

LRM 3500CI
LASER RANGE FINDER
MONOCULAR

105 Sparks Ave., Toronto, ON M2H 2S5, Canada

IMPORTANT INFORMATION

Read prior to activation

You have just purchased a sophisticated electro-optical device that emits invisible laser radiation. To operate it properly, please read this manual carefully.

- **NEVER** direct laser beam at the eyes of people or animals
- **NEVER** aim the unit at the Sun or bright sources of light
- **NEVER** subject the unit to impacts
- **NEVER** transport the unit without its case
- **NEVER** disassemble the unit. This may be hazardous for you due to high voltage currents in the system
- **ALWAYS** keep the unit out of children's reach
- **ALWAYS** remove the battery when the device is not in use for a long period
- **ALWAYS** store in a dry place
- **Caution** - use of controls or adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure
- **Caution** - use of optical instruments such as monocular, loupes, mirrors, lenses, etc. with this product increases eye hazard

- **Note:** Avoid eye exposure to direct laser beam or its close reflection
- **Prevent** bright light from focusing through the eyepieces
- **Never** aim the unit at highly reflective objects like mirrors and retroreflective surfaces, which are in close proximity to the laser rangefinder. This can lead to the permanent damage of the photoreceiver incorporated into the device.

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**CAREFULLY READ ALL THE INSTRUCTIONS
PRIOR TO USE!**

**FAILURE TO OBEY THE INSTRUCTIONS WILL
VOID THE WARRANTY AND MAY CAUSE
INJURY!**

1. BRIEF DESCRIPTION

LRM 3500CI Laser Rangefinder Monocular (System) is an advanced laser range finder system that enables instant distance, speed, vertical and horizontal angular measurements. An outstanding optics provides a sharp, clear image under any observation conditions.

The unit utilises time-of-flight method of distance and speed measurement. The System sends invisible, eye safe laser pulses to the target. The returned pulses are captured by the digital circuitry. The time difference is used to calculate the distance to the target. A built-in digital compass measures an angle between the optical axis and direction to the magnetic North Pole.

The unit complies with CFR 21, Part 1040.10 and Part 1040.11.

A built-in inclinometer allows elevation angle measurements and height (depth) calculations.

Key Features of the LRM 3500CI Laser Rangefinder Monocular

- Modern digital circuitry allows targeting through most types of glass
- First, last or the most reflective target acquisition
- Meters/Yards/Mils/Degrees/KMH/MPH display
- Last 10 measurements recall
- Selectable reticle shape (+ or □)
- Gating capability
- Speed detector
- Accurate digital compass
- Accurate digital inclinometer
- RS-232 bidirectional communication
- GPS interoperability (PLGR/DAGR protocol)

2. DEVICE APPEARANCE

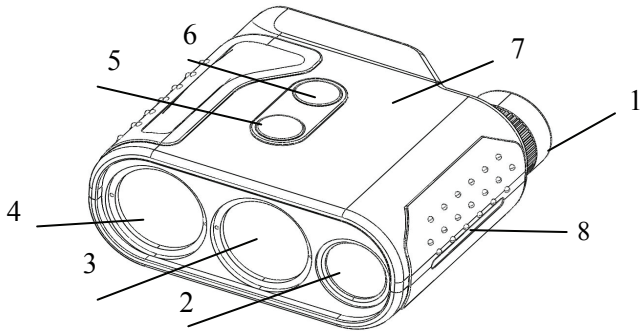


Fig. 1 Front view

1 – Eyepieces

2 – Objective lens

3 – Laser emitter lens

4 – Receiver lens

5 – M (Mode) button

6 – A (Action) button

7 – Body of the device

8 – Rubber grip

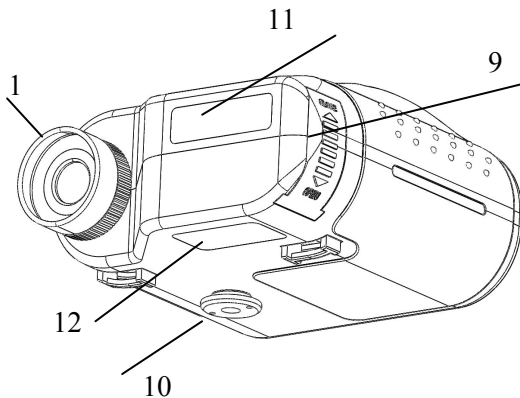


Fig. 2 Front view

1 – Eyepiece

11 – Identification
imprint

9 – Battery compartment
cover

12 – Classification
imprint

10 – Tripod socket

Newcon Optik

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This product complies with CFR 21 1040. 10 1040. 11

Made in Canada

N XXXXXXXX

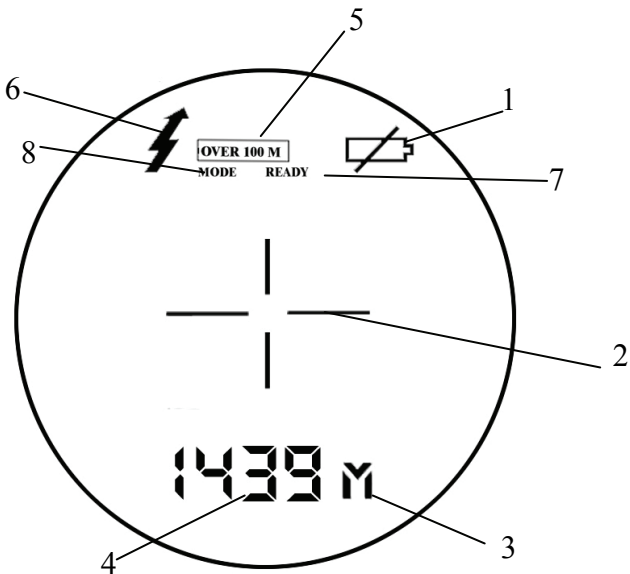


Fig. 3 Display

- | | |
|---------------------------|---|
| 1 – Low battery indicator | 2 – Reticle (either — — or \square) |
| 3 – Units of measurement | 4 – Measurement result |
| 5 – Gating indicator | 6 – Laser active indicator |
| 7 – Ready mode indicator | 8 – Setup mode indicator |

3. DELIVERY SET

Standard delivery set for LRM 3500CI includes:

	Qty
LRM 3500CI	1 pc.
Carrying case	1 pc.
Neck strap	1 pc.
User's manual	1 pc.
Warranty card	1 pc.
Cleaning cloth	1 pc.
RS-232 Computer cable	1 pc.
CD with communication software	1 pc.
Hard case	1 pc.
9V non-magnetic Lithium battery	1 pc.

Optional items

GPS cable

Exact delivery set depends on details of a contract or purchase order.

4. SPECIFICATIONS

Optics

Magnification	7x
Objective lens diameter	25 mm
Exit pupil diameter	3.6
Field of view	8°
Type of coating	Fully multi-coated optics
Dioptr adjustment range	±4

Range Finder

Laser	Class 1, eye safe, 905 nm
Measuring range	1 – 3,500 m
Accuracy and display resolution	±1 m
First, last and auto target selection	Yes
Meters / Yards display	Yes
Last 10 measurements recall	Yes
Reticle	⊥ or □
Gating capability	100 - 3,400 m; 100 m step

Speed Detection

Measured speed range	5-400 km/h or 3-250 mph
Accuracy	± 1 km/h or mph

Compass

Measured azimuth range	6400 mils /360°
Accuracy	$\pm 1^\circ$

Inclinometer

Measured elevation range	$\pm 60^\circ$
Accuracy	$\pm 1^\circ$
Height measuring	Yes (Meters or Yards)

Power

Battery	9V Lithium (non-magnetic)
Battery capacity	Min 5,000 measurements (Scanning regime)
'Low Battery' indicator	Yes

Environmental

Operational temperature range	-25...+50°C (13...+122°F)
Storage temperature range	-45...+65°C (49...+149°F)

Mechanics

Tripod thread	1/4" x 20 TPI
Weight without battery	460 g
Weight with hard case	2.2 kg
Dimensions	127x125x60 mm

5. OPERATION INSTRUCTIONS

To install a battery:

- Slide the battery compartment cover down (9, Fig. 2)
- Install the battery observing polarity
- Don't apply superfluous strength while pushing the battery inside the compartment.
- Close the compartment cover

If the battery does not fit the compartment easily, it means that either polarity was reversed or the battery contacts are jammed.

To take a battery out:

- Slide the battery compartment cover down (9, Fig. 2)
- Shake the rangefinder gently towards the open end of the battery compartment
- Pull out the battery

Note: Battery in metal casing will diminish compass accuracy. Non-magnetic batteries should be used for the utmost compass performance.

LRM 3500CI is equipped with battery monitoring sensor. If display shows “**LOW BATTERY**” warning when battery voltage falls below 6.5V this indicates that the battery is used up. You can still get readings, but the battery needs to be replaced soon.

Using the Device

The LRM 3500CI operational procedures are design to allow the user to use most applicable options in the fastest time possible. To activate it, press and hold Action button (6, Fig.1) for one second. At start the unit comes into Ready to Measure mode indicated by the word ‘READY’ on the display visible through the eyepiece.

Pressing Action button (6, Fig. 1) again will initiate measurement procedure. The results of measurement are displayed in default form of “Distance (M), Azimuth (mils) and Elevation (mils)” measurement parameters also can be modified to user preference (see Setup Mode).

If results of measurement are unreliable four dashes (‘----’) will be displayed in the area (4, Fig. 3).

Pressing Mode button (5, Fig. 1) gives the user the options to change settings from Factory default to specific modes required by user. For full list of Mode options please refer to Operation and Service modes

If the target is located below the unit the result of vertical measurement (elevation or height) will be preceded with minus (“-“) sign.

Factors affecting measuring distance

Though maximum measurement distance depends on target reflectivity, weather conditions and other conditions, for most targets the unit will provide accurate ranging for up to 2,500 meters. Under good conditions a large size target can be measured up to 3,500 meters.

Target reflectivity depends on its color, surface finish, size, shape, position in relation to the laser beam, etc. Bright target colors are more reflective than darks. A polished surface is more reflective than a rough one. Larger targets reflect better than small ones. Ranging a target perpendicular to the laser beam provides better results than the one positioned at a sharp angle to the beam.

Weather conditions that influence air transparency (rain, fog, snow, mist) reduce maximum range. Bright sunny days will reduce performance as well as IR sun radiation may cover reflected laser impulses.

While the unit will measure through many glass types, measuring through glass may reduce accuracy.

Natural hand tremor decreases the accuracy of long distance ranging. Using of a tripod is highly recommended.

Note: device may produce false readings when reticle is aimed at the sun or in $\pm 20^\circ$ solid angle from the sun.

Target selection logic

On its way towards the target the laser beam may be reflected from various objects, thus decreasing ranging accuracy. The smaller, the farther, and the less reflective is the target – the higher is the possibility of obtaining an incorrect measurement.

To improve accuracy the unit has a built-in target selection logic that allows user the option of choosing which target to range: the nearest ('first'), the farthest ('last'), or the most reflective ('auto').

This mechanism helps selecting the target when ranging from behind the bushes, wires, through the falling snow, or in similar conditions. Furthermore, it enables ranging a target in front of a bigger object, such as a wire in front of the wall.

Note: Even with target selection logic the unit may not always be able to range the desired target as its reflectivity may be too low to produce enough laser beam reflections for statistically reliable calculation. Individual Measurement and Scanning regimes

The unit can operate in two methods: (1) *Individual Measurement* and (2) *Scanning*. In *Individual Measurement* method the unit performs single measurement when Action button is pressed shortly, in *Scanning* regime the unit repeatedly measures and displays results every second while A button is pressed.

To activate *Scanning* regime press and hold Action button in Ready mode. The unit will work in *Scanning* regime while Action button is pressed.

Scanning or *Individual Measurement* regimes are available for any selected mode of measurement. When two or more parameters are measured in *Scanning* regime though first result will be displayed, the second and other results will be shown at the display if Action button is released. Nevertheless all data is transferred to the PC and recorded in internal memory, and may be recalled (see *Data Recall mode* for details.)

Operation and service modes

Pressing Mode button (5, Fig.1) in *Ready* mode switches the unit between modes of operation, to activate any desired mode from the menu you must confirm your selection by pressing Action button (6, Fig.1)

The unit has the following modes of operation:

- **Ready** – Unit is ready to perform measurements
- **dFLt** – sets default mode of operation with factory settings,
- **GAtE** – allows to set gating distance for measurement
- **Std** – allows the user to select single action measurements:

- Distance only (**d**)
- Compass Only (**C**)
- Elevation Only (**E**)
- Speed Only (**S**)
- Height Only (**H**)
- Speed + Distance (**Sd**)
- Distance +Compass + Elevation (**dCE**)
- **Unit** – allows the user to select units of desired measurements,
 - Distance from M to Y
 - Compass & Elevation from Mils to Degrees
 - Speed from KMH to MPH*

*note this option is only available if **Std Speed** is selected
- **rEc** – allows data recall of the last 10 measurement results,
 - **CLr** – Clears all Measurement
- **SEt** – allows the user to select the following advanced options:
 - **FrSt** – First Target Measurement
 - **LAST** – Last Target Measurement
 - **AUtO** – Last Target Measurement*

- **PLGr** – Communication to PLGR GPS*
 - **PC** – Communication to PC*
 - **Reticule** – Change reticule from + (cross) to □ (rectangle)
 - **CAL** – Compass calibration
 - **CALc** – compass calibration (CI model only)
 - **Corr** – accuracy correction of active measurement parameters
- *not shown in the menu if currently selected

Accuracy correction

If the System produces any measurement errors that lie beyond unit specification, it may be an indication that unit requires calibration similar to one conducted at production level. To do accuracy correction, please select **Corr** from **CAL** menu.

Perform correction according to required measurement parameters by pressing Action button, see table below:

Active mode of measurement (Std)	Correction parameter	Condition
S, Sd, d	Distance	Install unit at 1 meter ¹ from flat target ²
C, E	Azimuth and elevation	Put unit in a level plane and aim it to the North direction ³
dCE	Distance, azimuth and elevation	Install unit at 1 meter ¹ from flat target ² controlling its level position and direction to the North

1 – Accuracy of correction will depend on accuracy of installation against target. If distance is 0.9 meters, then unit will have 0.1 m offset during all future measurements.

2 – Target should not have high-reflective surface (white color is not considered high reflective in this case).

3 – Unit shall be well levelled with deviation from 0 not more than ± 0.75 degrees. Horizontal direction shall be to Magnetic North (not True North). If devices detects large installation errors (unit is not well levelled or not aimed to the North), then LCD will show result “444” and “99”,

which means that correction was not performed due to incorrect setup.

Compass calibration

If the System was exposed to a strong magnetic field or was not in use for a long time, the compass accuracy may diminish.

To return the compass into working condition:

- Select **CALc** from **CAL** menu
- Keeping the unit horizontally, perform one full rotation around vertical axis within half a minute and then one full rotation around vertical axis with device upside down during half a minute.
- If one rotation does not restore calibration – perform two rotations.

The normal compass functioning will be restored.

Setting interface format

In this mode data communication standard is set. The unit can output measurement data via RS-232 port in either PC format (description of the proprietary format can be obtained from Newcon upon a request) or in the format accepted by PLGF/DALGR.

To select required data format:

- Select **PLGr** or PC from **SEt** menu

- Pressing Action button will activate PC or PLGR format, the display name of format that can be activated will be shown.

Gating mode

In this mode gating function is activated: here user can set the minimal distance to the target, any object closer than the gating distance will be ignored.

To select Gating Mode:

- Select **GAtE** from mode menu

Minimal gating distance of 000 m will be initially set, further pressing M button will increase gating distance by 100 m up to 3,400 m. When the desired distance is reached – select it by pressing **Action** button.

OVER 100M – indicates that gating is active

To deactivate gating choose gating value zero.

Note: The gating distance can only be increased. To exit the gating selection cycle without setting any gating distance click through full gating range with **M** button or hold **M** button for 2 seconds.

Gating feature helps measuring remote targets in unfavourable atmospheric and environmental conditions by eliminating reflections from snowflakes, raindrops, industrial wires, tree branches, etc. At the same time, if gating distance is set incorrectly, you can remove the desirable object from measurement range.

Data Recall mode

In *Data Recall* mode results of the last 10 measurements can be displayed.

Measurement results are saved in on-board memory in sets depending on the parameters set for measuring, for instance, if only distance is measured - the set will consist of one number, if distance and azimuth are measured – the set will consist of two numbers.

To enter *Data Recall* mode select **rEc** from mode menu. First measurement set number (display name: **rEc 1**) will start flashing.

Pressing M button moves the unit along the list of measurement set numbers and measurement results:

- rEc 1**, distance 1, azimuth 1, elevation 1,
- rEc 2**, distance 2, azimuth 2, elevation 1, ...,
- rEc 0**, distance 0, azimuth 0, elevation 0.

Measurement sets are numbered in reverse order: first recalled set is the result of the last measurement. If any parameter has not been actually measured it will not be recalled.

Pressing A button at any moment within the list of recalled results brings the unit to *Ready to Measure* mode.

Choosing **cLr** at the end of recalled data will erase the device memory.

Computer interconnectivity

The unit supports RS-232 interface. Physical connection is performed through connector with threaded coupling mechanism, designed for the heavy-duty outdoor applications.

Note: Do not apply excessive force when disconnecting cable. Damage to cable or connector resulting from improper treatment is not covered by warranty.

To attach the cable to the rangefinder match the key on the plug (1, Fig. 5) with the corresponding key on the socket and then push gently the plug holding it by its casing (3, Fig. 5) until click.

To detach the cable slide sleeve (2, Fig. 5) away from the unit and pull the plug out.

The communication port must be initiated prior to connecting the unit to the computer. The data is transmitted as hex string code with fixed baud rate of 38400 bit/sec, 8 bits, one stop bit, and no parity.

This connector is IP67 rated.

GPS interconnectivity

LRM 3500CI can transmit the acquired data to a GPS receiver using DB15 connector and PLGR/DAGR protocol. An optional cable is required.

To work with GPS, perform the following steps:

- Switch the rangefinder to **PLGr** mode;
- Choose **dFLt** measuring mode;
- Connect the rangefinder and GPS unit with the cable.

For each measurement GPS will display the absolute coordinates of your target.

Note: If the rangefinder is not set initially to **dFLt** mode, the GPS will not operate properly.

Note: GPS unit automatically adjusts coordinates to reflect actual magnetic declination. Therefore, coordinates displayed on the GPS may differ from those calculated by the computer.

Short mode switching scheme

Upon request, your LRM 3500CI rangefinder may be manufactured with reduced functionality. This version is easier to use, and it is beneficial for users planning to work with GPS only. The short mode switching scheme does not transmit data in PC software format.

Note: The rangefinder can be programmed for the short or full mode switching scheme at the factory only.

6. BEST MEASURING TECHNIQUE

Laser range finder measures distance by catching laser beam reflected from the target. Everything that improves reflection increases the measurement reliability and maximum range.

1. Use tripod when ranging remote targets. The longer is the distance, the greater is the beam shift due to hand tremor.
2. Aim at a surface on the target that is the closest to perpendicular to the laser beam. The closer you get – the stronger will be the reflection.
3. The unit deploys sophisticated software that tries to understand which target you are aiming at. However, due to beam divergence several objects may produce a strong reflection. To help the System recognise the target the *Target Selection Logic* may be used. For example, if ranging a wire in front of a building, selecting the “first” target will produce a more reliable result. Alternatively, when aiming at a chimney behind the trees, selecting “last” target will be better. By default the System assumes “auto” target selection, that is, the object producing the most reflections will be considered a target.
4. Another way to improve reliability of measurement is to use gating mechanism. If gating is active reflections from all objects closer than the gating

distance will be ignored. This is especially effective when ranging in unfavourable atmospheric conditions, that is, in the rain, fog, haze or in the bright sun. Gating provides better results than the “last” target selection, but it requires preliminary rough distance estimation to cut off all objects closer than the chosen one.

Note: Gating setting is remembered by the System until altered. Therefore, if you forget to turn the gating off, the next time you start measuring it can ignore the desired object, if it is closer than the gating distance. The unit will display four dashes instead of the measurement results. “Over 100 meters” display indicator shows active gating.

7. STORAGE AND MAINTENANCE

The unit is a sophisticated precision optical instrument equipped with laser and electronics. Therefore, it should be handled with due care.

- Keep away from direct sunlight.
- Avoid impacts, jolts, dust, moisture, and sharp changes of temperature.
- Do not use the device at temperatures higher than 50°C (122°F).
- Do not touch optical surfaces. Doing so may damage the anti-reflection coating.
- Clean optical surfaces only with professional camera lens cleaning supplies.

- Clean the exterior of the unit with a soft clean cloth.
- Keep the unit away from heating appliances and central heating.
- Remove the battery when storing the device for long time.
- All repair works must be performed by an authorized service.

8. TROUBLESHOOTING

Ranging does not work. The display is transparent.

Check the charge of the battery. Replace it if it is weak.

Ranging does not work. The display indicates results of the last measurement.

Wait for 8 seconds until the display becomes transparent, and press the Action button again.

Black dots are visible on LCD.

Liquid Crystal Display may have small black dots, scratches and other blemishes inherited from the manufacturing process. These flaws are strictly regulated by number, area and location and do not degrade the product's measurement capabilities.

Range measurement cannot be obtained.

- Make sure that neither your hand nor finger is blocking objective lens, laser emitting lens or receiver lens.
- Hold the unit firmly (avoid hand tremor) while pressing the Action button.
- Check that the target is within measuring range of the device and the gating mode does not cut it off.

9. WARRANTY

NEWCON warrants this product against defects in material and workmanship for one year from the date of the original purchase. Longer warranty is available, subject to the terms of the specific sales contract. Should your Newcon product prove to be defective during this period, please deliver the product securely packaged in its original container or an equivalent, along with the proof of the original purchase date to your Newcon Dealer.

Newcon will repair (or at its option replace with the same or comparable model), the product or part thereof, which, on inspection by Newcon, is found to be defective in materials or workmanship.

*What This **Warranty Does Not Cover:***

NEWCON is not responsible for warranty service should the product fail as a result of improper maintenance, misuse, abuse, improper installation, neglect, damage caused by disasters such as fire, flooding, lightning, improper power supply, or service other than by a NEWCON Authorized Service.

Postage, insurance, and shipping costs incurred while presenting your NEWCON product for warranty service are your responsibility.

If shipping from North America please include a cheque or money order payable to NEWCON OPTIK for the amount of US\$15.00 to cover handling and return shipping.

10. CUSTOMER SUPPORT

Should you experience any difficulties with your NEWCON OPTIK product, consult the enclosed manual. If the problem remains unresolved, contact our customer support department at (416) 663-6963 or toll free at 1-877-368-6666. Our operating hours are 9am-5pm, Monday - Friday, Eastern Standard Time. At no time should equipment be sent back to Newcon without following the instructions of our technical support department.

NEWCON OPTIK accepts no responsibility for unauthorized returns.

To locate NEWCON Authorized Dealer call:

Tel: (416) 663-6963 Fax: (416) 663-9065

Email: newconsales@newcon-optik.com

Web: www.newcon-optik.com

The defective products should be shipped to:

US customers:

2498 Superior Ave. Cleveland, OH 44114

All other countries:

105 Sparks Ave., Toronto, ON

M2H 2S5, CANADA

11. QUALITY CERTIFICATE

Serial number _____

The unit indicated above has passed the quality inspection.

Production date _____

Quality Inspector _____

Purchase date _____

