Contents

Introduction

Target Detection, Recognition and Identification in any geographic and weather conditions are very important for military actions.

By using the infra-red spectral detection with ***RB100L*** , the system can see through haze, smoke, rain, snow and total darkness in order to track and aim targets which is difficult to be observed by human eyes in both day and night and all weather conditions. Target locating feature by using of a laser range finder, GPS and Compass makes this product as a unique assistant for the troops in the battle fields.

RB100L Thermal Camera is lightweight, low power dissipation, more reliable and robust performance and functionality.

Other features are as follow:

- High accuracy for night vision, identification and tracking.
- Accurate performances.
- Military standard
- Target Locating (geographical Coordination of target and camera)
- Target distance measurement
- Two targets distance difference measurement.
- Two targets speed difference measurement.
- Raw Data Display available on monitor via PC serial port.

- The printed User Manual provides the necessary information required safely camera operation.
- The camera must be used and maintain by trained users.
- Read the User Manual completely before preceding the operation of the camera.
- Do not try to repair or disassemble the camera.

Read the User Manual completely before using the RB100L Camera.

User Manual should be available as reference for all Users.

Precautions

Important notes should be considered before and during camera operation:

- Do not aim the ***RB100L***Thermal Camera directly at very high intensity radiation sources such as sun, carbon dioxide lasers or welding arcs, which will damage the camera.
- Do not power on the camera aiming direct to high temperature targets.
- Always carry the ***RB100L*** Thermal Camera on its special case

- Remove the batteries from the case of the camera and store it in the carrying case while it is not in use.
- In laser shooting mode for range finding, Make sure the distance is not less than 50 meter .Otherwise the Laser will be damaged.
- The ***RB100L*** Thermal Camera integrates precision optical equipment and high technology static-sensitive electronics, so keep the camera out of the high electro- static environments.
- Do not try to disassemble or repair the Camera, otherwise the guarantee will be void.
- Contact after sales service technical Department for any technical problems.

Important Notices:

- Read the User Manual completely and carefully. The RB100L Thermal Camera must be used by trained users.
- Do not use any nonstandard AC adapter.
- Do not power on/off the camera frequently. Duration between turning on and off the product should be at least 60 seconds.
- To protect the camera against electrical shock, connect or disconnect the cables when the Camera is power off.

- The RB100L Thermal Camera lens has been coated with an anti-reflective film layer and too much lens cleaning will damage the coating. So clean the optical surfaces if it is necessary.
- Please avoid touching the exposed lens surface, because the acid substance on the fingers will damage the coatings and lens surface.
- Use only lens cleaning tissue. Never use chemical solutions, thinner, ether, acetone, alcohol and etc.
- To clean the greasy surfaces use 80% ether and 20% alcohol solution and a soft cloth

Important notes for camera batteries and power adapter:

- The RB100L Thermal Camera operates for over 4 hours by using 7.2V/4.2Ah rechargeable Li-ion battery.
- Use the fully charged batteries.
- Place the batteries in the charger in correct position.
- Batteries will be completely charged in 5 hours.
- 5 hour charging time is necessary to charge the complete discharge batteries.

Technical Specification

Detector Material	Uncooled FPA microbolometer
Spectral Range	8 ~ 12μm
Pixels	384 × 288
Pitch	17 μm
Lens	100 mm
FOV	4.2˚× 5.5˚
Focus Range	10m ~ ∞
F#	1.4
MRTD	0.24 mrad
Video Output	PAL
Frame Frequency	50 Hz
Adapter	220VAC/ 9VDC
Power Dissipation	≤ 3W

Components		
Laser Range Finder	Operating Voltage	12V DC
	Range	50m ~ 10Km
	Serial Interface	RS232
GPS	Receiver Type	65 satellites, parallel and simultaneously
	Signal Detection	better than -160dbm
	Accuracy in Position	5m CEP
	Accuracy in Velocity	0.1m/sec
	Input Voltage	3.3 ~ 5V DC
Digital Compass	Operating Voltage	3.3 ~ 5V DC
	Measuring the angle	RS232,PWM,I2C
	Accuracy in angle	0.1 degree

other	
Display	OLED Viewfinder
	800 × 600 pixels
	12.78 × 9 mm^2
Battery	Li-ion
	7.2V / 4.2Ah
	≈ 4hours operating time
Color	Cream
Weight	3.3KG
Size	265x110x198 mm

Accessories Pictures

Power/Video/RS232 Cable

AC Power Adapter

Rechargeable Li-ion Battery

Battery Charger

Safety Bag

Tactical Bag

Software CD

Tripod

Tripod Bag

User Manual

RB100L Components

1. **GPS**
2. **Eye shield protection rubber**
3. **Command Keys**
4. **Camera Handhelds**
5. **Infrared Lens**
6. **Infrared Lens Cover**
7. **Laser Range Finder transmitter**
8. **Laser Range Finder Receiver**
9. **Laser Cover**


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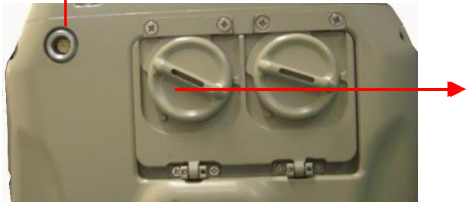
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10.Eyepiece Focal Length Adjust Ring (Diopter)

Adjustment to correct vision status for each user eyes.

11.On/Off Key

12.Connector (Lemo Type) Interface

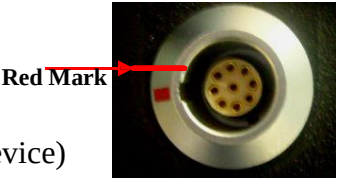
13.Battery Case Lockers

14.Battery Case

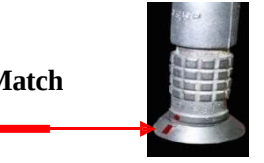
Connector (Lemo type) Interface

There is a Lemo Type connector interface on the ***RB100L*** body which provides one input and two outputs:

- **Input**
  1. AC Power Adapter
- **Outputs**
  1. Video (external display device)
  2. RS422 (target locating raw data)



Insert the enclosed cable connecting Lemo plug to the Lemo interface on the ***RB100L*** Thermal Camera. The red mark on the interface should match the red mark on the plug.



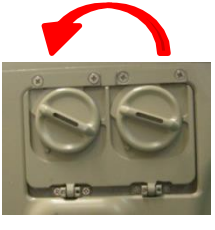
System Operation

RB100L Thermal Camera may be used by batteries or power adapter.

1. **AC Power Adapter**

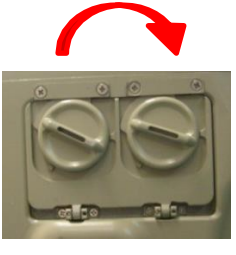
2. **Li-ion Battery**

   To open the battery case, rotate the battery case lockers counter clockwise.



Insert the battery and make sure the batteries placed in the right position.

Close the battery case cover.



The ***RB100L*** Thermal Camera has an Output Cable. The description is as follow:

1. External power supply inlet :
   For Camera operation with adapter

2. AV Video output:
   To display thermal image on monitor

3. RS232 serial connector:
   contol the camera through PC and geographical coordinate's information of target and camera can be shown on PC via a serial converter.
   (RS422 ➔ RS232)

- Insert the cable to the Lemo Interface on the camera.
- Connect the video port to external display device such as monitor.
- In case of using the camera without the batteries, Connect the AC adapter male output socket to the external power supply inlet.
- Connect the RS422 port to PC for getting the raw data of the camera readout.
- Remove the camera lens cover and laser.
- Press and keep the On/Off key for 3 ~ 5 seconds to turn on the ***RB100L*** Thermal Camera.
- Adjust the image resolution by rotating eyepiece focal length adjust ring.
- By using the command keys «F+ & F-»keys focus the image.
- After Operation, put back the lens cover

- Press and keep the On/Off key to turns off the camera.
- For unplugging the cable from the camera, do not twist the connector, just grab the body of the connector and pull it up, it will be released and easily comes out of its place

Command Keys

There are 8 command keys on ***RB100L*** Thermal Camera body. The following table will describe the function of each command keys.

Button	Function
M	**Displaying Menu Bar**
+	**Adjustment change (increasing)**
-	**Adjustm nt Change (Decreasing)**
D	**Modes Selection**
R	**Reticle show/hide**
F+	**Far Focus**
F-	**Near Focus**
L	**Laser Shot**
M & -	**Bad Pixel correction menu select**

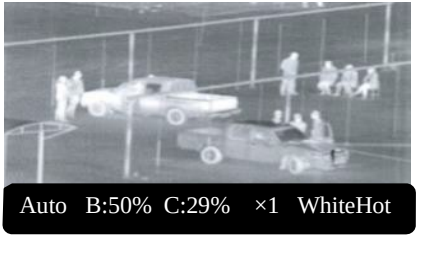
- «M» and «+, - » command keys are refer to IR menu bar. «M»button displays Infrared image parameters and «+, - »buttons adjust the parameters value.

- In some cases, «+, -»buttons are incorporated with «M»button and display special menu.

- Other command keys have independent function which will be explained.

Menu Bar Parameters

Turn on the Camera, press the menu button («M»button), the menu bar will be shown on display (as shown in the picture). There are parameters on menu bar that you may select by pressing the «M»button. You may select the parameters you need to change as soon as selecting a parameter. The selected parameter will be shown in bright white on gray background .Adjust each parameter value by pressing «+,-»buttons.



Menu bar Parameters

1. **Auto / Semi Auto Mode**
2. **Brightness**
3. **Contrast**
4. **Electronic Zoom**
5. **Polarity (White Hot / Black Hot)**

- **Auto or Semi Auto Mode**
  - Select parameter “Auto“.
  - by pressing «+ or -» buttons you may switch to “Auto” or “Semi Auto” modes

Mode	Menu Content	Effect
Auto	Brightness, Contrast	Auto brightness and Contrast
Semi Auto	Brightness, Contrast	Auto brightness, Manual Contrast

Auto Mode: In this mode, the camera will adjust the brightness and contrast automatically, but if you need to change the brightness and contrast select parameter ”B“ and “C” to adjust the brightness and contrast to set perfect image quality.

Semi Auto Mode: In this mode, the camera will adjust the brightness automatically, but you need to adjust the contrast manually by selecting the parameter “C”, also in this mode you can adjust the brightness manually by selecting parameter “B”.

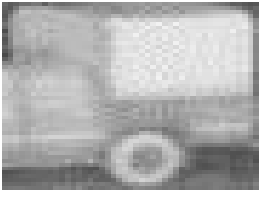
Auto Mode :C : 21%

Auto Mode :C : 38%

SemiAutoMode

♦ Electronic Zoom

The ***RB100L*** Thermal Camera has an electronic zoom feature to make the image bigger, default is ×1(no magnification) but by selecting this parameter and pressing «+ or -» buttons, it may select ×2(2 times magnification) and ×4(4 times magnification)



♦ **Polarity**

The ***RB100L*** Thermal Camera uses different gray level show thermal images. Under positive polarity mode, brighter part represents higher temperature, while under negative polarity mode, brighter part represents lower temperature. Select menu polarity parameter and press «+ or -» buttons to switch between two polarity modes.

Positive Mode

Negative Mode

Bad Pixel removing menu

In the following image the bright spots are bad pixels; it happens because of too-high or too-low response rate between pixel and IR radiation.

To remove bad pixel, press the «M & -» buttons simultaneously for 3 seconds until a menu appears on the bottom of display as below:

Bad pixels removing process is as follow:

1. Press «+, -» buttons to place the cursor exactly on the bad pixel.
2. Press «M»button until the “Add” parameter is highlighted. Then press «+»button.
3. After removing all the bad pixels, Press «M»button until the “Save BP” parameter become highlighted. Then press «+»button.
4. To exit this menu, Press «M»button until the “Exit” parameter is highlighted. Then press «+»button.

R button

The ***RB100L*** Thermal Camera offers 1 format of reticle as «R» button which can hide or display the reticle. Press «R» button to display this cursor. Press «R» button again to hide it

Note: when Menu bar is active («M» button has pressed before), The «R» button doesn't work.

The reticle sign is placed in a specific coordinates by manufacturers. In these coordinates, reticle coincides with fired laser pulse. Any changes in these aligned coordinates will leads to errors in target locating. Therefore please don't change the reticle coordinates.

The mentioned Coordinates for the camera with serial number is written in the table:

Camera Serial Number	
Reticle Coordinates	

- **F+ and F- buttons**

  In order to get clear image, focus adjustment is necessary after starting up.

  Focus adjustment method (motorized): Press and keep button «F+» to adjust far focus, press and keep button «F-» to adjust near focus.

- **D button**

  This button shows the information of laser range finder, GPS and compass on thermal image. The ***RB100L*** Thermal Camera designed for 8 modes of information.

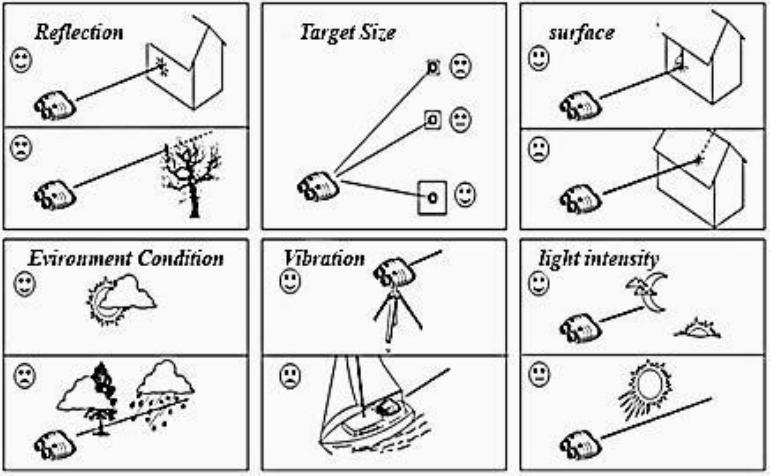
- **L button**

  By pressing the «L» button, user can determine the distance of the target.

  Notes:

  1. The distance between the camera and target must be at least 50 meter. Otherwise laser receiver will be damaged.
  2. Don’t fire the laser in indoor.
  3. The time interval between two shooting must be at least 10 seconds.
  4. If in laser firing time shaking hand or tripod is occurred, the target distance measurement has error and as a result LRF: 0000 will be appeared.

Conditions affect the range finding:



By pressing the «D»button, select one of the following modes.

Mode 1	**Without information**
Mode 2	Laser Range Finder + Compass Information
Mode 3	Laser Range Finder + Compass + GPS Information
Mode 4	Mode 3 + Target Locating
Mode 5	Measure the height of two targets
Mode 6	Measure the distance of two targets
Mode 7	Measure the speed of two targets
Mode 8	Laser Range Finder + Compass + GPS Information(based on UTM)

As soon as the camera turns on, Mode 2 as default mode shows the compass information. By pressing «L» button the laser range finder information will be added to this mode.

- MODE1

➢ In Mode 1 , there will be no data shown on image

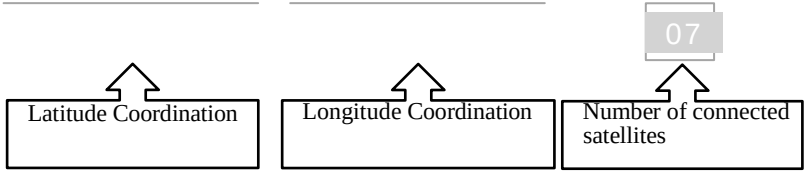
MODE2

- Mode 2 is the default setting when the camera turns on.
- Line 1: the line 1 and 2 information is referred to the camera.
- Line 2: the distance of target as soon as pushing the «L» button.
- Line 3 : the compass data (Yaw, pitch and Roll)

MODE3

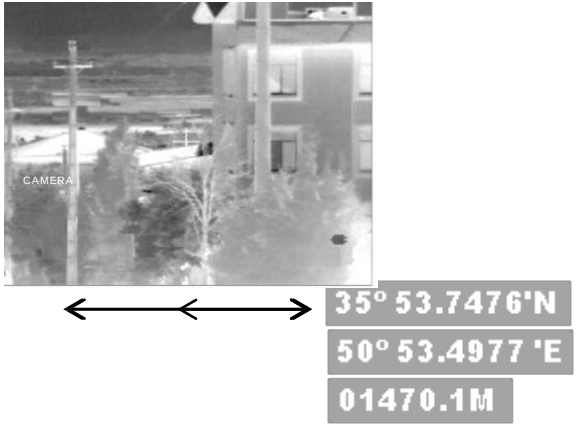
- In this mode the GPS data will be shown as soon as pushing the «D» button.

Note1: Flashing the GPS data on image shows the GPS communication is not available, so change the camera position to get the stable GPS data on screen.
Note2: Minimum 5 Satellite needs to communicate with camera GPS.



- MODE4

In mode 4 the coordination of the target and the height over the sea level will show on image. This coordinates is based on Latitude and Longitude.



MODE5

In Mode 5 it is possible to measure the difference height of two objects.

By selecting Mode 5, Point1 will appear on screen, aim to the first target and push «L»button, as soon as the laser data is valid, Point2 will show on the screen. Aim to the second target and push «L»buttonagain. By getting the valid data from the laser, the difference height in meter will show on the image.

MODE6

In Mode 6 two objects difference distance will measure.

By selecting Mode 6, Point1 will appear on screen, aim to the first target and push «L»button, as soon as the laser data became valid, Point2 will show on the screen. Aim to the second target and push «L»buttonagain. By getting the valid data from the laser, the difference distance in meter will show on image.

MODE7

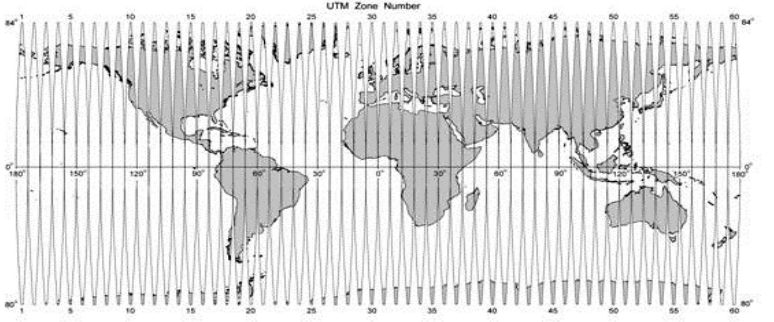
In Mode 7 it is possible to measure the difference Speed of two objects.

By selecting Mode 7, Point1 will appear on screen, aim to the first target and push «L»button, as soon as the laser data is valid, Point2 will be shown on the screen. Aim to the second target and push «L»buttonagain. By getting the valid data from the laser, the difference speed in meter per second will show on the image.

- MODE8

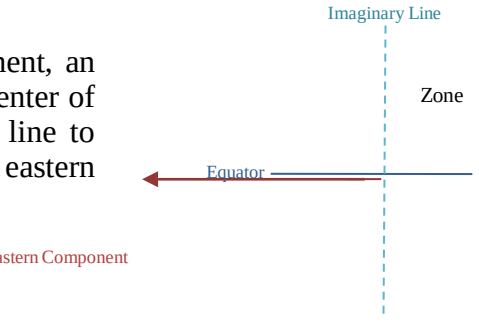
In mode 8 the coordination of the camera and target and the height over the sea level will show on image. The coordinates of them is based on UTM standard.

UTM standard : in UTM coordinate system , the Earth is divided into 60 regions (as Zone) and two components used to display the coordinates ; eastern and northern components.



Eastern Component :

To measure the eastern component, an imaginary line is drawn in the center of each zone.From this imaginary line to the border zone is the eastern component.

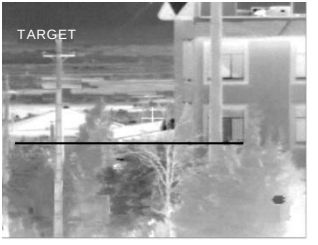


Northern Component :

Determines the target position in the northern or southern hemisphere (towards the equator)

1. Zone number
2. Position in the Northern or Southern hemisphere
3. Distance according to the eastern component
4. Distance according to the northern component

After pressing «L»button, target coordinates will be added.



39N 490230E

Target distance according to the northern component

Target height over sea level

Software Control

The ***RB100L*** Thermal Camera can be controlled either by PC through RS232 communication. The related software to control the camera is on the CD.

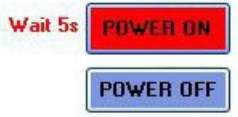
Connect the camera to a PC that will run the RS232 communication protocol. Run the CD; double-click on

 **RU100L .exe** file.

The interface below will be shown on the PC.


RU100L Commander Camera
SELECT COM
POWER ON
POWER OFF
BAD PIXEL CORRECTION
MENU
+
FAR
LASER
RETICLE
-
NEAR
D-MODE
RU100L Commander Camera

* Any communication port of the PC is used for this protocol.
* To activate any keys, just press it once.
* Turn on the camera by clicking on POWER ON once. The RB100L camera will be turned on and the related key will be red. IR image will be displayed on monitor after 5 seconds (Wait 5s) , Don't press any keys during this time.



* The function of keys is written on this table:

Key	Function
POWER ON	Turning on the Camera
POWER OFF	Turning off the Camera
MENU	Displaying Menu Bar
+	Adjustment change (increasing)
-	Adjustment Change (Decreasing)
RETICLE	Modes Selection
D – MODE	show/hide Reticle
FAR	Far Focus
NEAR	Near Focus
LASER	Laser Shot
BAD PIXEL CORRECTION	Bad Pixel correction

Trouble shooting

Check the instructions listed below in case of problems. If the problems still exist, contact the after sales service technical Department.

- **The camera doesn’t turn on**
  1. Replace the battery with fully charged battery.
  2. Clean battery contacts.
- **The image is blurry(not sharp)**
  Use «F+,F-» to focus on the target.
- **The image is too bright or too dark**
  Adjust brightness and contrast manually or select the auto mode.

Guaranty	
Model	
Serial No.	
Guaranty Start date	
Guaranty End date	
Verification Signature	

Guaranty will be void in following conditions:

- Physical damage or any visible burns
- Change or remove the serial number or hologram sticks
- Unusual applications
- Maintenance and repair by unauthorized persons

Comments:

Repairs	
Model	
Serial No.	
Referral Date	

Fault description :

Unit Name	
Transferee Name	
Deliverer Name	
Delivered Date	
Returned Date	

Unit Name	
Transferee Name	
Deliverer Name	
Delivered Date	
Returned Date	