DragonEye Technology, LLC

DragonEye Compact Speed LIDAR™

Operator's Manual

Document # 30666 Rev. 01

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Introduction

Thank you for purchasing a DragonEye Technology speed LIDAR product.

The DragonEye Compact 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 DragonEye Compact Speed LIDAR™ was designed for compact, light-weight operation and long battery life. It provides numerous useful settings and features including advanced ECCM (Electronic Counter Counter Measures), inclement weather modes and a USB interface for easy data interface and upgrades.

Most importantly, each DragonEye Compact Speed 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 DragonEye Compact Speed LIDAR™ is a Class 1 Laser product in accordance with U.S. 21CFR parts 1040.10 and 1040.11, ***(or IEC 60825-1 2007 in countries using this international standard)*** 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--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 when possible.

Caution: Use Care When Cleaning Optics

Glass surfaces should be gently 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 you LIDAR directly at the sun as this could damage internal components

Unpacking and Checking the LIDAR Device

The basic DragonEye Compact Speed LIDAR™ unit includes the follow items:

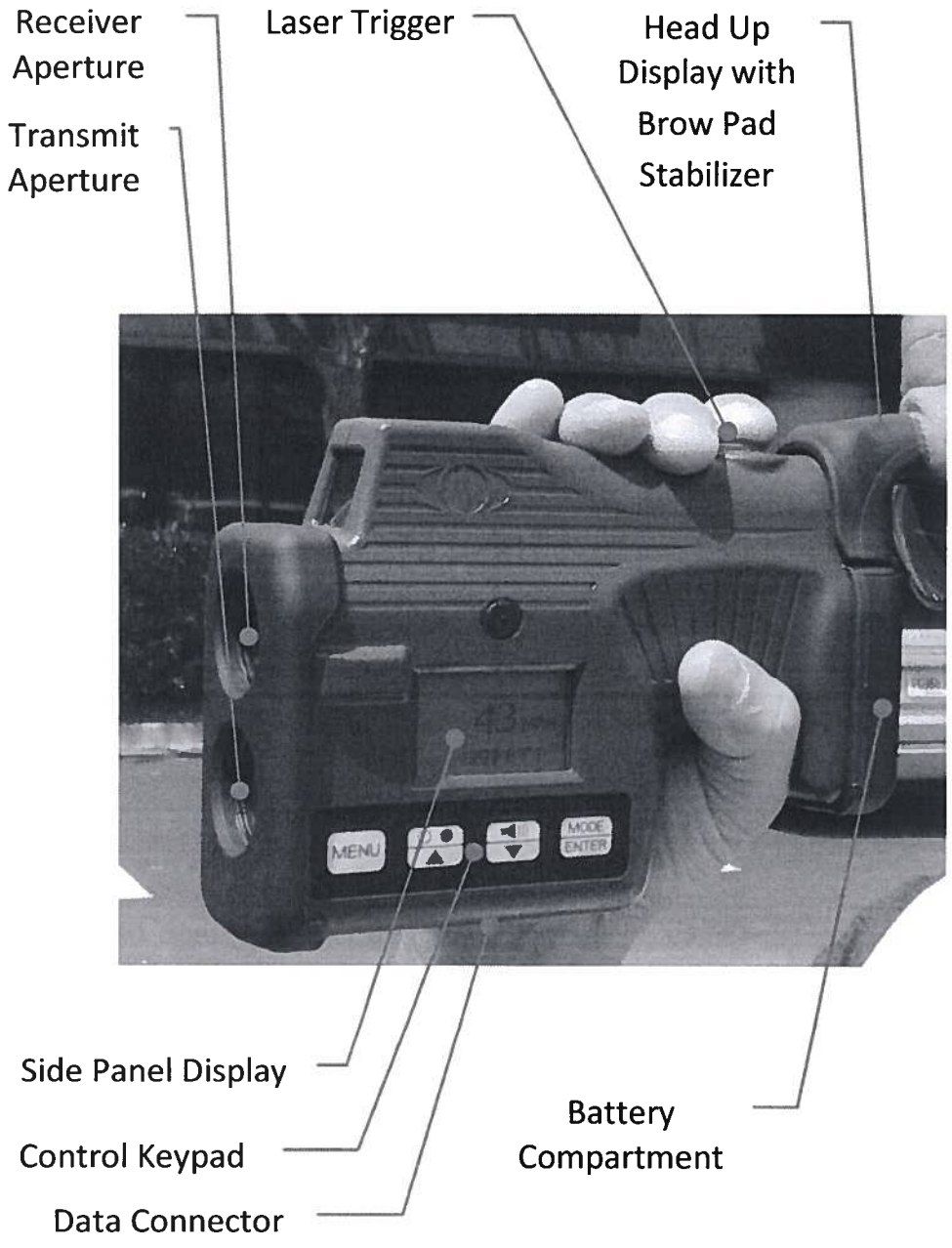
1. DragonEye Compact Speed LIDAR™ unit
2. Two "AA" Alkaline Batteries
3. Soft Pack Carry Pouch
4. Operator's Manual (DVD)
5. Quick Start Guide

Your DragonEye Compact Speed 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 DragonEye Compact Speed LIDAR™ controls and features.

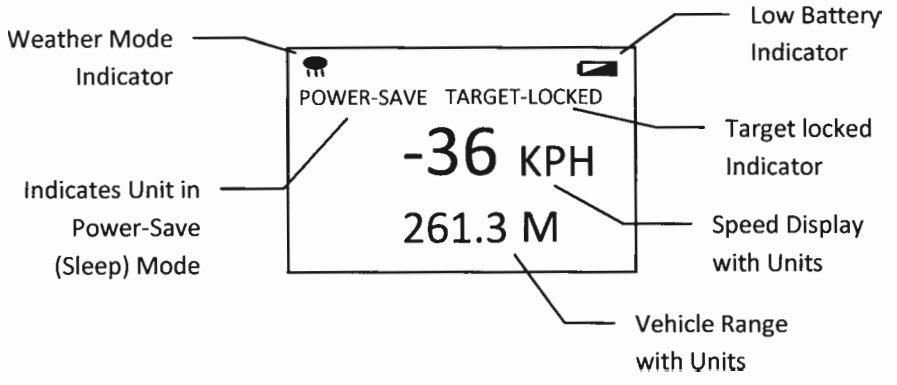
The DragonEye Compact Speed LIDAR™ is a compact easy to use speed and distance measurement tool. The following diagram shows the locations of the key external features of the device.



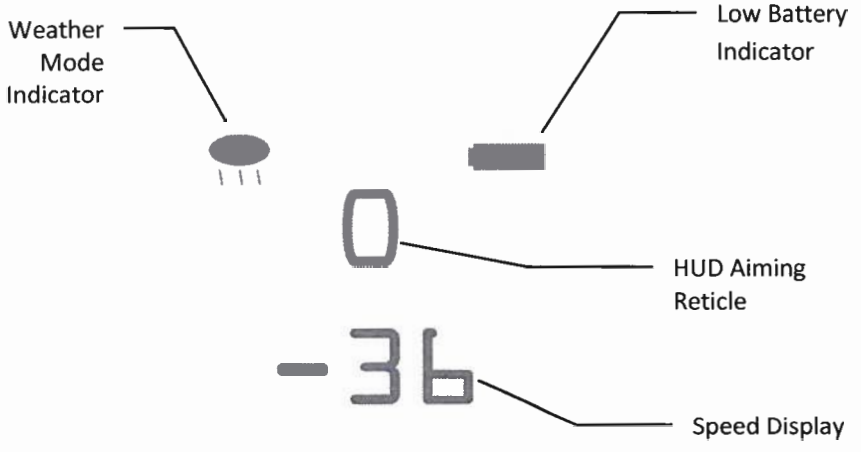
Display Descriptions

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

Side Panel Display (LIDAR in Speed Mode)



Head-Up Display (LIDAR in Speed Mode)



Controls and Indicators

The DragonEye Compact Speed LIDAR™ has an ergonomically styled grip with a top mounted laser fire trigger and an easy to use side 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.

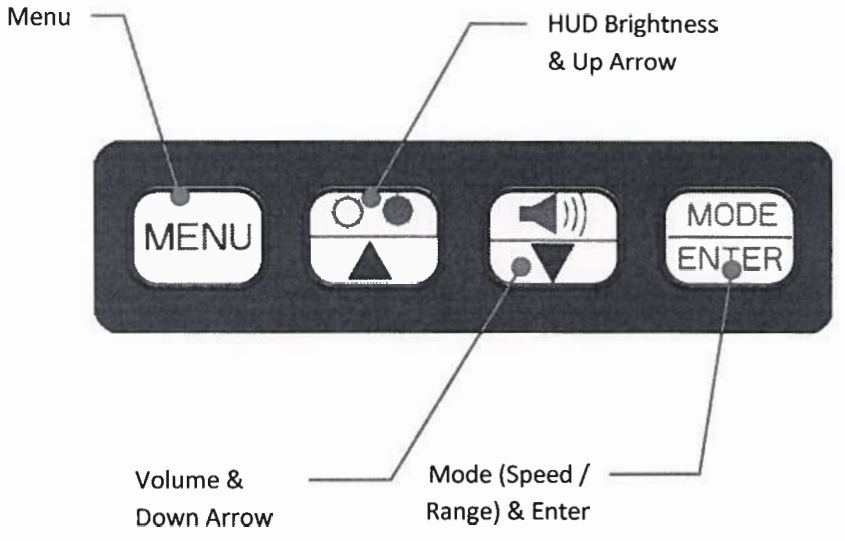
Laser Fire Trigger

The Laser Fire Trigger is used to turn-on the DragonEye Compact Speed LIDAR™ when the unit is off and to initiate laser firing when the unit is awake and ready. Simply press and release the trigger and the LIDAR will wake up and be ready to fire in a fraction of a second. ***Note: If the unit has been off for an extended period or new batteries have just been inserted, the device will automatically run the Self Test routine.***

Keypad Controls

All remaining controls are on the keypad located on the side of the Lidar, under the display. The following diagram gives the location and a brief description of the various buttons. Further details of the button functions are given 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 MENU ***button.***

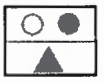


Mode Control

Pressing MODE ENTER toggles between Distance and Speed Measurement Modes. In Speed Mode the side display will show KPH and M for Kilometers per Hour and Metres for devices programmed with SI units. In Range Mode the display will simply show "M" for range

measured in Metres. Note: the LIDAR is factory set and cannot be changed by the operator.

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.***

Side Panel Display Backlight

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

Volume Control

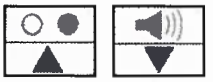
The  button toggles through the two volume levels for the audible target tracking indicator. The audio cannot be muted.

Menu/Exit Menu

The MENU 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. To exit the Menu system without making changes, press the MENU again. The general description of blue menu 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 side panel display and HUD. The unit may continue to be used; however a replacement set of batteries should be handy to avoid down time.

When the batteries reach the end of their capacity, the side 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 DragonEye Compact Speed 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 side 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 locking in a speed reading 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 DragonEye Compact Speed LIDAR™ for normal speed measurement applications. Be sure to review the "Recommended System Checks" section to understand the suggested daily performance checks and periodic certifications. Additional details of special features and other operation modes are given in "Advanced Controls and Modes" sections.

Battery Installation

Lift the rubber battery cover from the lower corners and remove the old batteries using the pull ribbon.

Insert two "AA" cell batteries on top of the pull ribbon, with positive end against the flat contacts and negative end against the spring contacts. Replace the rubber battery cover and ensure a good seal along the tongue and groove interface.

Note: The DragonEye Compact Speed LIDAR™ is designed to use quality alkaline "AA" cells from brand name manufacturers. The device also functions with rechargeable NiMH "AA" cells commonly available at consumer stores.

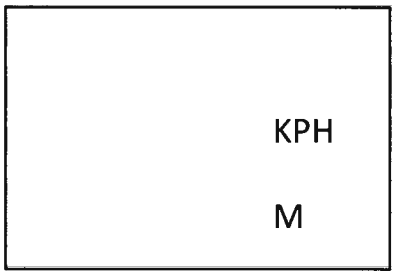
Caution: The LIDAR's rubber battery cover forms part of the water resistant enclosure protecting the unit from rain and moisture. Please be sure to change batteries in a dry environment.

Powering On

When fresh batteries are installed, the unit will automatically power up, run through Self Test and be ready for use. ***(Note: If the LIDAR is inactive for approximately 30 seconds, it will automatically transition into sleep mode to conserve battery life. If this happens, simply click the fire trigger again to wake up the unit.)***

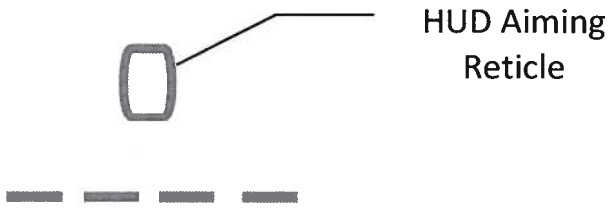
Selecting Speed Mode

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 MODE ENTER until the side panel displays:



Using the HUD Sighting System

The Head-Up display provides a precision aiming reticle, speed reading, and other status information. To find the sighting reticle, press and release 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 haven't used a HUD device before, it might take a minute or two for your eyes to adjust the first time.



(Note: Make sure the LIDAR's brightness setting is on medium or high if working in daylight.)

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 DragonEye Compact Speed 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 reading.)*** A good rule of thumb for approximately straight roadways is to target a vehicle at a range which is at least ten times the operator's perpendicular distance to the vehicles lane of travel. For example, if the operator is 9 metres from the vehicle's lane of travel, the vehicle should be targeted at 90metres, or greater. This would result in a measured speed reading which was approximately 0.5% less than actual.

Measuring Vehicle Speeds

For approaching targets, aim the LIDAR's reticle at the front grill or front license plate of the vehicle. Good targets for receding vehicles are the license plate 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 reading will be displayed in the HUD and on the side panel.

Note: At typical distances 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 reading will be shown for an approaching vehicle, while receding vehicles are indicated with a negative reading. ***(Note: Both the HUD and the side panel will show a "-" sign for receding vehicles.)***

The DragonEye Compact Speed LIDAR™ will continuously update the target's speed reading at an approximate rate of 3 times per second as long as the trigger is depressed and the data quality is acceptable. While not required, it is recommended to track the vehicle for at least 1 second to establish robust confidence in the speed reading.

Speed Display Lock

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

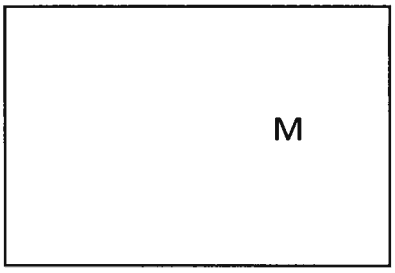
Speed Display Lock Retention

Once a speed is locked into the side display, it will be retained there for up to 20 minutes. If the laser fire trigger is pressed 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 reading is locked, the unit will go into a sleep mode, turning off the HUD and displaying "Power-Save" on the side panel along with the locked reading. In the Power-Save state, a first laser trigger press and release will "wake" the LIDAR but retain the locked reading. A second trigger press 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 [MODE / ENTER] until the side panels displays:



Use the aiming reticle in the HUD to select your desired target. Squeeze and hold the trigger down until a range reading is displayed in the HUD and on the side panel display. The trigger may be continuously held down 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 foot on the side panel and in the HUD up to 999.9 metres. Above this, range readings are displayed to the nearest integer foot or meter.

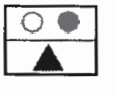
The maximum target distance is approximately 914 metres which can be obtained from highly reflective surfaces such as retro-reflective road signs or vehicle tail lights/license plates. The range to non-retro-reflective targets will vary depending upon their infrared reflectivity. Typical ranges are >305 metres from a tree with green foliage, >457 metres to a white concrete building. The minimum range (in "Normal" Weather Mode) is 3 metres when in Range Mode and 15 metres when in Speed Mode

Advanced Controls and Modes

Daily Test Initiation

Press MENU to enter the system menu options. "Self Test" is displayed as the first menu option. Press MODE ENTER to initiate the Daily Test sequence. The operator will be prompted to complete each test required. All critical internal timing electronics and software components are checked. Also, all display components are illuminated to allow the user to verify proper operation. A pass or fail indication is given at the end of the self-test. A "pass" indication then returns the operator to the current mode of operation, while a "fail" indication will halt operation indicating the need for service.

Weather Modes

Press the MENU button, and then use the up/down arrows   to select "Weather". Press Enter MODE ENTER to select "Weather"

then use the up/down arrows to select "Normal" or "Poor". Press the Enter button MODE ENTER to confirm your choice and exit back to your current mode of operation. The weather modes function as described below:

Normal Weather Mode

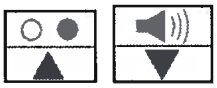
In Normal Mode, the LIDAR has no additional restrictions placed upon the minimum distance at which a target can be acquired (besides the normal minimum range specification). If rain, snow, fog or other obstacles are present in the line of sight to the target, it is possible the LIDAR will receive signals from these objects preventing a reading from being displayed on the targeted vehicle.

Poor Weather Mode

Select Poor Weather Mode to improve the LIDAR's ability to shoot through rain, snow, fog, or other airborne particulates such as heavy dust or sand. The Weather indicator  will be displayed in both the HUD and the side 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 metre limit, provided they were initially acquired outside of this range.***

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 readings will not be displayed.

To adjust either of these settings, press the menu button [MENU] and then use the up/down arrows  to display "Minimum Range" or "Maximum Range". Press the Enter button [MODE ENTER] 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 [MODE ENTER] to accept.

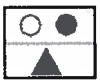
Note, once the operator begins to use the up/down arrow buttons to set the range limit, the "shoot" option will no longer be available.

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 and instead of using the up/down arrows, pull and 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 [MODE ENTER] 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 locked audible tone will be heard but dashes (- - - -) will be displayed in the HUD and on the side display in the speed reading area. Also 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 DragonEye Compact Speed 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 [MENU] then use the up/down arrows   until "Direction Filter" is displayed on the side panel. Press the Enter button [MODE ENTER] and then use the up/down arrows to display the desired filter setting: APPROACH, RECEDE, or BOTH. Press Enter [MODE 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 side panel will show "----" in the speed display area. The side 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 0.5m x 0.5m square, painted flat white. Place the targets at precise distances from a "zero" point where the LIDAR will be positioned. The targets should be set at integer feet values from the LIDAR zero point and should be approximately 10 metres apart. Recommended target distances are 20.0 metres and 30.0 metres from the LIDAR unit. Please note, minimum range capability is 3 metres. Ensure the front end of the LIDAR unit is positioned exactly at the zero point, using a tripod if necessary.

On the LIDAR unit, press the Menu button [MENU] then use the up/down arrows until "Diff Distance" is displayed. Press Enter [MODE / ENTER]. Carefully obtain a range reading from the first target and then press Enter [MODE / ENTER]. Carefully obtain a range reading from the

second target and then press Enter [MODE / ENTER]. The LIDAR will then display the distance between the two targets on the side display. The distance should be within 0.5 metres of the actual distance between the targets.

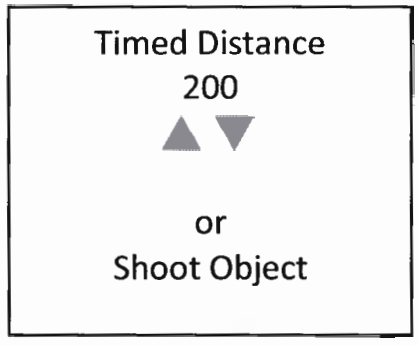
If the LIDAR does not pass the test, carefully recheck the distances and reposition the targets and LIDAR if necessary then repeat the test. If the unit continues to fail the test, please contact customer service.

Timed Distance Mode

Note: Timed Distance Mode may not be supplied on some Compact Lidar models due to restrictions in the jurisdiction.

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.

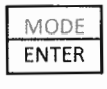
To enter the Timed Distance Mode, press Menu [MENU] and then use the up/down arrows  to display "Timed Distance" on the side display. Press Enter [MODE / ENTER]. The side panel will display:

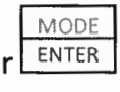


The operator may now enter the reference distance in metres between the two reference objects using the up/down arrows   . Alternatively, the operator may shoot the two reference points to determine the distance to be traveled.

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 first reference object again. Once you are satisfied with the reading, press Enter 

. The unit will prompt you to shoot the second reference object. If the second reference object is located where you are standing with the LIDAR, simply press Enter 

. Otherwise

shoot the second reference object and press Enter [MODE / 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, Press Enter [MODE / ENTER]. Otherwise press the Menu [MENU] button to "escape" from the menu system.

Once the reference distance is accepted, the side 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 side 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 [MENU] then selecting "Load Defaults" using the up/down arrows [ ] and pressing Enter [MODE / 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 MENU then use the up/down arrows  to select "ECCM" and press MODE ENTER. Then use the up/down arrows to select "Active" or "Disabled" and press MODE ENTER 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 DragonEye Compact Speed LIDAR™ 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

A mini USB style connector is located on the bottom of the unit. This connector can be used to collect speed and range measurement data during operation using a standard cable and custom software provided by DragonEye Technology. Contact the manufacturer for further details regarding use of the I/O port.

Note: The protective rubber strip covering the mini USB connector forms part of the Lidar's water resistant seal. After using the connector, carefully replace the rubber cover and ensure it is seated properly.

Recommended Daily Test

The DragonEye Compact Speed 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 system checks before each shift that the operator is going to use the DragonEye Speed LIDAR ® for enforcement purposes. This will ensure operator confidence in the instrument:

Daily Recommended Test

Press [MENU] to enter the system menu options. "Self Test" is displayed as the first menu option. Press [MODE / ENTER] to initiate the Daily Test sequence. 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 [MODE / ENTER] button to verify. The unit will commence a series of internal tests of the check sum, firmware, personality, battery voltage and unit temperature.

Fixed Target Distance

The DragonEye Compact Speed LIDAR™ uses time of flight laser distance measurement as its core technology in determining 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 MODE ENTER. 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 integer meter value. Once that measurement is completed and verified, the operator must press MODE ENTER. 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 MODE ENTER 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 DragonEye Compact Speed 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 DragonEye Compact Speed 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 DragonEye Compact Speed LIDAR™ is built to be rugged and endure many types of accidental 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.

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 Mode if necessary. 2. Steady LIDAR for better aiming.
Unit will not obtain readings at close ranges	1. Disable Weather Mode if on. 2. Minimum Range in Speed Mode is 15 metres.

Specifications

Weight:	455 grams with batteries	
Dimensions:	184 x 135 x 57 mm	
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 5 m 76 m
Maximum Range:	914 m	
Speed Max/Min:	+/- 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:	3.0 milliradian	
Laser Source:	Diode, 905 +/- 10 nm	
Eye Safety:	IEC 60825-1 2007	
Temperature Range:	-30° C to +60°C	

Power Source:	Two AA-cells; High Quality Alkaline or NiMH Rechargeable
Battery Life:	Up to 16 Hours of Operation (Alkaline AA-cells)
Environmental:	Water Resistant to IP57

Additional Features:

- Timed Distance (Stopwatch) Mode
- Advanced Anti-Jamming ECCM
- Vertical grip keeps elbow down for less shoulder strain
- Vertical orientation with HUD on top gives better peripheral vision
- Brow pad stabilization for greatly improved aiming stability

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 labeled 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:

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