workflow

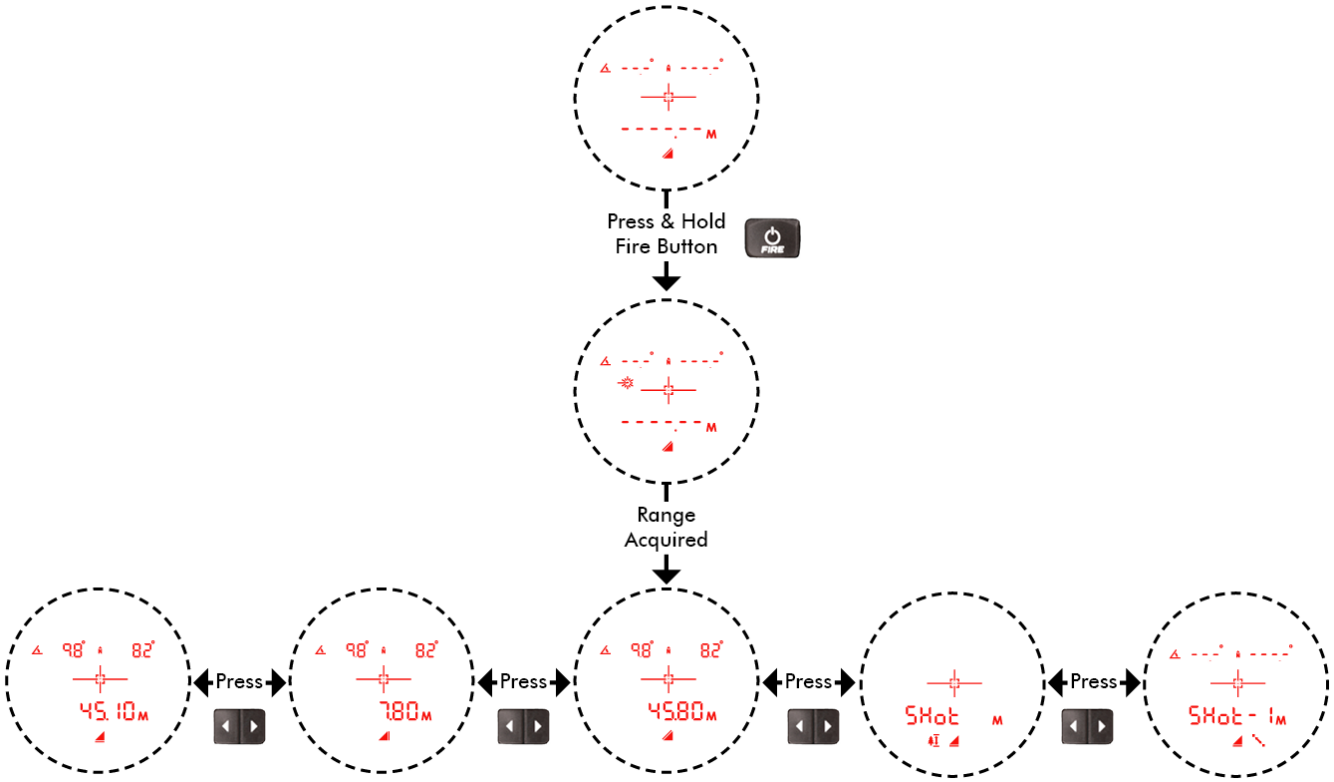


Figure 13

Inclination Percent Slope

The Inclination units can be changed from Degrees to Percent. Refer to Section 7 Units of Measurements (UoM) for options (Page 37).

Percent slope, indicated by the % icon, is a calculation equal to 100 times the tangent of the inclination angle. It is a variant way of expressing the inclination. You can get percent slopes only in the basic measurement displays, never in the Height measurement displays. Note also that the instrument never downloads a percent slope. It always downloads the inclination angle.

NOTE An inclination angle of 5 degrees for example is equal to a slope of about 8.7 percent.

The calculated results of Percent Slope:

- If under ±45 degrees, in the upper left segment if the display, the calculated percentage result will have a decimal.
- If over ±45 degrees, in the upper left segment if the display, the calculated percentage result will not have a decimal, the value is rounded.

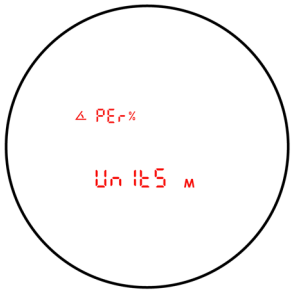


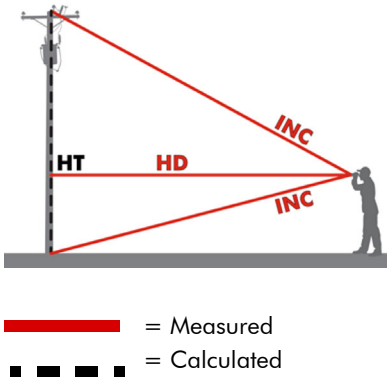
Figure 14

Height Routine (3-Point Routine)

Height Measurements involve a simple routine that prompts you to take 3 shots to the target: Horizontal Distance, Inclination Angle_1 and Inclination Angle_2. The TruPulse 360i uses these results to calculate the height of the target.

In the routine, the next measurement required will auto sequence once the first measurement is acquired.

Figure 15 shows the three shots required for the height routine.



Abbreviation	Description	Display Icon
HD	Horizontal Distance	
INC	Inclination Top Angle	
INC	Inclination Bottom Angle	
HT	Height	

Figure 15

1. Press Navigation buttons to the Height & HD icon and "Shot" is displayed.
2. Select your target and look through the eyepiece, using the crosshair to aim to your target where you have a clear line of sight. The HD icon is prompting you to measure the Horizontal Distance to the "face" of the target.
3. Press-and-hold FIRE button. The Laser status indicator is displayed while the laser is active. The laser will remain active for a maximum of 6 seconds while acquiring measurement data about the target. The measured horizontal distance appears briefly in the Main Display and then Ang_1 and the INC icon is displayed; prompting you to measure the inclination to base (or top) of the target.
4. Press-and-hold FIRE button and aim to the base (or top) of the target. The measured inclination appears in the upper left segment of the display and is updated as long as you continue to hold FIRE button. The measured inclination is "locked" when you release FIRE button. The measured inclination flashes briefly in the display and then Ang_2 appears and the INC icon is displayed; prompting you to measure the inclination to the top (or base) of the target.
5. Press-and-hold FIRE button and aim to the top (or base) of the target. The measured inclination appears in the upper left segment of the display and is updated as long as you continue to hold FIRE button. The measured inclination is "locked" when you release FIRE button. The measured inclination flashes briefly in the upper left segment of the display and then the calculated Height is displayed. The measurement flashes and then displays steady until you press any button or the unit powers OFF.
6. When the height result is displayed, press FIRE Button to start the routine and repeat the steps

NOTE

- See Height Routine (3-Point Routine) Workflow on Page 18.

Height Routine Tips:

- This routine is ideal for flat, vertical objects that do not lean. To shoot through brush, use the filter mode, foliage filter and a reflector.
- The laser sensor does not measure when taking the two inclination angle measurements. You do not need a clear line of sight to the bottom or top of your target.
- The sequence of the two inclination angles shots does not matter: Bottom to Top OR Top to Bottom.
- Press the Down arrow during the Height routine to re-measure previous measurement (ANG_1 or ANG_2).
- Ideal for taking multiple height measurements on the same target.

Height Routine (3-Point Routine) Workflow

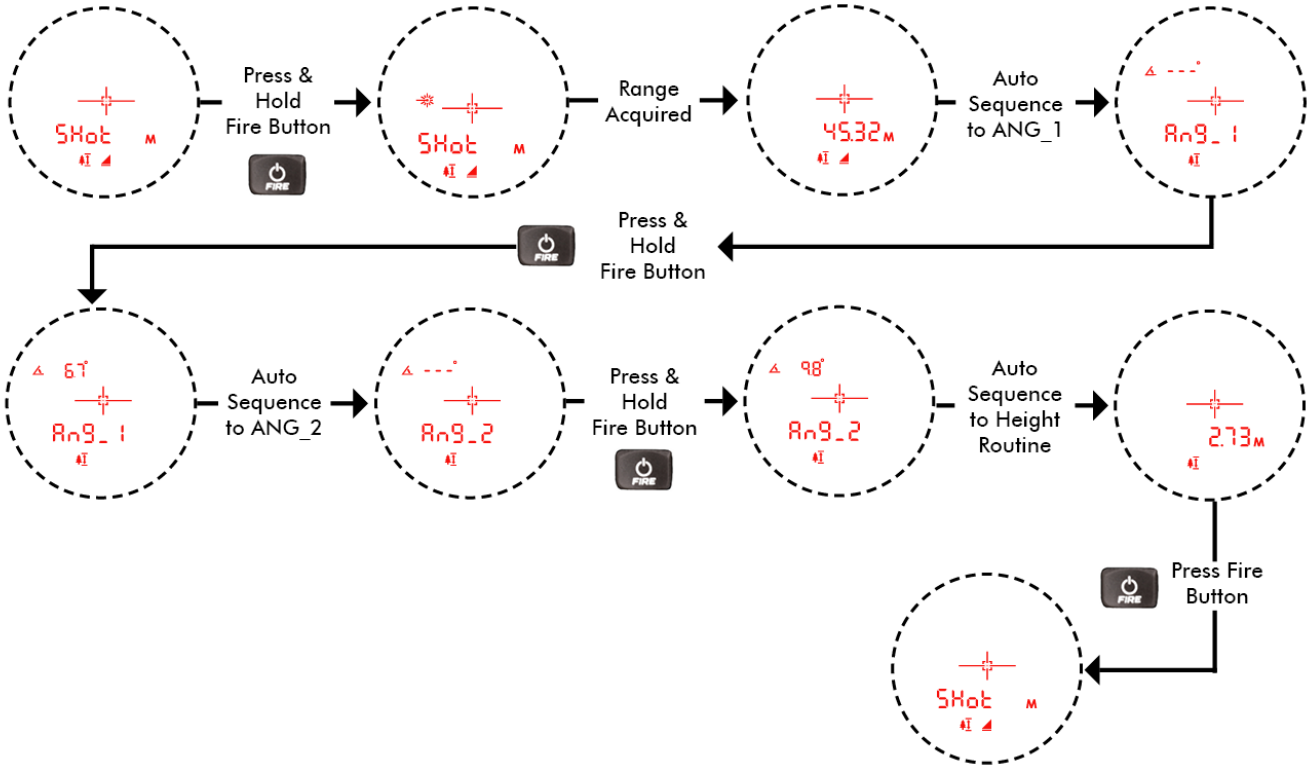
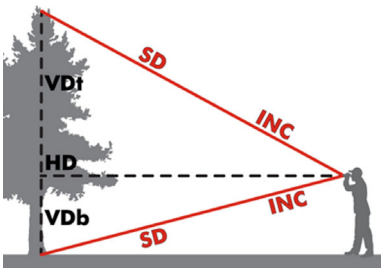


Figure 16

Height Routine (2-pt Routine)

This measurement routine is ideal for leaning objects and requires a clear line of sight for both shots.



= Measured

= Calculated

Figure 17

1. Press Navigation buttons until the Vertical Distance (VD) indicator is displayed.
2. Aim where you have a clear line of sight to the base of the target and press-and-hold FIRE button.
   - The laser indicator will be displayed. When the measurement is acquired the result will be displayed.
     Note this value for the Vertical Distance (VDb) measurement.
3. Aim where you have a clear line of sight at the top of the target then press- and-hold the FIRE button.
4. The laser indicator will be displayed. When the measurement is acquired the result will be displayed.
   Note this value for the Vertical Distance top (VDt) value.
5. Subtract the two values to calculate the height, VDt - VDb = Height.

NOTE when subtracting the values, pay attention to the sign of the VD.

Example:
VDt 8.5 meters - (VDb -3.5) meters = Height 12 meter

Missing Line Routine

The Missing Line Routine calculates distances and angles to describe the relationship between two points in three-dimensional space (connecting vector). This routine is ideal for span lengths, remote slope determinations, and changes in elevation from one location.

The simple routine prompts you to take two shots to targets: "Shot 1" and "Shot 2". The TruPulse uses the results to calculate five variables between the two points: slope distance, inclination, azimuth, horizontal distance, and vertical distance as shown in Figure 18

- **HD** Horizontal Distance: Horizontal component of the missing line.
- **VD** Vertical Distance: Change in elevation between point #1 and point #2.
- **SD** Slope Distance: Length of the missing line.
- **INC** Inclination between point #1 and point #2.
- **AZ** Relative Azimuth: Direction from the point #1 to point #2.

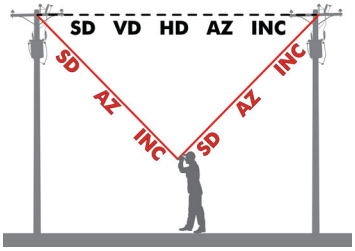


Figure 18

1. Press Navigation buttons to the Missing Line and HD icons and "Shot-1" in the display.
2. Select your first target and look through the eyepiece, using the crosshair to aim to your target. The HD icon is prompting you to measure the Horizontal Distance to the first target.
3. Press-and-hold FIRE button. The LASER status indicator is displayed while the laser is active. The laser remains active for a maximum of 6 seconds while acquiring measurement data about the target. The measured horizontal distance appears and flashes in the Main Display.
4. Once the FIRE button is released, "SHot_2" appears steady and the HD icon is prompting you to measure the Horizontal Distance to the second target. Looking through the eyepiece and using the crosshair to aim to the second target.
5. Press-and-hold FIRE button. The LASER status indicator is displayed while the laser is active. The laser remains active for a maximum of 6 seconds while acquiring measurement data about the target. The measured horizontal distance to the second target appears and flashes in the Main Display.
6. Once you release FIRE button, display auto sequences to the ML results, HD and INC appears and flashes, then becomes steady until you press any button or the unit powers off.

At this time, you can:

- Press either Navigation button to scroll and see the other missing line measurements results (VD, SD, and INC).
- Reshoot Shot 2 by pressing the Select button. Shot_2 and ML appear in the display. The HD icon is prompting you to measure the horizontal distance to the second target (or new target). Go to #4 above.
- Press FIRE button to exit the Missing Line results and return to Shot_1.

NOTE See Missing Line Tips and Routine Workflow on Page 21.

Tips

- Improving the Accuracy of Handheld Results
- During the Missing Line Routine, it is important that the TruPulse stay positioned above one particular point on the ground.
- Mounting the TruPulse on a monopod or tripod will improve the accuracy of your results location of the TruPulse.
- If you are using the TruPulse handheld, your body will usually a have a swinging motion as you aim to target #2. There are some steps you can take that should improve the accuracy of your results:
  - ☐ Before you take "SHot-1", drop an object, such as a coin, on the ground.
  - ☐ Place your feet on either side of the coin, so the coin is centered between your feet and the TruPulse is directly above the coin. See Figure 19.
  - ☐ Shoot point #1.
  - ☐ While keeping the TruPulse directly above the coin, aim to target #2. Being careful not to make a big swinging motion, reposition your feet on both sides of the coin. See Figure 19.
  - ☐ Shoot point #2.

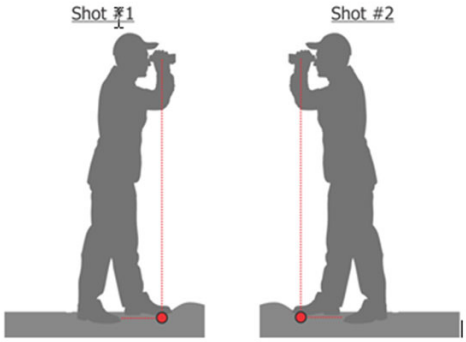


Figure 19

Missing Line Routine Workflow

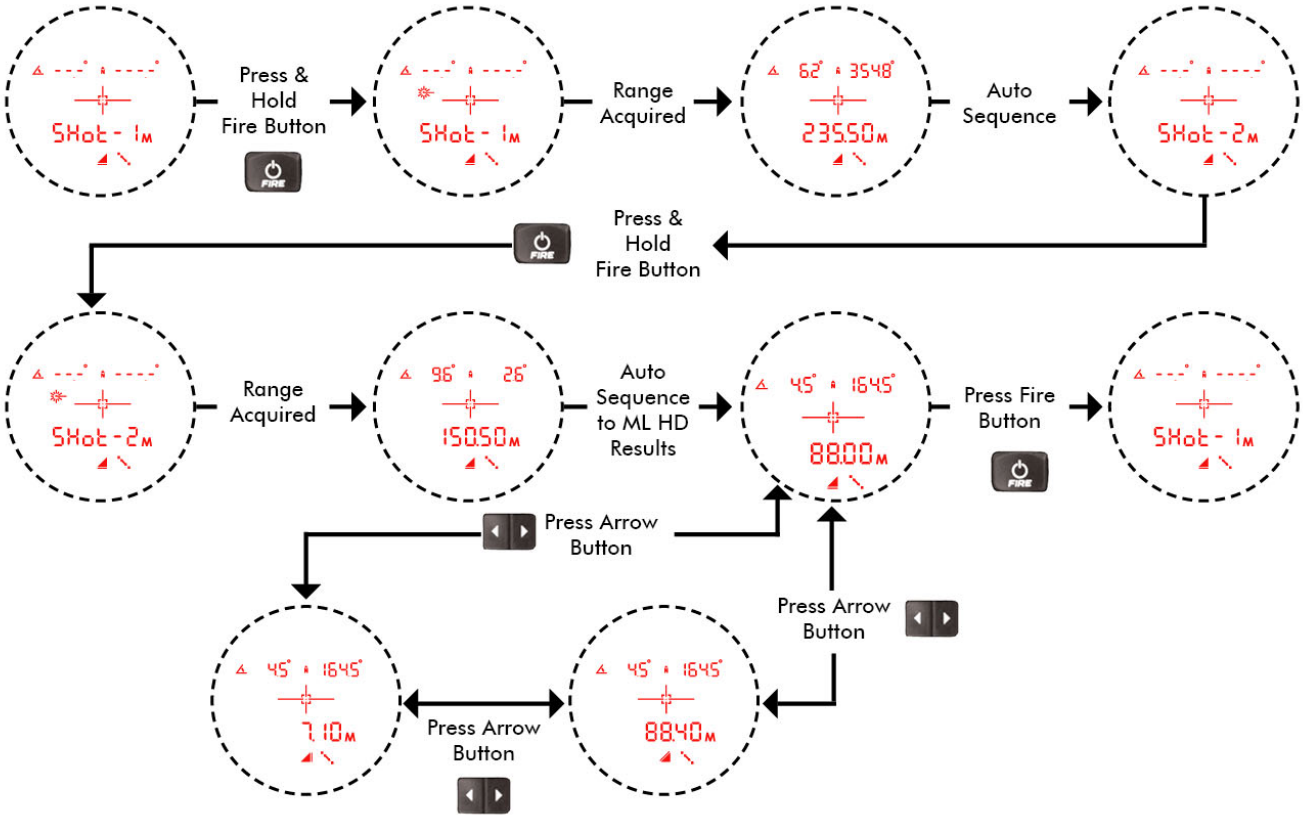


Figure 20

Section 6 - System Setup Mode

The System Setup Mode can be accessed from the Measurement Mode.
Each option is described separately in the following sections:

- Bluetooth Options
- Reticle Options
- Declination
- Factory Reset
- Code Firmware

System Setup Mode Workflow

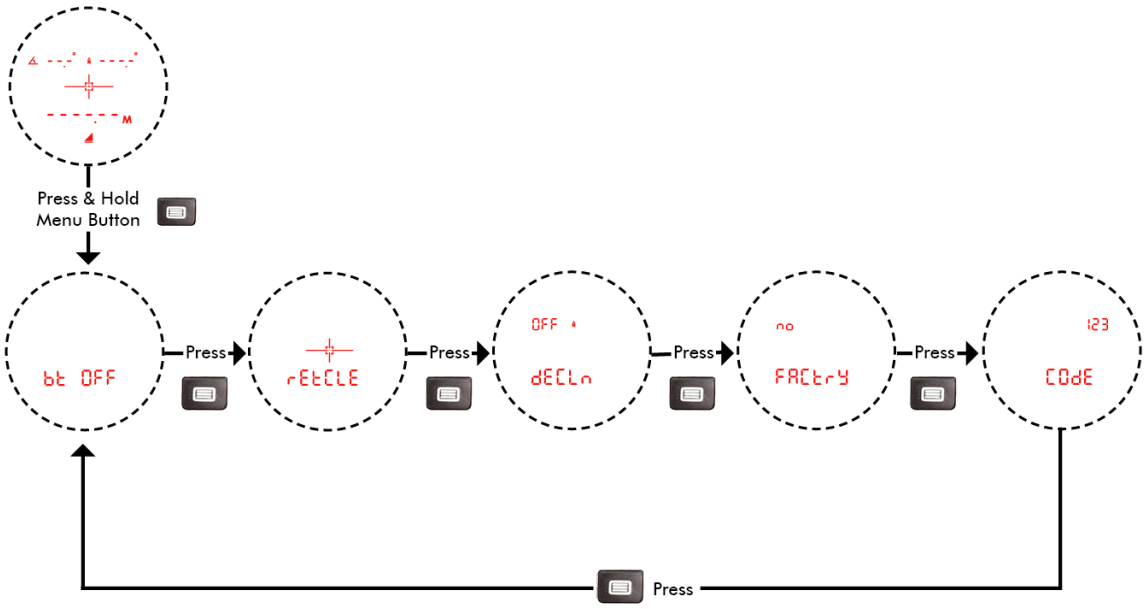


Figure 21

Saving Changed Options

During the System Setup Mode, the option chosen will be set when you return to the Measurement Mode.

To save the option and be active when the unit powers off and on:

- Manually power off the unit (Page 7).

-or-

- Let the unit auto power off.

This ensures that any option chosen is saved.

NOTE If the battery door is opened before performing the above steps, the options chosen will not be saved and revert to last options saved.

Bluetooth Options

The TruPulse 360i is equipped with Bluetooth® module that adds functionality to connect to Classic BT and Bluetooth Low Energy (BLE) devices. Bluetooth ® is a short-range wireless technology standard that is used for exchanging data between fixed and mobile devices over short distances. The TruPulse 360i will output messages to the connected device, refer to the "LTI TruPulse 2 Bluetooth Communications" document on Laser Tech's website.

1. Long press Menu button and the Bluetooth option will be displayed.
2. Press the Navigation button to display the Bluetooth options (bt OFF, bt On, bt bLE)
3. Short press Select button to accept the Bluetooth option and return to the Measurement Mode.
    - Short Press the Menu button to save option and navigate to the Pulse options.
    - Short Press the FIRE button to exit and not save the option.

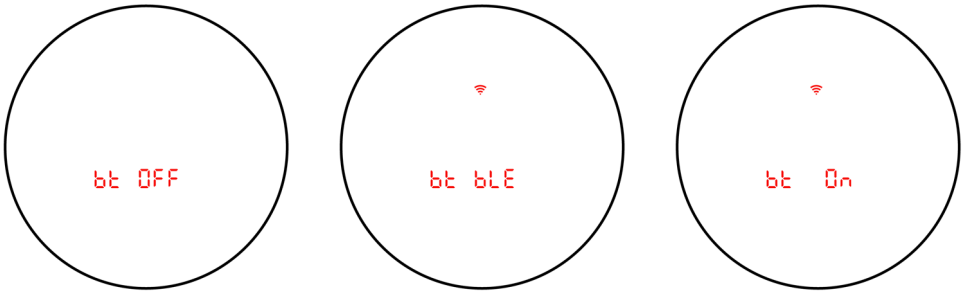


Figure 22

- OFF: Turns the Bluetooth communications off.
- bt bLE: Turns the Bluetooth Low Energy (BLE) on. (Android & iOS devices)
- bt On: Turns the Bluetooth Classic communications on (Windows & Android devices).

NOTES

- If you want to save the chosen Bluetooth option, power off the TruPulse 360i (Page 22).
- Each time the TruPulse 360i is powered ON, it will return to the saved Bluetooth option.
- Bluetooth v4.0 - Dual Mode (Classic Bluetooth and BLE)

Refer to the instructions below when connecting your TruPulse 360i to another Bluetooth device. This information is provided as a general guideline.

NOTE Refer to the third party product documentation for your specific Bluetooth device.

Bluetooth Options Workflow

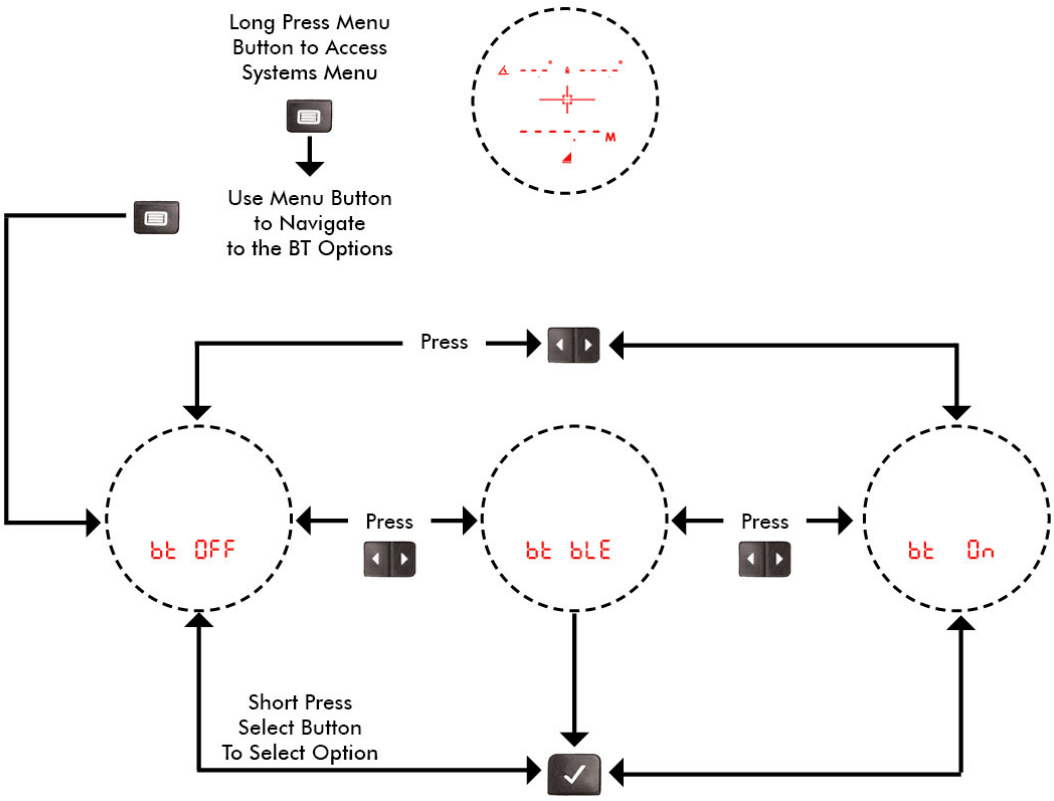


Figure 23

Bluetooth troubleshooting tips:

- TruPulse: Verify that the TruPulse Bluetooth option is toggled ON.
- Bluetooth enabled PC device: Verify that the Bluetooth connection is active.
- Verify that the Bluetooth device is physically located within the wireless transmission range of the TruPulse 360i. Transmission range can vary depending upon (1) position relative to the TruPulse or (2) type of Bluetooth connection.

Aiming Reticle Options

The reticle is used to align over the target you would like to measure to. Choose from four reticle options:

Figure 24

To change the Reticle:

1. Long press the Menu button, the bt option will be displayed.
2. Short press the Menu button to scroll until the Aiming Reticle option screen is displayed. The last option chosen will be displayed.
3. Press Navigation buttons to change option.
4. Short press Select button to accept the Reticle option and return to the Measurement Mode.
    - Short press the Menu button to save option and navigate to the Declination options.
    - Short press the FIRE button to exit and not save the option.

Aiming Reticle Options Workflow

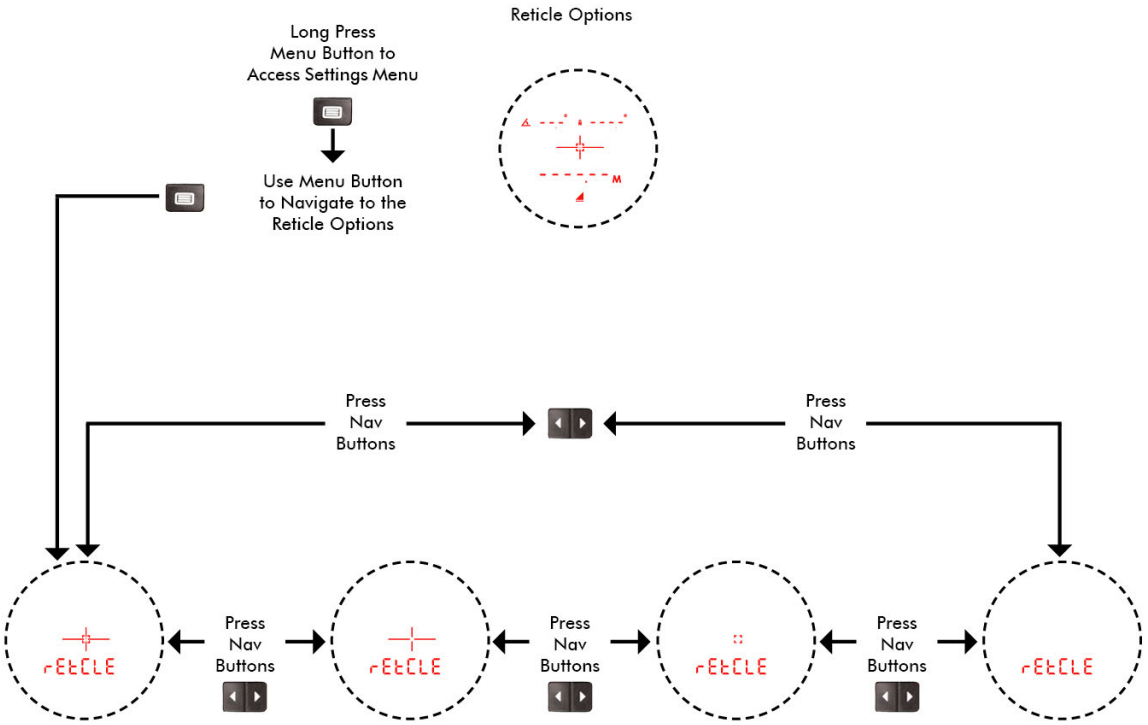


Figure 25

- If you want to save the chosen Aiming Reticle option, power off the TruPulse 360i (Page 22).
- Each time the TruPulse 360i is powered ON, it will return to the saved Aiming Reticle option.

Declination

About Magnetic Declination

The magnetic poles are not located at the same place as the geographic North and South poles. Moreover, they move in a predictable direction by a small amount annually. A compass always points toward the magnetic pole. The direction that the compass points is called a magnetic meridian. True North, or geographic North, relative to magnetic North varies somewhat depending on your location on the surface of the earth. Declination is the value of the variation between Magnetic North and True North, expressed in degrees or degrees west of True North.

It is important that you determine the correct declination value for the area that you are working in and enter this value into the TruPulse 360i. You need to know your local latitude and longitude in order to determine the magnetic declination. This must be done prior to using the instrument for azimuth measurements.

Example Declination Value

Magnetic declinations are east (positive) if the compass measures east of true North, and west (negative) if the compass measures west of true North.

Online Declination Software

NOAA's National Geophysical Data Center (NGDC) website includes online declination software that computes the estimated declination for your location. You only need to enter the location (US zip code) and date of interest.

NOTE Do not set a Declination value in the TruPulse 360i if you use a GPS/GNSS and Software/App that applies a local Declination.

Entering a Declination

- To Set a Declination Value:
  - Long press the Menu button, the bt option will be displayed.
  - Short press the Menu button to scroll until the Declination option screen is displayed. The last option chosen will be displayed.
  - Press Navigation buttons to change option.
- Long press Select button to enter a Declination Value
- Short Press the Navigation buttons to scroll values slowly.
  - Long press Navigation buttons to scroll values quickly.
  - Right Navigation button decreases value (even Negative);
  - Left Navigation button increases value.
  - Tenths CAN have a value set.
  - Value Limits: The edit range is ±39.9 degrees
- Short press the Select Button to set the Declination value.
- Short Press the Menu button to save option and navigate to the Factory Reset option.
- Short Press the Select button to save On/Off option and return to Measurement Mode.
- Short Press the FIRE button, exits and does not save the option.
- If a Declination value is set and save, the display will indicate the value it active.

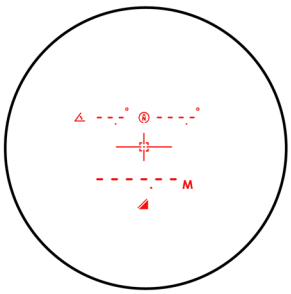


Figure 26

NOTES

- If you want to save the chosen Declination value, power off the TruPulse 360i (Page 22).
- Each time the TruPulse 360i is powered ON, it will return to the saved Declination value.

Factory Reset

It is possible to restore the TruPulse 360i factory default settings.
Restoring the default settings affects some of the system setup options.

1. Long press the Menu button, the bt option will be displayed.
2. Short press the Menu button to scroll until the Factory Reset option screen is displayed.
3. Press Navigation buttons to change option (no/yes/bt).
    - Short press Select button to exit and return to the Measurement Mode.
    - Short press the Menu button to navigate to Code Firmware option.
4. Navigate to "Yes FactrY", then Long Press & Hold the Select Button to perform the Factory reset. The Display will flash and then all display icons will be solid.
5. Navigate to the "bt FACtrY", then then Long Press & Hold the Select Button to perform the Factory reset. The display will flash and then all display icons will be solid.

NOTE This should be done if there is Bluetooth connectivity issues to devices.
It does a full reset of the Bluetooth module.

Factory Reset Workflow

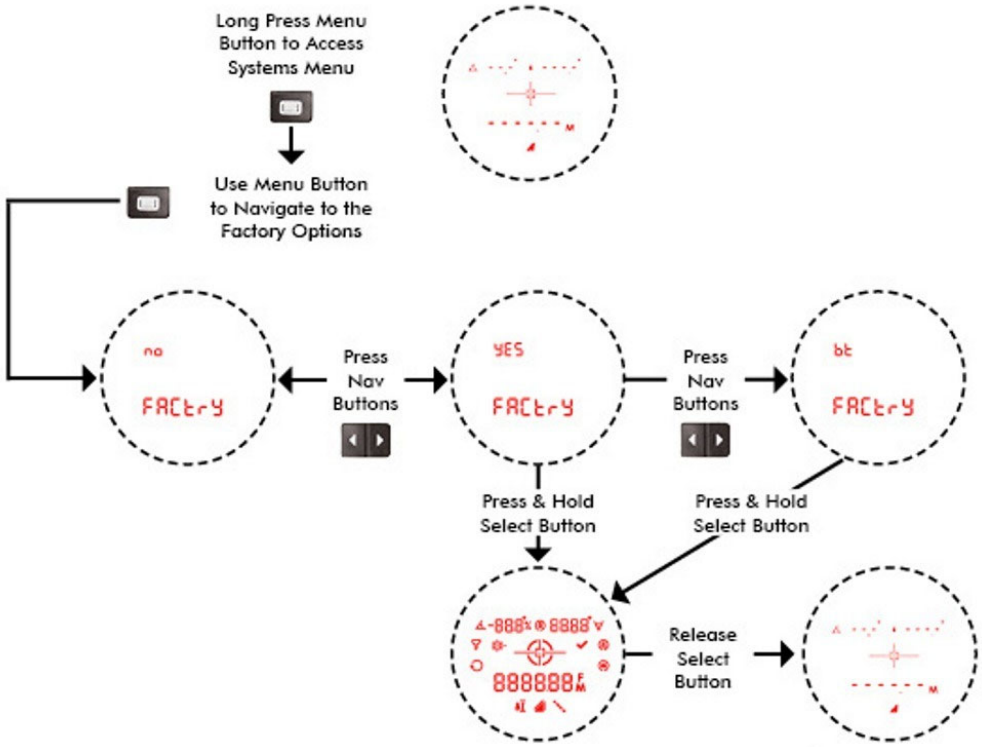


Figure 27

Factory Default Settings

Units of Measurement:

- Distance: Meters (M)
- Inclination: Degrees

Targeting Mode:	Standard (STD)
Reticle Option:	Full
Pulse:	Off
Measurement Mode:	Horizontal Distance
Bluetooth:	Off
Brightness level:	2
Range Gate:	Off
Short Range Gate Value	1 m (3 ft)
Long Range Gate Value	2500 m (8202 ft)
Declination	0.0

Code Firmware

The code firmware revision number provides Laser Tech Service Department information about your TruPulse 360i.

To display the code firmware revision:

1. Long press the Menu button, the bt option will be displayed.
2. Short press the Menu button to scroll until the Code Firmware option screen is displayed. In Figure 28, Code 123 is used as an example.
3. Short press Check Select button to return to the Measurement Mode.
    - Short press the Menu button to navigate to bt options.
    - Short press the FIRE button to exit to the Measurement Mode.

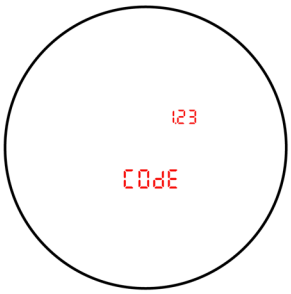


Figure 28

NOTE The TruPulse 360i firmware version can be updated using t he LaserSoft® Measure2 App on Google Play store. Download the App and follow the help instructions to update the firmware version.

Section 7 - Settings Mode

The Settings Mode can be accessed from the Measurement Mode.
Each option is described separately in the following sections:

- Brightness Levels
- Targeting Modes
- Range Gate
- Units Of Measurement
- Calibration

1. Short press the Menu button to enter the Settings options.
2. Press the Menu button to navigate through the options.
3. Press the FIRE button to exit to Measurement Mode.
4. Press the Select button to choose option and exit to Measurement Mode.

Settings Mode Workflow

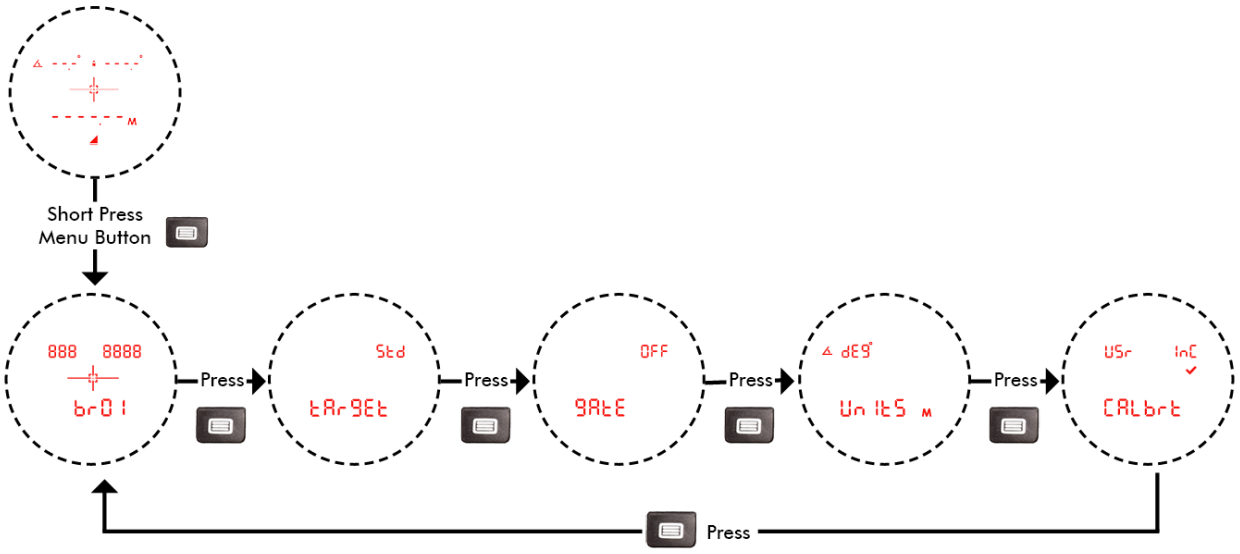


Figure 29

Saving Changed Options

During the Setting Mode, the option chosen will be set when you return to the Measurement Mode.

To save the option and be active when the unit powers off and on:

- Manually power off the unit (Page 7).

-or-

- Let the unit auto power off.

This ensures that any option chosen is saved.

NOTE If the battery door is opened before performing the above steps, the options chosen will not be saved and revert to last options saved.

Brightness Levels

1. Short press the Menu button to enter Settings menu, Brightness level is the first option.
2. Press either Navigation button until the desired setting is achieved.
   It's easy to get the desired setting if you look through the eyepiece while making the adjustment.
   - The LED in-scope display has five intensity settings from DIM (1) to BRIGHT (5).
   - Each time you press right Navigation button, the "brxx" value increases by 1.
   - If you press the right Navigation button while "br05" is displayed, you will see "br01" next.
3. Press Select button to accept the brightness level and return to the Measurement Mode.
   - Press the Menu button to Save brightness level and advance to Targeting Mode options
   - Press the FIRE button to exit to the Measurement Mode and not save the Brightness options Reverts to last options saved.

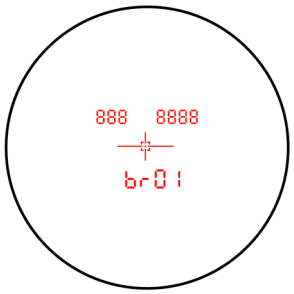


Figure 30

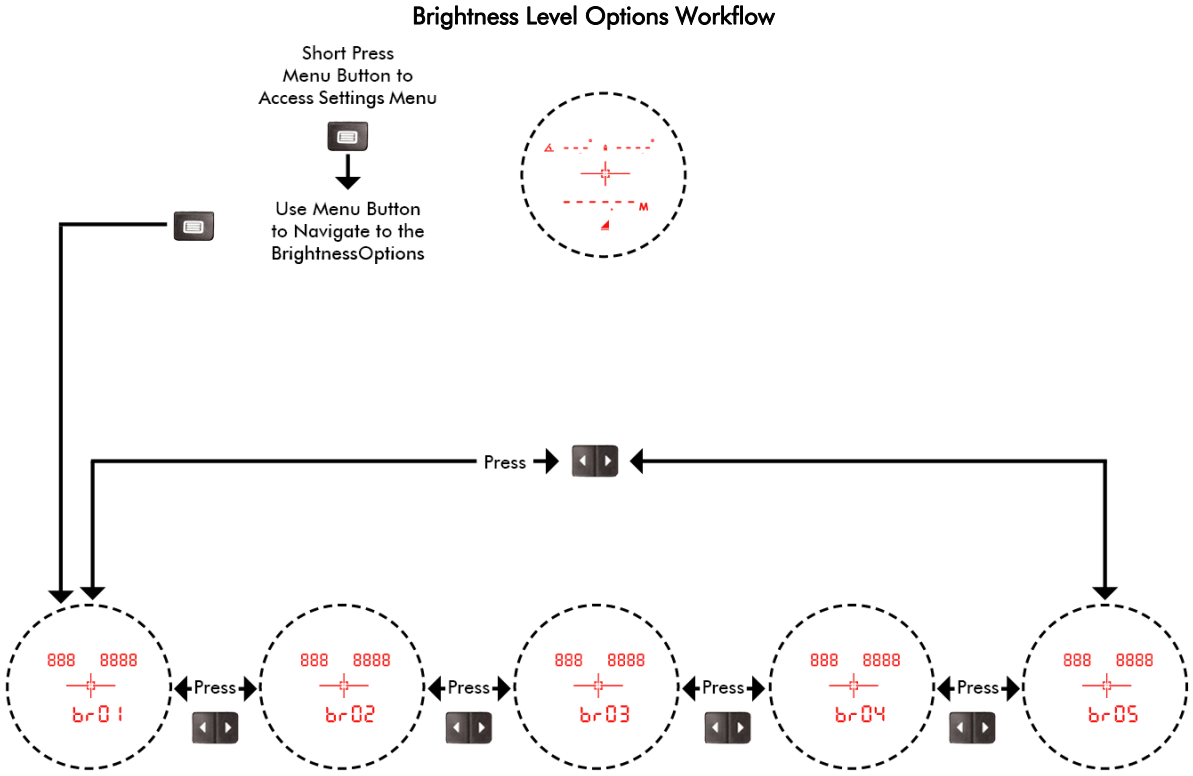


Figure 31

NOTES

- If you want to save the chosen Brightness Level option, power off the TruPulse 360i (Page 29).
- Each time the TruPulse 360i is powered ON, it will return to the saved Brightness Level option.

Targeting Modes

The TruPulse 360i has five Target Modes which allow you to select or eliminate targets and to take the most accurate measurements possible in various field conditions.

The selected Target Mode remains active until you select a different Target Mode.

Each time the TruPulse 360i is powered ON, it returns to the same Target Mode that was last used.

- **Std** = Standard. There is no icon in display when selected.
  Single shot mode.
  - Max measurement time, FIRE button held is 6 seconds
  - Once high-quality target (XX.XX) is acquired, measurement stops and display results.
  - If low quality target (XX.X) is measured, the TruPulse will continuously acquire additional targets until:
    - High quality target is acquired.
    - The FIRE button is released
    - The 6 second laser timeout has expired.
  - **NOTES:**
    - The MULTI indicator is not displayed in this mode.
    - Azimuth Value displayed:
      - Once a High Quality target is acquired, then Azimuth is displayed.
      - If Low Quality target and fire button is released, then Azimuth is displayed.
      - If Low Quality target, then a High Quality target, then Azimuth is displayed.
      - If Low Quality target and laser timeouts out, then Azimuth is displayed.

- **Con** = Continuous 
  Press-and-hold the Fire button. Once the target is acquired, the TruPulse 360i can continuously acquire additional targets for a maximum of 10 seconds. The most recently acquired target appears in the Main Display.
  - **NOTES:**
    - The MULTI indicator is not displayed in this mode.
    - Azimuth Value displayed:
      - The value will display quickly and update as you take measurements.
        This happens even with Low Quality or High Quality range measurements.

- **CLO** = Closest  or Closest Multi 
  Press-and-hold Fire button. Once the initial target is acquired, the TruPulse 360i can acquire additional targets. The Closest Multi indicator denotes that additional targets have been acquired. The closest acquired target always appears in the Main Display.
  - Max measurement time, FIRE button held is 6 seconds.
  - The minimum separation distance between targets is approximately 0.5 meters (10 ft).
  - **NOTE:** Refer to Panning Feature section about Azimuth value displaying (Page 33).

- **FAr** = Farthest  or Farthest Multi 
  Press-and-hold Fire button. Once the initial target is acquired, the TruPulse 360i can acquire additional targets. The Farthest Multi indicator denotes that additional targets have been acquired. The farthest acquired target always appears in the Main Display.
  - Max measurement time, FIRE button held is 6 seconds.
  - The minimum separation distance between targets is approximately 0.5 meters (10 ft).
  - **NOTE:** Refer to Panning Feature section about Azimuth value displaying (Page 33).

- FiLt = Filter .
  In this mode the laser's sensitivity is reduced to only detect pulses returned from a reflector. The mechanical receive foliage filter must be used in conjunction with this mode. Typical maximum distance is 350 feet to a 3-inch reflector.
  - Max measurement time, FIRE button held is 6 seconds.
  - Azimuth Value displayed: The value will be displayed when a High Quality target is acquired.
    In Filter mode, only High Quality targets are acquired since measuring to a reflector or prism.

  1. Short press the Menu button until the Target Mode option screen is displayed.
     The last Mode option chosen will be displayed.
  2. Press either Navigation button until the desired setting is achieved.
  3. Press the Select Button to accept the Targeting Mode option and return to the Measurement Mode.
     - Press the Menu button to Save Targeting mode option and advance to Range Gate options
     - Press the FIRE button to exit to the Measurement Mode and not save the Targeting mode option. Reverts to last option that was saved.
  4. Ready to take measurement with selected Target Mode option.
     - The icon of selected mode will be displayed.
     - Standard Mode does not have an icon displayed.
  5. Repeat steps to change target mode option.

Targeting Modes Workflow

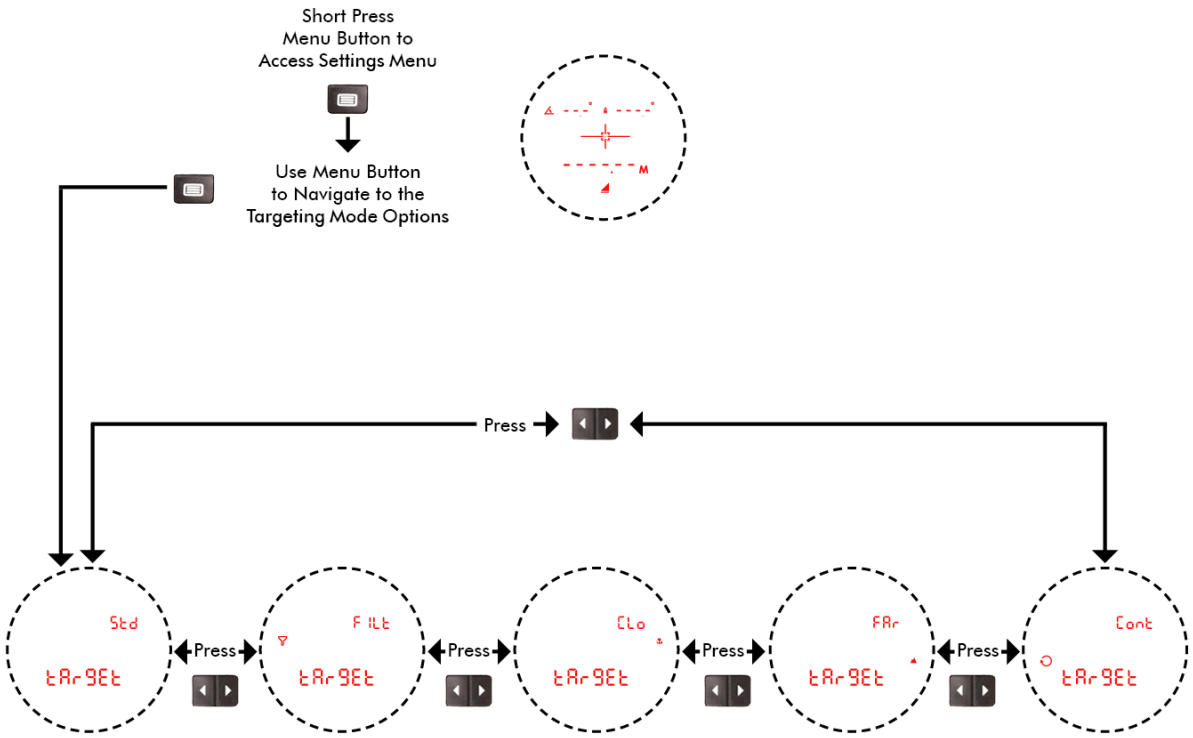


Figure 32

NOTES

- If you want to save the chosen Targeting Mode option, power off the TruPulse 360i (Page 29).
- Each time the TruPulse 360i is powered ON, it will return to the saved Targeting Mode option.

Closest & Farthest Panning Feature

To help ensure an accurate Azimuth value on the intended target while using Closest and Farthest modes, a Pan feature warning has been implemented.

- Different from previous generations of product, the TruPulse 360i Azimuth reading is measured and displayed only after the fire button is released.
- When long pressing the fire button in Closest or Farthest mode and an initial target is acquired, the TruPulse 360i will continue to scan. As additional targets are seen, the multi-target indicator will illuminate. Panning from one target to another can be performed to determine if the displayed measurement is the closest or farthest target. While panning, the Distance & Inclination values are updated. The Azimuth value is not displayed until the fire button is released.
- If panning is detected, the system will illuminate the reticle outer circle.
- In certain circumstances the instrument will return a PAn error, indicating the system protected the user from acquiring a suspect Azimuth heading.
- **NOTE** A user can defeat the pan detection warNoning by moving slowly and there is a potential for a false or incorrect Azimuth value intended in such cases.

Because the 360i reads the Azimuth angle after button release in CLOSEST and FARTHEST modes, care must be taken to ensure that the measured Azimuth reflects the position of the intended target. LTI has implemented a Pan detection algorithm to help prevent inaccurate measurements. The algorithm is designed to detect a scenario in which the user acquires a target, pans off it a significant amount, then releases the button.

Example: User acquires target 1 then pans to target 2 and remains there (Figure 33).

CLOSEST mode:

- Distance of 100 feet will be displayed along with inclination.
- Pan ring will illuminate while panning.
- Multi-target indicator will illuminate when second target is acquired.
- Inclination angle will be displayed real-time.
- Distance displayed will update from 100 feet to 50 feet.
- Pan ring will turn off after the unit is held steady for a short time on the second target.
- After button is released, Azimuth (5°) will display.
- If the button is released before the pan ring turns off, the unit will display PAn (no Azimuth, Inclination or Distance).
- **Pan is displayed in this scenario because the system wasn't given time enough to settle once the new (closest) target was acquired**

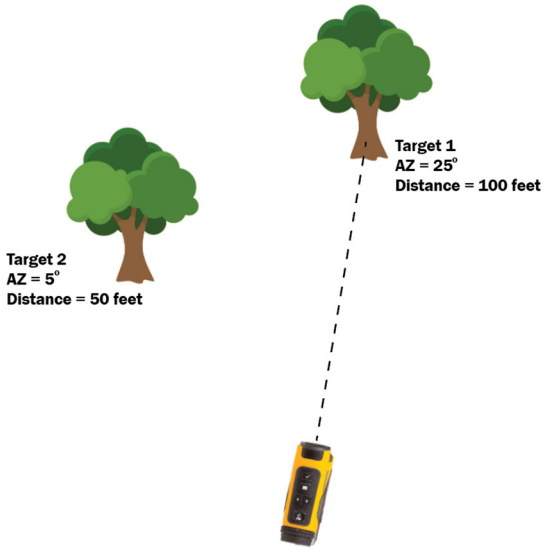


Figure 33

FARTHEST mode:

- Distance of 100 feet will be displayed along with inclination
- Pan ring will illuminate while panning
- Multi-target indicator will illuminate when second target is acquired
- Inclination angle will be displayed real-time
- Distance displayed will remain at 100 feet
- After button release, PAn will be displayed (no Azimuth, Inclination or Distance)
- **Pan is displayed in this scenario because the system detected a pan after acquiring the farthest target**

Panning Feature Workflows

Closest Mode Panning Workflow

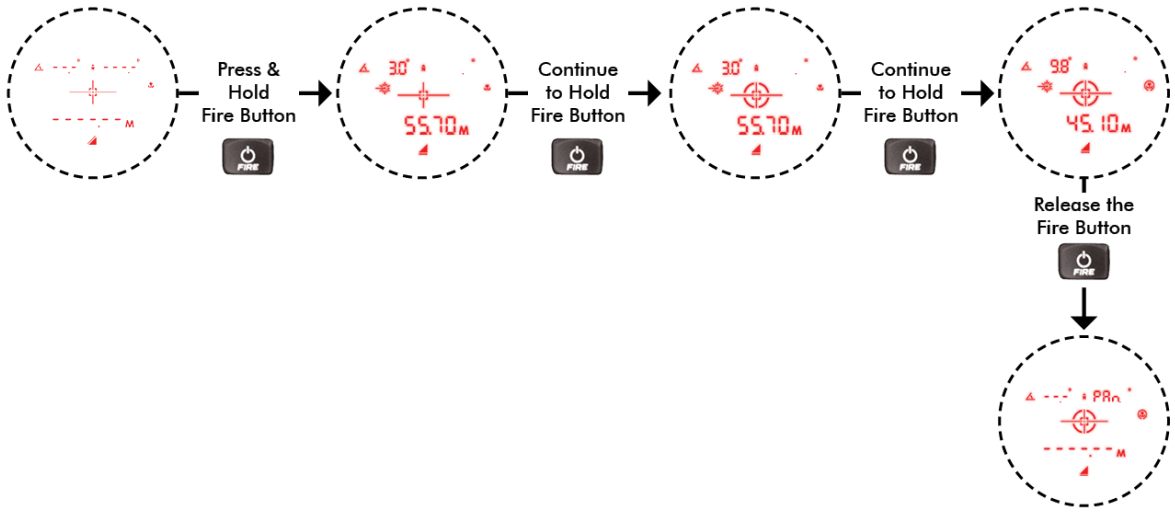


Figure 34

Farthest Mode Panning Workflow

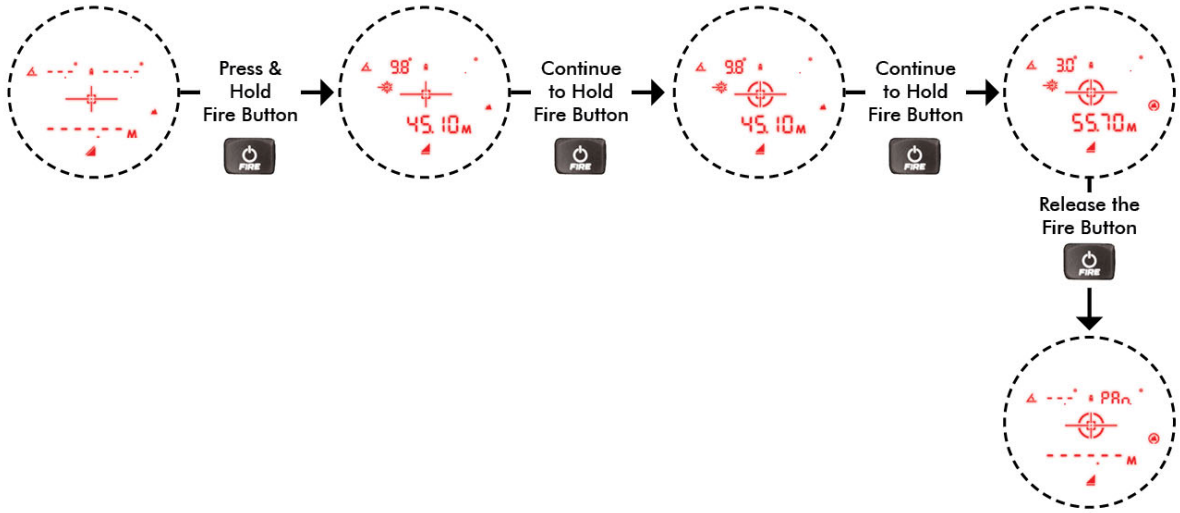


Figure 35

Range Gate

Using the Range Gate option it is possible to artificially extend the instrument's minimum range and restrict its maximum range. The range minimum is the Short Gate and the range maximum is the Long Gate. The specified ranges, which are always slope distance values, form the gate window.

- The ranges specified, form the "gate window." The range minimum is called the "short gate", and the range maximum, is called the "long gate."
  - The Short Gate artificially extends the instrument's minimum range. The gate window extends from the Short Gate value to the maximum range of the instrument.
  - The Long Gate restricts the instrument's maximum range. The gate window extends from the instrument's minimum range to the Long Gate value.
  - Both: The gate window extends from the Short Gate value to the Long Gate value
- One of the uses of the gate window is to help you make certain you are getting the right target when objects near you or just beyond your intended target present a danger of giving you false readings.

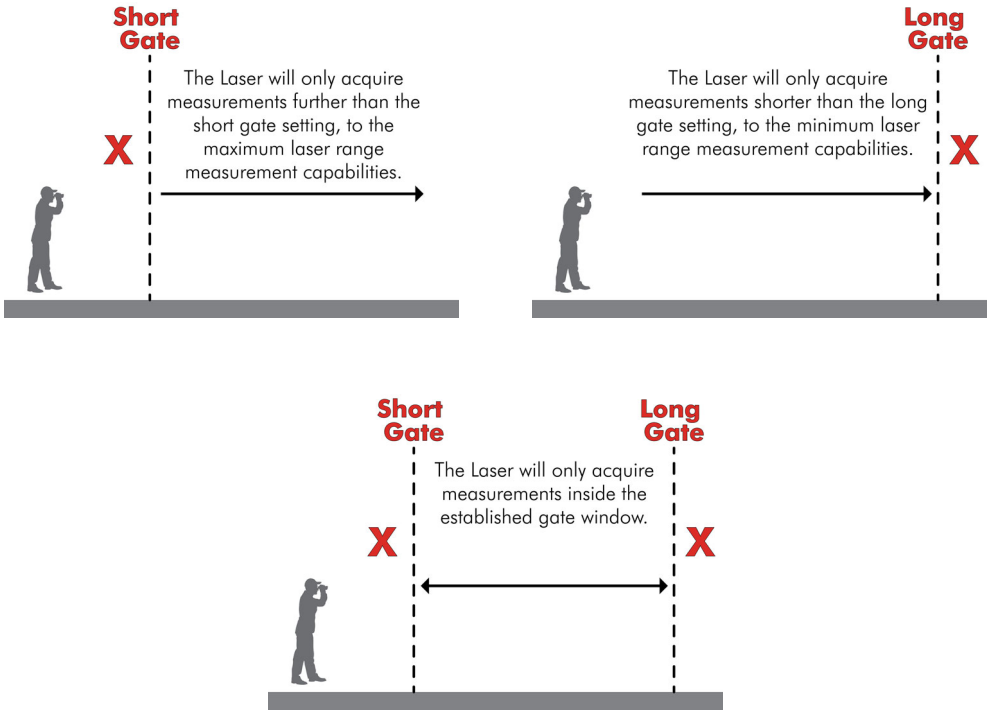


Figure 36

1. Short press the Menu button until the Range Gate option screen is displayed. The last option chosen will be displayed.
2. Press either Navigation button until the desired option is achieved.
3. Press the Select Button to accept the Range Gate option and return to the Measurement Mode.
   - See below Short and Long Gate have default values.
4. To change Short or Long gate values:
   - Long Press the Select Button
   - Short Press the Navigation buttons to change values slowly.
   - Long Press the Navigation buttons to change values quickly.
   - Press FIRE button to exit and return to Measurement Mode. Does not save options.
   - e.Menu button has no function.
5. Once desired value is set, short press the Select button to set value.
6. Display will be back at the desired option. User can change another value, or change options.
   - Press the Select button to save option and return to the measurement mode.
   - Press the Menu button to Save option and navigate to Units of Measurement options.
   - Press FIRE button to exit, option has been saved and returns to measurement mode.
7. The Range gate option icon will be displayed if Selected.
8. Repeat steps to change options.

Range Values

- Tenths and Hundredths cannot have a value set.
- Short Gate: Min Limit 1 m (3 ft) / Max limit 2499 m (8199 ft).
- Long Gate: Min Limit 2 m (6 ft) / Max limit 2500 m (8202 ft).
- The gate window has a minimum distance of 1 m (3 ft).
- Long gate cannot be set less than short and short cannot be set more than long gate.
- Neither gates can be set to 0.0.

NOTE If the unit does not acquire a measurement within the window, the display will show "------" dashes (No target acquired).

Range Gate Workflow

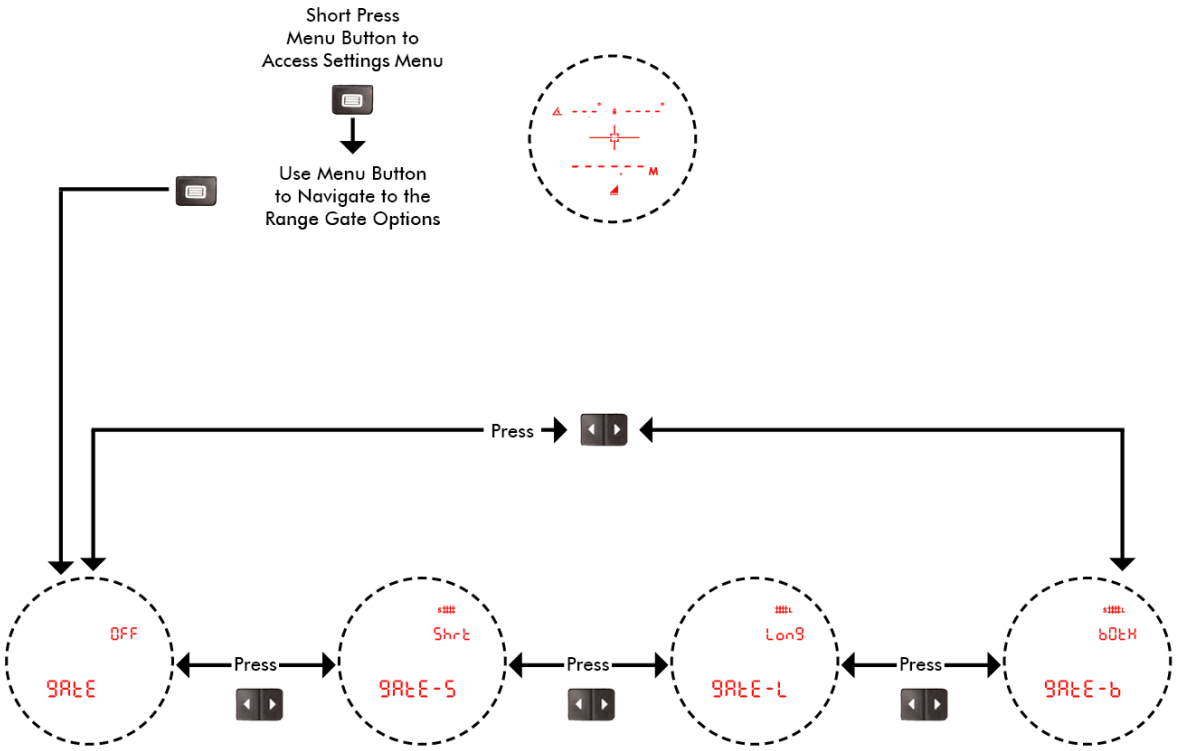


Figure 37

NOTES

- If you want to save the chosen Range Gate values, power off the TruPulse 360i (Page 29).
- Each time the TruPulse 360i is powered ON, it will return to the saved Range Gate values.

Units of Measurements (UoM)

The TruPulse 360i allows you to choose the units of measure. Distance: meters or feet. Inclination: Degrees or % Slope. To change the units of measurement option:

1. Short press the Menu button.
2. Press the Menu button to scroll until the UoM option screen is displayed.
   - The last UoM options chosen will be displayed.
3. Press either Navigation button until the desired setting is achieved.
4. Press the Select Button to accept the UoM option and return to the Measurement Mode.
   - Press the Menu button to Save UoM option and advance to Brightness level options
   - Press the FIRE button to exit to the Measurement Mode and not save the UoM option. Reverts to last options saved.

Units of Measurements Workflow

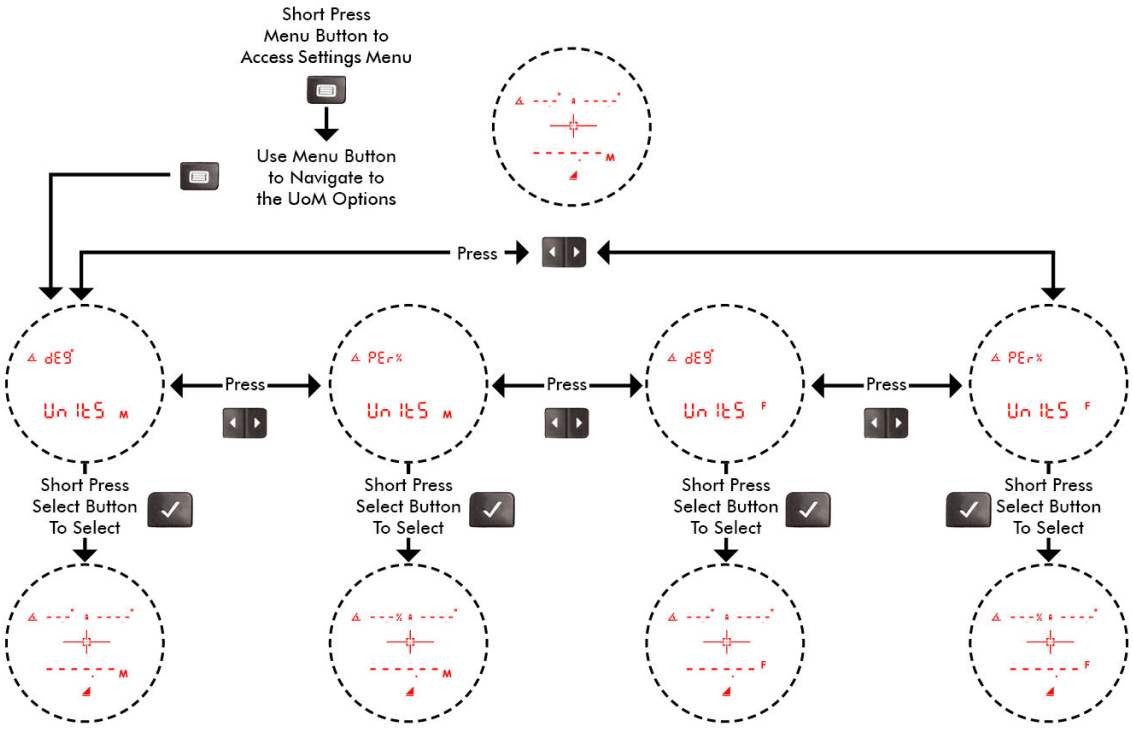


Figure 1

Figure 38

NOTES

- If you want to save the chosen Units of Measurements, power off the TruPulse 360i (Page 29).
- Each time the TruPulse 360i is powered ON, it will return to the saved Units of Measurements.

Calibration

Tilt Sensor Calibration

The tilt sensor is aligned during assembly. In the rare event that your TruPulse 360i suffers a severe drop shock, refer to the instructions below to re-align the tilt sensor.

Procedure

1. Short Press Menu button to enter Setting menu.
2. Press Menu button to scroll to the User Calibration option
3. Press the Select Button to enter the User Calibration options.
4. Press Navigation buttons "Yes InC Calbrt" display. Press the Select button.
5. At each step, wait approximately 1 second before pressing the FIRE button. Then wait another second before moving to the next position.
   NOTE It is important that the unit is held steady when the button is pressed.

Calibration Sequence

Position the TruPulse on a flat, relatively level surface (15 degrees of level).

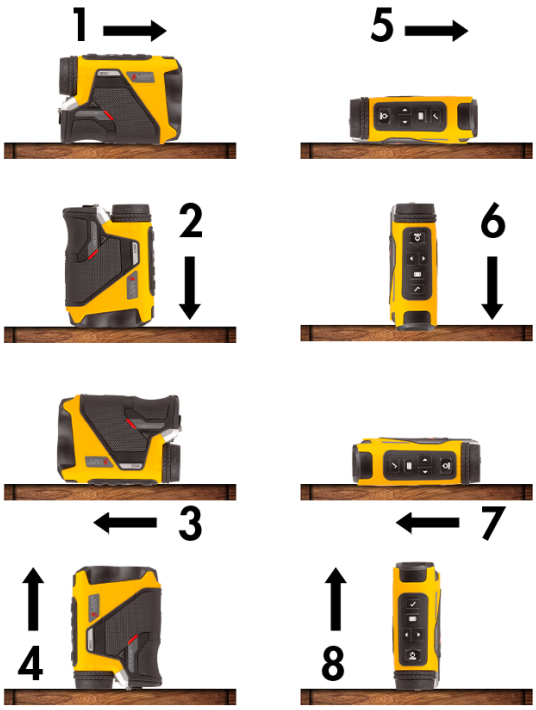


Figure 39

1. Place in Position 1 (C1_Fd), press FIRE button.
2. Place in Position 2 (C2_dn), press FIRE button.
3. Press FIRE button and place in Position 3 (C3_bc). At this position, wait 3 seconds then move to the next position.
4. Place in Position 4 (C4_UP), press FIRE button.
5. Place in Position 5 (C5_rF), press FIRE button.
6. Place in Position 6 (C6_rd), press FIRE button.
7. Place in Position 7 (C7_rb), press FIRE button.
8. Place in Position 8 (C8_rU), press FIRE button.
   - *If Fail Message appears,* repeat steps 1 through 8 above.
   - *If Pass Message appears,* the new calibration is saved. Press FIRE or SELCET button to return to the Measurement screen.

Fail Messages

- **FAiL1**: Excessive motion during calibration. Unit was not held steady.
- **FAiL2**: Magnetic saturation error. Local magnetic field too strong. User should move to a more suitable location and remove metallic and electronic objects from their person.Local magnetic field too strong.
- **FAiL3**: Mathematical fit error. User should move to a more suitable location and remove metallic and electronic objects from their person.User should move to a more suitable location and remove metallic and electronic objects from their person.
- **FAiL4**: Calibration convergence error.
- **FAiL6**: Orientations were wrong during the calibration.

NOTE If the calibration fails, the previous calibration is restored.

See Page 42 for the Tilt Sensor and Compass Calibration Workflow.

Compass Calibration

To begin the routine, you should be holding the TruPulse facing towards Magnetic North. Always perform outside and away from magnetic interference. The user compass calibration allows the unit to discover its own magnetic fields and to mathematically correct for them. See below about magnetic interference.

The compass is susceptible to magnetic interference and should be kept away from all ferro-magnetic materials and strong magnetic fields when performing the compass calibration. Do not perform the calibration inside a building, or in or near vehicles. The user calibration for the compass merely compensates for the magnetic changes of the unit itself.

Procedure

1. Short Press Menu button to enter Settings menu.
2. Press Menu button to scroll to the User Calibration option
3. Press the Select Button to enter the User Calibration options.
4. Press Navigation buttons "Yes 360 Calbrt" display. Press the Select button.
5. At each step, wait approximately 1 second before pressing the FIRE button.
   - Then wait another second before moving to the next position. It is important that the unit is held steadywhen the button is pressed.

Calibration Sequence

Figure 40

1. Face North (+/- 10 degrees), hold in Position 1 (C1_Fd), press FIRE button.
2. Hold in Position 2 (C2_dn), press FIRE button.
3. Hold in Position 3 (C3_bc). press FIRE button. At this position, wait 3 seconds then move to the next position.
4. Hold in Position 4 (C4_UP), press FIRE button.
5. Hold in Position 5 (C5_rF), press FIRE button.
6. Hold in Position 6 (C6_rd), press FIRE button.
7. Hold in Position 7 (C7_rb), press FIRE button.
8. Hold in Position 8 (C8_rU), press FIRE button.
9. Hold in position 9 (C9_UF), press FIRE button.
10. Hold in position 10 (C10_Ur), press FIRE button.
11. Hold in position 11 (C11_Ub), press FIRE button.
12. Hold in position 12 (C12_UL), press FIRE button.
    - *If Fail Message appears,* repeat steps 1 through 12 above.
    - *If Pass Message appears,* the new calibration is saved. Press FIRE or SELCET button to return to the Measurement screen.

Fail Messages

- **FAiL2**: Magnetic saturation error. Local magnetic field too strong. User should move to a more suitable location and remove metallic and electronic objects from their person.Local magnetic field too strong.
- **FAiL4**: Calibration convergence error.
- **FAiL6**: Orientations were wrong during the calibration.

NOTE If the calibration fails, the previous calibration is restored.
See Page 42 for the Tilt Sensor and Compass Calibration Workflow.

Continued on Next Page

Tips

- Always recalibrate your compass when the Calibration icon  flashes.
  - Large temperature changes occurred since last calibration.
  - Unit has been exposed to magnetic fields which may subtly magnetize it and its batteries.
  - Battery voltage has changed from last calibration by a certain amount.
  - Battery door was opened.
  - After a firmware update.
- If compass calibration fails repeatedly, perform the tilt calibration then repeat the above steps.

Magnetic Interference Guidelines

The following list represents minimum distances that should be kept between the TruPulse 360i and some common objects to prevent interference to the TruPulse compass. Be aware of what's around you and what you're carrying. Distance yourself from possible disruptions to get a good reading.

A user can use nonferrous metals and nonferrous alloys around a compass. These metals are not based on iron and include alloys of aluminum, copper, titanium, zinc, nickel, cobalt, tungsten, precious metals, and refractory metals.

Be aware that magnetized materials like soft iron, steel, and some stainless steels can become magnetized and demagnetized as they rotate relative to the earth's magnetic field.

Minimum 15.2 cm (6")

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

Minimum 1.8 m (6')

- Bicycle
- Fire Hydrant
- Road Sign
- Sewer Cap or Drain
- Steel Pole
- ATV
- Guy Wire
- Magents
- Barbed-Wire/Chain-I\Linked Fence
- GPS/GNSS receivers with magnets
- Data Collectors/Smart devices with magnets

Minimum 45.7 m (18")

- Clipboard
- Data Collector
- Computer
- GPS/GNSS Receivers/Antennas
- Speakers
- 2-Way Radio
- Hand Gun
- Hatchet
- Cell Phone Case w/ Magnetic Closure

Minimum 4.6 m (15')

- Electrical Box
- Powerline
- Building Concrete & Steel

Minimum 9.1 m (30')

- Vehicles/EVs
- Steel/Metal Building
- Bridges
- Heavy Machinery

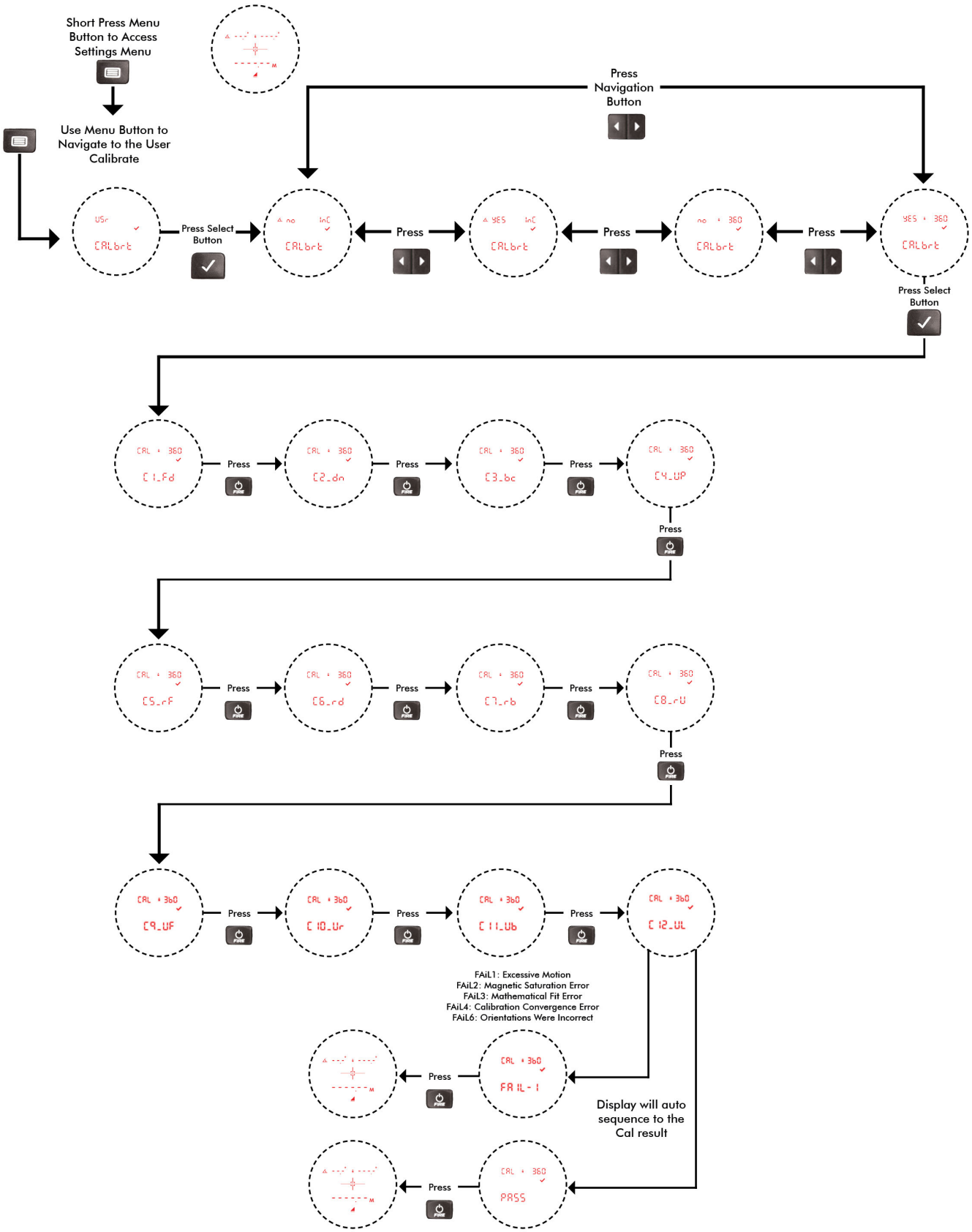
Field Tests for Local Magnetic Conditions

The following simple tests can be used in the field to test for local magnetic interference.

- If you are working on a street, and you know its orientation relative to true North, aim down the street and take a measurement. Nearly 80% of the streets in the US are oriented in a north-south or east-west direction.
  - The azimuth from the compass should match the known direction of the street.
- Choose a target at least 100 meters away (e.g., a pole) and shoot to it. Note the azimuth.
  Then step backwards or forwards 1 meter (or 1 yard) along the sight line to the target and shoot again.
  - The second azimuth should be within 1/10th to 5/10ths of a degree of the first azimuth.
    If it is, you are very likely within an anomaly-free area.
  - For increased confidence, repeat the test to a target at 90 degrees to the azimuth of the first target.
- This third test can be performed if you are in a questionable area. Aim and measure to your prospective next target and note the azimuth. Move to the next station and aim and measure back to the original station.

The azimuths should be 180 degrees different, plus or minus a few tenths of a degree.

Tilt Sensor and Compass Calibration Workflow



Section 8: Bluetooth Communication

Introduction

For more detailed information on the Bluetooth Communications, refer to the Laser Tech's Professional Measurement FAQs technical documents website (https://lasertech.com/professional-measurement-faqs/).

The TruPulse 360i Bluetooth module has Bluetooth Low Energy (BLE) and Bluetooth Classic architecture The module is Bluetooth v4.0 - Dual Mode. A description of command structures are found in a separate document "TruPulse 360i User Interface Communication Protocols and Commands".

Both Bluetooth Classic and BLE modes implement an ASCII command-response communication scheme described in the section Data Format. The master smart device can issue a command, and the slave LTI laser device will issue a response if the command is supported. In addition, upon acquisition of a range, the LTI laser device will report range data to the master smart device without the master's request.

Bluetooth Classic (BT)

All LTI devices that support Bluetooth Classic will use the Serial Port Profile (SPP), as defined by the Bluetooth Special Interest Group (SIG).

Bluetooth Classic-enabled LTI devices follow the guidelines of the NMEA 0183 Standard for Interfacing Marine Electronic Navigational Devices, Revision 2.0:

- NMEA 0183 provides for both standard and proprietary data formats. Since none of the standard formats are useful for the data transferred from the laser, special proprietary formats are used. Rules described in the NMEA standard governing general message structure, leading and trailing characters, numeric values, delimiting character, checksums, maximum line length, data rate, and bit format are followed exactly.
- As required by NMEA 0183, the LTI device will not respond to unrecognized header formats, malformed messages, or messages with invalid checksums.
- Bluetooth Classic can communicate/connect to Windows, Windows Mobile and Android devices. Classic mode cannot connect to iOS devices, must use BLE mode to connect to iOS devices.

Bluetooth Connection

Advertisement Name: The name that Smart devices/phones will see when "scanning" for a Bluetooth device.

- TruPulse 360i: "TP360i-000000" where "000000" is the serial number of your TruPulse.

Section 9 - Care & Maintenance

The batteries are the only user-replaceable parts in the TruPulse 360i. Do not remove any screws. To do so will affect or void the LTI Limited Warranty.

- **Temperature Range**
  TruPulse® 360i components are rated for Operating temperature range of -20 to 60° C (-4 to 140° F). Do not expose the instrument to temperatures outside these ranges.

- **Protecting from Moisture and Dust**
  The TruPulse 360i is sealed to provide protection from normally expected field conditions. It is protected from dust and rain, but will not withstand submersion.

  If water leakage is suspected:
  - Power OFF the TruPulse 360i.
  - Remove the battery.
  - Air dry the TruPulse 360i at room temperature with the battery compartment open.

- **Protecting from Shock**
  The TruPulse 360i is a precision instrument and should be handled with care. It will withstand a reasonable drop shock. If the unit suffers from a severe drop shock, you may need to send the unit to LTI for service repair.

- **Transporting**
  When transporting the TruPulse 360i, the unit should be secured in the provided carrying case. The provided neck strap can be used when carrying the TruPulse 360i in the field.

- **Cleaning**
  Clean the TruPulse 360i after each use, before returning to the carrying case.
  Check all of the following items:
  - *Excess moisture*. Towel off excess moisture, and air dry the instrument at room temperature with the battery removed and the battery compartment open.
  - *Exterior dirt*. Wipe exterior surfaces clean to prevent grit buildup in the carrying case. Isopropanol may be used to remove dirt and fingerprints from the exterior.
  - *Transmit and Receive Lenses*. Use the provided lens cloth to wipe the lenses. Failure to keep the lenses clean may damage them.

- **Storing**
  If you won't be using the TruPulse 360i again soon, remove the batteries before storing the instrument.

Section 10 - Specifications

All specifications are subject to change without notice. Please refer to LTI's website for current specifications. If you are not able to locate the information on the website or if you do not have internet access, please contact LTI via phone or fax.

Distance Accuracy:	0.1 m < 1,000 m (4 in < 3,280 ft) and to a High-Quality target 0.2 m > 1,000 m (8 in > 3,280 ft) or to a Low-Quality target	
Distance Units:	Meters and Feet	
Inclination Accuracy:	0.1° @ 0° to ±30° 0.2° @ ±30° to ±90°	
Inclination Units:	Degrees, % Slope	
Azimuth Accuracy:	< 1.0° RMS	
Performance Range:	**Distance:** **Inclination:**	50 cm - 2,500 Meters (20 in - 8,202 ft) ±90°
Display Resolution:	**Distance:** **Inclination:**	0.01 = High-Quality Target, 0.1 = Low-Quality Target 0.1 degree, 1% Slope
Target Acquisition:	0.5 Seconds	
Optics:	5X Magnification	
Display Type:	Ultra Bright LED HUD; 5 Brightness levels	
Wireless Communication:	Bluetooth V4.0 Dual Mode: BLE / Classic BT; iOS, Android™, and Windows® Compatible	
Bluetooth Regulatory Certificates:	USA (FCC) SQGBT900 EU N/A UK (UKCA) N/A Canada (ISED) 3147A-BT900 Japan (MIC) 201-140156 Taiwan (NCC) CCAF20Y10110T8	
Battery Type:	AA battery (2)	
Battery Duration:	**Alkaline:** Expected Time 6 hrs. Approximately 1,000 measurements. **Lithium-ion:** Expected Time 40 hrs. Approximately 6,300 measurements. **NOTE** These are sample numbers and can vary based on the specific brand, temperature, usage conditions, and battery quality. Assumes pressing FIRE button every ~20 seconds over BLE.	
Environmental Rating:	IP67: Waterproof & Dustproof	
Operational Temperature:	-20°C to +60°C. (-22°F to 140°F)	
Storage Temperature:	-25°C to +70°C (-13°F to 158°F)	
Size:	H = 88mm (3.4"), W = 43.4mm (1.7"), L = 118.3mm (4.6")	
Weight:	382.6g (13.5oz) with batteries; 337.4g (12 oz) without batteries	
Regulatory Standards:	FCC; CE; IEC; RoHs; REACH, WEEE	
Eye Safety:	FDA CLASS 1 LASER PRODUCT: Product complies with IEC60825-1 Ed. 3:2014-5 and 21CFR1040.10/11 per Notice 50:2007	
Certifications and Standards:	**Temperature/Humidity:** **Vibration:** **Shock:**	OIML D11 Method 514.6, CAT24 MIL-STD-810G Method 514.6, CAT 24 MIL-STD-810G Method 514.6, CAT 24
Laser Wavelength:	905 nm	
Warranty:	2 year	

Section 11 - LTI Limited Warranty

What is Covered?

Laser Technology, Inc. (LTI) warrants this product to be in good working order. Should the product fail to be in good working order at any time during the warranty period, LTI will, at its option, repair or replace this product at no additional charge.

Parts and products that have been replaced as a result of a warranty claim become the property of LTI.

What is the Period of Coverage?

This warranty remains in force for two years from the date of purchase from LTI or an authorized LTI product dealer; unless otherwise noted by LTI at the time of sale. LTI reserves the right to require written verification of the date of the original purchase of any product.

What is Not Covered?

LTI has no obligation to modify or upgrade any product once sold. Any reproduction of software products is strictly forbidden. This limited warranty does not include service to repair damage to the product resulting from:

- Accident
- Disaster
- Misuse
- Abuse
- Non-LTI modification
- Batteries or damage caused by batteries used in our products.

In no event will LTI be liable to you for any damages, including any lost profits, lost savings, or other incidental or consequential damages arising out of the use or inability to use such product. Furthermore, LTI shall not be held responsible if an LTI authorized dealer has been advised of the possibility of such damage, or for any claim by any other party.

What Will We Do to Correct Problems?

If this product is not in good working order as warranted above, your sole remedy shall be repair or replacement as provided above.

How does State Law Relate to this Warranty?

LTI hereby disclaims all other express and implied warranties for the product, including the warranties of merchantability and fitness for a particular purpose. Some states do not allow the exclusion of implied warranties, so the above limitations may not apply to you.

How do You Get Service?

In the unlikely event that your LTI product should require warranty or repair service, contact us to receive a Return Merchandise Authorization (RMA) number before returning your product.

If the product is delivered by mail, you agree to insure the product or assume the risk of loss or damage in transit. In addition, the shipping container or equivalent, will be sent prepaid and for door-to-door delivery.

Why Should You Complete and Return the Warranty Validation Card to LTI?

The Warranty Validation Card (shipped in the box with your TruPulse) must be completed and received by LTI in order to benefit from this limited warranty. If an LTI software product requires registration, this must also be completed to benefit from this limited warranty. Receipt of the warranty validation card not only activates the limited warranty, it also allows LTI to contact you directly when hardware or software upgrades become available.

If you prefer to register your LTI product electronically, please visit our website (www.lasertech.com/Warranty-Registration.aspx)

Section 12 - Main Display LCD Characters

The Main Display is used to convey messages and measurement results.

Upper Left Display Characters

Upper Right Display Characters

Lower Main Display Characters

Numbers 0-9:

Alpha Characters:

Display	Alpha	Display	Alpha	Display	Alpha
	a		g		p
	b		h		r
	c		i		s
	d		L		t
	e		n		u
	f		o		

Due to the limited number of characters available, many messages have to be abbreviated.
The table below lists the messages that appear in the Main Display.

Upper Left Display

Display	Translation
	Degrees of Inclination
	Percent Inclination
	Off
	On

Upper Right Display

Display	Alpha	Display	Alpha
	Standard Target Mode		Range Gate Off
	Filter Target Mode		Range Gate Short
	Closest Target Mode		Range Gate Long
	Farthest Target Mode		Range Gate Both
	Continuous Target Mode		Code

Lower Main Display

Display	Translation	Display	Alpha	Display	Alpha
SHot	Height Routine Shot	tAr9Et	Target Modes	bt OFF	Bluetooth Off
An9_1	Height Routine Angle 1	9AtE	Gate Mode	bt bLE	Bluetooth Low Energy
An9_2	Height Routine Angle 2	9AtE-S	Gate - Short	bt On	Bluetooth Classic On
SHot-1	ML Routine Shot 1	9AtE-L	Gate - Long	PULSE	Pulse Mode
SHot-2	ML Routine Shot 2	9AtE-b	Gate - Both	rEtCLE	Reticle Options
br01	Brightness Level 1	Un itS	Units of Measurement	dECLn	Declination - Compass
br02	Brightness Level 2	CALbrt	Calibration	FACtrY	Factory Default
br03	Brightness Level 3	C i_Fd	TruPulse Position for Calibration	UP9rdE	Upgrade
br04	Brightness Level 4	PASS	Calibration - Pass	CodE	Code
br05	Brightness Level 5	FA iL-1	Calibration - Fail (1-4 and 6)		