DragonEye

SPEED LIDAR®

Operator Manual

Canadian Version

Doc: 30508 Rev. 05

Basic Operation

The following sections give an overview of the basic operation of the DragonEye 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.

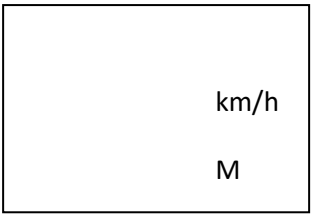
Powering On

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.

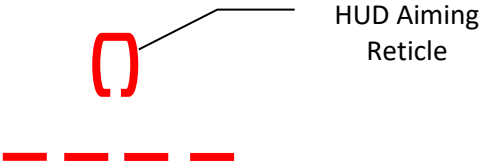
Selecting Speed Mode

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 reading, 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 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 Speed LIDAR®, it is best to select a straight stretch of roadway with a line of sight of 150 metres or more. (or follow your provincial program)

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 stationary 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 90 metres 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 back 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 back panel will show a "-" sign for receding vehicles.)*

The DragonEye 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 rear 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.*

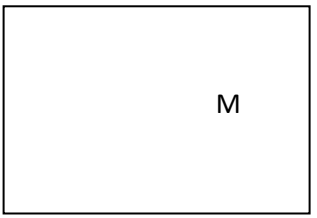
Speed Display Lock Retention

Once a speed is locked into the 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 reading 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 panels 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 integer 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. Typical ranges are >548 metres from a tree with green foliage, >610 metres to a white concrete building and 305metres from a very black, non-reflective target. The minimum range (in "Normal" Weather/Obstruction Mode) is 3 metres.

Recommended Daily Test

The DragonEye 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

Initiate the system Daily Test by pressing the  button. The initial segment of the Daily Test is comprised of two parts, the internal electrical tests and the visual rear display/HUD tests. 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 indicator. The rear

panel will also display a test pattern of alphanumeric characters along with icons (note: not all icons may be active during use on your software version). If all displays are illuminated and legible the operator must press the  button to verify. The unit will commence a series of internal tests and displays on the rear panel:

1. ChkSum: verifies no corruption of firmware
2. Firmware Version is displayed
3. DataFlash: verifies no corruption of specific unit settings in flash memory (e.g. unit of measure, menu items, etc.)
4. Serial Number is displayed
5. Battery Voltage is displayed
6. Unit Temperature is displayed

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 utility 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.

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:

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