

LRM 2200SI
LASER RANGE FINDER MONOCULAR

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 the case
- **NEVER** disassemble the unit. This may be hazardous for you due to high voltage currents in the system
- **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
- **ALWAYS** keep the unit out of the reach of children
- **ALWAYS** remove the battery when the device is not in use for a long period
- **ALWAYS** store the unit 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 binoculars, loupes, mirrors, lenses, etc. with this product increases eye hazard
- Avoid eye exposure to direct laser beam or its close reflection
- Prevent bright light from focusing through the eyepiece

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**CAREFULLY READ ALL THE INSTRUCTIONS BEFORE
USING THE UNIT!**

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

1. BRIEF DESCRIPTION

LRM 2200SI Laser Rangefinder Monocular (the unit) is an advanced laser range finder system that enables instant distance, direction, elevation, azimuth and speed measurement.

The unit complies with CFR 21, Part 1040.10.

High quality multi-coated optics are combined in this device with complex circuitry design to create a system that can outperform other product in its class.

Principle of operation

Once activated, the unit sends invisible, eye-safe laser pulses to the target. The pulses reflected from the target are captured and processed internally. The unit operates based on the time-of-flight principle meaning that range is calculated by measuring the delay between the sent and received laser pulses.

A built-in digital inclinometer measures the elevation simultaneously with distance measurement, in its turn elevation

measurement allows height calculation. The unit measures azimuth simultaneously as well. Speed of an object moving closer or further from the unit can also be calculated using the time-of-flight principle.

Key Features

- Three channel optical solution (optical, laser and receiver) ensures measurement accuracy
- Original digital circuitry allows ranging through most types of glass, bushes and other obstacles
- Distance is displayed in meters or yards
- Speed is displayed in km/h or mph
- On-board memory stores results of last 10 measurements, for recall
- Selection of the first, last or the most reflective target
- Target quality display indicator assures results are reliable
- Two reticle shapes: -|- or □
- Built-in digital compass and inclinometer
- Speed and height measurement capability
- The unit automatically turns off when idle for 16 seconds to preserve battery
- Rubberised weatherproof body

2. DEVICE APPEARANCE

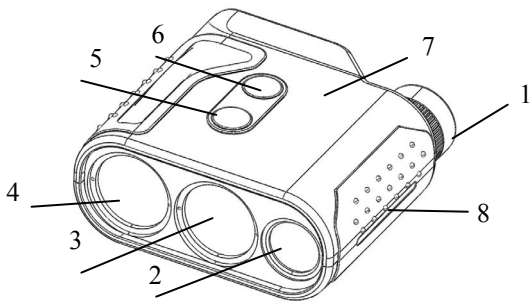


Fig. 1. Front view

1 - Eyepiece

3 - Laser emitter lens

5 - M (Mode) button

7 - Body of the device

2 - Objective lens

4 - Receiver lens

6 - A (Action) button

8 - Rubber grip

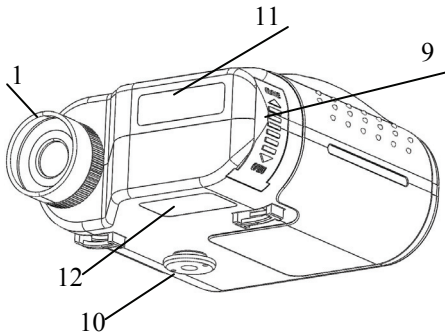


Fig.2. Rear view

1 - Eyepiece

9 - Battery compartment cover

11 - Identification imprint

10 - Tripod socket

12 - Classification

imprint, shown below

Newcon Optik

105 Sparks Ave. Toronto, ON Canada M2H 2S5

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

Made in Canada

N XXXXXXXX

3. DELIVERY SET

Standard delivery set

LRM 2200SI is supplied in a set comprised of the following:

	Qty
LRM 2200SI	1
9V Lithium (non-magnetic) battery	1
Soft carrying case	1
Cleaning cloth	1
Neck strap	1
Operation manual	1
Warranty card	1

4. SPECIFICATIONS

Optics

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

Range Finder

Laser	Class 1, eye safe, 905 nm
Measuring range	10 m – 2,200 m
Accuracy	± 1 m
First, last and auto target selection	Yes
Meters/Yards display	Yes
Last 10 readings recall	Yes
Reticle	- - or □
Target quality indicator	Yes

Compass

Measuring azimuth range	360°
Accuracy	±2°

Inclinometer

Measuring elevation range $\pm 80^\circ$

Accuracy $\pm 1^\circ$

Speed Detector

Measured speed range 5-400 km/h

Accuracy ± 2 km/h

Power

Battery 9V Lithium (non-magnetic)

Battery capacity Min 5,000 measurements
(Scanning regime)

'Low Battery' indicator Yes

Environmental

Operational temperature range $-25 / +50^\circ\text{C}$ ($-13 / +122^\circ\text{F}$)

Storage temperature range $-45 / +65^\circ\text{C}$ ($-49 / +149^\circ\text{F}$)

Mechanics

Tripod thread $\frac{1}{4}$ inch

Weight without battery 450 g

Dimensions 127x125x60 mm

5. OPERATION INSTRUCTIONS

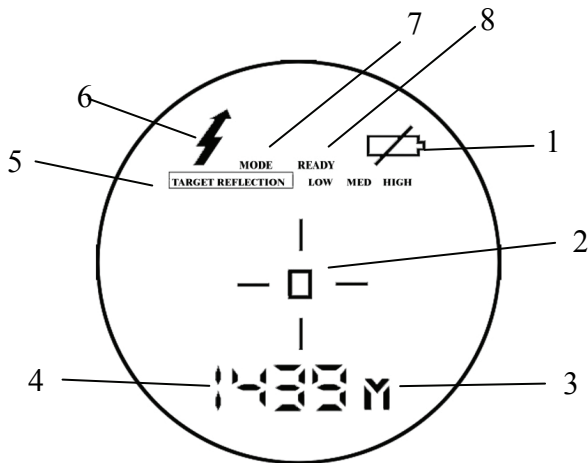


Fig. 3. Liquid Crystal Display as seen through the eyepiece

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

Changing battery

To install a battery:

- Slide the battery compartment cover down (Fig. 2)
- Install the battery, observing correct polarity
- Do not force the battery while placing back 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 remove battery:

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

The unit is fully operational when battery voltage is higher than 6.2V. A '**LOW BATTERY**' warning is displayed when battery voltage falls below 6.5V.

Ni-MH rechargeable batteries capable to sustain current drain up to 250 mA can be used to power the unit.

Note: Non-magnetic batteries should be used for peak compass performance. If a non-magnetic battery is not used, you may need to calibrate the unit after changing the battery (see *Compass calibration* below for more details).

Measuring procedure

When the unit is powered off the LCD will appear blank. To activate the unit press and hold A button (Fig. 1) for half a second. The word 'READY' will appear on the display to indicate the unit is powered on.

Pressing the A button (Fig. 1) in *Ready to Measure* mode will initiate measurement. The result of the measurement is displayed in a form that depends on the measurement parameters (see Setup Mode).

If a measurement is unsuccessful for any reason, four dashes ('----') will be displayed on the LCD. For successful measurement the target must be at least 10 m away.

If more than one parameter is chosen to measure, e.g. distance and elevation, the results will replace each other on the display every second.

Maximum distance

Though maximum measurement distance depends on target reflectivity, weather conditions and other conditions, for most relatively large targets the unit will provide accurate ranging for up to 2,200 meters. The indicated measurement range (2,200 meters) is proven to a NATO standard target with the following characteristics: 2.3x2.3 meters, albedo 0.3, visibility >20km.

Target reflectivity depends on its color, surface finish, size, shape, position in relation to the laser beam and other factors. 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 under 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 interfere with 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. Use of a tripod is highly recommended.

Target selection logic

On its way towards the target the laser beam may reflect off various objects in the atmosphere, 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, which allows 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 bushes, wires, through falling snow, or in similar conditions. Similarly 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. A warning will be displayed if the result is not statistically reliable. See more about target reflectivity in *Additional display information*.

Operation and service modes

Pressing Mode button (5, Fig.1.1) 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 the Action button (Fig.1.1). The unit has the following modes of operation:

- **Ready** – Unit is ready to perform measurements
- **dFLt** – sets default mode of operation with factory settings¹
- **GAtE** – sets gating measurement mode
- **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 + Elevation (**dE**)
- **Unit** – allows the user to select units of desired measurements:

- Distance from meters to yards
- Speed from km/h to mph²
- **rEc** – allows data recall of the last 10 measurement results:
 - **CLr** – Clears all measurements
- **SEt** – allows the user to select the following advanced options:
 - **FrSt** – First Target Measurement
 - **LASt** – Last Target Measurement
 - **AUtO** – Auto Target Measurement³
 - **Reticle** – Change reticle from + (cross) to □ (rectangle)
 - **CAL** – Calibration
 - **CALc** – Compass calibration
 - **corr** – Accuracy correction of active measurement parameters
 - Display Test

1 - in default, the following modes are set: distance in meters, elevation in degrees, speed is set to km/h (not measured), cross reticle, most reflective ('auto') target selected, no gating.

2 - this option is available only if Speed is selected from the **Std** menu.

3 - 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 during production process. To perform the accuracy correction, select **corr** from the **CAL** menu.

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

Active mode of measurement (Std)	Correction parameter	Condition
D, dE	Distance	Install unit at 1 meter ¹ from a flat target ²
C	Azimuth	Put unit on a level plane and aim it to the North direction ³
E, dE	Elevation	Put unit on the horizontal level

1 – Accuracy of correction will depend on accuracy of installation against the target. It must be exactly as specified. The numbers shown on the display reflect the correction.

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

3 – The 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 the unit 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 horizontal, 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.
- Normal compass function should now be restored.

Gating mode

In this mode gating function is activated. Here the minimal distance to the target can be set. Any object closer than the gating distance will be ignored.

To select Gating Mode:

- Select **GAtE** from the 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 2,100 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 or switch to the default mode.

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 measure 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.

Individual Measurement and Scanning regimes

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

Scanning or *Individual Measurement* regimes are available for any selected mode of measurement. When two parameters are

measured in the *Scanning* mode, though both will be quickly displayed, the second one may be difficult to register by eye. Nevertheless all data is recorded and may be recalled (see *Data Recall mode* for details.)

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

Additional display information

Additional indication is displayed in *Ready to Measure* mode:

Y or M	Indicates that distance is displayed in yards or meters; elevation may or may not be measured
o	Indicates that only azimuth or elevation is measured
KMH or MPH	Indicated speed is displayed in either kilometres per hour or miles per hour

Reliability of ranging depends on the number of impulses that reflect from the target and reach the unit. The unit informs the user:

TARGET REFLECTION LOW – ranging results have low statistical reliability,

TARGET REFLECTION MED – ranging results have medium statistical reliability,

TARGET REFLECTION HIGH – ranging results have high statistical reliability.

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 bright smooth surface on the target that is the closest to perpendicular to the laser beam. The closer to perpendicular 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 choosing the object that produces most reflections at maximum distance.

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 away from heating appliances and central heating.
- Remove the battery when storing the device for long time.
- All repair works must be performed only by an authorized service.
- Prevent bright light from focussing through the eyepiece

8. TROUBLESHOOTING

The ranging does not work. The display is transparent.

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

The ranging mode does not work. The display shows results of the last measurement or is transparent.

Wait for 16 seconds, and press the Action button again.

Compass shows zero at any direction.

Wait for 8 seconds, and press the Action button again. If this does not help, perform compass calibration.

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.

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 this manual first. 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: +1(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

The unit has passed the quality inspection.

Production date

Serial number

Quality Inspector

Purchase date

NEWCON OPTIK™

Printed in Canada