Laser Ally Speed LIDAR

Operator Guide

Doc: 30157 Rev. 12

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Introduction

Thank you for purchasing the Digital Ally LIDAR

The Laser Ally Speed LIDAR is a high performance electro-optical product providing accurate speed and distance measurements custom designed for the law enforcement community. The LIDAR provides pinpoint target identification via its clear head up display targeting system and fast target acquisition using sophisticated, robust data processing algorithms. The Laser Ally Speed LIDAR was designed for lightweight operation and long battery life. It provides numerous useful settings and features including advanced ECCM (Electronic Counter Counter Measures), weather/obstruction modes and a USB interface for easy data interface and authorized upgrades.

Most importantly, each Laser Ally LIDAR comes with the support of one of the most knowledgeable speed enforcement expert witness teams in the industry having defended LIDAR systems since their inception in the early 1990's.

Notices and Precautions

Caution: Class 1 Laser Product

The Laser Ally Speed LIDAR is a Class 1 Laser product in accordance with U.S. 21CFR parts 1040.10 and 1040.11, which is safe for use in all intended operation modes. However, standard precautions should always be taken with laser products:

- Avoid staring into the output aperture of the device,
- Avoid directing the LIDAR at other individuals for prolonged periods,
- Do not direct the output of the LIDAR at anyone using optical instruments such as binoculars as this will increase the risk of eye hazard.
- Caution—the use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Caution: Precision Instrument

Your LIDAR system is built to be durable and robust. However, like any precision optical instrument, care should be taken to protect the unit from drops and hard impacts. Store the unit in a cool dry place when possible. Avoid temperature extremes beyond -30°C and 60°C.

Caution: Use Care When Cleaning Optics

Glass surfaces should be cleaned with a soft cloth or tissue and water. Isopropyl Alcohol (rubbing alcohol) can be used if needed. Use water and a mild soap to clean the housing if necessary. Avoid the use of acetone (nail polish remover) or other strong cleaning solutions as these may damage the polymer housing materials.

Caution: Do not Point the Device at the Sun

Do not aim your LIDAR directly at the sun as this could damage internal components.

Unpacking and Checking the LIDAR Device

The basic Laser Ally LIDAR unit includes the following items:

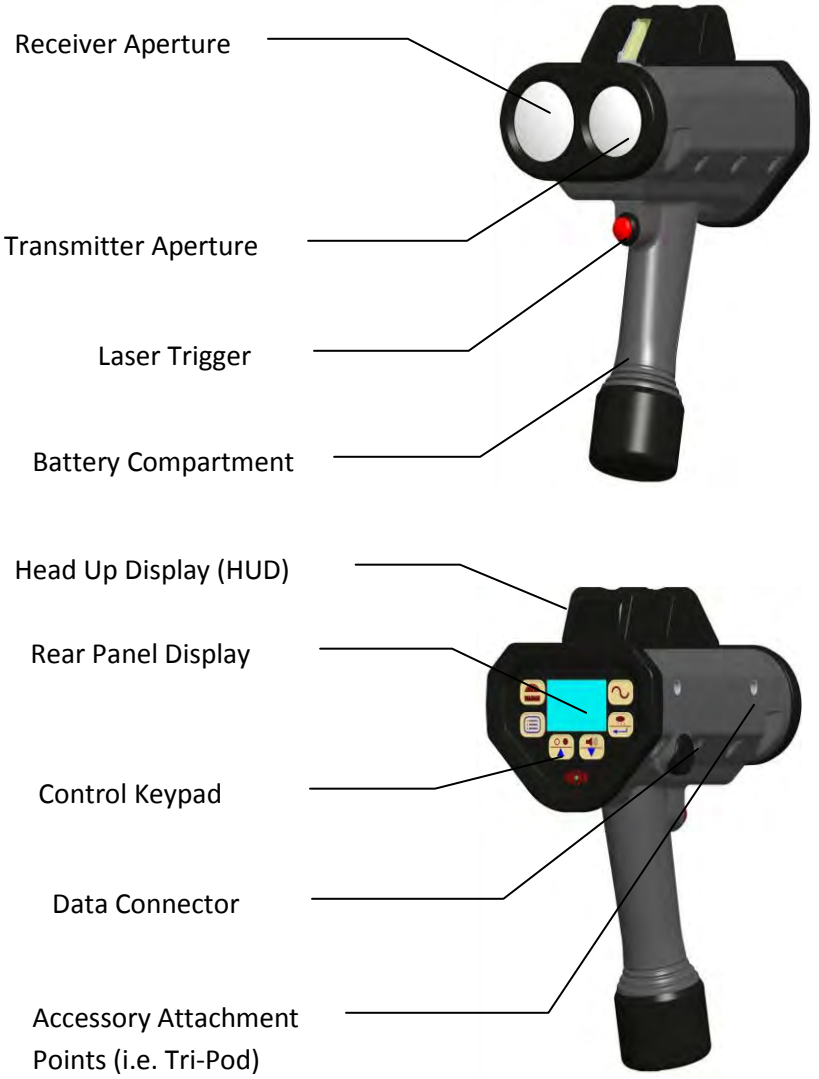
1. Laser Ally LIDAR unit
2. Two "C" Cell Batteries or optional Rechargeable Kit
3. Carrying Case
4. Operator's Guide (DVD)
5. Optional 8 X Magnification Monocular

Your Laser Ally LIDAR may have come with special accessories. Please check for packing lists or special instructions with any additional items.

Diagram, Controls and Displays

Use the diagrams and descriptions in this section to quickly familiarize yourself with the Laser Ally LIDAR controls and features.

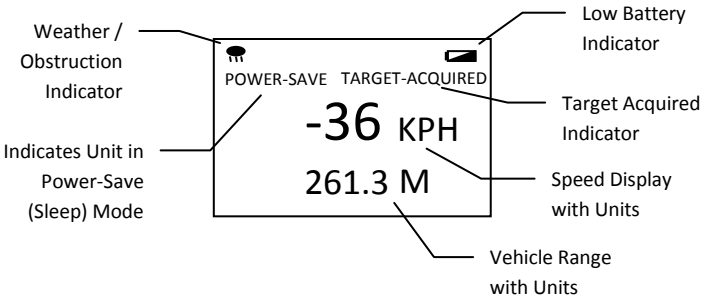
The Laser Ally LIDAR is a compact easy to use speed and distance measurement tool. The system has a four-point rubber cushioning system to minimize the shock of unintended impacts. The following diagram shows the locations of the key external features of the device.


Receiver Aperture
Transmitter Aperture
Laser Trigger
Battery Compartment
Head Up Display (HUD)
Rear Panel Display
Control Keypad
Data Connector
Accessory Attachment Points (i.e. Tri-Pod)

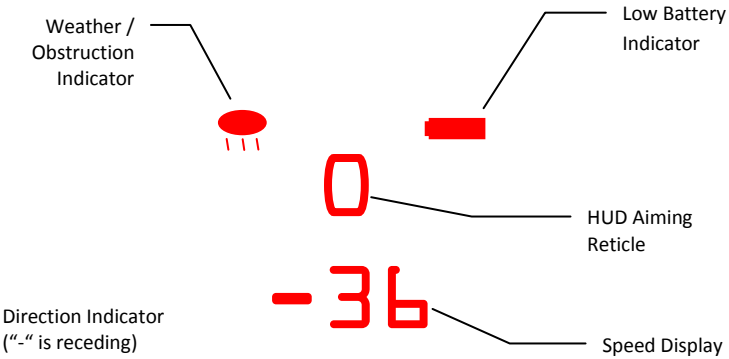
Display Descriptions

The following figures show typical displays for both the rear panel and (Head-Up Display) HUD. Special menu displays and HUD indicators will be covered in their respective sections of this manual.

Rear Panel Display (LIDAR in Speed Mode)



Head-Up Display (LIDAR in Speed Mode)



Controls and Indicators

The Laser Ally LIDAR has an ergonomically styled handle with a sealed laser fire trigger and an easy to use back panel keypad to select modes of operation and tailor settings for particular conditions. The most frequently used functions have been assigned a dedicated button to allow for extremely fast setup and operation. Following is a description of the available controls for your LIDAR system. Additional details are provided in the "Advanced Controls and Modes" section.

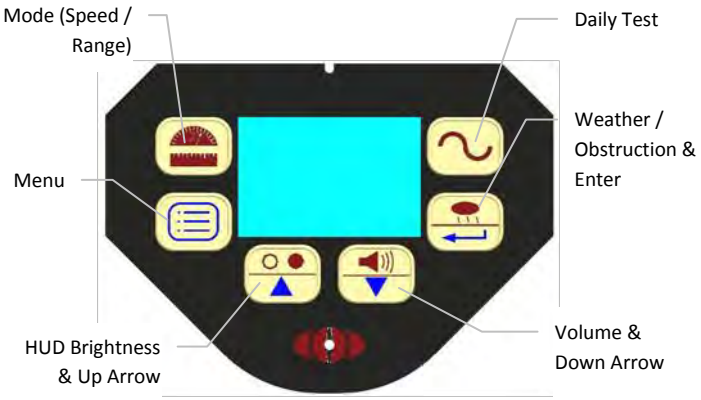
Laser Fire Trigger

The Laser Fire Trigger is used to turn on the Laser Ally LIDAR when the unit is off and to initiate laser firing when the unit is awake and ready. Simply depress the trigger and the LIDAR will wake up and be ready to fire in a fraction of a second.

Rear Panel Controls

All remaining controls are located on the rear panel, adjacent to the display. The following diagram shows the location of the various buttons. Further descriptions of the button functions are detailed in the following sections.

Note: Some control buttons are dual use and their secondary function is indicated by the blue symbol located below the primary symbol on the button. These secondary functions are active only in "menu mode" after pressing the  *button.*



Mode Control

Pressing  toggles between Distance and Speed Measurement Modes. In Speed Mode, the rear display will show KPH and M for Kilometres per Hour and Metres. In Range Mode the display will simply show "M" for range measured in Metres.

Note: the LIDAR is factory set for Metric and cannot be changed by the operator.

Daily Test Initiation

Press  to initiate the system Daily Test sequence. The operator will be prompted to complete each test required. During the test all critical internal timing and electronic components will be checked, all display components will be illuminated to allow the operator to verify each segment. If a "fail" indication appears during this test, the unit will halt operation indicating the need for service.

HUD Brightness Control

Use the  button to toggle through the six HUD Brightness levels. *Note: Level 1 and Level 2 are typically used for night operation only and will most likely not be visible in normal daylight conditions!*

Rear Panel Display Backlight

The backlight for the rear panel display is fully automated and does not have an on/off control. The backlight will be illuminated after each range or speed-calculation. It will be switched off during targeting.

Volume Control

The  button toggles through the three volume levels for the audible target-tracking indicator. The audio cannot be muted.

Weather/Obstruction Control

The  button toggles the system through three environmental modes. In addition, this button is used to verify each testing sequence during the Daily Test.

1)  Weather Mode: Ellipse and rain indicator on; minimum range of device set to approximately 76 metres

2) Obstruction Mode: Only ellipse indicator is on; minimum range is adjusted to ignore obstruction by requiring the obstruction to be targeted with an initial range reading, and then verified with enter button; (see "Advanced Controls and Modes").
3) Normal Mode: No indicators on; no change in minimum range of the LIDAR.

Menu/Exit Menu

The  button is used to enter and exit the LIDAR's Menu system. The Menu system allows the operator to adjust certain parameters and features as well as enter the Time/Distance mode. (See "Advanced Controls and Modes").

After the Menu button is pressed, the blue functions on the dual use buttons become active. After all settings have been selected, pressing  again will exit the menu system. The general description of blue function buttons are as follows:

Up and Down Arrows

While in the Menu system, the  buttons are used to navigate through the menu options, to highlight a desired item, or to scroll through various values.

Enter Button

The  button is used to select or activate a particular menu item or value.

Battery Voltage Indications

When the LIDAR unit's batteries begin to run low on power, the battery indicator will illuminate on both the rear panel display and

HUD. *(Note: The rear panel low battery symbol will be partially filled in).* The unit may continue to be used, and may last a considerable amount of time particularly with low volume settings; however a replacement set of batteries should be handy to avoid down time.

When the batteries reach the end of their capacity, the rear panel will display:

Battery Voltage
Critical
Shutdown
in 5 Seconds

The unit will then automatically countdown to turn off.

Note: Significant gains in battery life can be realized by setting the audio and HUD brightness settings at the lowest levels required for your environment. Even if you have received the "Battery Voltage Critical Warning", you may be able to restart the LIDAR and gain usable time by switching the brightness and volume to the lowest acceptable levels.

Jam / ECM Attempt Indication

The Laser Ally LIDAR contains sophisticated counter measures to defeat LIDAR "Jamming" devices available in the consumer market place, while continuing to display accurate speed-calculations. The system also indicates when a jammer or other Electronic Counter Measure (ECM) is detected on the target vehicle by displaying the phrase "Jam ECM" on the rear display and flashing the " \ \ \ " symbol in the HUD. Note that extremely bright surfaces on the

target vehicle, such as high beam headlights or sun reflections can cause the jam indicators to turn on. If you experience any difficulty in obtaining a speed-calculation when "Jam" is indicated, try moving the HUD aiming point to another location on the vehicle.

Basic Operation

The following sections give an overview of the basic operation of the Laser Ally LIDAR for normal speed measurement applications. Be sure to review the "Recommended Daily Checks" section to understand the suggested daily performance. Additional details of special features and other operation modes are given in "Advanced Controls and Modes" sections.

Battery Installation

Unscrew the end cap at the bottom of the handle by turning counter-clockwise.

Insert two "C" cell batteries, positive end first, into the handle compartment. Replace the end cap and screw clockwise until the cap is securely in place. *Do not over tighten!*

Note: The Laser Ally LIDAR is designed to use quality alkaline "C" cells from brand name manufacturers. The device also functions with rechargeable NiMH "C" cells supplied with the optional "Rechargeable Battery Kit".

Caution: The LIDAR's battery end cap forms part of the watertight seal protecting the unit from rain and moisture. Please be sure to change batteries in a dry environment.

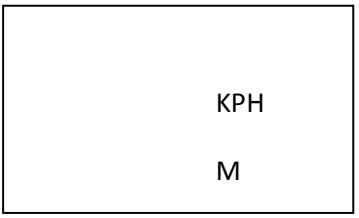
Powering On

When fresh batteries are installed, the unit will NOT automatically power up. Simply click the laser fire trigger to turn on the unit. The LIDAR's rear panel and Head-Up Displays will activate.

Note: If the LIDAR is inactive for a period of time, it will automatically power down to conserve battery life. If this happens, simply click the fire trigger again to wake up the unit.

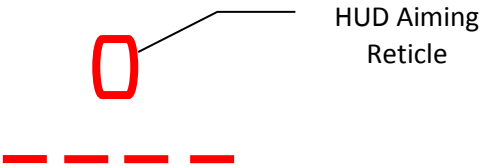
Selecting Speed Mode

The LIDAR will normally power up in "Speed" mode, unless it was recently used in a different mode. If "Speed" mode is not displayed on power up, simply press  until the back panel displays:



Using the HUD Sighting System

The Head-Up display provides a precision aiming reticle, speed-calculation, and other status information. To find the sighting reticle, click the trigger to wake up the LIDAR and look directly through the HUD letting your eyes focus on a target well in front of the LIDAR unit. If you have not used a HUD device before, it might take a minute or two for your eyes to adjust the first time.



The LIDAR's laser beam is invisible, but will be contained within the aiming reticle. This is your aim point for target vehicles.

Roadside Setup

When first learning to use the Laser Ally LIDAR, it is best to select a straight stretch of roadway with a line of sight of 150 metres or more.

Approaching or receding vehicles should be targeted such that your line of sight through the HUD is as parallel as possible to the path of the target vehicle. This will minimize the "cosine effect" as described in Appendix A of this manual.

Note: The cosine effect applies to both RADAR and LIDAR systems and always results in a slightly lower than actual speed reading.

Measuring Vehicle Speeds

For approaching targets, aim the LIDAR's reticle at the front of the motor vehicle, the grill, headlight or front license plate, as they possess good reflective quality targets. Good reflective targets for receding vehicles are the license plate, rear of the vehicle or tail lights. Use the boundaries of the reticle pattern to ensure only the intended vehicle is being targeted. Squeeze and hold the laser fire trigger while maintaining your aim.

You may hear an intermittent audible tone as the LIDAR searches for a valid target signal. You will also see "----" displayed in the HUD, indicating the laser is firing and a reading is being acquired. Once target vehicle data is identified, the LIDAR will produce a continuous lower frequency tone. When the data from the vehicle reaches an acceptable accuracy level, audible tone will switch to a continuous, higher frequency and the vehicle speed-calculation will be displayed in the HUD and on the back panel.

Note: The above acquisition sequence can happen very quickly and you may simply hear the high frequency tone and see the speed display immediately.

A positive speed-calculation will be shown for an approaching vehicle (this will be a whole number, less the "+" symbol) while receding vehicles are indicated with a negative reading.

Note: Both the HUD and the back panel will show a "-" sign for receding vehicles.

The Laser Ally LIDAR will continuously update the target speed-calculation at an approximate rate of three times per second as long as the trigger is depressed and the data quality is acceptable. While not required, operators are encouraged to track the vehicle for at least 1 second to establish robust confidence in the speed-calculation.

Speed Display Lock

Once a desired speed-calculation is acquired, the operator can "lock" the speed-calculation on the rear panel display by simply releasing the laser fire trigger. If a speed-calculation is lost after tracking a vehicle, the last speed-calculation will flash for approximately two seconds, giving the operator an opportunity to lock in the vehicle's speed. *Note: The flashing speed-calculation will be immediately over written if the operator acquires a new speed-calculation.*

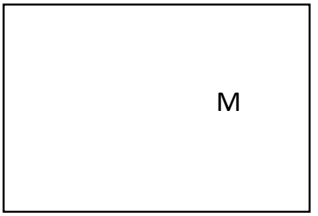
Speed Display Lock Retention

Once a speed is locked into the rear display, it will be retained there for up to 20 minutes. If the laser fire trigger is depressed within 30 seconds after the speed is locked, the display will clear and prepare for a new reading. If no buttons are pressed for 30 seconds after the speed-calculation is locked, the unit will go into a sleep mode,

turning off the HUD and displaying “Power-Save” on the rear panel along with the locked reading. In the Power-Save state, a first laser trigger pull will “wake” the LIDAR but retain the locked reading. A second pull will then clear the reading. This feature is intended to aid in preventing the operator from accidentally clearing the locked reading.

Range Mode

The LIDAR system can be used to measure distances to a variety of targets. To enter Range Mode, press the Mode Button  until the rear panel displays:



Use the aiming reticle in the HUD to select your desired target. Squeeze and hold the trigger until a range reading is displayed in the HUD and on the rear panel display. The trigger may be continuously held as the unit is moved from target to target for quickly checking multiple ranges. The last range reading in the display is locked when the trigger is released. Range readings are displayed in tenths of a metre on the rear panel and in the HUD up to 999.9 metres. Above this, range readings are displayed to the nearest metre.

The maximum target distance is 1828 metres, which can be obtained from highly reflective surfaces such as retro-reflective road signs or vehicle tail lights. The range to non-retro reflective targets will vary depending upon their infrared reflectivity. The minimum operational range in all modes is 3 metres.

Advanced Controls and Modes

Weather and Obstruction Modes

The  button is used to select one of three environmental operating modes:

1. Normal Mode
2. Weather Mode
3. Obstruction Mode

To select a particular Weather/Obstruction mode simply press the  button. The rear panel will display the current mode of operation. Continue to press the  button to toggle through the three modes, selecting the desired mode as described below:

Normal Mode

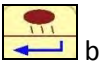
In Normal Mode, the LIDAR has no additional restrictions placed upon the minimum distance at which a target can be acquired (besides the normal minimum range specification). If rain, snow, fog or other obstacles are present in the line of sight to the target, it is possible the LIDAR will receive signals from these objects preventing a reading from being displayed on the targeted vehicle. To select Normal Mode, toggle through the three modes and select “Normal”. Wait for a couple of seconds and the LIDAR will return to Range or Speed mode. No special icons will be displayed.

Weather Mode

Select Weather Mode to improve the LIDAR’s ability to shoot through rain, snow, fog, or other airborne particulates such as heavy dust or sand. After pressing  , toggle through the three modes

to select Weather Mode; wait for a couple of seconds and the LIDAR will return to Range or Speed mode with the Weather mode activated. The Weather indicator  will be displayed in both the HUD and the rear panel display. ***In Weather mode, the LIDAR will not acquire any targets within 76 metres***. ***However, due to its smart target-lock capability, the LIDAR will continue to track oncoming cars inside the 76 metres limit, provided they were initially acquired outside of this range.***

Obstruction Mode

Select Obstruction Mode to allow the LIDAR to detect targets beyond small obstructions such as tree limbs, wires or see through fence material. Toggle through the three modes using the  button and stop at Obstruction Mode. Wait for a couple of seconds and the LIDAR will prompt you to "shoot the obstruction" or press the Menu button  to exit without effecting changes. If Obstruction Mode is desired, aim at the obstruction and pull the trigger to measure the distance to the obstruction. The distance will be displayed in the rear panel. If you are not sure you hit the correct object, simply pull the trigger to acquire another range. Once you are satisfied with the range reading, press the Enter  button to accept. The obstruction symbol  will be displayed in the HUD and on the back panel. The LIDAR will now ignore all objects up to and slightly beyond the obstruction.

Note: You must have at least a partially clear line of sight to the target beyond the obstruction. Also, please note that Obstruction Mode is designed for overcoming one, fairly well defined obstruction. It is not intended to function with multiple obstructions at differing distances along the line of sight.

Minimum and Maximum Ranges (Range Window)

While in Speed mode, the Minimum and Maximum Range settings are used to set limits (or a range window) outside of which, speed-calculation will not be displayed.

To adjust either of these settings, press the Menu button  and then use the up/down arrows  to display "Minimum Range" or "Maximum Range". Press the Enter button  to select. The display will give you the option to use the up/down arrows to set the range or "shoot object" to use the LIDAR's range function to set the range limit. To manually set the range, simply use the up/down arrow buttons to set the desired limiting distance. If the arrow buttons are held down, the units will change in larger increments after about 10 seconds. When the desired range value is in the display, press the Enter button  to accept.

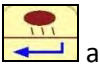
Note, once the operator begins to use the up/down arrow buttons to set the range limit, the "shoot" option will no longer be available.

Alternatively, the Minimum and/or Maximum range values may be set by "shooting" a target that represents the particular range limit (such as a school zone or work zone sign). To shoot the Minimum or Maximum range, enter the desired menu, instead of using the up /down arrows, pull, hold in the LIDAR trigger, and aim at the target that represents the Minimum or Maximum range. You may range to the target multiple times until you are positive the correct target has been selected. Press the Enter button  to confirm the value. Once the Minimum and/or Maximum range values are set, the LIDAR will display only speeds between these values. If a vehicle is

acquired outside of this range window, a target acquired audible tone will be heard but dashes (- - - -) will be displayed in the HUD and on the rear display in the speed reading area. In addition, the word "window" will be displayed to indicate the target was acquired outside of the allowable range window. To quickly remove the Range Window settings, use the Menu button, then use the arrow buttons to select "Load Defaults". Press the Enter button to reset all user settings to default values. *Note: The adjustable Maximum Range Menu may not be available on some units where jurisdictions may fix the maximum range allowed for the LIDAR devices.*

Direction Filter

The Laser Ally LIDAR allows the user to set the system to display speeds on: 1) Only approaching Vehicles, 2) Only receding Vehicles or 3) Both approaching and receding vehicles. The default value is set for both approaching and receding vehicles.

To set the Direction Filter, press the Menu button  , then use the up/down arrows   until "Direction Filter" is displayed on the rear panel. Press the Enter button  and then use the up/down arrows to display the desired filter setting: APPROACH, RECEDE, or BOTH. Press Enter  to accept the setting.

The LIDAR will return to the current operating mode (range or speed).

Note: If a vehicle is targeted in a direction opposite that of the Filter selection, the LIDAR will still output the solid audible tone, however the HUD and rear panel will show "----" in the speed display area.

The rear panel will also display the indication "Approach" or "Recede" to indicate that a vehicle has been targeted traveling in a direction opposite to that of the Filter.

Differential Distance Test

Note: The Differential Distance Test is an optional accuracy check preferred by some jurisdictions. It is not a manufacturer required test for daily required testing; however it is an additional test that the operator may complete if they wish.

Differential Distance: LIDAR in Metric Units (KPH)

The (KPH) Differential Distance Test uses two fixed targets separated by a precisely known distance. Using the LIDAR's range function to determine the separation between the targets, the KPH Differential Distance test provides a quick check of the LIDAR's ability to measure the distance between two targets.

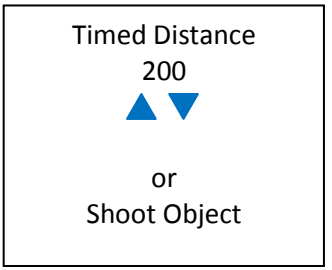
Use two flat targets, approximately 0.5 metres x 0.5 metres square. Place the targets at precise distances from the datum point (front of the lens) where the LIDAR will be positioned. The targets should be set at integer metre values from the LIDAR datum point and should be approximately 10 metres apart. Please note, minimum range capability is 3 metres. On the LIDAR unit, press the Menu button  , then use the up/down arrows until "Diff Distance" is displayed. Press Enter  . Carefully obtain a range reading from the first target and then press Enter  . Carefully obtain a range reading from the second target and then press Enter  . The LIDAR will then display the distance between the two targets on the rear display. The distance should be within 0.5 metres of the actual distance between the targets.

If the LIDAR does not pass the test, carefully recheck the distances, reposition the targets and LIDAR, if necessary, and then repeat the test. If the unit continues to fail the test, please contact customer service.

Timed Distance Mode

The Timed Distance Mode allows the LIDAR unit to be used to determine a vehicle's average speed over a known distance between two visible reference objects along the roadway.

To enter the Timed Distance Mode, press Menu  and then use the up/down arrows  to display "Timed Distance" on the rear display. Press Enter  . The rear panel will display:



The operator may now enter the reference distance in metres between the two reference objects using the up/down arrows   . Alternatively, the operator may shoot the two reference points to determine the distance to be traveled.

Note: The reference distance must be at least 60 metres.

Note: If the operator elects to shoot the distance to the reference objects, please ensure both reference points are on one side of the operator and in a straight line with the operator's position. The LIDAR will subtract the two readings to determine the distance.

To shoot the distances, simply aim at the longer-range reference object first and pull the trigger to obtain a distance reading. Release the trigger to lock in the distance reading. If you are not satisfied with the reading, you may simply aim and shoot the longer-range reference object again. Once you are satisfied with the reading, press Enter  . The unit will prompt you to shoot the shorter-range reference object. If the shorter-range reference object is located where you are standing with the LIDAR, simply press Enter  . Otherwise, shoot the shorter-range reference object and press Enter  when satisfied with the distance reading. The unit will show the distance between the reference objects.

At this point, you have either entered the reference distance or determined it by shooting the reference objects. If the reference distance is acceptable (at least 60 metres), press Enter  , or press the Menu button  to "escape" from the menu system.

Once the reference distance is accepted, the rear display will show the reference distance and instructions to "Click Trigger to Start". Click the trigger when a vehicle crosses the first reference object point to start the timer. Click the trigger a second time to stop the timer. The unit will display the average speed of the vehicle on the rear panel.

To measure the average speed of additional vehicles, simply click the trigger once to clear the old reading and timer is re-armed for a new reading.

Load Defaults

The factory default settings for the LIDAR can be restored at any time by pressing  then selecting “Load Defaults” using the up/down arrows  and pressing Enter  . This command restores default brightness and audio levels as well as settings for Minimum and Maximum range values.

ECCM Control

The ECCM menu allows the operator to temporally disable the LIDAR’s Electronic Counter-Counter Measure (anti-jamming) system. To activate or disable the ECCM, press  then use the up/down arrows  to select “ECCM” and press  . Then use the up/down arrows to select “Active” or “Disabled” and press  to confirm your selection. If ECCM is disabled, the LIDAR unit will return to ECCM “Active” if it is not in use for a few hours, if the batteries are replaced, or if “Load Defaults” is selected.

Note: While the Laser Ally is fully functional with ECCM set to “Disabled”, the ECCM setting should be left in the “Active” state during normal operation to give the full protection against laser detectors and jammers.

Input / Output Port

An eight-pin DIN style connector is located on the right side of the unit. This connector can be used to collect speed and range measurement data during operation using a special USB cable provided by Digital Ally. Contact the manufacturer for further details regarding use of the I/O port.

Recommended Daily Test

The Laser Ally LIDAR system is designed to provide years of service with limited maintenance. The unit uses sophisticated digitally locked electronics to ensure continued accuracy. However, we recommend performing the following tests before each shift that the operator is going to use the Laser Ally for enforcement purposes. This will ensure operator confidence in the instrument:

Daily Recommended Test

Initiate the system Daily Test by pressing the  button. All critical internal timing electronics and software components are checked. In the HUD will be displayed “888.8”, the Battery indicator, the Aiming Reticule and the Obstruct / Weather indictor. If all are illuminated the operator must press the  button to verify. The unit will commence a series of internal tests of the check sum, firmware, personality, battery voltage and unit temperature.

Fixed Distance Test

The Laser Ally LIDAR uses time of flight laser distance measurement as its core technology in calculating vehicle speed. Therefore, a quick check of unit's ranging accuracy is suitable for daily confidence checks.

Next the unit will require the operator to perform the short range test, which must be a minimum of 3 metres using an integer meter value. Once that measurement is completed and verified, the operator must press  . The unit will then prompt the operator to perform a long range test. The long range test must be at least 10 metres or greater in interger meter value. Once that measurement is completed and verified, the operator must press  .

The front of the LIDAR unit is the datum point, carefully obtain range readings from the target. Verify the readings are within +/- 0.3 metres of the actual range.

If the unit does not pass both of the above tests, carefully check your setup and perform the test again. If the unit still does not pass, please contact your specified service representative.

Alignment Test

The operator will be prompted to complete a horizontal and vertical alignment test of the HUD aiming reticle by selecting a target with straight boundaries such as a telephone pole or road sign at a distance of 30 metres or greater. While holding the trigger in, slowly pan the aim point on and off the target edge, verifying the range reading in the HUD changes as the reticle passes onto the target. The preceding verifies horizontal alignment. Rotate the unit 90° onto its side while continuing to look through the HUD and repeat the above test to verify vertical alignment. This will allow the operator to confirm that the Infrared energy is contained within the aiming reticule and the Lidar will confirm the range selected to perform this test. The operator will again be prompted to press the  button.

The internal Self Test will also initiate automatically anytime the LIDAR is turning on from an "off" state such as a change in batteries or after the LIDAR is idle for a few hours.

Certification

An optional recertification program is available upon request. Please contact your distributor for further information.

Maintenance and General Care

Your Laser Ally LIDAR is designed to keep performing with very little user maintenance. Besides replacing the batteries, there are no user serviceable parts and the unit should NOT be disassembled.

Cleaning

Periodic cleaning of the front lenses or HUD glass is only necessary if they acquire significant dirt or other debris that limits optical transmission. If cleaning is necessary, use compressed air or a soft brush to remove loose debris first. Then use a soft tissue with water or isopropyl alcohol, wiping from the center of the lens outward in a spiral motion. The HUD glass may be cleaned with a cotton swab to facilitate reaching the surfaces. *Note: If you encounter a stain or speck that cannot be removed with gentle pressure, do not increase the cleaning pressure as this may damage the lens coatings. Small scratches and stains during the lifetime of a unit are normal and will not noticeably affect the performance of the LIDAR.*

If necessary, the main body of the LIDAR can be cleaned with soapy water or mild household cleaning solutions. Avoid the use of acetone or ammonia.

Storage

When not in use, the Laser Ally LIDAR should be stored in moderate temperature, dry environments. Avoid leaving the unit in excessively hot or cold areas such as the dashboard of a car in summer or in the trunk on extremely cold nights. When storing the LIDAR in holsters or other containers used on motorbikes or vehicles, do not hard mount the LIDAR to the container; instead use a cushioned container. Hard mounting to vehicle frames can couple excessive

vibration into the LIDAR unit resulting in damage to internal components.

General Handling

The Laser Ally LIDAR is built to be rugged and endure many types of accident impacts and drops. However, please remember that much like a camera, the LIDAR is a precision optical instrument that should be handled with reasonable care. Avoid dropping or throwing the unit into the patrol car as hard surfaces can scratch or break the glass components.

LIMITED WARRANTY

We warrant that our Laser Ally LIDAR System will be free from defects in workmanship and material for a period of 12 months (or any other negotiated term) from the date of purchase by the original purchaser. If any defect is discovered through normal and proper use of the unit during this period, the defect will be repaired or the unit will be replaced at our factory or at one of our authorized service centers at no cost to the purchaser. The purchaser must return the defective unit to the factory or one of our authorized service centers, freight prepaid. We will pay for shipping charges for the return of the unit. This warranty applies only to structural defects in the external housing and defects in a unit's internal electro-optical components and circuitry, and is void as to units that have been opened without prior authorization, have experienced unauthorized repairs, or have had unauthorized modifications. This warranty does not cover the following:

- Normal wear and tear on the unit such as batteries, broken connectors, or scratched or broken exterior components including optical components.
- Damage caused by operator abuse or neglect.
- Damage caused by incorrect use of the unit, carelessness, unauthorized alterations to the unit, improper storage of the unit or unauthorized service, installation or repairs made to the unit.
- Damage caused by fire, flood, lightning, vandalism, collision, Acts of God, or other events beyond the reasonable control of Digital Ally, Inc. or the purchaser.

- Damage to external parts of the unit such as buttons, connectors, wires, and cables, etc.
- Damage from use of the unit in hostile operating environments.

We reserve the right to charge for repairs to a unit during the warranty period made necessary because of any of the foregoing causes at our standard rates for repair of units not under warranty. The purchaser assumes all risk of use from its purchase and use of the unit. Harmful personal contact with a unit might occur in the event of violent manoeuvres, collisions, or similar circumstances, even if the unit was properly deployed and used. We are not responsible for, and we specifically disclaim any liability for injury caused by a unit in such circumstances.

THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THIS STATEMENT. ALL IMPLIED WARRANTIES ARE DISCLAIMED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, FITNESS FOR A PARTICULAR PURPOSE, AND WARRANTIES IMPLIED FROM A COURSE OF DEALING, COURSE OF PERFORMANCE OR USAGE OF TRADE. THE PURCHASER'S SOLE AND EXCLUSIVE REMEDY FOR A WARRANTY CLAIM WILL BE THE REPAIR OR REPLACEMENT OF A UNIT.

Troubleshooting and Service

Symptom	Possible Causes
Unit will not power up when trigger is pulled	1. Replace batteries. 2. Check that batteries are inserted correctly.
Head Up Display is not visible	Check HUD brightness setting
Audio tone indicates an acquired speed, but the displays show dashes	1. Speed is less than 8 KPH. 2. Speed was acquired outside the set range windows or direction filter. Adjust Min/Max Ranges or Direction settings in Menu.
Unit has difficulty acquiring speed reading	1. Use Weather or Obstruction Mode if necessary. 2. Steady LIDAR for better aiming.
Unit will not obtain readings at close ranges	1. Disable Weather Mode if on. 2. Disable Obstruction Mode if on. 3. Minimum Range in Speed Mode is 15 metres.

Specifications

Weight:	1.14 kg with batteries	
Dimensions:	11.4 x 17.1 x 24.8 cm	
Acquisition Time:	1/3 Second	
Speed Accuracy:	+/- 1 Unit of Measure (One Sigma Standard Error)	
Minimum Range:	Speed Mode Range Mode Weather Mode	15 m 3 m 76 m
Speed Min/Max:	8 to 320 KPH	
Speed Mode:	True, Full time, Continuous Tracking History	
Distance Accuracy:	+/- 15.0 cm (to one sigma Standard Error)	
Distance Resolution:	3.0 cm	
Beam Divergence:	2.5 milliradian	
Laser Source:	Diode, 905 +/- 10 nm	
Eye Safety:	FDA CDRH Class 1	
Temperature Range:	-30° C to +60°C	
Power Source:	Two C-cells; High Quality Alkaline or NiMH Rechargeable	
Battery Life:	Up to 32 Hours of Operation (Alkaline C-cell)	

Environmental:	Waterproof to IP67
Additional Features:	Timed Distance (Stopwatch) Mode
	Obstruction Mode
	Advanced Anti-Jamming ECCM

Appendix A – Cosine Effect

The term "Cosine Effect" as typically used in law enforcement speed measurement, refers to the reduction of a vehicle's measured speed using Radar or Laser systems as compared to the actual vehicle speed when targeting the vehicle at an angle. The diagram below shows the line "V" as the vehicle's travel direction and the LIDAR operator's line of sight "O" to the target vehicle. The angle between these two lines is labelled theta "Θ". Motion of the vehicle along "Line V" is projected onto the LIDAR operator's line of sight "Line O". Using standard trigonometry, this projected motion can be shown to be:

$$\Delta O = \Delta V \times \cos\Theta$$