Laser Technology, Inc.

TruPulse® 200
User's Manual

Measurably Superior®

LTI TruPulse 200 User's Manual
Sixth Edition - Part Number 0144773

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This product is covered by the following issued U.S. Patent:
7,349,073

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TruPulse Reference Information:

Record information about your TruPulse in the table below.

	You can find this value:	*Value*
Serial Number	On the serial number sticker affixed to the TruPulse.	
Firmware Revision Numbers	See page 13 for information.	Main: Auxiliary:

Table of Contents

Precautions

Avoid staring directly at the laser beam for prolonged periods.

   ⓘ This product complies with IEC 60825-1, 2014-5, Ed. 3.0 and complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice 50, Dated June 24, 2007.

The TruPulse® 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.

Avoid direct sun exposure on the eyepiece.

Exposing the eyepiece to direct sunlight can damage the internal display.

Do not expose the instrument to extreme temperatures.

TruPulse® components are rated for a temperature range of -4° F to +140° F (-20° C to +60° C). Do not expose the instrument to temperatures outside this range whether in use or in storage.

Section 1 - Introducing the LTI TruPulse 200

Congratulations on the purchase of your TruPulse, a cost-effective professional rangefinder. This compact and lightweight laser is a flexible tool for your measurement needs. The TruPulse includes five measurement modes, five target modes, and serial data output.

Features of the TruPulse 200:
- Crystal clear optics and the heads up display lets you keep your eye on the target.
- "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.
- The Target Mode allows you to select or eliminate targets; which helps 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 via wired RS232 serial and/or Bluetooth wireless communication.
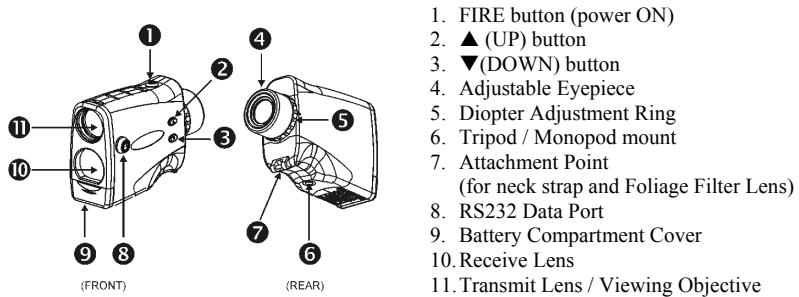

1. FIRE button (power ON)
2. ▲ (UP) button
3. ▼(DOWN) button
4. Adjustable Eyepiece
5. Diopter Adjustment Ring
6. Tripod / Monopod mount
7. Attachment Point
   (for neck strap and Foliage Filter Lens)
8. RS232 Data Port
9. Battery Compartment Cover
10. Receive Lens
11. Transmit Lens / Viewing Objective

Figure #1

Operating Modes

Measurement Modes*	Target Modes	System Setup Modes
Slope Distance	Standard	Units Selection
Vertical Distance	Continuous	Bluetooth Enable
Horizontal Distance	Closest	Tilt Sensor Alignment
Inclination	Farthest	
3-Point Height Routine	Filter	
2D Missing Line Routine		

* Domestic Lasers: feet or yards

* International Lasers: meters, feet or yards

Unpacking Your TruPulse

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

Basic Package

- TruPulse 200
- Carrying Case
- Eyepiece Cover
- Lens Cloth
- Neck Strap

Compatible Accessories

● Data Download Cable　　　　● Foliage Filter　　　　● Tripod / Monopod

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

Understanding How the TruPulse Works

The TruPulse consists of a laser range sensor, an integrated tilt sensor, and a digital processor. The TruPulse has three buttons that access the unit's internal software, which controls the integrated sensors.

LCD Display

A liquid crystal display (LCD) is mounted within the optical system and when activated, displays a reticle for targeting, yards / meters, and the display indicators. Inherent in the manufacturing process are small black spots that appear in the optical system. These are a natural characteristic of the LCD and cannot be fully eliminated in the manufacturing process. These small black spots do not affect the distancing performance of the unit.

Laser Range Sensor

The laser range sensor emits invisible, eye safe, infrared energy pulses. The TruPulse 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 10 seconds. Once the target is acquired or the laser has timed out, you can release the FIRE button. The TruPulse has a broad spectrum of sensitivity and can work with both reflective and non-reflective targets. See TruTargeting (below) for information about high quality and low quality targets.

TruTargeting

The TruPulse 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 non-reflective target, the maximum measurement distance is approximately 1,000 meters (3,280 feet). When shooting to a reflective target, the maximum measurement distance is approximately 2,000 meters (6,560 feet).

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 has an effect on the precision of measurements. A high quality target will result in a measurement that includes one decimal place (tenths). A low quality target will result in a measurement that is a whole number.

(i) Examples:

- *120* feet (meters / yards) indicates a measurement was made to a low quality target.
  - o Accuracy: ±1 yd (±1 m).
- *120.0* feet (meters / yards) indicates a measurement was made to a high quality target.
  - o Feet are shown in half-unit increments (.0 or .5).
  - o Meters and Yards are shown in tenth-unit increments (.0 - .9).
  - o Accuracy: ±8 inches (±20 cm).
- Only International lasers include meters.

Tilt Sensor

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

(i)
- The laser is not active in the Inclination (INC) Measurement Mode.
- Generally, the inclination is measured when you press (FIRE). However in (1) the Continuous Target Mode and (2) in the Height Measurement Mode, the inclination reading appears in the Main Display and the display updates as your aiming point changes as long as you press (FIRE). In these two situations, the measured inclination is based upon the aiming point when you release (FIRE).

Digital Processor

The TruPulse includes LTI's proprietary ASIC chip (Application-Specific Integrated Circuit). The ASIC chip combined with high-speed CPU processing allows the TruPulse to deliver accurate and fast measurements.

Section 2 - Quick Start

Note: Only International lasers include meters.

1. Install the batteries .
2. Press ⏻ to power ON the TruPulse.
3. Select a target such as a tree or a building. For this example, the target should be approximately 250 feet (82 yards or 75 meters) from you.
4. Look through the eyepiece (see Figure #2) and use the crosshair to aim to the target. The in-scope LCD should look similar to Figure #3A.
   o If the HD indicator is not displayed, press ▲ or ▼ until the HD indicator is displayed.
5. Press-and-hold ⏻. The LASER status indicator is displayed while the laser is active (Figure #3B). The laser will remain active for a maximum of 10 seconds while acquiring data about the target.

   o If the target is not acquired, release ⏻ and repeat this step.
6. Release ⏻ once the distance is displayed (Figure #3C). The measurement will flash one time and then will be displayed steady until you press a button or the unit powers OFF.
   o Press ▲ or ▼ to scroll through the measurement modes and see the results acquired for each function.
   o Repeat steps #3-#6 above to take another measurement.
   o Simultaneously press-and-hold ▲ and ▼ for 4 seconds to power OFF the TruPulse.
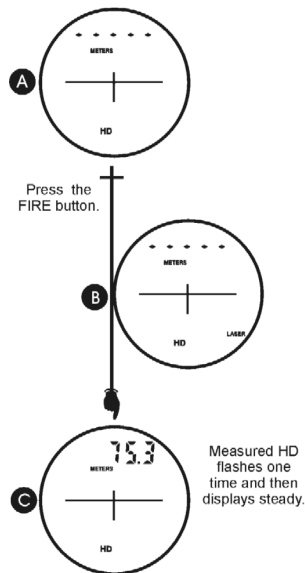
Figure #2

Figure #3

Section 3 - Basic Operations

Batteries

Installation

You may use two AA batteries (or 1 CRV3 battery) to power the TruPulse. The CRV3 battery provides approximately twice the usage time of the AA batteries.

1. Remove the battery compartment cover by gently pressing and sliding the cover in and down as shown in Figure #4A.
2. *If using AA batteries*, install the batteries as shown in Figure #4B. Batteries must be oriented (+/-) as shown in Figure 4B and also on the indication sticker found inside the battery compartment.
   o *If using one CRV3 battery*, the battery compartment is designed so the battery will only fit one way.
3. Replace the battery compartment cover by aligning the tabbed edges of the cover with the grooved edges of the battery compartment, and slide the cover up until the tab locks into position.
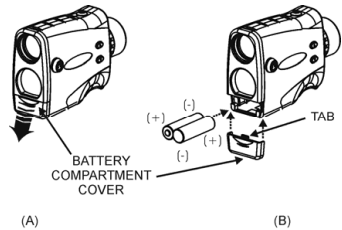

Figure #4

Low Battery Warning

The TruPulse monitors the incoming battery voltage. Figure #5 shows the location of the battery status indicator.

* *When the voltage drops below 2.2V*, the BATT status indicator flashes every 5 seconds, alternating with the normally displayed information.
  o You should replace the batteries as soon as possible.
* *When the voltage drops below 2.0V*, the BATT status indicator stops flashing and is displayed steady. At this point, system operation is locked.
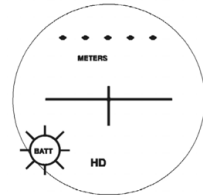 o You must replace the batteries to return to normal system operation.

Figure #5

Buttons

The TruPulse has three buttons. With the TruPulse in your right hand and looking through the

eyepiece, 🔘 is located on top, near your index finger and ⬤ and ⬤ are located on the left side
of the instrument.

	Measurement Modes	Powers ON the unit. Distance Measurement: fires the laser. Inclination: Release "locks" tilt sensor in (1) Height Measurement Mode and (2) Continuous Target Mode.
	Height Routine	(HD) Fires the laser. (INC) Release "locks" tilt sensor.
	Target Modes **System Setup Modes**	Selects option and returns to the Measurement Mode.
	Aligning Tilt Sensor	When "DonE" message displayed, exits the routine and returns to the Measurement Mode.

	Measurement Modes	Press to scroll to the previous Measurement Mode.
(UP)		Press-and-hold 4 seconds to access the Target Mode.
	Height Routine	Clears the last measurement and re-displays the previous prompt.
	Target Modes **System Setup Modes**	Press to scroll to the previous option.

	Measurement Modes	Press to scroll to the next Measurement Mode.
(DOWN)		Press-and-hold 4 seconds to access the System Setup Modes.
	Height Routine	Exits the Height Routine.
	Target Modes **System Setup Modes**	Press to scroll to the next option.

Powering OFF the TruPulse

To power OFF the unit, simultaneously press-and-hold ⬤ and ⬤ for 4 seconds. To conserve
battery power, the TruPulse powers itself OFF if no button presses are detected after a specified
length of time:

- o   Bluetooth OFF: 2 minutes
- o   Bluetooth ON: 30 minutes

Display Indicators

Figure #6 shows the LCD in-scope display. 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.
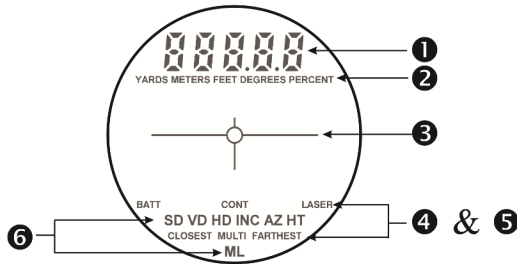

Figure #6

❶	Main Display	888.8.8	Displays messages and measurement results.

❷	Measurement Units	YARDS METERS FEET	Distance measurement units. Selection available in the System Setup Modes. Note: Only International lasers include meters.
		DEGREES	Inclination measurement units.

❸	Crosshair		Serves as the aiming point reference, both horizontally and vertically.

❹	Status Indicators	BATT	*Flashing:* battery voltage is low. *Steady:* battery voltage is too low for system operation. *Not Visible:* battery voltage is within acceptable range.
		LASER	*Visible:* laser is firing. *Not Visible:* laser is not active.
		MULTI	Multiple targets have been logged in the Closest or Farthest target mode.

❺ Target Modes	CONT	The unit continuously acquires targets and displays measurements while 🔘 is held down. The distance to the most recently acquired target is displayed.
	CLOSEST	The unit logs multiple targets while 🔘 is held down. Of the targets acquired, the distance to the closest target is displayed.
	FARTHEST	The unit logs multiple targets while 🔘 is held down. Of the targets acquired, the distance to the farthest target is displayed.
	Filter ('F' appears as the left most character of the Main Display to indicate Filter Mode is active.	Similar to Standard, single shot mode, but the laser's sensitivity is reduced to only detect pulses returned from a reflector. The optional foliage filter must be used in conjunction with this mode.
	Standard (No display indicator)	Standard, single shot strongest target mode.

❻ Measurement Modes	SD Slope Distance	Straight line distance between the TruPulse and the target.
	VD Vertical Distance	The distance between the target and the perpendicular to the path of the horizontal distance.
	HD Horizontal Distance	The level distance between the TruPulse and the plane of the target.
	INC Inclination	The angle of inclination between the TruPulse at level and the target.
	AZ	Not available.

HT Height	Three-step height routine. The final calculation represents the vertical distance between the points on the target represented by ANG1 and ANG2.
ML 2D Missing Line	Two-step Missing Line Routine finds the connecting vector (or missing line) between two points. The final calculation shows the SD, VD, HD, and INC associated with the missing line.

Display Indicator Test

To verify that all display indicators are working properly:

1. Start with the TruPulse powered OFF, press-and-hold ⊙.
2. Compare the in-scope display to the Figure #6 (page 9) to verify that all indicators are working properly.
3. Release ⊙ to start normal operation.

Error Codes

Error conditions can occur in a measurement or in the system hardware. To make sure that you never get an erroneous measurement, the TruPulse monitors both system hardware and measurements. When the instrument detects an error condition, it displays and error code instead of a measurement.

Error codes appear in the main display and are in the form of "Exx", where "xx" is an error code number. Figure #7 shows an example error code, E36.
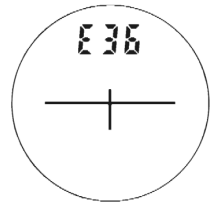

Figure #7

ⓘ If an error code persists:

1. Release ⊙ and press again to try to retake the measurement.
2. Remove and re-install the batteries and then try to retake the measurement.
3. If the above steps do not resolve the error, contact LTI or an Authorized LTI Distributor for assistance. Refer to the inside front cover for LTI contact information.

Eyepiece

The adjustable eyepiece (see Figure #8) 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.
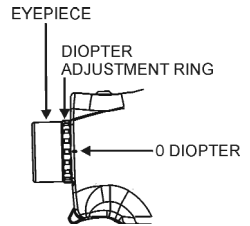
EYEPIECE

DIOPTER
ADJUSTMENT RING

0 DIOPTER

Figure #8

(i) Eyepiece Cover:
The eyepiece cover protects the internal components from sunlight exposure. The eyepiece cover should be in place whenever the TruPulse is not in use.

To attach the eyepiece cover:
Feed the thin cord under the metal bar and flare the loop open.
Pull the eyepiece cover through the loop and cinch tight.

Diopter Adjustment Ring

The diopter adjustment ring (see Figure #8) allows you to focus the LCD in-scope display relative to the target for your eye. During assembly, optimum focus is set to infinity. To adjust the LCD focus, turn the diopter adjustment ring to suit your personal preference.

Firmware Revision Numbers

The firmware revision numbers provide manufacturing information about your TruPulse. To display the main and auxiliary firmware revision numbers:

1. Start with the TruPulse powered OFF, press-and-hold ⏻.

    o   Do not release ⏻ until done. If you release the button too early, power OFF the TruPulse and repeat step #1.

2. Looking through the eyepiece:

    o   Press ▲ to display the main firmware revision number. The display should look similar to the example below. The leftmost character will always be '*A*' and the remaining 3 digits represent the main firmware revision number (*1.02* in Figure #9).
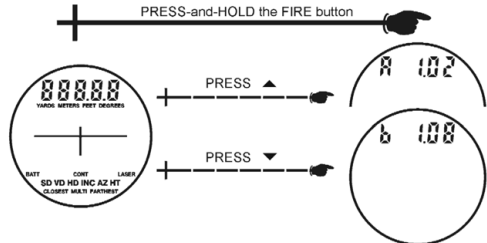
Figure #9

    o   Press ▼ to display the auxiliary firmware revision number. The display should look similar to the example above. The leftmost character will always be '*b*' and the remaining 3 digits represent the auxiliary firmware revision number (*1.08* in Figure #9).

Neck Strap

To attach the neck strap:
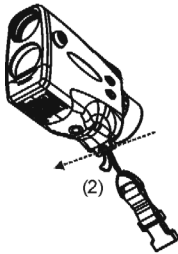
(1) Disconnect anchor end of the strap using the buckle.
(2) Feed loop around metal bar.
(3) Thread the neck strap through the loop.
(4) Gently tighten to secure.
(5) Reconnect anchor end of the strap using the buckle.
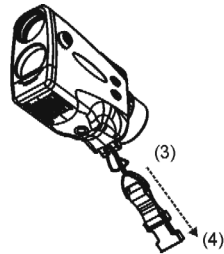
Figure #10

Section 4 - System Setup Modes

Figure #11 shows an overview of the System Setup Mode which can be accessed from the Measurement Mode. Each option is described separately in the following sections.

1.   From the Measurement Mode, press and hold ⬇ for 4 seconds. "UnitS" will appear in the Main Display.
2.   Press ⬆ or ⬇ to display the previous or next option.
3.   Press ⏻ FIRE to select an option.
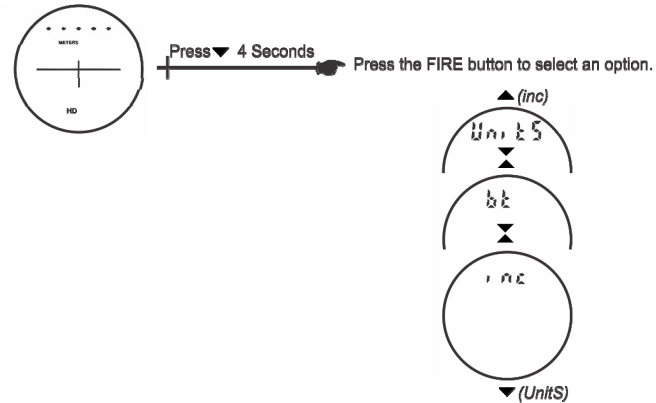
Figure #11

Units

The TruPulse allows you to choose between YARDS, METERS, and FEET for distance measurements and PERCENT and DEGREES for inclination measurements.
Note: Only International lasers include meters.

To toggle the units selection:

1. From the Measurement Mode, press ⬤ for 4 seconds to access the System Setup Mode. "UnitS" will appear in the Main Display.

2. Press ⬤ to select the "UnitS" option.

3. Press ⬤ or ⬤ to display the previous or next distance unit option.

4. Press ⬤ to select the displayed distance unit.

5. Press ⬤ or ⬤ to select Inclination Units (PERCENT or DEGREES).

6. Press ⬤ to select the displayed inclination units and return to the Measurement Mode.
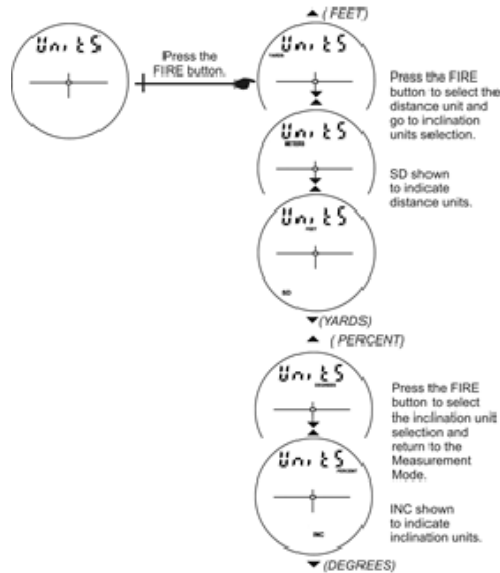
Figure #12

ⓘ
- Domestic Lasers: feet or yards.

- International Lasers: meters, feet or yards.

- Each time the TruPulse is powered ON, it will return to the same unit setting that was last used.

Bluetooth Enable

Bluetooth wireless technology is an industry standard specification for short-range wireless connectivity. As a short-range radio link, Bluetooth replaces cable connections between devices allowing you to download measurement data to any Bluetooth enabled PC device such as a computer, smart device, etc. The TruPulse cannot connect to Apple iOS devices.

- TruPulse Bluetooth offers serial port service to connect to an RS-232 style serial connection. It replaces the download cable from the TruPulse to any Bluetooth enabled PC device.
- TruPulse Bluetooth is a slave device. Bluetooth master devices can detect the TruPulse when the TruPulse is powered ON and the Bluetooth option is enabled.

To toggle the Bluetooth selection:
1. From the Measurement Mode, press ⬤ for 4 seconds to access the System Setup Mode. "UnitS" will appear in the Main Display.
2. Press ⬤ to display the "bt" option.
3. Press 🔘 to select the Bluetooth Enable Mode.
4. Press ⬤ or ⬤ to display the other "bt" options.
   - o   on: Turns the Bluetooth communication on.
   - o   oFF: Turns the Bluetooth communication off.
   - o   EnC: Bluetooth loop function for MapStar TruAngle. See note on Page 17.
5. Press 🔘 to select the Bluetooth option and return to the Measurement Mode.
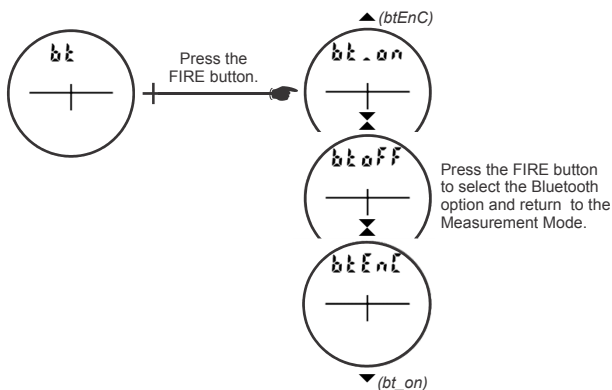
Figure #13

(i) • Each time the TruPulse 200 is powered ON, it will return to the same
   Bluetooth setting that was last used.
   • Bluetooth Version 2.0 Class 2.
   • Cannot connect to Apple iOS devices.
   • The MapStar TruAngle current production firmware version 1.17 has a
   Bluetooth® Encoder Loop feature. Mapping systems consisting of a
   TruPulse and TruAngle can now work via Bluetooth with a wider variety
   of data collectors. The MapStar TruAngle current production firmware
   version 1.17 contains a Bluetooth® Encoder Loop feature so a cable is
   no longer necessary. Set your TruPulse Bluetooth setting to "btEnc" to
   transfer measurement data that includes the TruAngle's angle
   measurement to Bluetooth® devices.

Refer to the instructions below when connecting your TruPulse 200 to another Bluetooth device.
This information is provided as a general guideline; please refer to the product documentation for
your specific Bluetooth device.

1. Toggle the TruPulse Bluetooth option ON and return to the measurement
   mode . A host device can now detect the Bluetooth communication
   from the TruPulse.
   o Refer to the host device documentation for connecting to Bluetooth devices.
2. Use the Bluetooth Manager to scan for the TruPulse Bluetooth module. The TruPulse
   Bluetooth will be named "TP200B*000000*" where "*000000*" is the serial number of your
   TruPulse 200.
3. Tap the icon that matches your TruPulse Bluetooth device.
4. You **may** be prompted to enter:
   o Passkey = 1111
   o Service Selection = SPP Slave
   o Select (long press) "Connect". The Bluetooth Manager on the host device should find and
   display the active connection status.

(i) Bluetooth troubleshooting tips:
   • TruPulse: Verify that the TruPulse Bluetooth option is toggled ON.
   • Bluetooth enable 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.
   o Transmission range can vary depending upon (1) position relative to
   the TruPulse or (2) type of Bluetooth® connection.

Tilt Sensor Alignment

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

1. From the Measurement Mode, press ⬇ for 4 seconds to access the System Setup Mode. "UnitS" will appear in the Main Display.

2. Press ⬇ to display the "inc" option.

3. Press 🔥 to select the "inc" option. The message "CAL_n" appears in the Main Display and the display should look similar to Figure #14.
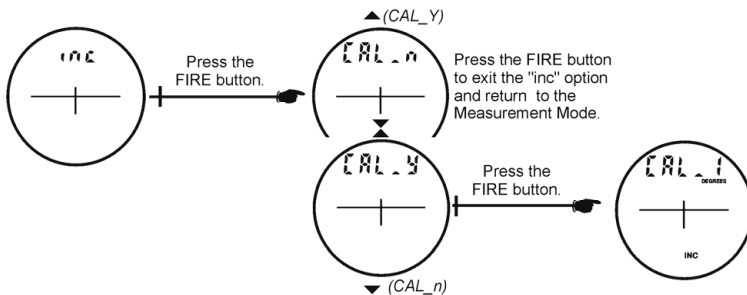
Figure #14

- o Press ⬆ or ⬇ to display the previous or next "CAL" option.

- o If "CAL_n" is displayed, press 🔥 to exit the "inc" option and return to the Measurement Mode.

- o If "CAL_Y" is displayed, press 🔥 to align the tilt sensor. The message "CAL_1" appears in the Main Display.

4. Position the TruPulse on a flat, relatively level surface as shown in Figure #15. Use one finger to hold the front of the unit is flat on the surface (indicated by the arrow in Figures #15A and B).

Figure #15

- o Keep your finger in place and do not lift or raise the TruPulse until step #7 below is completed.
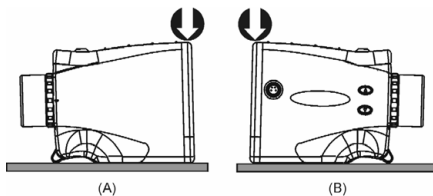
5. Press 🔘 to store the first inclination measurement. The message "CAL_2" appears in the Main Display.

6. Rotate the TruPulse 180 degrees as shown in Figure #15B above.

7. Press 🔘 to store the second inclination measurement and complete the zero offset correction. The message "donE" appears in the Main Display.

8. Press 🔘 to clear the "donE" message and return to the Measurement Mode.

Section 5 - Measurement Modes

When you power ON the TruPulse, the last used Measurement Mode will be active. Press ⏶ or ⏷ to display the previous or next Measurement Mode. Figure #16 shows the four different types of measurements that the TruPulse can take.

❶ Slope Distance (SD)
❷ Inclination (INC)
❸ Horizontal Distance (HD)
❹ Vertical Distance (VD)

= MEASURED   = CALCULATED
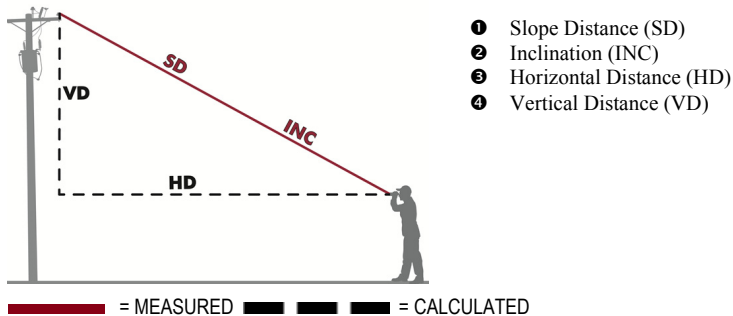
Figure #16

Notes: Figure #16 does not include the Height Routine (HT), refer to page 22.
         Figure #16 does not include the 2D Missing Line (ML), refer to page 23.

Distance Measurements

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 🔘. The LASER status indicator is displayed while the laser is active. The laser will remain active for a maximum of 10 seconds while acquiring data about the target.

     o   If the target is not acquired in the 10 second period, release 🔘 and repeat this step.

3.   Once the measurement is displayed, release 🔘. The measurement will flash one time indicating the measurement was downloaded. Then the measurement will be displayed steady until you press any button or the unit powers OFF.

Notes about Measurements

(i) • Press ⬛ or ⬛ to scroll through the individual measurement functions
  and see the results acquired for each function.

  o Both inclination and distance are measured in the HD, SD, and VD
    modes.
  o Example Range Measurement: HD = 12.5 meters
    ⬛ VD = 1.6 meters
    ⬛ SD = 12.6 meters
    ⬛ INC = 7.3 degrees
    Note: Only International lasers include meters.
  o When you scroll to the Height Function, the Main Display will be blank
    and the HD indicator will be flashing.
  o In the Inclination Mode, the Main Display will be blank for all other
    measurement functions since the laser is not active when measuring
    inclination only.
• The last measurement does not need to be cleared before acquiring your next
  target.
• Each time the TruPulse is powered ON, it will return to the same measurement
  mode that was last used.

Inclination Measurements

The laser is not active in the Inclination (INC) Measurement Mode. Generally, the inclination is

measured when you press 🔘. However in (1) the Continuous Target Mode and (2) in the Height
Measurement Mode, the inclination reading appears in the Main Display and the display updates as

your aiming point changes as long as you press 🔘.

Percent Slope

Percent slope (indicated by "PERCENT") 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.

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

Height Routine

Height Measurements involve a simple routine that prompts you to take 3 shots to the target: HD, INC base (or top), and INC top (or base). The TruPulse uses these results to calculate the height of the target. Figure #17 shows the three shots required for the height routine.
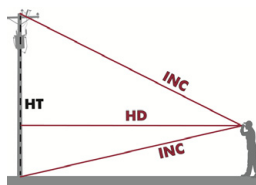
HD = Horizontal Distance
INC = Top Angle
INC = Base Angle
HT = Height

= MEASURED ▬ ▬ ▬ = CALCULATED

Figure #17

1. Select your target and look through the eyepiece, using the crosshair to aim to your target. The HT indicator displays steady and the HD indicator flashes; prompting you to measure the Horizontal Distance to the "face" of the target.

2. Press-and-hold (FIRE). The LASER status indicator is displayed while the laser is active. The laser will remain active for a maximum of 10 seconds while acquiring data about the target. The measured horizontal distance appears briefly in the Main Display and then Ang_1 and the INC indicator flashes; prompting you to measure the inclination to base (or top) of the target.

3. Press-and-hold (FIRE) and aim to the base (or top) of the target. The measured inclination appears in the Main Display and is updated as long as us you continue to hold (FIRE). The measured inclination is "locked" when you release (FIRE). The measured inclination appears briefly in the Main Display and then Ang_2 appears and the INC indicator flashes; prompting you to measure the inclination to the top (or base) of the target.

4. Press-and-hold (FIRE) and aim to the top (or base) of the target. The measured inclination appears in the Main Display and is updated as long as you continue to hold (FIRE). The measured inclination is "locked" when you release (FIRE). The measured inclination appears briefly in the Main Display and then the calculated Height is displayed. The measurement flashes one time and then displays steady until you press any button or the unit powers OFF.
Note: Only International lasers include meters.

Press the FIRE button to measure HD. | Measured HD displayed briefly.

▲ (HD)

Press the FIRE button to measure INC. | Measured INC displayed briefly.

▲ (Ang_1)

Press the FIRE button to measure INC. | Measured INC displayed briefly.
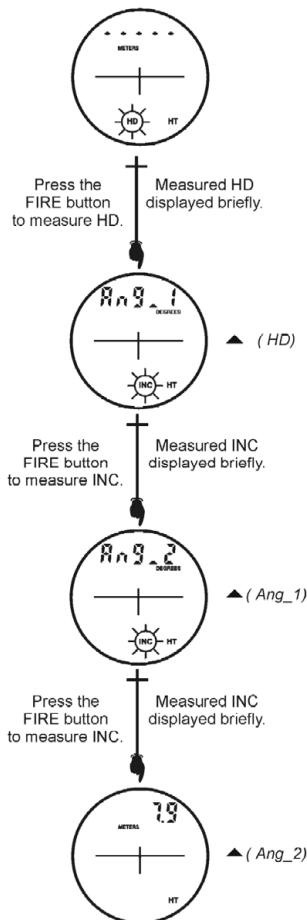
▲ (Ang_2)

Figure #18

(i) During the height routine:

- Press ⬤ to re-shoot the previous point.
- Press ⬤ to exit the height routine.
- The laser is not active while measuring the ANG1 and ANG2 values. As long as you hold 🔘, the inclination reading is displayed and updated as your aiming point changes. The measured inclination is based upon your aiming point when you release 🔘.
- When the height result is displayed, just press 🔘 to start the routine and repeat the steps.

2D Missing Line Routine

The 2D Missing Line Routine calculates distances and angles to describe the relationship between two points in two-dimensional space (connecting vector). This routine is ideal for remote slope determinations and changes in elevation from one location.

━━━ = MEASURED ▬ ▬ ▬ = CALCULATED
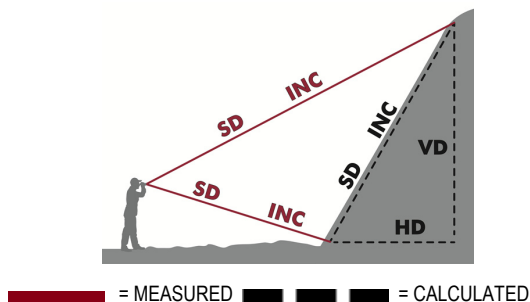
Figure #19

The simple routine prompts you to take two shots to targets: "Shot 1" and "Shot 2". The TruPulse uses the results to calculate four variables between the two points: Slope Distance, Inclination, Horizontal Distance, and Vertical Distance as shown in figure to the right.

- 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.

Note: Only International lasers include meters.

During the 2D Missing Line Routine:

- Press ⬆ to re-shoot Shot 1.
- Press ⬇ to exit the Missing Line Routine.

1. Select your first target and look through the eyepiece, using the crosshair to aim to your target. The ML indicator displays steady and the HD indicator flashes; prompting you to measure the Horizontal Distance to the first target.

2. Press-and-hold **FIRE**. The LASER status indicator is displayed while the laser is active. The laser remains active for a maximum of 10 seconds while acquiring data about the target. The measured horizontal distance appears in the Main Display.

3. Once the **FIRE** button is released, "SHot2" appears steady and the HD indicator flashes (with ML steady); 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.

4. Press-and-hold **FIRE**. The LASER status indicator is displayed while the laser is active. The laser remains active for a maximum of 10 seconds while acquiring data about the target. The measured horizontal distance to the second target appears in the Main Display.

5. Once you release **FIRE**, HD and ML are steady and the calculated horizontal distance of the missing line is displayed. The measurement

    flashes one time and then displays steady until you press any button or the unit powers off. Note: Only International lasers include meters.

Press the FIRE button to measure HD. Measured HD displayed briefly.

Press the FIRE button to measure HD. MeasuredHD displayed briefly.

(Shot1)
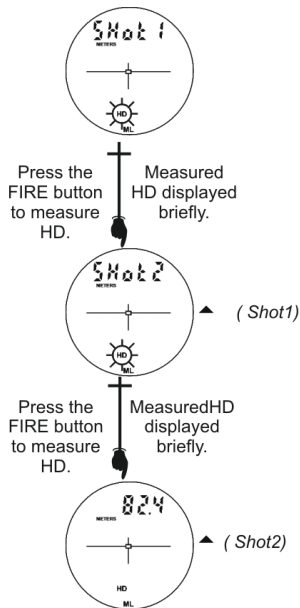
(Shot2)

Figure #20

At this time, you can:

- Press ⬆ or ⬇ to scroll and see the other missing line measurements results (VD, SD, and INC).

- Reshoot Shot 2 by pressing ⬆ or ⬇ until Shot 2 and ML appear steady in the display as well as HD flashing, prompting you to measure the horizontal distance to the second target (or new target). Go to #4 above.

- Press **FIRE** to exit the missing line results and return to Shot 1.

Section 6 - Target Modes

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

1. From the Measurement Mode, press ⬆ for 4 seconds. The active Target Mode appears in the Main Display.
2. Press ⬆ or ⬇ to display the previous or next Target Mode.
3. Press 🔘 to select the displayed Target Mode and return to the Measurement Mode.
   - o Std = Standard: Single shot mode.
   - o Con = Continuous: Press-and-hold 🔘. Once the target is acquired, the TruPulse can continuously acquire additional targets for a maximum of 10 seconds. The most recently acquired target appears in the Main Display.
     Note: The MULTI indicator is not displayed in this mode.
   - o CLO = Closest: Press-and-hold 🔘. Once the initial target is acquired, the TruPulse can acquire additional targets. The MULTI indicator denotes that additional targets have been acquired. The closest acquired target always appears in the Main Display.
   - o FAr = Farthest: Press-and-hold 🔘. Once the initial target is acquired, the TruPulse can acquire additional targets. The MULTI indicator denotes that additional targets have been acquired. The farthest acquired target always appears in the Main Display.
   - o Flt = Filter: In this mode the laser's sensitivity is reduced to only detect pulses returned from a reflector. The optional foliage filter must be used in conjunction with this mode. In this mode, measurements always include 'F' as the left most character in the Main Display. Typical maximum distance is 107 meters (350 feet) to a 3-inch reflector.

▲ (FLt)

Std

Con

CLO

FAr

FLt

▼ (Std)
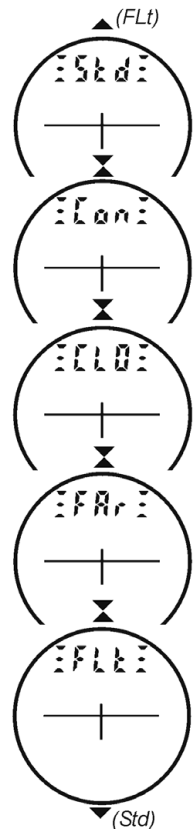
Figure #21

ⓘ
- The selected Target Mode remains active until you repeat the above steps and select a different Target Mode.
- Each time the TruPulse is powered ON, it will return to the same Target Mode that was last used.
- In Closest and Farthest Modes, the minimum separation distance between targets is approximately 20 meters (66 feet).

Section 7 - Care & Maintenance

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

Temperature Range
The instrument is rated for an operating temperature range of -4º F to +140º F
(-20º C to +60º C). Do not expose the TruPulse to temperatures outside this range.

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

(i) If water leakage is suspected:

1. Power OFF the TruPulse.
2. Remove the batteries.
3. Air dry the TruPulse at room temperature with the battery compartment open.

Protecting from Shock
The TruPulse 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 re-align the tilt sensor .

Transporting
When transporting the TruPulse, the unit should be secured in the provided carrying case. The provided neck strap can be used when carrying the TruPulse in the field. The eyepiece cover should be in place whenever the TruPulse is not in use.

Cleaning
Clean the TruPulse after each use, before returning it to its carrying case. Check all of the following items:

- *Excess moisture.* Towel off excess moisture, and air dry the instrument at room temperature with the batteries 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 again soon, remove the batteries before storing the instrument.

Section 8 - Serial Data Interface

The TruPulse includes a hard-wired serial (RS-232) communication port. Wireless Bluetooth communication is available as an option on the TruPulse 200. In either case, the measurement data downloaded from the TruPulse is in ASCII Hex format, and duplicates LTI's Criterion 400 (CR400) communication protocol and download messages.

Requirements for transferring serial data using hard-wired connection:
- Serial data transfer cable to connect the TruPulse to the PC, such as:
  o 36-inch LTI 4-Pin to DB9 Download Cable (7053038)
  o 36-inch LTI 4-Pin to DB9 Download Cable with Remote Trigger (7054223)
  o 5-meter LTI 4-Pin to DB9 Download Cable (7054244)
- Data collection software installed on PC, Pocket PC, or other data collection device.

Requirements for transferring serial data using Bluetooth connection:
  o See pages 16-17.
  o Data collection software installed on a Bluetooth enabled laptop PC, Pocket PC, etc.

Format Parameters

4800 baud, 8 data bits no parity, 1 stop bit

Serial Port

Figure #22 shows the pin-out assignments for TruPulse's serial port.
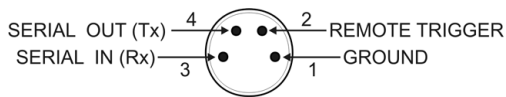
Figure #22

Download Instructions

The instructions below are provided for general information only. Specific steps may vary, depending upon your data collection program.

1. Connect the TruPulse to the PC, Pocket PC, etc.
2. Start the data collection program on the PC and adjust settings to match format parameters (4800 baud, 8 data bits no parity, 1 stop bit).
3. Power ON the TruPulse.
4. Verify/select measurement units, Measurement Mode, and Target Mode.
5. Take the desired measurement. The measurement result flashes one time indicating that it is being downloaded.

Optional Remote Trigger

It is possible to remotely trigger the TruPulse and take a measurement by using an external computer, data collector, or switch closure. Remote triggering is accomplished by providing an open collector closure to ground or an active low TTL or RS232 level signal to the 'trigger' pin on the serial connector. This option requires a special order download cable that connects the remote trigger signal from the TruPulse to the 'RTS' output signal of a computer's serial port.

When using a serial cable with a remote trigger connection, care must be taken in controlling the state of the RTS signal from the host computer. Often times the default state of the RTS signal will be low, causing an inadvertent trigger of the TruPulse. Since the remote trigger signal is treated the same as a button press on the TruPulse, holding the signal low is identical to holding down a button, which prevents a response to any additional keys that are pressed.

Download Message Format

The CR400 data format follows the guidelines of the NMEA 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 TruPulse, 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 CR400-format does not respond to unrecognized header formats, malformed messages, or messages with invalid checksums.

Query

The TruPulse accepts Criterion 400 format requests for the firmware version ID. The instrument will not respond to an invalid query. The format is as follows:

$PLTIT,RQ,ID<CR><LF>

$PLTIT	The Criterion 400 message identifier.
RQ	Indicates a request message.
ID	Indicates the request type.
<CR>	Carriage return.
<LF>	Optional linefeed.

The instrument's response is as follows:

$PLTIT,ID, model,*versionid *csum**<CR><LF>**

$PLTIT	The Criterion 400 message identifier
ID	Identifies the message type.
model	Indicates the model.
versionid	The main firmware revision number.
*csum	An asterisk followed by a hexadecimal checksum. The checksum is calculated by XORing all the characters between the dollar sign and the asterisk.
<CR>	Carriage return.
<LF>	Linefeed.

Example Version ID Message

Request:	$PLTIT,RQ,ID
Response:	$PLTIT,ID,TP200,1.02,*73

Download Message Formats

Horizontal Vector (HV) Download Messages

$PLTIT,HV,HDvalue,units,AZvalue,units,INCvalue,units,SDvalue,units,*csum**<CR><LF>**
where:

$PLTIT,		is the Criterion message identifier.
HV,		Horizontal Vector message type.
HDvalue,		Calculated Horizontal Distance. Two decimal places.
	units,	F=feet Y=yards M=meters
		Note: Only International lasers include meters.
AZvalue,		Azimuth dummy value (always 0.00).
	units,	D=degrees
INCvalue,		Measured Inclination value. Two decimal places.
		May be positive or negative value.
	units,	D=degrees
SDvalue,		Measured Slope Distance Value. Two decimal places.
	units,	F=feet Y=yards M=meters
		Note: Only International lasers include meters.
*csum		An asterisk followed by a hexadecimal checksum.
		The checksum is calculated by XORing all the
		characters between the dollar sign and the asterisk.
<CR>		Carriage return.
<LF>		Optional linefeed.

(i)
- HDvalues, INCvalues, and SDvalues always include two decimal places:
  X X.Y$\underline{Y}$
       ↓
  0 = high quality target
  1 = low quality target
- Closest and Farthest Target Modes: multiple targets can be acquired, however, the download message corresponds to the value that appears in the Main Display.

Examples:
High Quality Target: $PLTIT,HV,11.80,M,0.00,D,3.70,D,11.80,M*63
Low Quality Target: $PLTIT,HV,7.01,M,0.00,D,3.00,D,7.01,M*64
Inclination Only: $PLTIT,HV,,,0.00,D,29.10,D,,*5D
Note: Only International lasers include meters.

Height (HT) Download Messages

$PLTIT,HT,HTvalue,units,*csum**<CR><LF>**

where:

$PLTIT,	is the Criterion message identifier.
HT,	Height message type.
HTvalue,	Calculated Height. Two decimal places. units, F=feet Y=yards M=meters Note: Only International lasers include meters.
*csum	An asterisk followed by a hexadecimal checksum. The checksum is calculated by XORing all the characters between the dollar sign and the asterisk.
<CR>	Carriage return.
<LF>	Optional linefeed.

Example:

HD Measurement: $PLTIT,HV,16.00,F,0.00,D,-1.20,D,16.00,F*49
Ang_1 Measurement: $PLTIT,HV,,,0.00,D,-19.10,D,,*73
Ang_2 Measurement: $PLTIT,HV,,,0.00,D,32.40,D,,*52
Calculated Height: $PLTIT,HT,15.70,F*0E
                            Note: Only International lasers include meters.

(i)   HTvalues always include two decimal places:

      X X.Y$\underline{Y}$
           ↓

       0 = HD was measured to a high quality target
       1 = HD was measured to a low quality target

Examples:
         High Quality Target: $PLTIT,HT,5.50,M*36
         Low Quality Target: $PLTIT,HT,2.01,M*35
                             Note: Only International lasers include meters.

2D Missing Line (ML) Download Messages

For "SHot1" and "SHot2" refer to Horizontal Vector (HV) Download Message.

$PLTIT,ML,HD,HDunits,AZ,AZunits,INC,INCunits,SD,SDunits*csum<CR><LF>

$PLTIT,	is the Criterion message identifier.
ML,	Missing Line message type.
HD,	Specifies horizontal distance measurement value.
HDunits,	Specifies horizontal distance units.
	F=feet, M=meters, Y=yards.
	Note: Only International lasers include meters.
AZ,	Azimuth dummy value (always 0.00)
AZunits,	Specifies azimuth units.
	D=degrees.
INC,	Specifies inclination measurement value.
INCunits,	Specifies inclination units.
	D=degrees.
SD,	Specifies slope distance measurement value.
SDunits	Specifies slope distance units.
	F=feet, M=meters, Y=yards.
	Note: Only International lasers include meters.
*csum	An asterisk followed by a hexadecimal checksum.

The checksum is calculated by XORing all the
characters between the dollar sign and the asterisk.

<CR>	Carriage return.
<LF>	Line feed.

Example:

SHot1:

$PLTIT,HV,6.00,Y,0.00,D,7.20,D,6.10,Y*68

SHot2:

$PLTIT,HV,5.90,Y,0.00,D,11.60,D,6.00,Y*5D

Calculated Missing Line:

$PLTIT,ML,8.10,Y,0.00,D,3.20,D,8.10,Y*74

Note: Only International lasers include meters.

- HDvalues, INCvalues, and SDvalues always include two decimal places:
  X X.Y<u>Y</u>
  ↓
  0 = high quality target
  1 = low quality target
- In the example above, shots 1 and 2 both used high quality targets

Uploading Serial Data

General:

1. Download a PC software terminal emulator (communication program) which supports serial port connections.

2. Commands are not case sensitive.

3. Each command is starts with '$' sign and is ended with <CR><LF>(Enter).

4. There are no spaces inside command.

5. Every command which needs a parameter can be used to enquire the current setting of the parameter by entering the mnemonic command by itself (rule 2 applies).

   > For example:
   >
   > $MM,2<CR><LF> sets the Measurement Mode to 2 (SD)
   >
   > $MM<CR><LF> returns value 1 (current Measurement Mode setting).

6. TruPulse sends $OK if parameter change is successful or ER,## if not successful.

Terminal Program example: This section uses a terminal emulator called "Tera Term Pro".

1. Setup Tera Term Pro.

2. Open program.

3. Select Serial and the correct com port and click OK.

   - Bluetooth connection can be used instead:

     i. Turn on Bluetooth in the TruPulse "bt_on"

     ii. Connect to device using the devices Bluetooth set up manager.
         Might need to a Pair Code depending on device:
         TruPulse 200/360/360R code is: 1111

     iii. Remember the com port number that is assigned after

4. Enter into the Setup tab and select Serial Port. Change the baud rate to 4800 click on OK.

5. Enter into the Setup tab again and select Terminal, in the New Line box change the Transmit and Receive to CR+LF.

   - Check local Echo box and click on OK.

6. Type $ID and press enter.

   - Response string should be the similar to:
     "$ID,TP200 MAIN,4.21,10-20-2015,103529"
     Indicates that you have communication with the TruPulse.

Notes: All commands are preceded with $
To ask for current value (measurement units for example) just type: $MU
To change setting to Feet type: $MU,2

Upload Serial Data Commands

- START_MEASUREMENT: GO = Single shot
  (will output "E01" if no target found after 15 seconds)

- STOP_MEASUREMENT: ST

- SET_DISTANCE_UNITS: MU
  - Meters: 0
  - Yards: 1
  - Feet: 2
  - Note: Only International lasers include meters.

- SET_MEASUREMENT_MODE: MM
  - Horizontal Distance: 0
  - Vertical Distance: 1
  - Slope Distance: 2
  - Inclination: 3
  - Height: 4
  - Missing Line 6

- SET_TARGET_MODE: TM
  - Normal: 0
  - Continuous: 1
  - Closest: 2
  - Farthest: 3
  - Filter: 4

- GET_BATTERY_VOLTAGE: BV (millivolts)
  - Example Reply: 3125 = 3.125 volts

- SET_POWER _OFF PO

- Get ID $ID
  - response: $ID,TP200 MAIN,4.21,10-20-2015,103529

    $PLTIT,RQ,ID
  - response: $ID,TP200 MAIN,4.21*09

- GET_INSTRUMENT_STATUS: TS,*n*
  - Battery Voltage OK: 0
  - Battery Voltage below Warning Level (2.15V) 2

- Set Shutdown Timeout –no Bluetooth: NT,*n*
  - n = Time in Minutes   (0…120)
  - Never Shutdown: 0
  - Default: 2

- Set Shutdown Timeout – Bluetooth ON: BT,*n*
  - n = Time in Minutes   (0…120)
  - Never Shutdown: 0
  - Default: 30

Section 9 - 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. Refer to the inside front cover for LTI contact information.

Dimensions: 5" x 2" x 3.5"
(12 cm x 5 cm x 9 cm)

Weight: 10 ounces
(285 g)

Data Communication: Serial, via wired RS232 and wireless Bluetooth

Power: 3.0 volts DC nominal;
  Battery Type: (1) CRV3 or (2) AA
  Battery Duration: 8 hours continuous use

Eye Safety: Class 1 Laser Product. This product complies with IEC 60825-1, 2014-5, Ed. 3.0 and complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice 50, Dated June 24, 2007

FCC ID: VMTZBA - BT44

Environmental: Impact, water and dust resistant.
NEMA 3, IP 54

Temperature: -4° F to +140° F
(-20° C to +60° C)

Optics: 7X Magnification

Display: In-scope LCD

Units: Feet, Yards, Meters, and Degrees
Note: Only International lasers include meters.

Monopod/Tripod Mount: ¼" - 20 female thread

Measurement Range:

Distance:	0 to 3,280 ft (1,000 m) typical,
	6,560 ft (2,000 m) max to reflective target
Inclination:	±90 degrees

Accuracy:

Distance:	±8 inches (±20 cm) to high quality targets
	±1 yd (±1 m) to low quality targets
	Refer to TruTargeting page 4.
	Note: Target quality can be affected by
	atmospheric conditions, such as heat shimmer,
	dust, target reflectance, traverse angle to target
	and beam spread.
Inclination:	±0.25 degrees

Measurement Modes: Horizontal Distance, Vertical Distance, Slope Distance and Inclination, 3-point flexible Height routine with auto sequencing, and 2D Missing Line routine.

Target Modes: Standard, Closest, Farthest, Continuous, and Filter (requires reflector and foliage filter).

Declaration of Conformity   Laser Technology, Inc. affirms that it manufactures the TruPulse 200 which fulfill the requirements of the Directive of Electromagnetic Compatibility (EMC) 89/336/EEC of May 3, 1989 as amended by 93/34/EEC of April 28, 1992 and 93/68/EEC, Article 5 of July 22, 1993.

Please contact your LTI Sales Representative or Authorized LTI Distributor to obtain a copy of the Declaration of Conformity.

Section 10 - Troubleshooting

**See page 17 for Bluetooth troubleshooting information.

| Problem	Remedy
The unit does not power ON or the LCD does not illuminate.	Press . Check and if necessary, replace the battery or batteries.
The target cannot be acquired.	Make sure the unit is powered ON. Make sure that nothing is obstructing the transmit and receive lens. Make sure the unit is held steady while pressing . Make sure that you press-and hold as long as the laser is active (10 second maximum). Make sure that Filter (Flt) Target Mode is OFF if not using a reflector.
The TruPulse does not have an OFF button.	Simultaneously press-and-hold ▲ and ▼ for 4 seconds. To conserve battery power, the TruPulse will turn itself off if no button presses are detected after a specified length of time: • Bluetooth OFF: 2 minutes • Bluetooth ON: 30 minutes
Incorrect measurements.	Align the Tilt Sensor (page 18). If problem persists, contact LTI for assistance. See inside front cover for LTI contact information.
E37 (or similar value) appears in the Main Display.	Contact LTI Service. See inside front cover for LTI contact information.

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 LCD Main Display is used to convey messages and measurement results. When all of the indicators are active the Main Display looks like:

Numbers 0-9:

Alpha Characters:

= a	= f	= o
= b	= g	= r
or x = c	= i	= s
= d	= l	= t
= e	= n	= u

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.

Message	Explanation	Page #
An9_1	Angle 1. Height Routine.	22
An9_2	Angle 2. Height Routine.	22
bt	Bluetooth option.	16
btEnC	Bluetooth loop function for MapStar TruAngle.	16
btoFF	Bluetooth option off.	16
bt_on	Bluetooth option on.	16
CAL_n	Calibrate Tilt Sensor: No.	18
CAL_Y	Calibrate Tilt Sensor: Yes.	18
CAL_1	Calibrating the Tilt Sensor: Position 1.	18
CAL_2	Calibrating the Tilt Sensor: Position 2.	18
CLo	Closest target mode.	25
Con	Continuous target mode.	25
donE	Done. Appears when the Tilt Sensor aligned.	18
FAr	Farthest target mode.	25
FLt	Filter target mode.	25
inC	Inclination.	18

Message	Explanation	Page #
SHot 1	Shot 1 Missing Line Routine	23
SHot2	Shot 2 Missing Line Routine	23
:Std:	Standard target mode.	25
Units	Units.	15