



SARMA SD/SARMA HD

Automated
Thermal Sighting System

USER MANUAL

About

- This manual is a guide through functions and features of your device.
- Before using your device, read this manual thoroughly to ensure safe and proper use.
- Images and screen shots used in this manual may vary from images on the screen of your device.
- Features available for devices and software depend on a specific device model.
- A product, accessories or software may differ from the description given herein and can be modified without prior notice.

Trademarks

- BNV Systems and BNV Systems logo are registered trademarks of the BNV Systems company.
- Bluetooth® is a registered trademark of Bluetooth SIG, Inc. worldwide.
- Wi-Fi® and Wi-Fi logo are registered trademarks of the Wi-Fi Alliance company.
- All other copyrights and trademarks are the property of their respective owners.

Copyrights

This manual is protected by international copyright laws. No parts of this manual may be reproduced, distributed, translated, or transmitted by any electronic or mechanical ways including copying, recording, and storing in any data storage and retrieval system without the prior written permission of the BNV Systems company.

Important

You have purchased a sophisticated electronic and optical device. For the proper use of your product, please read this manual thoroughly.

- Before transporting device across the borders you need to learn about requirements and regulations of strategic good (weapon sight) import/export in particular country.
- Do not point the IR receiver (a thermal core in both activated and deactivated status) towards high-intensity IR sources of over 800°C in temperature such as the **sun**, a laser beam, an incandescent filament, an electric arc, etc. It can cause a thermal core damage.
- Do not direct a rangefinder laser at a human or animal eye.
- Do not aim directly at the sun or bright light sources.
- Do not subject the product to a mechanical impact.
- Do not transport the unit without a protective case.
- Do not disassemble the product, to prevent high voltage shock hazard.
- Do not leave the device within the reach of small children.
- Store the product in a dry place.

**VISIBLE AND INVISIBLE
LASER RADIATION
AVOID DIRECT EYE EXPOSURE
CLASS 3R LASER PRODUCT**

User Manual History

Version	Date	Description
1.0	10/09/2018	First edition

Contents

Getting started

- 7 External view
- 8 Buttons
- 10 Power Supply
- 11 Power On/Off
- 11 Power saving
- 11 Connection to PC

General information

- 12 Screen
- 15 Icons
- 18 Screen Control
- 20 Profiles
- 21 Thermal sensor setup
- 23 Lens focus adjustment
- 24 Quick setup options
- 24 Operation modes

Sight Features

- 25 Weapon Database
- 26 Zeroing
- 28 Reticle
- 29 Distance
- 32 Ballistic computer

Multimedia

- 37 Video Recording Settings
- 38 Video Archive
- 39 Photo Recording Settings
- 39 Photo Archive
- 40 Motion sensor
- 41 Shot sensor

Wireless network

- 42 Wi-Fi network configuration
- 43 Wi-Fi connection
- 44 Wi-Fi Creation
- 45 Video Streaming via Wi-Fi
- 46 Wi-Fi Information
- 46 Bluetooth
- 46 Telemetry radio interface 2,4 GHz
- 48 Remote control device (wristband) – optional
- 50 WindMaster Weather station – Optional

Navigation

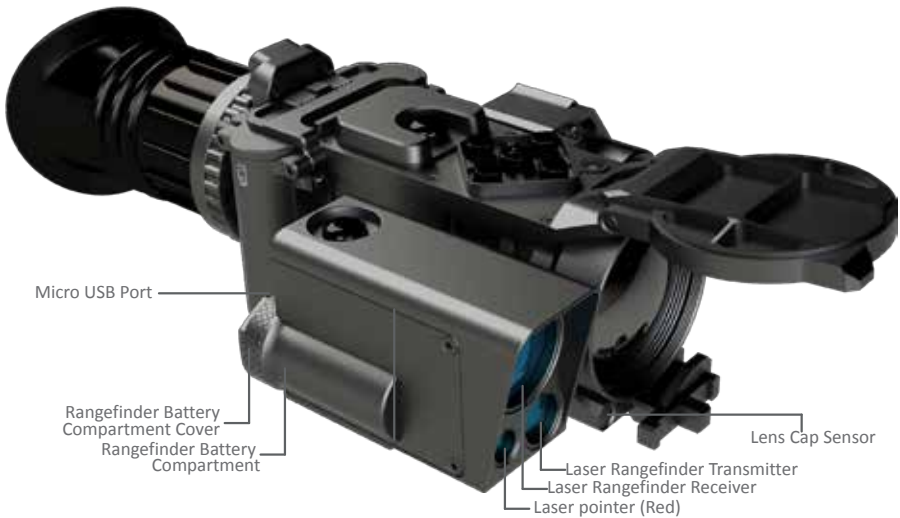
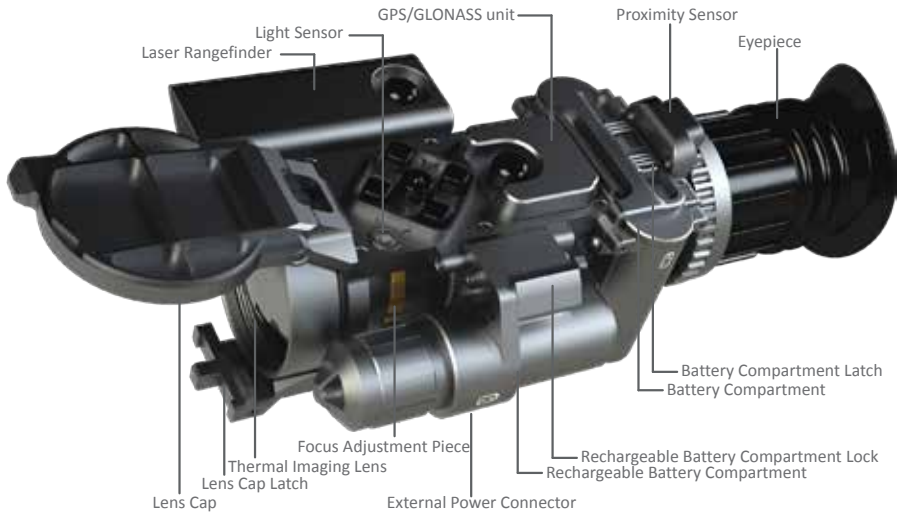
- 51 General Information
- 53 Compass
- 55 Maps
- 56 Routes
- 56 Targets by Range
- 57 Targets by Shot

Settings

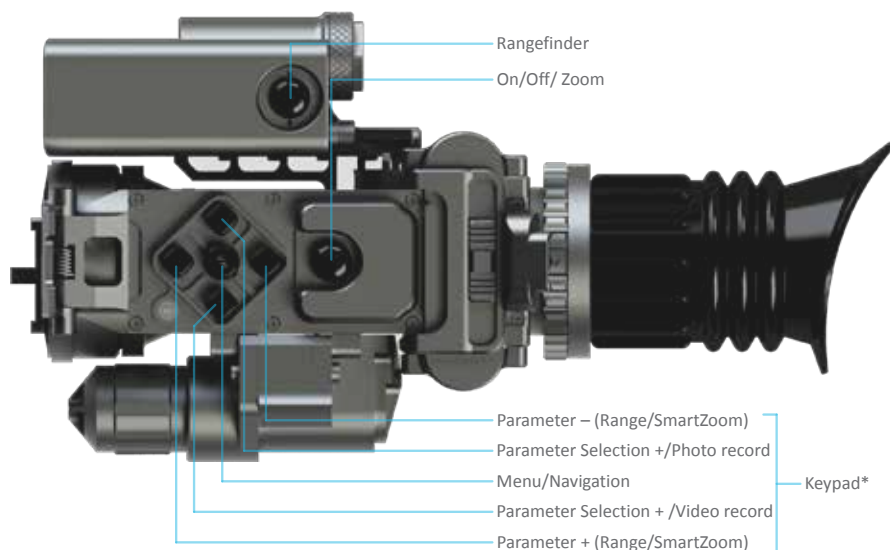
- 58 Time and date
- 59 Memory, backup
- 60 Automatic shutdown sensors
- 61 Localization
- 62 Information and Software Update

Getting started

External view



Buttons



* When entering a menu, keypad button functions can vary depending on the custom parameters as described below.

Description of the button functions is given in the following table:

Button	Functions
On/ Off/ Zoom	- Press and hold for 2 seconds to turn on or off the device. - Press to zoom.
Menu/ Navigation	- Press to switch over standard and navigation screen modes. - Press and hold for 2 seconds to enter or exit the device menu. - Press and hold over 10 seconds to enter a service menu. - Press twice to set a current distance equal to a reset distance of the selected ammo.

Button	Functions
Parameter +/- (Range/SmartZoom)	• Press to change a parameter by one value (range by default). • Press and hold over 1 second for fast parameter changing. • Keep holding it over 3 seconds for even faster parameter changing.
Parameter +/- (Photo/Video recording)	• Press for fast selection of a required parameter. As selected, adjust it by the Parameter +/- buttons. • Press and hold the button parameter + for 2 seconds to take a photo. • Press and hold the button parameter - for 2 seconds to turn video recording on/off.
Rangefinder	• Press and hold to turn the rangefinder on. As a rangefinder reticle appears, aim it at your target and release the button. The range will be measured. • Press three times to turn the laser pointer on/off.

Keypad keys features for a menu are described in the picture. To exit the menu, select Exit or press and hold a central button for 2 seconds.

Power Supply

- The device can be powered in different ways as follows:
- By two CR123A batteries installed in the battery compartment which serve as a main power supply.
- By a lithium rechargeable battery of 18650 type installed in a quick-detachable compartment which serves as an auxiliary power supply.
- Via a 5V external power input.

The device supports a priority powering feature. The highest priority belongs to the powering via 5V external power input, then the rechargeable battery goes, and CR123A batteries have the lowest priority. So, the device uses a power supply of the highest priority if several are available. If high priority power supply is run out or disconnected, the device switches automatically to lower priority power supply, and vice versa – if the high priority power supply is connected, the unit switches to it automatically.

Use a supplied cable to connect the external power supply. A voltage range of the external power supply must be from 4.5 up to 5.5 V DC. Out of this range output voltage may cause device damage. The connected power supply indicator is displayed on the device screen.

The laser rangefinder has its own power supply from the CR123A lithium battery.

Attention!

- If rechargeable battery is used, CR123A batteries must be installed. If only the 18650 battery is used, the device may not turn on.
- Do not use batteries other than those described above. Using of incompatible batteries may cause damage to the unit.
- Keep the correct polarity during battery installation.

Note:

- Unprotected 18650 rechargeable batteries may be used.
- The device cannot charge rechargeable batteries.
- Use of functions which require connection to the other devices via Wi-Fi drains batteries faster.

You can check the battery status by an indicator on the device screen.

Attention!

Select a battery type in Menu for displaying the charge level correctly.

Power On/Off

Press and hold the power button for 2 seconds to turn the unit on or off.

The LOADING indicator pops up during the system booting after activation. The device does not respond to any button press while booting. A thermal image and a reticle will be display on the screen during booting process. The reticle position coincides with a zeroing position of the selected ammo.

Attention!

- Follow warning signs and instructions of personnel in public places if use of wireless devices is prohibited. Disable Wi-Fi, Bluetooth, and telemetry radio interfaces via Menu if the device functions requiring a wireless network connection are not used.

Power saving

To extend a battery life, follow recommendations listed below:

- disable Wi-Fi and Bluetooth if you don't use them;
- set up the power saving sensors such as: a proximity sensor (deactivates the screen when removing an eye from the eyepiece, depending on a model), Off-timer, Standby timer.

Use the power saving mode to reduce power consumption. The device activates this mode if it has been enabled in Menu and the lens cap has been closed over 5 seconds. To exit the power saving mode and enter the operation mode, open the lens cap. The time of switching from the power saving mode to the operation mode is 3–4 seconds.

Connection to PC

Use a supplied USB cable to connect to a PC. You can sync video and photo archives, profiles, and other device integrated flash memory or PC.

General information

Screen

The screen displays screen trays, status icons, reticles of the sight, and rangefinder, widgets, etc., as well as thermal core videos.

The device has several modes of the screen:

- **standard** (the screen displays trays, reticles, and custom widgets in this mode);
- **navigation** (applied for navigation and target search).

Press Menu button to switch over screen modes.

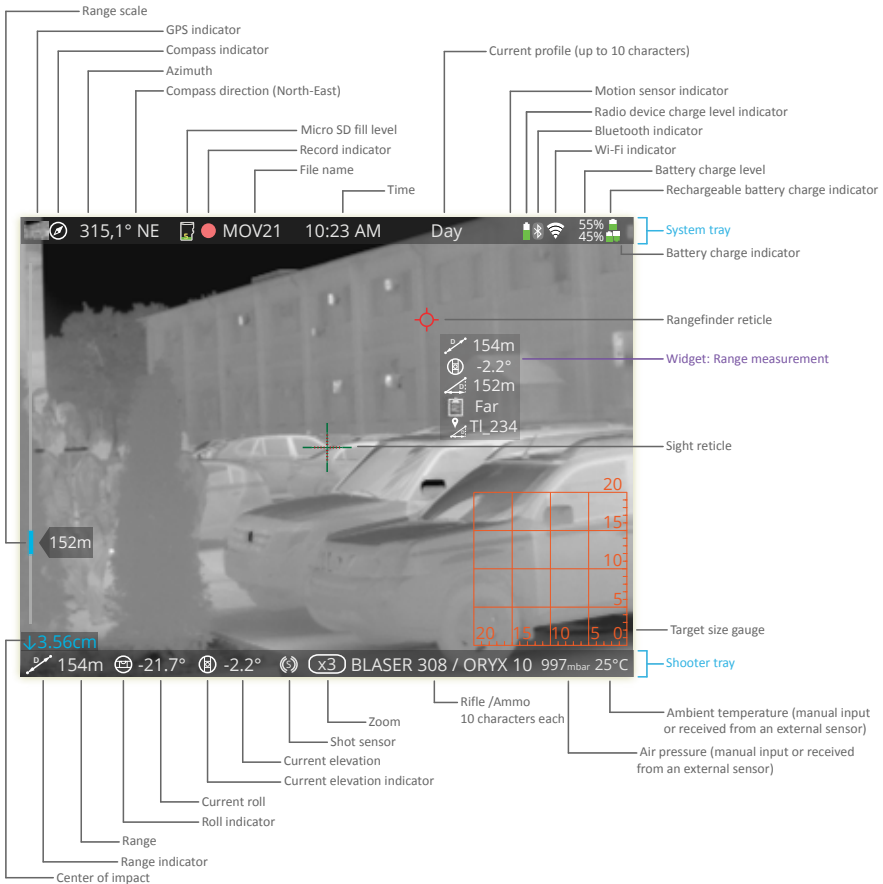
Note:

- **Widgets** are mini-applications that display certain information on the screen.
- Various icons can be displayed depending on a selected mode and preset parameters including different from the specified herein.

Attention!

- The device has a diopter adjustment option. Adjust an eyepiece to get a sharp image on the screen, if required.
- The device comprises a proximity sensor that activates the screen when an eye is close to the eyepiece. If the screen is off after booting and not turned on as getting close the eye to the eyepiece, disable the proximity sensor by pressing and holding the Menu button for 10 seconds and calibrate it.

Standard Screen

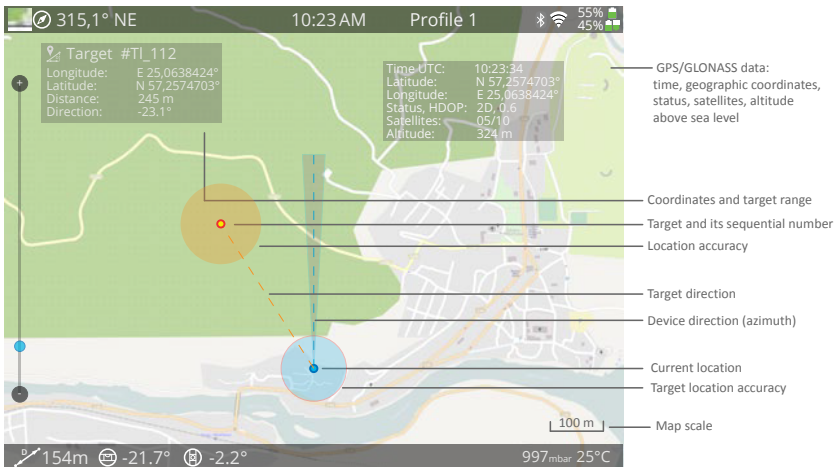


Device status icons are displayed in the System tray located at the top of the screen.

The Shooter tray located at the bottom of the screen displays all necessary shooting data.

The screen also shows sight and rangefinder reticles.

Navigation Screen:



Navigation screen supports current own location identification on the map, as well as target location.

Icons

Icons at the top of the screen – **the System Tray** – display a current status of the device.

Icon	Description
	Navigation enabled, coordinates searching
	Navigation enabled, coordinates identified
	Compass enabled, North-East direction
	Compass enabled, North direction
	Compass enabled, North-West direction
	Compass enabled, West direction
	Compass enabled, South-West direction
	Compass enabled, South direction
	Compass enabled, South-East direction
	Compass enabled, East direction
	Video recording by shot sensor
	Continuous video recording
	Synchronous video recording (with proximity sensor)
	Video archive file playback
	Fast video archive file playback

Icon	Description
	Reverse video archive file playback
	Video archive file playback stop
	Video archive file playback pause
	Motion detector enabled, no motion
	Motion detector enabled, motion detected
	Motion detector disabled
	Bluetooth enabled, no connection
	Bluetooth connected to other device
	Wi-Fi connection and Wi-Fi signal level (more bars, stronger signal)
	Battery charge level
	Battery charge level less than 10%
	Battery charge level, external power plugged
	Micro SD card filling more than 90%
	Micro SD card filling 50%
	Micro SD card filling 5%
	No microSD card or microSD card malfunction

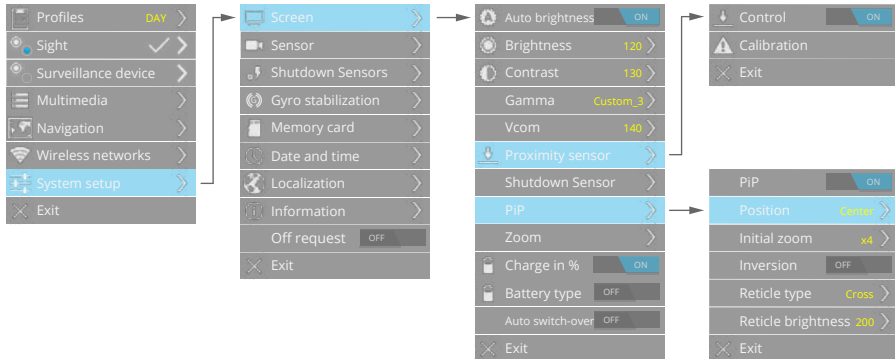
The System Tray also displays a memory card filling level (in percentage), a recorded video/played video/photo file name, a current device time (preset format), a current profile, and a battery charge level (in percentage and its estimated duration), an integrated motion detector status.

Icons at the bottom of the screen – **Shooter Tray** – display the shooting data.

Icon	Description
	Range (by rangefinder)
	Manually preset range
	Maximum roll angle $\pm 1^\circ$
	Roll angle more than $+1^\circ$ (leftward)
	Roll angle more than -1° (rightward)
	Maximum elevation angle $\pm 1^\circ$
	Elevation angle more than $+1^\circ$ (backward)
	Elevation angle more than -1° (forward)
	Shot sensor

The Shooter Tray also displays the range (measured by the rangefinder or preset manually), current roll and elevation angles, optical magnification, a current rifle and ammo (selected in the database), ambient temperature and air pressure (input manually or received from an optional external weather station).

Screen Control



Standard screen mode is activated after booting. Press of the Menu button switches between screen modes.

Screen brightness can be set manually, or **Auto brightness** feature can be enabled to adjust it automatically depending on light conditions (an ambient light sensor measures lighting through a transparent window on the top of the device).

Adjust **contrast** to provide comfortable on-screen information display.

Gamma parameter allows selecting one of gamma correction options for on-screen image display.

Vcom parameter sets up a constant brightness level.

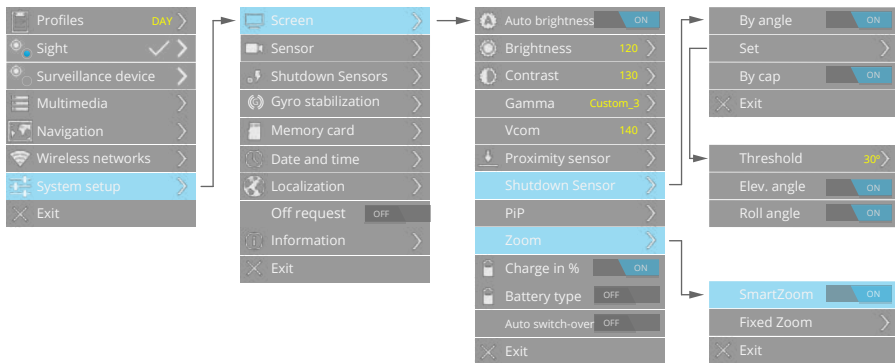
Note:

- The device comprises a proximity sensor that activates the screen as an eye gets close to an eyepiece. This sensor is disabled by default. Select an appropriate menu item to turn it on. If the screen is off after booting and not turned on as getting close the eye to the eyepiece, disable the proximity sensor by pressing and holding the Menu button for 15 seconds and calibrate it following the screen instructions.

Battery charge level data will be displayed in percents if the **Charge in %** mode activated. Otherwise, device operation time estimated for these batteries is displayed. The **Type – Rechargeable Battery** feature shall be enabled if the device is powered by rechargeable batteries contrary to CR123A batteries (to display a charge level correctly).

The PiP allows to adjust various options of the picture-in-picture mode. Three locations of the panoramic window are available such as: an upper left part, an upper center, and an upper right part of the screen. Initial **Zoom** parameter presets PiP window opening zoom. When an inversion

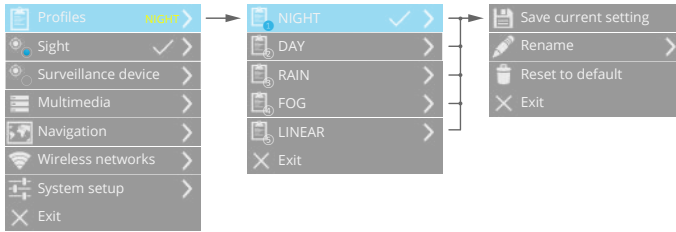
mode is activated, a part of the image can be enlarged in the PiP window; otherwise the PiP window serves as a panoramic view window. **Reticle Type** and **Brightness** can adjust the PiP window reticle. Zoomed reticle type is a magnified standard reticle displayed in the PiP window.



The device screen can be deactivated by angle sensors and by closing the cap. The user can preset shutdown angles (elevation or roll) and its value likewise.

The device allows to adjust the image flexible zooming options. **SmartZoom** is a gradual zoom controlled via the shortcut menu (Press the left button for the gradual zoom and change it smoothly by up/ down buttons. Both holding and short press of the button can be used. The gradual zoom interval is 0.1). **FixedZoom** selects fixed magnification values and switch between them by Zoom button press.

Profiles



Five user profiles are available to apply quickly a range of settings required for various conditions. These profiles can be set up via the device menu. Adjust parameters and then choose **Save Current Settings** to customize the selected profile. You can reset all customized parameters to defaults. Profile can be renamed via the device menu.

Note:

- The profile name length is limited to 10 characters.
- All changes are saved in memory and applied after power on, but not saved in profile parameters.

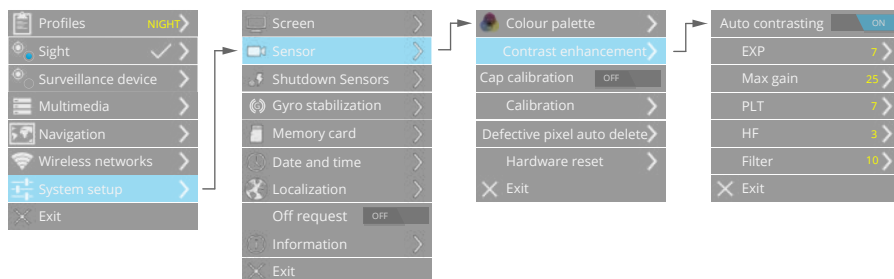
A current profile name is always displayed in the System tray.

All device settings including profiles can be saved as a backup copy created in System Menu/Memory.

Thermal sensor setup

The thermal imaging sensor provides the temperature distribution monitoring of investigated object surface. Ability to see objects depends on the settings of the thermal imaging sensor.

Carefully explore all possible sensor parameters for more accurate adjustment for selected mission, or use profiles for fast and simple adjustment of the device.



ATTENTION!

- No often cap calibration of the integrated thermal sensor is required during service. You can calibrate the sensor (by lens cap) via an appropriate menu item if necessary.

User can set the **color palette** to change the color of the thermal image. White Hot palette set by default. In this mode 256 values of brightness represented by grey undertones, and 0 relevant to completely white, and 255 is completely black, that's why hot objects appears brighter. For the Black Hot palette the distribution of middle tones is opposite – hotter objects appear darker than colder. There is also a number of color palettes that make the image colored.

Warning!

- Defective pixels (bright and dark dots) can appear on a thermal image that cannot be considered as a device malfunction.

To remove dead pixels automatically, choose **Auto Delete** in the menu, close the lens cap, and select **Delete**. You can cancel deal pixel deleting via the device service menu.

Thermal image quality can be preset in the **Contrast Enhancement** menu item. The device profiles have already been adjusted under various environmental conditions, so the user should set up this item only in case when the profile parameters are inappropriate.

Automatic contrast enhancement comprises an automatic algorithm that will adjust a thermal image to the observed scene. Parameters of this setting depend upon EXP, Max gain, PLT values.

The EXP parameter determines rate of conversion a sensor thermal image into an on-screen image. The less the value is, the closer the image is to a linear conversion, and the larger the value is, the higher the equalization is.

The Max gain (maximum gain) serves to reduce excess contrast enhancement of the image. This parameter should be increased for a low-contrast scene and decreased to reduce contrast for a high-contrast scene.

The PLT parameter determines visibility rate of small objects detailed considerably in a high-contrast scene. Having the PLT value increased, the scene turns less contrasting and the small objects keep their high contrast ratio.

HF is a parameter defining detail and edge enhancement of an object. The higher the value of this parameter is, the sharper the image is and the more detailed the small objects are; but this makes image spatial noise more visible.

Filter is a parameter determining image smooth ratio.

Lens focus adjustment

A lens has the 50 mm focal length and manual focus adjustment.

Adjust the lens by rotating a focus knob for an accurate distance to the target until the picture becomes clear and sharp. The target distance can be adjusted by rotating the knob within the range from 10 meters up to infinity.

Attention!

- To ensure easy use of the device, adjust the focus to 300 m distance minimum. Lens depth of field covers all the distances from 50 meters to infinity – no focus adjustment during device use.
- Close the lens cap to avoid scratches and dust penetration if the device is not used.

Optical system basic parameters:

Parameter	SARMA SD	SARMA HD
Focus range	10m ... ∞	25m ... ∞
Field of view	7.5° x 5.6°	12.4° x 9.3°
100 m field of view, m	13.1 x 9.8	21.8 x 16.3
Initial click value, cm, for 100 m	1.63	2.72
Min click value, cm, for 100 m	0.2	0.17
Initial optical zoom	3.09	1.85

- Lens focal ratio – f/1.25;
- Focal length – 50 mm;
- Human detection range – 1500 m;
- Human recognition range – 380 m;
- Human identification range – 190 m.

Note:

- Human detection, recognition, and identification criterion corresponds to Johnson criterion. For example, detection requires 2 pixels, recognition – 8 pixels, and identification – 16 pixels under the object height.

Quick setup options



A user can configure settings quickly by the shortcut buttons.

Parameter+/- button adjusts a range by default. Press to select and then adjust a required parameter by **Parameter+/-** buttons.

Shortcut button functions are changed in the **Navigation Screen** mode. They allow to configure and display the required navigation data.

Operation modes

Two device operation modes are available that are sight or monocular modes. Use Menu to select a mode or a mount sensor sets it automatically.

Automatic switching between modes can be preset via **System Menu/Screen – Auto Switch over**. If the auto mode is enabled, the device activates the sight mode automatically when installed on the mount.

The thermal image has no reticle in the monocular mode. User can activate/deactivate the digital image stabilization if required. The gyro sensor is calibrated via System **Menu – Gyrostabilization**.

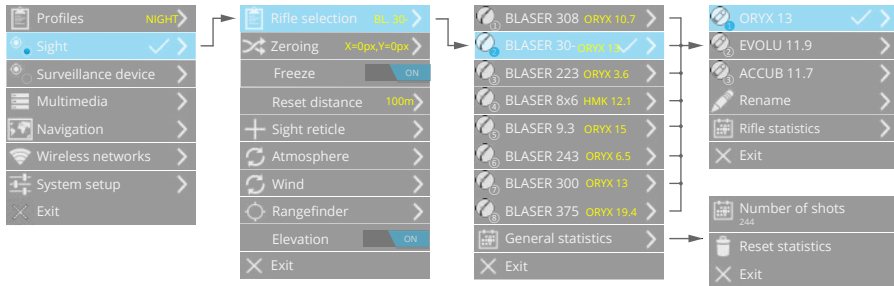
Electronic image stabilization might malfunction in the following situations:

- the device moves while shooting a moving object,
- short distance objects are surveyed.

Sight Features

Weapon Database

A user can choose one of 8 rifles and 3 ammo per each of them.



A user can change the weapon database (add rifle/ammo, name, preset ballistic calculator parameters). The selected rifle/ammo is displayed in the Shooter Tray.

Warning!

- For correct device operation with the selected rifle/ammo, the zeroing is required, as well as the user should set up the integrated ballistic calculator or enter the ballistic data table manually.
- Make sure the proper rifle and ammo is selected before operation.

The device maintains statistics on each rifle, ammo, and the general statistics of the device. The user can view the number of shots in statistics. Statistics can be reset if required.

The device can calculate ballistics using both the tables entered manually and the integrated ballistic calculator. See a related section for the detailed description of the ballistic calculator operation.

Zeroing

Zeroing should be done at the selected range (from 10 p to 300 meters) after the rifle and ammo selection. Virtual knobs of elevation and windage corrections are located in upper left part of the screen determining the reticle position on the screen. Least count of the knob is equal to 1 pixel at initial zoom and it decreases with each zoom fold respectively. So, the high zoom values for accurate zeroing are recommended. The device screen is arranged in the following way:

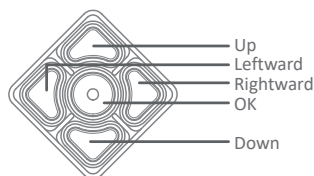


Attention!

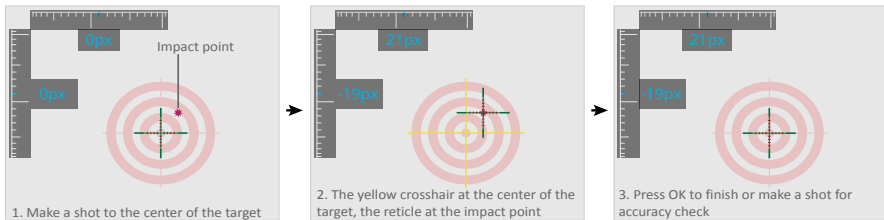
- Zeroing shall be done when a true distance to the target is equal to the selected zeroing distance. Otherwise, ballistic calculator correctness cannot be guaranteed.
- To improve zeroing accuracy, use digital zoom, since a click value for them is less.

The device supports **one shot zeroing**. User should perform the following actions:

- select a rifle, ammo, and then a zeroing mode;
- make a shot (aligning the reticle with the center of the target) at a selected zeroing distance;
- move the reticle to align a yellow crosshair (previous position of the reticle) with the center of the target and to bring the reticle in line with the center of impact;



- press the OK button to finish zeroing or make a shot (aligning the reticle with the center of the target) to check zeroing. In this case the shot sensor removes the last reticle, that allows to adjust zeroing by the method described in a previous paragraph if required.



To make the zeroing setup easy, you can use the **Freeze mode** (holding an image still in case of crosshair offset). In this mode, act as follows:

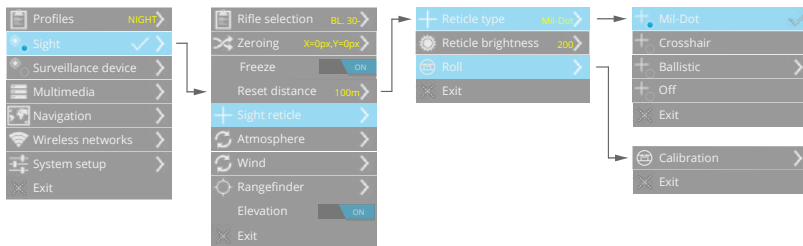
- select a required rifle and ammo, then enter the zeroing;
- shoot a target (aligning the reticle with the center of the target) located at a selected zeroing range;
- superimpose the impact point with the reticle and press any of reticle offset buttons. The image “freezes”. So, no need to fix the rifle position. Move the reticle to align the yellow crosshair (last reticle position) with the center of the target and to bring the reticle in line with the center of impact;
- press the OK button to deactivate the Freeze mode and once again to finish zeroing or make a shot (aligning the reticle with the center of the target) to check zeroing. In this case the shot sensor removes the last reticle, that allows to adjust zeroing by the method described in a previous paragraph if required.

The zeroed reticle position for a particular rifle and ammo is stored in memory when the device is off and after reflashing.

Note:

- Wide-spread chemical hand warmers made as a square pads are very suitable as test targets. They ensure high-contrast thermal image even after several impacts. For a good picture in sunny weather, you can use targets with a black square or circle (10x10 cm or larger), as well as plastic or glass bottles filled in with warm water.

Reticle



User can select a standard (Mil-Dot, Crosshair) or a ballistic reticle.

Standard reticle is a crosshair which center fits to a ballistic correction for this type of rifle/ammo under the selected parameters of atmosphere and distance (related to the zeroing distance). In case of changing the atmosphere and/or distance parameters, the reticle automatically moves according to ballistic correction tables or calculations of the integrated ballistic calculator.

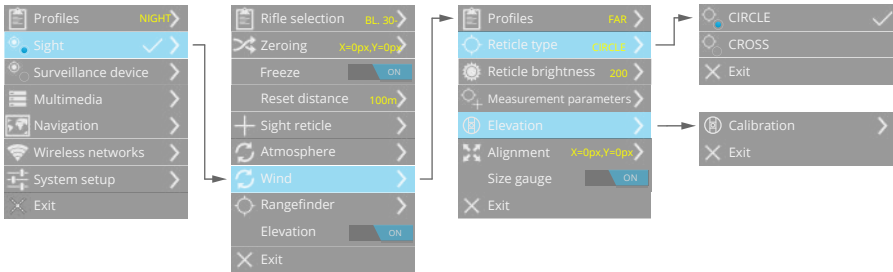
Ballistic reticles is calculated for a selected type of the rifle/ammo and created automatically under the elevation correction tables entered manually or calculations of the integrated ballistic computer. Opposed to the standard reticle, not the ballistic reticle offsets in case of atmosphere parameters change but its parts – horizontal serifs of 200m, 250m, etc. distances.

User can adjust the reticle brightness within 0 to 255 range.

Use the Calibration menu to calibrate a roll angle. Place the device on a calibrated horizontal surface and calibrate the angle following the instructions on the screen.

When a digital zoom is enabled, the reticle changes in proportion and stay fixed, and a thermal image is always centered on the reticle.

Distance



The range can be set both manually (from 10 up to 2000m) and by a radio rangefinder (in case a measured distance is over 2000 meters, the range sets as 2000 meters).

Use shortcut buttons to input a distance manually.  indicator in the Shooter Tray displays the manually inputted distance. A current elevation is included in the elevation correction calculation made by the integrated ballistic calculator if the **Elevation** mode is enabled and the range is inputted manually.

Reset distance is a distance selected by a user (preset via Menu for a selected rifle/ammo) when the **“direct shot”** is the most effective. The **Reset Distance** is set when the device is on and by double press of the Menu button.

Note:

- The Reset Distance feature allows to make an accurate and fast shot at short distances without using of the sight rangefinder and ballistic calculator due to the limited time to prepare and usually lack of fixed rests (that affects correct range measurement and the reticle position on the screen respectively) that improves the sight usage efficiency in the above-mentioned conditions.
- To use this option correctly, the user must apply reset to optimal distance after each use of the rangefinder (double press of the Menu button). While performing this operation, the reticle will be returned by the user selection to the reset distance (optimal distance for a direct shot). Use the Sight section of Menu to set up the Reset Distance. The optimal reset distance is determined by the user (based on ballistic parameters of the selected ammo and a sight height) with any ballistic calculator that allows the user to display the bullet trajectory data as a table.

- An example of optimal Reset Distance selection: Sight height is 64 mm, BC 0.475, Muzzle velocity – 830 m / s (at the temperature +20C). The Reset Distance for the optimal “direct shot” is 190 m. Applying these parameters, in the range 10–220 m the bullet will not rise and will not drop more than 5 cm relative to the optical axis of the sight, so the user can shoot with specified ammos in these intervals without using of the rangefinder and the ballistic calculator, that means “as fast as possible”. When the user wants to increase/decrease the over/beyond “corridor” limits of a trajectory relative to the optical axis – Reset Distance decreases or increases.
- Example of influence of the Reset Distance to the size of the over/ beyond “corridor” limits of a trajectory relative to the optical axis of the sight: the sight height is 64 mm, BC 0.475, Muzzle velocity – 830 m/s (at the temperature +20C). The reset distance of the optimal “direct shot” is 190 m. Using these parameters, in the range 10–220 m the bullet will not rise and will not drop more than 5 cm with relative to the optical axis of the sight. Reducing the reset distance to 150 m, in the range of 30–170 meters the bullet will not rise and will not drop more than 2 cm relative to the optical axis of the sight, however, usage of the “direct shot” farther than 190 m in this case is not recommended. By adjustment of this parameter the user chooses the “size of a corridor” according to hunting targets and tactics.

To measure a distance to the target by the rangefinder, press and hold the **Rangefinder** button, when the rangefinder reticle appears on the screen, point it at the target, and then release the button. The rangefinder will calculate the target distance and displays a result in the Shooter Tray and/ or in the widget, and in the range scale. In case of ranging failure, dashes will be displayed. A remote control can be used to measure a distance by the rangefinder, see a related section. When digital zoom is on, the thermal image is always centered relative to the rangefinder reticle during ranging. User can calibrate an elevation angle  if required. To perform calibration, place the device on a calibrated horizontal surface and calibrate the angle following instructions on the screen. User can select a type of the rangefinder reticle and set its brightness in the range from 0 to 255 in Menu. Preset reticle types (by default) are the following: , .

Note:

- The device is supplied with an adjusted rangefinder. User can adjust it manually, if required.
- Accuracy of manual and rangefinder measurements is 1 meter.

User can set up the rangefinder parameters, if required:

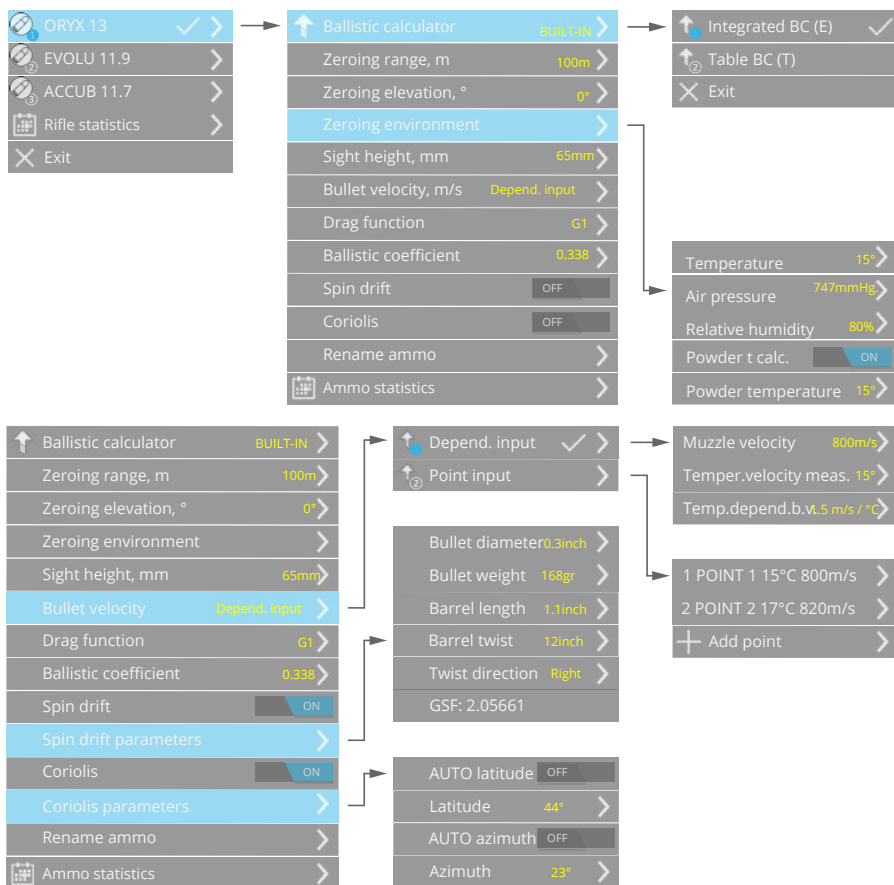
- **Number of pulses** (in the range from 100 to 5000, step 500). By increasing this parameter provides measurement of longer distances, but at the same time extends the ranging time.
- **Target detection** – choosing of a target detection algorithm. First response, second response, and last response options can be applied.
- **Range correction** – a variable component for presetting a deviation of the measured distance with respect to the distance to the target.

The number of the rangefinder parameters such as number of pulses and the target detection algorithm are saved in the rangefinder profiles. These profiles can be quickly selected from the **Quick Menu**.



Size gauge – automatically builds a scale on the screen that can be used to calculate dimensions of a target. This scale is based on a current target range. In case of thermal-contrast target ranging, its size (width and height) will be displayed.

Ballistic computer



The device can calculate ballistics by manually entered tables or by the integrated ballistic calculator. Selection between **Table BC/ Built-in BC** is performed in **Ammo** parameters via Menu. User can select the type of the ballistic calculator for each type of the ammo.

Table ballistic calculator (T) (NON RECOMMENDED) – tables of ballistic reticle corrections by range and ambient temperature for each type of a rifle and ammo are stored in device memory. The reticle will automatically move when a user changes distance and ambient temperature according to ballistic correction tables.

Ambient temperature can be set manually in the Atmosphere/Wind in Menu, if required. Value of elevation correction in cm for a current

distance and ambient temperature will be displayed in the bottom left part of the screen.

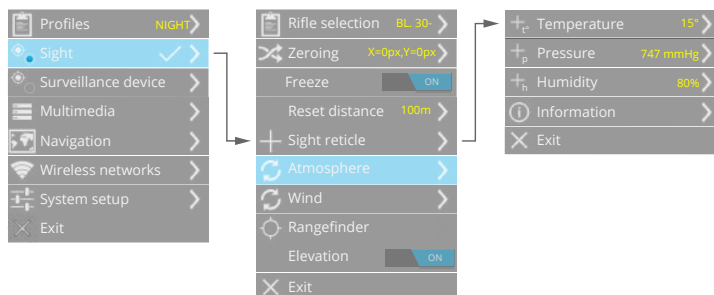
Integrated ballistic calculator (E) – allows calculating ballistics directly for each type of the rifle and the ammo, via the device. Opposite to the table BC, this one calculates range and temperature, as well as such parameters as air pressure, humidity, wind speed and direction, and elevation (if this feature enabled).

User must configure the basic parameters of the weapon after choosing the rifle, ammo, and the integrated ballistic calculator. Settings of the integrated ballistic calculator are given in the following table:

Parameter	Distance	Interval	Defaults
Zeroing range, m	10...300	1	100
Zeroing elevation, °	-40...+65	0.5	0
Zeroing temperature, °C	-40...+65	1	+15
Zeroing air pressure, mmHg	600...900	1	747
Zeroing rel. humidity, %	0...100	1	80
Powder temperature calculation	On/Off		Off
Powder temperature, °C	-40...+65	1	+15
Sight height, mm	0...300	1	100
Muzzle velocity input type	Depend/ point		Depend
Muzzle velocity, m/s	250...1350	1	500
Temperature during velocity measurement, °C	-40...+65	1	+15
Temperature dependence of bullet velocity, m/s / °C	0.1...10	0.1	0
Drag function	G1 or G7	-	G1
Ballistic coefficient	0.01...2	0.001	0.500
Spin drift	On/Off		Off
Bullet diameter, inch	0.1...1.0	0.001	
Bullet weight, grain	5...1500	1	
Barrel length, inch	0.2...3.5	0.001	
Barrel twist, inch	0.35...37.0	0.01	

Parameter	Distance	Interval	Defaults
Twist direction	Right/ left		Right
Coriolis	On/Off		Off
AUTO latitude	On/Off		Off
Latitude	-90...90		
AUTO azimuth	On/Off		Off
Azimuth	0...359	1	

Atmosphere – atmospheric parameters (environmental parameters). By going to this Menu item, user enter the atmospheric parameters manually. The user can set up ambient temperature, air pressure, and relative humidity. Only ambient temperature can be adjusted when the table ballistic calculator selected.



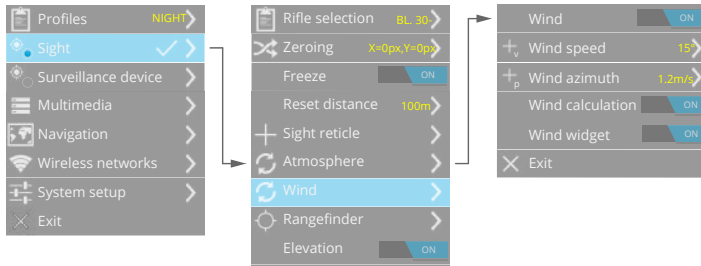
Adjustable atmospheric parameters are given in the following table:

Parameter	Distance	Interval	Defaults
Temperature, °C	-40...+65	1	+20
Air pressure, mmHg	600...900	1	747
Relative humidity, %	0...100	1	80

Menu “Atmosphere/Information” displays current atmosphere settings. The device is compatible with external weather stations (WindMaster, Kestrel) for precise metering of environment parameters.

Wind. The device allows taking into account wind parameters (direction and speed) preset by the user both manually by means of shortcut buttons or via the menu and automatically – received from the BNV external weather station. Wind parameters are not taken into account when the table ballistic calculator selected.

The user can input the direction of the wind relative to the device, for example 0 degrees, means a following direction, 180 degrees – a contrary direction, 90 degrees – from left to right side of the device, 270 degrees – from right to left.



Adjustable wind parameters are given in the following table:

Parameter	Distance	Interval	Defaults
Wind speed, m/s	0...30	1	0
Wind azimuth, °	0...359	1	0

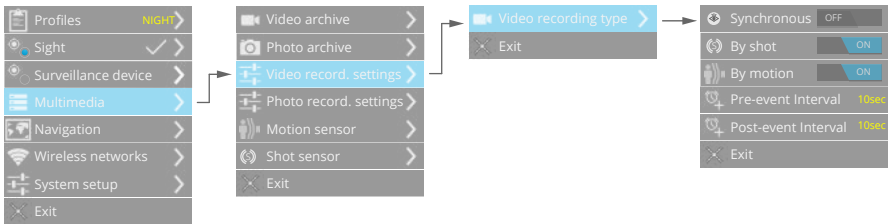
When the wind calculation feature is enabled, the reticle indicates a wind forecast (vertical bars) of impact point for a current range. For easy use, 3 reticle bars are added to display: the current range wind forecast; the wind speed forecast for 1 m/s more; the wind speed forecast for 1 m/s less.



The weather station wind forecast is displayed optionally if connected. Wind widget is an extra window in the left upper part of the screen which displays wind parameters in graphics. This widget can be disabled. Having the wind calculation enabled, a wind vertical component is added to a basic correction vertical component, so the reticle will be moved up/down according to wind.

Multimedia

Video Recording Settings



The device can record video. Video can be recorded manually – press the Left button for 2 seconds or automatically – by a shot sensor and/or a motion detector.

Attention!

- Video and photo records to the built-in memory. Recording will not be accomplished in case of its 100% fill.

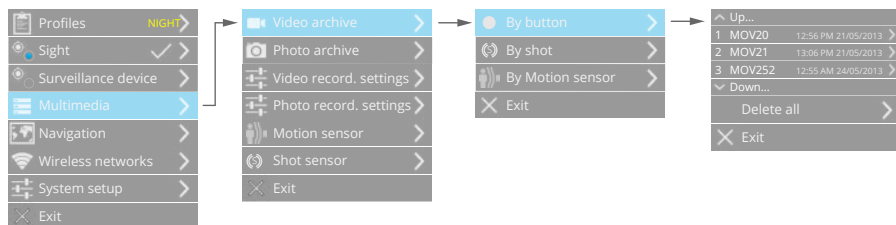
Recording is controlled via Menu. Continuous recording  will be enabled by press of the button by default. **Record** will be produced until it is stopped or the memory card is filled. User can enable the **Synchronous** recording  in the video recording type settings and video will be recorded only when the screen is powered on by the proximity sensor. Also this menu item controls **recording by the shot sensor and the motion detector**. This recording will be automatically made on event, and pre-event actions (the interval is set in the Pre-event Interval menu item) and post-event actions (Post-event Interval) will be recorded likewise.

Name of the recorded file shall be displayed in the System Tray. Memory filling level shall also be displayed next to the recording indicator.

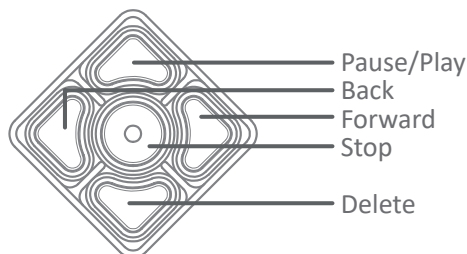
Note:

- Video shall be recorded by using of H. 264 codec, container – MP4. Photo recording is performed by using of JPEG codec.

Video Archive



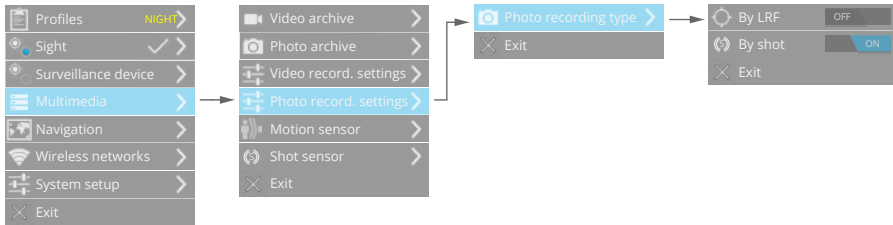
User can playback recorded files from the archive. The video archive is divided to directories – files recorded by button; files recorded by the shot sensor, and the files recorded by the motion detector. All directory files are sorted under a creation date. To playback a file, select an archive file from the list.



Button functions in the playback mode are shown on the picture. Press the **Stop** button to exit the playback mode. Archive files can be deleted in the playback mode, freeing the space on the memory card. User can delete all video archive files, if required.



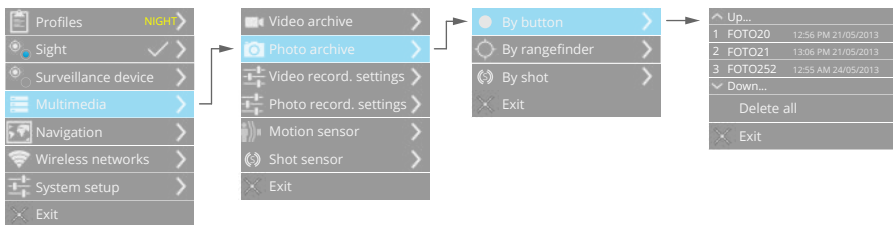
Photo Recording Settings



The device can make photos. Photo can be taken manually by press and hold over 2 seconds of the Right button or automatically – by the shot sensor during ranging.

If the photo was made by the rangefinder, a location map with specified navigation parameters of the device and the target is referenced to a captured image (if the device coordinates defined).

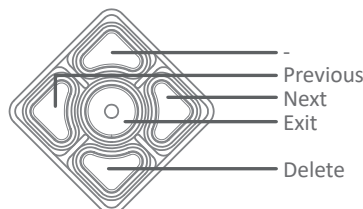
Photo Archive



User can view recorded files from the photo archive. The archive divided into directories – files recorded by button; files recorded by the rangefinder, and files recorded by the shot.

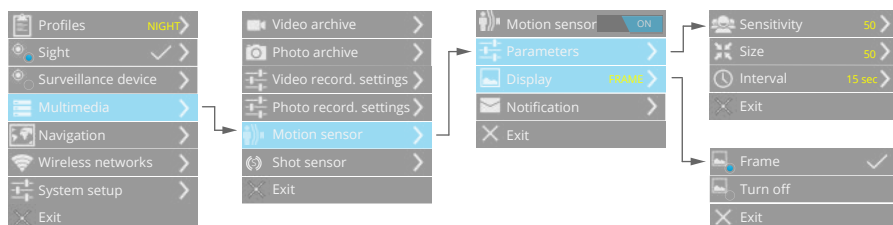
All directory files are sorted under a creation date. To view a file, select an archive file from the list.

Photo archive files can be deleted in the view mode, freeing the space on the memory card. User can delete all archive files of the directory, if required. Button functions in the view mode are shown on the picture.



Motion sensor

The device has an integrated software-based motion sensor which allows detecting a motion of thermal contrast object within the device field of view.



User can set up the following parameters of the motion sensor:

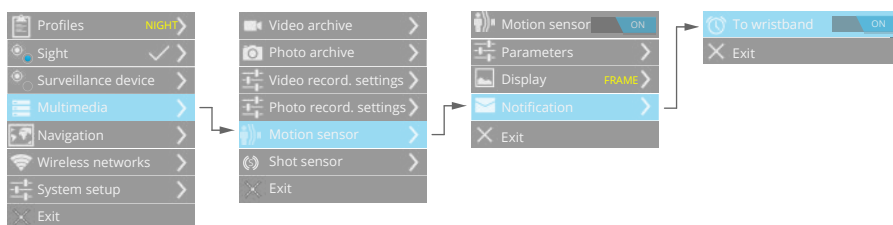
Sensitivity. Determines the sensitivity of the motion sensor. The higher the percentage, the more sensitive is the motion detector.

Size. Determines the percentage of image change rate required for motion sensor activation.

Interval. It is the time interval during which only one motion is detected in a frame (the other motions are ignored). Increasing of this interval reduces the number of alarm messages/records from the recorder.

User can enable selection of a moving object on the screen (by frame).

Device can activate video recording to the video archive when a motion is detected (see video recording setup parameters), and send alarm messages to a wireless remote control/wristband.



An alert for a remote control/wristband is transmitted via 2.4 GHz radio channel. The remote control/bracelet must be enabled and registered in the list of the device.

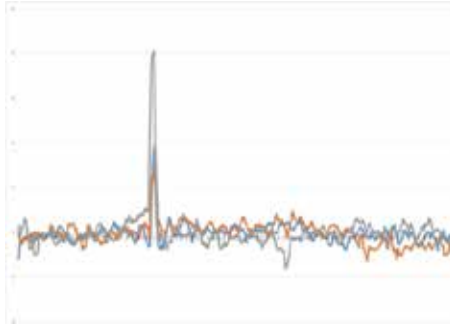
Note:

- The motion sensor will be disabled automatically to prevent a false response during movement of the device (determined by integrated sensors).
- The motion sensor turns on after the activation 15 seconds timeout.

Shot sensor

The device comprises an integrated shot sensor that allows determining the fact of the shot and recording the acceleration of the device when fired (including pre- and post-shot events). The device can capture accelerations up to ± 400 g.

User can configure an activation threshold of the shot sensor via Menu (1-127, interval 1). Threshold exceeding time is non-variable and equal to 1 m/s.



Each shot has a unique number. The device can record video and photo (with a map indicating the device position and target location) during shot detection.

Wireless network

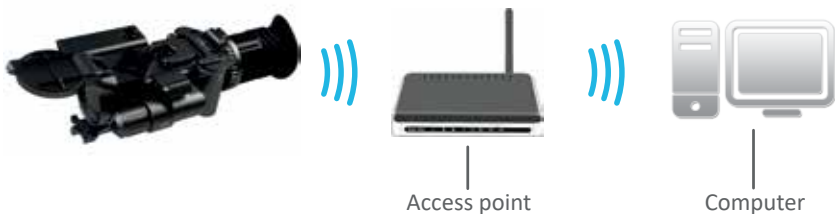
Wi-Fi network configuration

Wi-Fi functions of the device provide wireless transmission of the video stream, files and configuration of the device parameters, eliminating a cable connection. The device supports wireless connection to a Wi-Fi network in two modes:

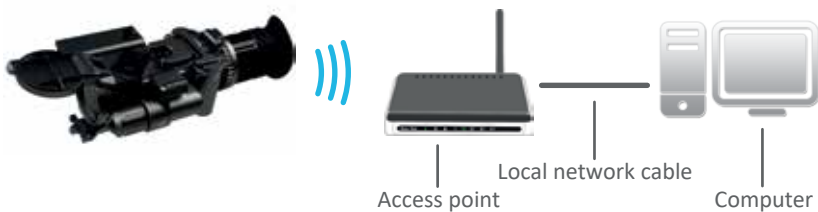
- connection to an existing network (using an access point);
- create your own network (for direct connection, for example, to iPad with the iOS) without using of an access point.

General schemes of each type of Wi-Fi network connection are given below:

Mode “Connection to a network” Scheme 1.



Mode “Connection to a network” Scheme 2.



User can select a connection scheme in the “Connection to a network” mode, it does not affect the device operation and its configuration, as described below.

The user can use any device instead of PC.

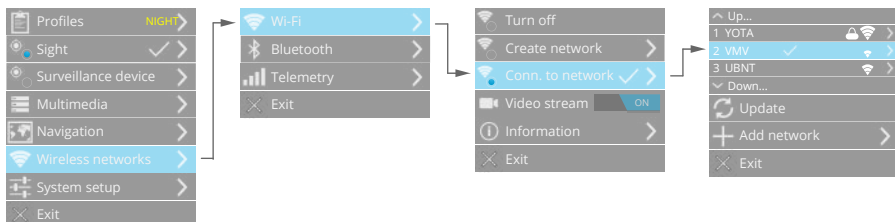
“Create a network” mode

The device Wi-Fi standard provides support of IEEE standard 802.11b/g/n in the 2.4 GHz frequency. The maximum speed is 54 Mbps for IEEE 802.11g and 150 Mbps for IEEE 802.11n. Theoretical values of the speed may differ from the actual.



Wi-Fi connection

Enable “Connect to a network” mode for a Wi-Fi network connection, select a network you want to connect to from the list of networks, press the Menu button to connect to the selected network. Protected networks are indicated by a lock icon, when user connects to a secured network, a password is required. Enter the password using on-screen keyboard.

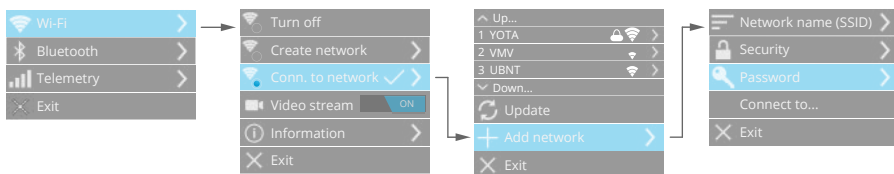


Once connected, the devices will connect automatically afterwards whenever the network is available.

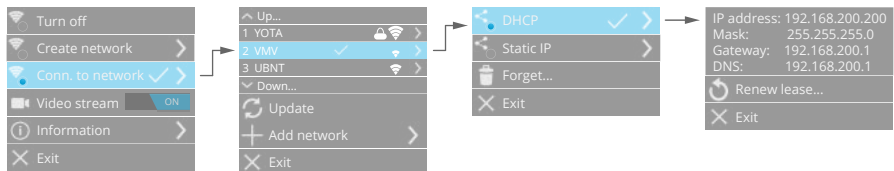
If the desired network is not listed, select the **Add Network** menu item. Enter the network name (SSID) in this item, select a security (no security, WEP, WPA, WPA2), and enter a password. Then select **Connect to**. If connection is successful, the network will appear in the list of networks, otherwise a failure message will be displayed.

Lai mainītu tīkla pieslēguma iestatījumus, izvēlieties tīklu un nospiediet pogu «pa labi».

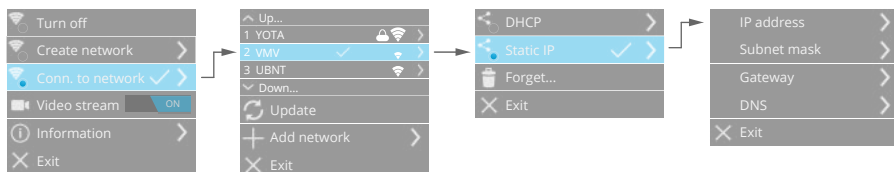
The network settings can be deleted any time to deactivate automatic connection of the devices. For this, select the required network in the list, press Right button and select **Forget** item.



DHCP menu item displays current network settings (DHCP server) and the user can renew the lease by pressing a relevant button if required.



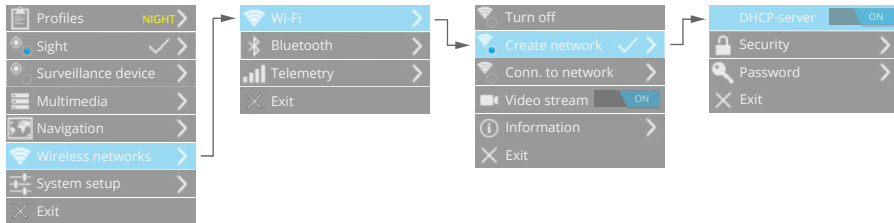
User can preset the Wi-Fi network connection parameters in the Static IP menu item such as: IP address, Subnet mask, Gateway, DNS.



Wi-Fi Creation

By applying the **Network Creation** item, the user can connect mobile phones, smart phones, tablets, etc. directly to the device without using an access point.

Select the **Create Network** item for wireless network setup.



The device will create a relevant Wi-Fi network, name format BNVXXXX, where XXXX are last four MAC-address hexadecimal digits of the built-in Wi-Fi network adapter.

User can change network settings.

- Built-in DHCP server will automatically allocate IP addresses to connected devices without additional settings in a mobile phone, smart phone, etc. IP addresses range 192.168.200.1 – 192.168.200.199, subnet mask 255.255.255.0. IP address of the device is always fixed – 192.168.200.200.
- Security activation (no security, WEP, WPA, WPA2) and password entry are required for secured connection.

Video Streaming via Wi-Fi

The device is equipped with a built-in video streaming server that can transmit video over Wi-Fi to a mobile phone, a smartphone, a tablet, etc. with iOS, Android operating system in real time mode. Remote control mode is also available.

Install BNV Operator app on your iOS or Android device (available on AppStore or Google Play) to receive streaming video and remote management. Follow instructions of BNV software for device connection.

Video streaming is also possible on any computer. Video streaming protocol is RTSP. Name for streaming video reception (for example, via VLC): `rtsp://192.168.200.200/media.h264`.

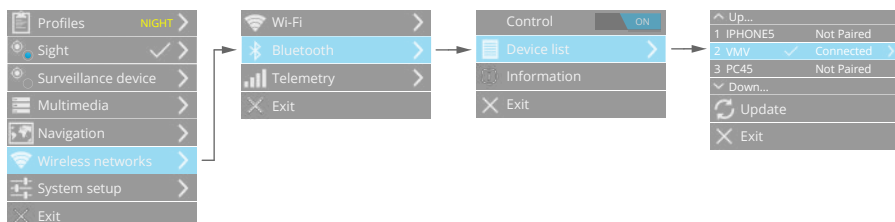
Wi-Fi Information

This menu item displays current Wi-Fi network settings and MAC-address of the integrated Wi-Fi network adapter.

Bluetooth

Bluetooth provides an opportunity of direct connection between two devices (e.g. your device and the Kestrel weather meter) on a short distance.

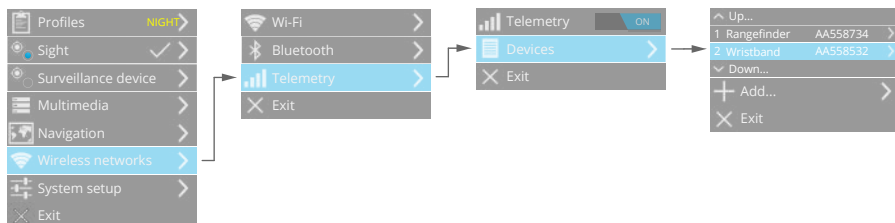
Enable the relevant interface in the device menu for Bluetooth connection.



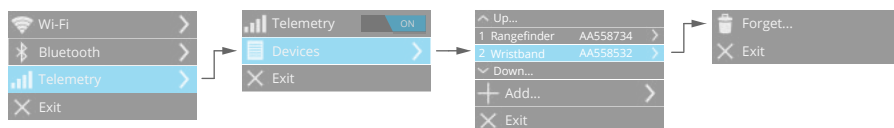
Then select the device you want to connect from the list of networks and press the Menu button to connect to the network. Follow the instructions for Bluetooth connection displayed on the screen of the device. Once connected, the devices will connect automatically afterwards. The connection settings can be deleted any time to deactivate automatic connection of the devices. For this, select the required network in the list, press the Right button and select the Forget item.

Telemetry radio interface 2.4 GHz

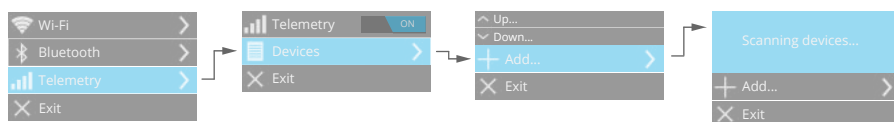
Various devices such as the BNV smart mount, the BNV wristband remote control, etc., can be connected to the device via telemetry radio interface. All devices have an address and a unique ID.



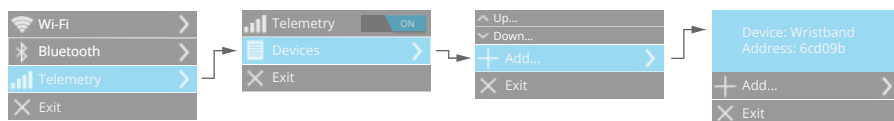
You can find registered radio devices in the list of the devices. Any radio device can be disabled if required. Enter the settings of the radio device and select **Forget**.



You can also add new radio devices by entering the radio device list and selecting **"Add"**. The device will be switched into the radio device search mode. The screen will display a window with the **"Scanning devices"** message.

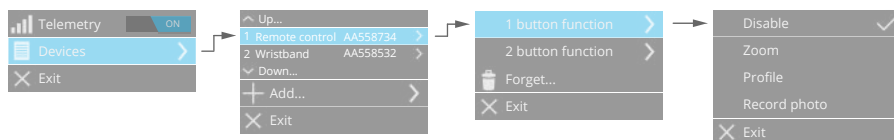


Turn on the radio device you want to add and press any of its buttons. On the screen, you will see the type and the address of the found radio device.



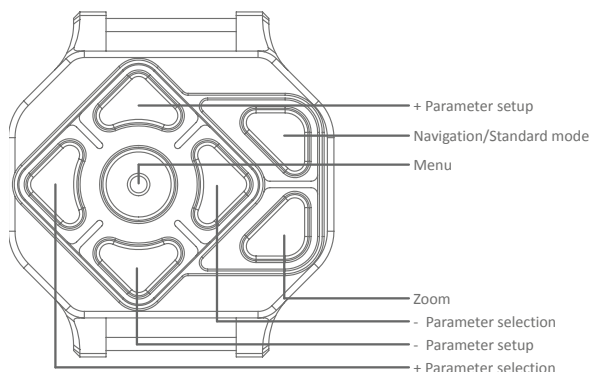
Select **"Add"** to have the available radio device added to the list of your radio devices.

Additional options can be applied for some radio devices. For example, button functions can be preset for the 2-button remote control.



Remote control device (wristband) – optional

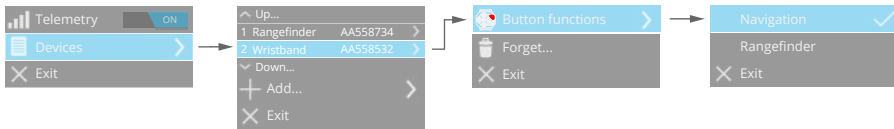
Thermal sight features can be controlled by a remote control (wristband).



Remote control (wristband) buttons options are listed in the table below:

Button	Function
Parameter selection +/-	• Press for parameter selection.
Parameter setup +	• Press to increase the selected parameter by 1 unit in a setup mode, press and hold for fast increase of the selected parameter. • Distance+ (by default).
Parameter setup -	• Press to decrease selected parameter by 1 unit in the setup mode, press and hold for fast decrease of the selected parameter. • Distance- (by default).
Zoom	• Press to change magnification.
Menu	• Press to enter the Menu. • For the remote control on/off, press and hold the button for 7 seconds (until long vibration). In disabled mode, the remote control will enter ultra- low power consumption mode – will not respond to key presses and will not receive alarm messages from the device.
Navigation/ Standard mode*	• Press to select Navigation/Standard mode.

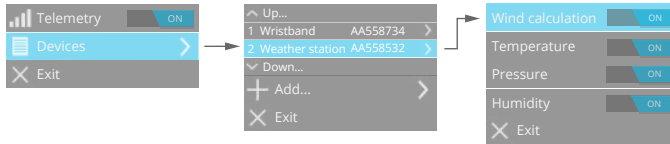
*This button functions can be preset via menu. Optionally, the user can include distance measuring feature by the rangefinder (the first press enables the rangefinder, the second press activates range measurement if the second press is made not later than 15 seconds after the first press).



Options of remote control buttons can be changed depending on a current operation mode (see the paragraph below). The remote control is powered by a CR2450 battery. Low battery status icon is displayed on the screen if discharged.

WindMaster Weather station – Optional

The device can be connected to the BNV weather station via a radio channel. In a real-time mode the weather station transmits temperature, air pressure, relative humidity, wind speed and direction data which can be included in the integrated ballistic calculator and a wind forecast.



The device calculates weather station data automatically if the **Wind calculation** item is enabled.

Attention!

- For a proper operation of the weather station, its integrated magnetic compass must be calibrated.

To turn the Weather station on, press and hold the button over 2 seconds till the green LED is on. This is followed by initiation of the sensors and reading of the compass calibration data. If the compass has been calibrated, the green LED blinks, otherwise the red one (compass calibration is required). Press and hold the button app. 2 seconds to turn the device off. As the button is pressed, the red LED will light up to indicate deactivation of the device after the LED is off.

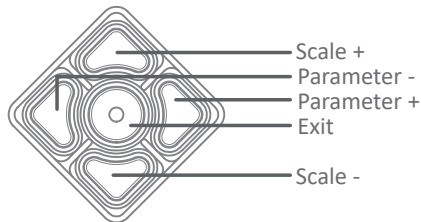
Navigation

General Information

Use the navigation service to determine your location, target search.

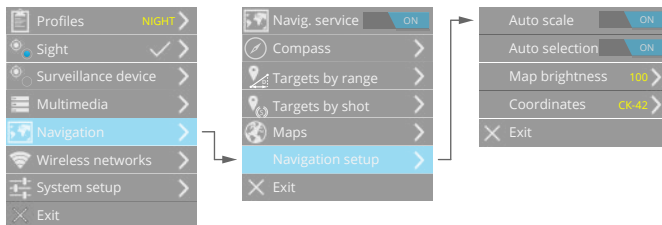
The navigation service is provided by an integrated GPS receiver, and an electronic compass.

To view the device location, select the **Navigation** mode. The device current location is displayed as a dot on the map. Button functions in the Navigation mode are shown on the picture.



Scale+ and Scale- buttons change the map scale and Param+ and Param- allow to select the desired option for its quick setup. Press the **Exit** button to exit to a standard playback mode.

Navigation service parameters are controlled via menu. The user can optionally disable the navigation service, in this case the GPS receiver will be disabled (if the GPS time synchronization is enabled, the GPS receiver will be turned off after timing over).



The user can adjust image brightness in the Navigation mode.

If **Auto Scale** is enabled and target is selected, the map scale changes automatically to view own location and target location respectively.

Auto Selection activates the last target automatic selection by range or by shot. Otherwise, the user target shall always be displayed in the Navigation mode.

Coordinate determination time depends upon a lot of factors and the most significant is satellite visibility conditions. First coordinate determination (cold start) may take more time in an urban area with limited sky view than in the field. The cold start time takes about 60 seconds in perfect conditions.

In case of the warm start (providing that the device is activated after 4 hours maximum since the last coordinate determination) the GPS receiver may not calculate the satellite ephemerides, so the coordinate determination takes 25 seconds approximately for the perfect conditions of the sky visibility.

If the power saving mode is enabled, the GPS receiver activates its low power consumption mode with all GPS data saved in RAM. By exiting the low power consumption mode, the hot start of the GPS receiver is carried out (providing that coordinates were determined before turning on the power saving mode that results in approximately 5 second coordinate determining for the perfect conditions of the sky visibility).

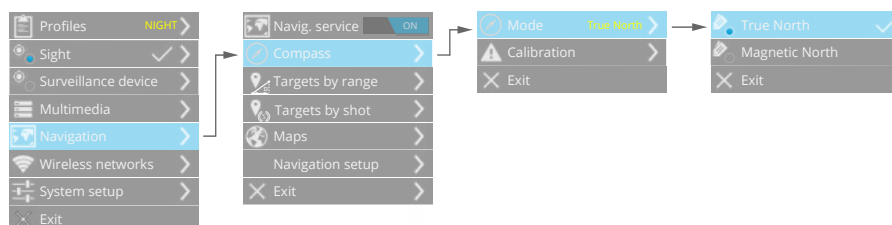
Note:

- A GPS receiver antenna is located on the top side of the device. Make sure that the GPS receiver antenna has the maximum sky visibility to reduce the **cold start** time.

Compass

The integrated magnetic compass must be calibrated for a proper operation of the navigation service.

If the compass is not calibrated, its indicator in the System Tray will be yellow.



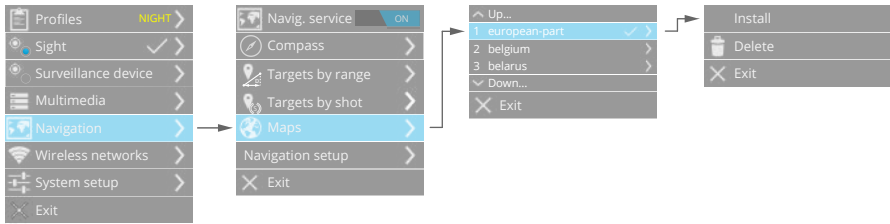
Notwithstanding that the software activates automatic background calibration of sensors (an accelerometer, a gyroscope, and a magnetometer), some of step must be taken previously to provide operation accuracy.

Azimuth digits colour	Compass	Actions required
White	Calibrated	–
Yellow	Non-calibrated	Make some motions by the device while holding it (i.g., draw a number 8 in the air with it) till azimuth digits turn white
Red	Non-calibrated	Place the appliance on 6 slabs in each position not moving it for a few seconds. Changing the position of the device move it slowly. Successful accelerometer and gyroscope calibration in the case of an azimuth need to be yellow or white.

Attention:

- In the Magnetic North mode the compass will indicate the direction to the magnetic pole, in the True North mode – to the geographical North of the Earth. The location of the true geographical North does not coincide with the location of the magnetic pole. The device automatically corrects declination during the True North calculation depending on the own location.

Maps



The user can update or install maps of any region, if required.

Map installation:

- download a map from the irnd.be website;
- turn the device On;
- connect the device to your computer via USB – open BNV disk ;
- copy the map file in the root directory of the BNV disk;
- disconnect the device from the computer USB;
- select map files and select **Install** in the Navigation/Maps menu.

Map Installation procedure will be displayed. The device is ready for operation with a new map after 100% installation.

Note:

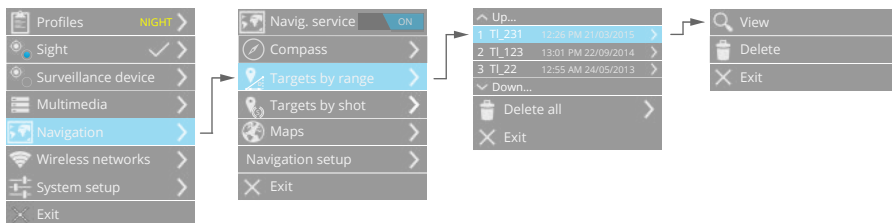
To view the map in the navigation mode, the device must determine coordinates by using of the integrated GPS receiver.

Only one map can be installed into the device. To install a new map, delete the pre-installed one.

Attention!

Navigation service uses maps from the OpenStreetMap project, which works like Wikipedia, allowing users from all over the world to create and edit maps. If you want to add anything, or make corrections of themap, you can correct it directly on the website <http://openstreetmap.org>, and your changes will appears at the next update time of maps on the BNV website.

Routes

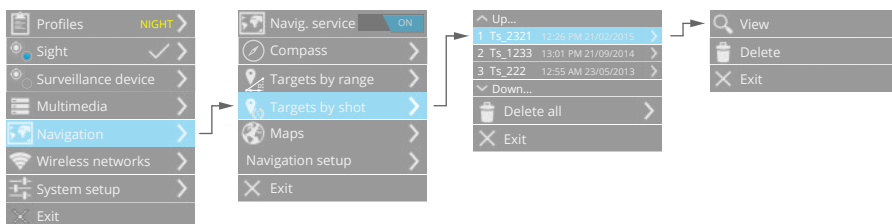


The device automatically records the user's routes (if the device is on, the navigation service is activated and the device with the "GPS" receiver has set the coordinates). Routing is recorded until the device is turned off, or the navigation service is deactivated.

For each route, the device creates an unique name. For each route, time and location navigation data are recorded every second. To view the current route (starting from the moment of turning on), the user can select an appropriate element in the navigation mode using the "Shortcut buttons". The user can view the old routes in the "Menu". To do this, select the desired route from the "Route List". All routes are arranged in the folder after the date of creation. The user can delete the selected route, or all the recorded routes in the "Menu".

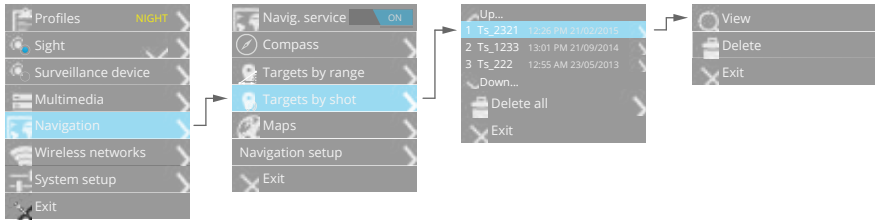
When you look at the route, the map scale will automatically be changed so that the user can view the full route.

Targets by Range



The device determines the target geographical coordinates and its altitude above ground automatically for each ranging. Also the photo is recorded automatically including a thermal image and a mapped target location.

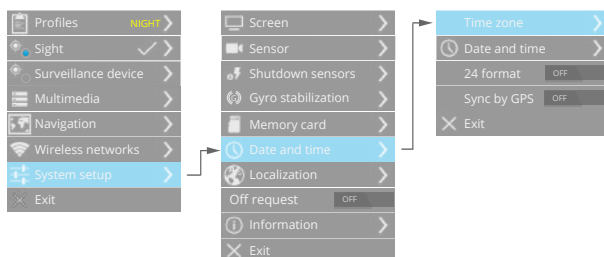
Targets by Shot



The device determines the target geographical coordinates and its altitude above ground automatically for each shot. Also the photo is recorded automatically including a thermal image and a mapped target location.

Settings

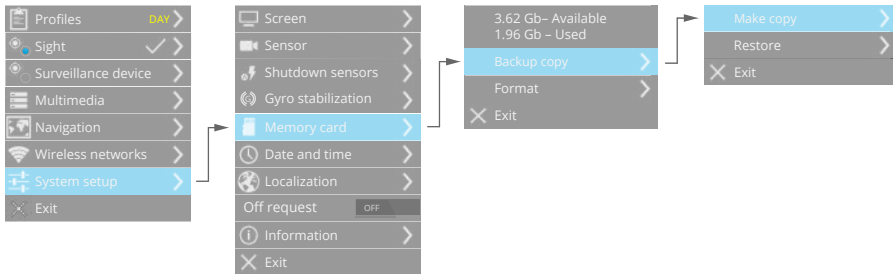
Date and Time



Use the **Date and Time** menu item for setup of a date and time, a time zone, a current date and time, and a time format.

When the **Sync by GPS** mode is enabled, date and time will be set by signals of the satellite navigation based on the selected time zone. If the Sync by GPS is enabled and the Navigation is disabled, the device will activate a GPS/GLONASS receiver after booting, then determine time, and deactivate the GPS/GLONASS receiver afterwards.

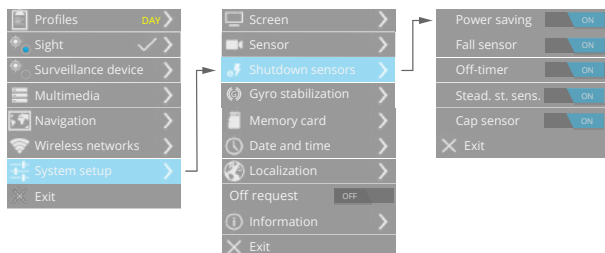
Memory, backup



Delivery set includes a 4 GB internal flash memory.

The user can view the memory information via Menu if required. Also the indicator of the memory and its filling level is displayed in the **System Tray**. The user can format the memory via Menu. All data of the memory will be deleted. The device can backup settings and a weapon database. The user can restore the pre-backup device condition afterwards if required. To make a backup copy of settings and the weapon database to the memory, select **Make Copy**. A new backup copy will be created. To restore all data of the memory backup copy, press **Restore**.

Automatic shutdown sensors



Enable sensors via Menu for automatic shutdown of the device.

Free fall sensor will shut down the device automatically in case of free fall sensing and reduce its damage risk.

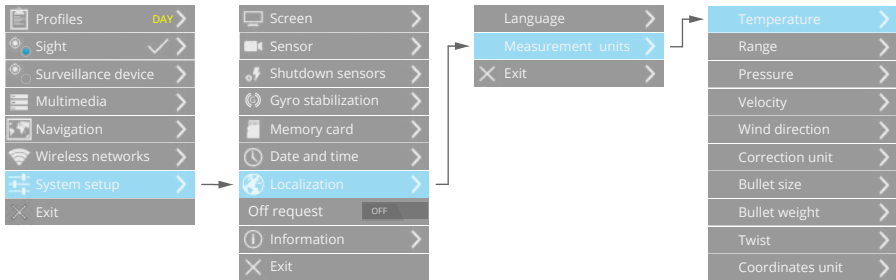
Off-timer will shut down the device if the user forgot to turn it off – no buttons are pressed for more than 15 minutes.

Steady state sensor will shut down the device if the user forgot to turn it off – it doesn't move for more than 15 minutes.

Cap closing sensor will shut down the device if the lens cap is closed for more than 10 minutes.

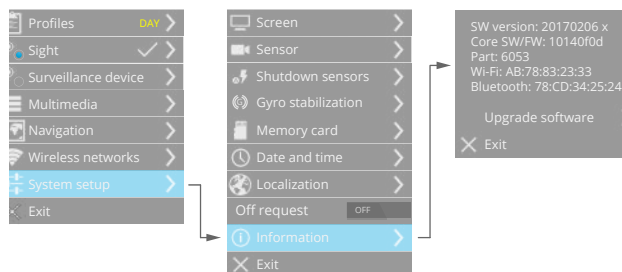
Power saving – this mode is used to save power consumption of the device when you need quick power on. When this mode is enabled, and the lens cap is closed for more than 5 seconds, the device enters low power consumption mode. To exit the power saving mode, open the lens cap. To turn off the device in power saving mode, press the power button for 2 seconds. The transition time from power saving mode to the operation mode is 3–4 seconds.

Localization



In this Menu item the user can select the language (English /German/ Spanish/French/Arabic), as well as units of a distance, temperature (C/F), air pressure, wind speed and direction, corrections, bullet size, bullet weight, twist, and navigation coordinates.

Information and Software Update

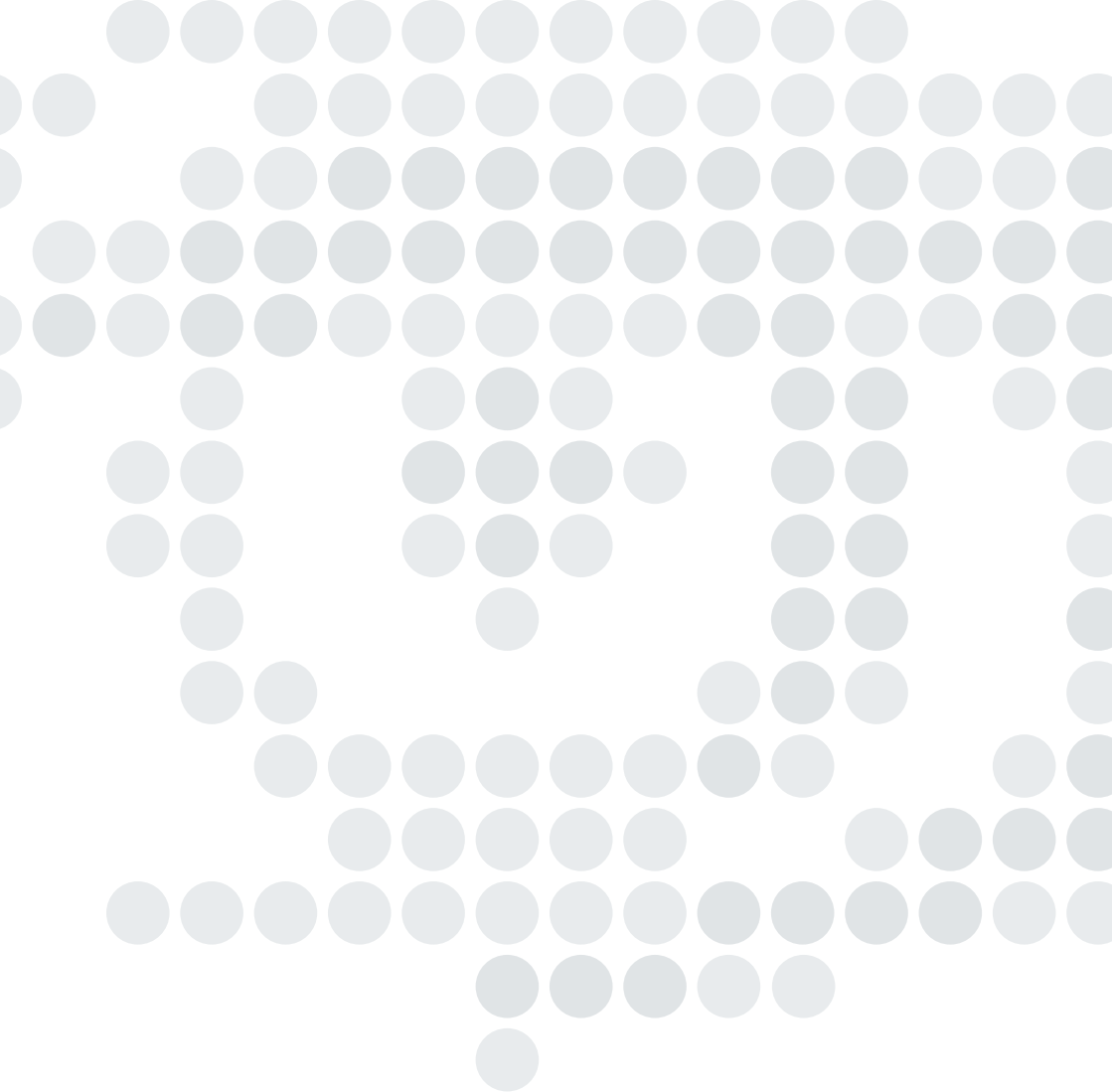


This Menu item displays system information and the firmware version. The user can also update the device software.

How to update software:

- download a new firmware from the irnd.be website;
- turn the device on, check that the battery operating time is 1 hour minimum;
- connect the device to your computer via USB – open the BNV disk;
- copy the firmware file in the root directory of the BNV disk;
- disconnect the device from the computer;
- in the System settings/Info/Update menu item – select the downloaded firmware file and select **Upgrade**;
- the device will start the firmware upgrade and turn off automatically afterwards. Turn on the device – updating will take 2 minutes. After full booting, the device is ready to operate with the new software.

[illegible]



Meža street 2, Salaspils, Latvia, LV-2169
E-mail: bnv@bnvsystems.com

WWW.BNVSYSTEMS.COM