

ThermalTronix
TT-1750MS-NVBM
Thermal Binocular

Operator's Manual



Warning and Attention

- Never put the lens directly towards to the strong radiation source (the Sun, direct or reflection laser beam, etc.) in any situation (power on or power off) since thermal inductor used in infrared telescope is very sensitive. Otherwise, infrared telescope will be damaged permanently.
- The original package box must be used in the transportation. Do not shake or hit the apparatus strongly in use and transportation.
- Please use the original package box to store the apparatus. The environment should be cool, dry ventilated and no strong electromagnetic field.
- Protect the surface of the lens from being stained or damaged by oil sludge and any chemical matters. Please put on the lens cap after using.
- Never open the case or refit the apparatus. Only authorized people from our company are allowed to do maintenance.

Content

ACCESSORY	3
1. INTRODUCTION.....	4
1.1 Component names and function.....	4
1.2 Inserting the battery	5
1.3 Charging the battery	5
1.4 External interface	6
2. OPERATION GUIDE.....	7
2.1 Startup	7
2.2 Stop and Pending	8
2.3 Interface Overview	8
2.4 Button operation.....	10
3. MENU OPERATION	12
3.1 Main Menu Operation	12
3.2 Image Setup Menu Operation.....	13
3.3 Focus Setup Menu.....	16
3.4 Display Setup Menu Operation	17
3.5 Compass Setup Menu Operation	18
3.6 Position Setup Menu operation	20
3.7 Compass calibration menu operation	22
4. PROCESS OF COMPASS CALIBRATION	24
4.1 Auto calibration mode:	24
4.2 Manual calibration mode:	25
4.3 Calibration result analysis.....	27
4.4 Direction and Attitude	28
5. DISTANCE MEASURE OPERATION.....	29
5.1 Prepare for range finder.....	29
5.2 Trigger the laser finder.....	30
5.3 Cancel range finder.....	30
5.4 Range finder success.....	31
5.5 Range finder failed.....	32
5.6 Low power notice.....	32
6. VIDEO CAMERA OPERATION	33
6.1 Photo capture	33
6.2 Video record	34
6.3 Playback files.....	35
6.4 USB flash mode:.....	36
7. SPECIFICATIONS.....	37
8. ERROR, FAULT AND EMERGENCY RECOVERY.....	38
9. NEWS.....	39

Accessory

- Thermal Binocular ×1
- Lithium battery pack ×2
- Battery charger ×1
- Power cable ×1
- Data transmission cable ×1
- Strap ×1
- Unipod ×1
- Air bellow ×1
- Transport case ×1
- Operator's manual ×1
- Test certificates ×1

System Information

TT-1750MS-NVBM is developed for whole day surveillance type thermal binocular, which offers thermal imaging, video recording, image record, target position and distance detection functions.

Camera is operated with specified batteries; all main functions could be realized by 8 button buttons. The images could be displayed by OLED and its crosshair is on center of the image to aim at the target. The equipment includes laser detection function to measure the ranges of target.

Note: it is not allowed to use laser detection function to measure object ranges within 100m.

1. Introduction

1.1 Component names and function

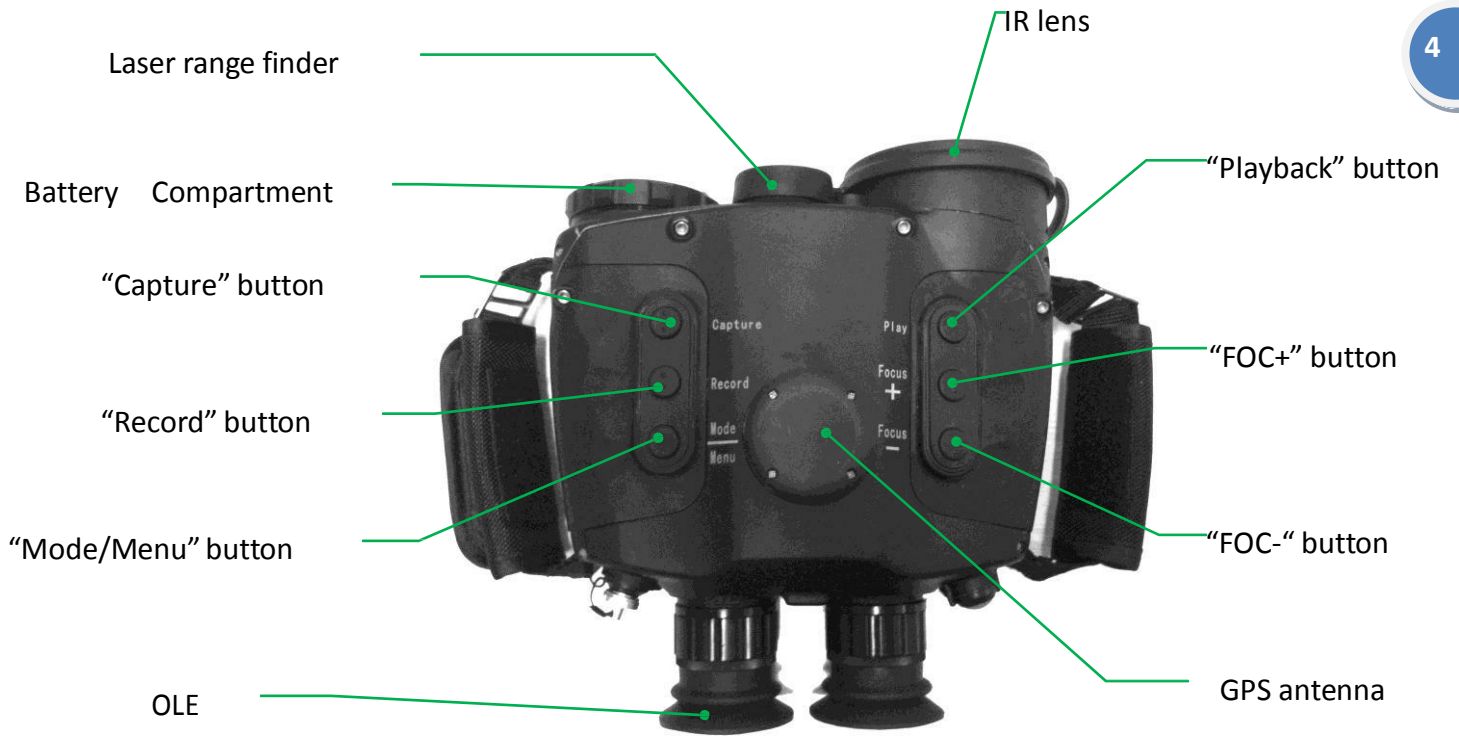


Fig.1 Top View



Fig.2 Side View



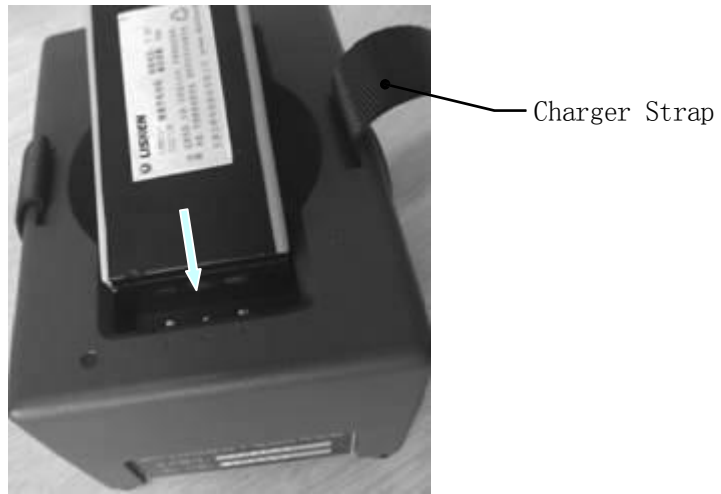
Fig.3 Back View

1.2 Inserting the battery

1. Screw the lid of the battery compartment (Fig.1) anticlockwise, remove the lid, insert the battery, ensuring the terminal pads are forwards the front of the battery compartment
2. Screw the lid clockwise, put it back

1.3 Charging the battery

1. Insert the plug of A/C adapter into the charger case
2. Plug another head of A/C adapter into an 220V AC wall outlet, upon power on ,the charger's LED status indicator will flash red
3. Insert the battery into the charge as illustrated (Fig.4) .The LED indicator will flash from green to red, When the battery is full charged, the LED indicator will flash from red to green.
4. Use the strap to fasten the battery tightly if it is necessary



1.4 External interface

Fig.4

Pin Num	Name	Definition
1	RS232_RXD	RS232
2	RS232_TXD	RS232
3	RS232_GND	
4	PAL_VIDEO	Analog Video Output
5	PAL_GND	Analog Video GND
6	USB_+5V	USB Power Positive
7	USB_D+	USB Signal
8	USB_D-	
9	USB_GND	USB Power Negative

Red Point

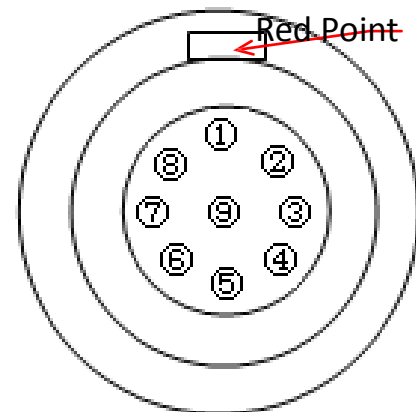
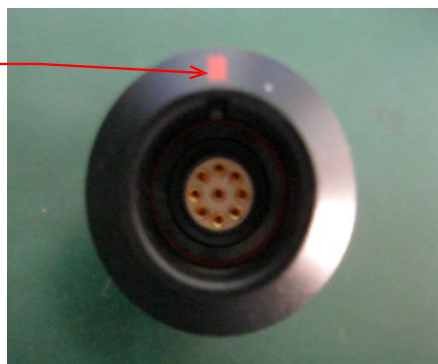


Fig.5 External Interface

2. Operation Guide

2.1 Startup

Press “Power” button, system processes startup processing and initialization interface will come up to the screen after 2-3s.

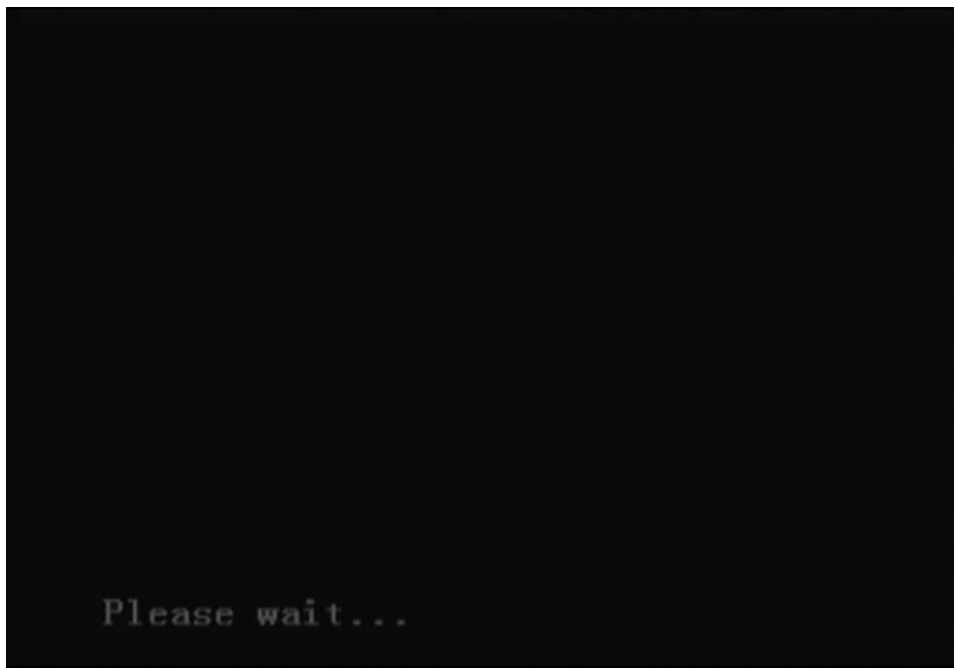


Fig.6 Initialization Interface

Self-checking interface will be display on screen after another 3-4s.

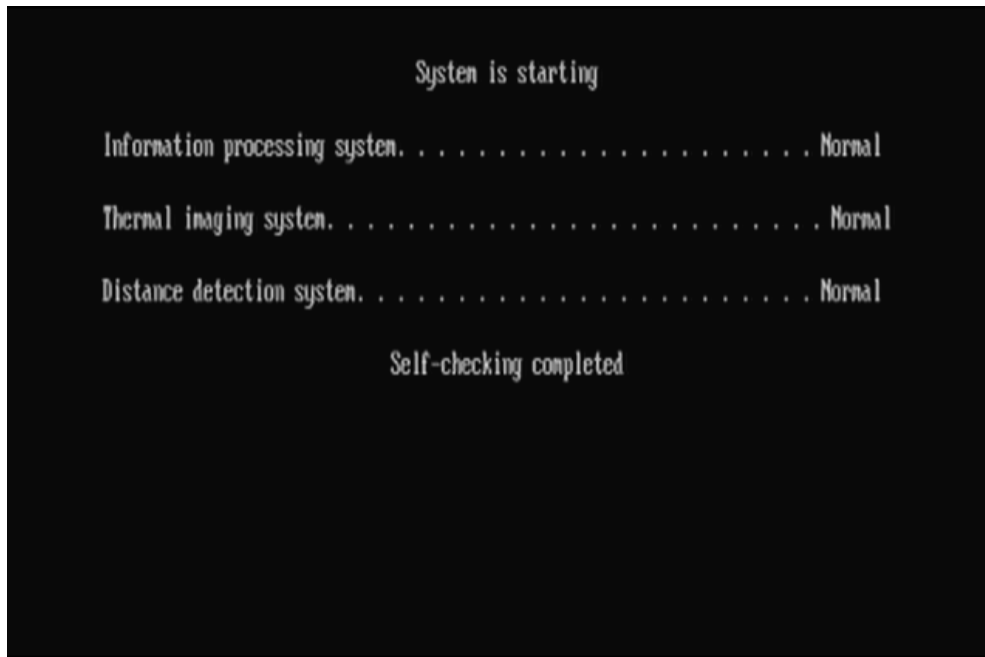


Fig.7 Self-checking interface

After process of self-checking is completed, system enters operation interface.

2.2 Stop and Pending

When camera is startup, operator could turn off camera by pressing power button to stop firmware running. Power off: camera could be turned off and it will not effect on saved parameter lost.

2.3 Interface Overview

When a stable thermal imaging shows, they appear the following interface. The default mode is FN.Mode(full-function boot mode). Full-function mode with laser rangefinder, GPS positioning, electronic compass angle and other functions, the interface contains a self-locating information, targeting information, laser ranging information, electronic compass angle information, battery and other information, the interface is shown below:



Fig.8 Full-function mode interface

Press “Mode / Menu “button to switch modes to TI mode. TI mode only display live thermal image with no additional functionality, the interface as shown below:

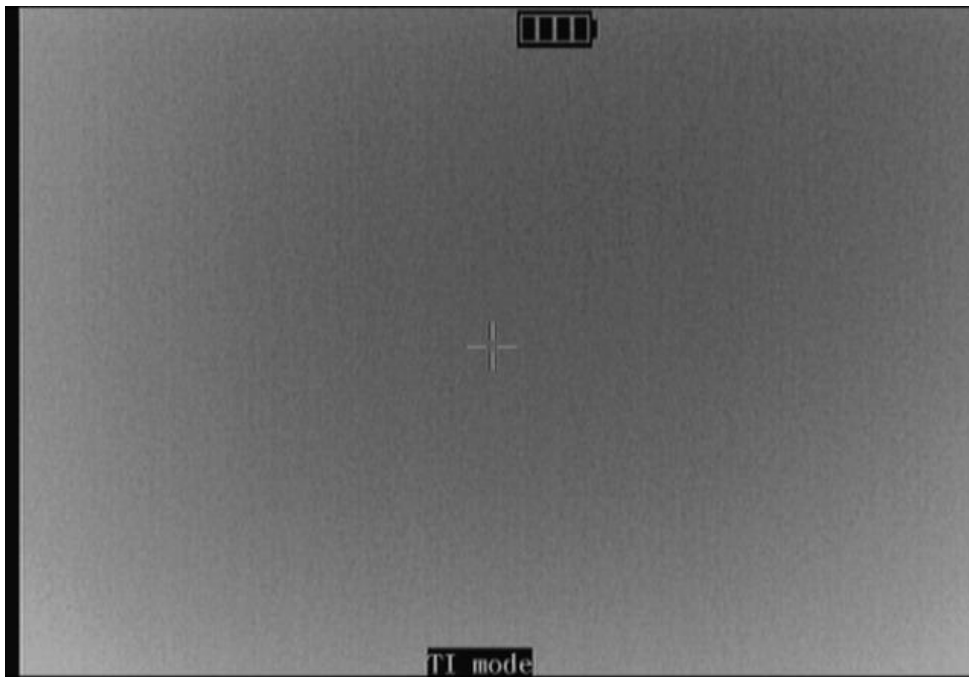


Fig.9 Thermal imaging mode interface

Press “Mode / Menu “button to switch Range mode. Ranging Mode only laser rangefinder and thermal imaging capabilities, No GPS positioning, compass angle function, the interface as shown below:



Fig.10 Rang mode interface

2.4 Button operation

- 1) **“Power”** button: switch. Power on and off.

- 2) **“Mode / menu”** button: in the absence of the menu, long press ($\geq 3s$), and then release the button to activate the main menu, short press ($<3s$) for the work mode, "all mode", "hot like mode ", " distance mode " to cycle . In the case of a menu, press and release to select menu options, select the Top-down cycle of operation.

- 3) **“Focus +”** button: in the absence of the menu, for a long time ($\geq 1s$) push forward to manually adjust the lens focus straight , short press to manually adjust the lens focus positive step ; When the menu shows , the button functions as the menu or menu options to determine the increase in property values.
- 4) **“Focus –”** button : in the absence of the menu, for a long time ($\geq 1s$) press to manually adjust the lens focus back straight , short press to manually adjust the lens focus single-step reverse ; When the menu shows , the button functions as the menu options or menu item to determine the property value will decrease.
- 5) **“LRF / Calibration”** button: Short press for the correction function to achieve the image non- uniformity correction, a long time ($\geq 3s$) compression function for the distance control laser range finder, to achieve the target ranging.
- 6) **“Capture”** button: Short press to take photographs. When the playback of the list is opened, the button to return to the parent directory or exit the playback list.
- 7) **“Play”** button: Short press to open the play list. When the playback of the list is opened, the button to select the file.
- 8) **“Record”** button: short press to start record video, short press again, stop recording. When files browse list is opened, the button to enter the lower-level directory or open the file

3. Menu Operation

3.1 Main Menu Operation

Pressing “Mode/Menu” button for more than 3s, and release the button, the image will display below Main menu interface

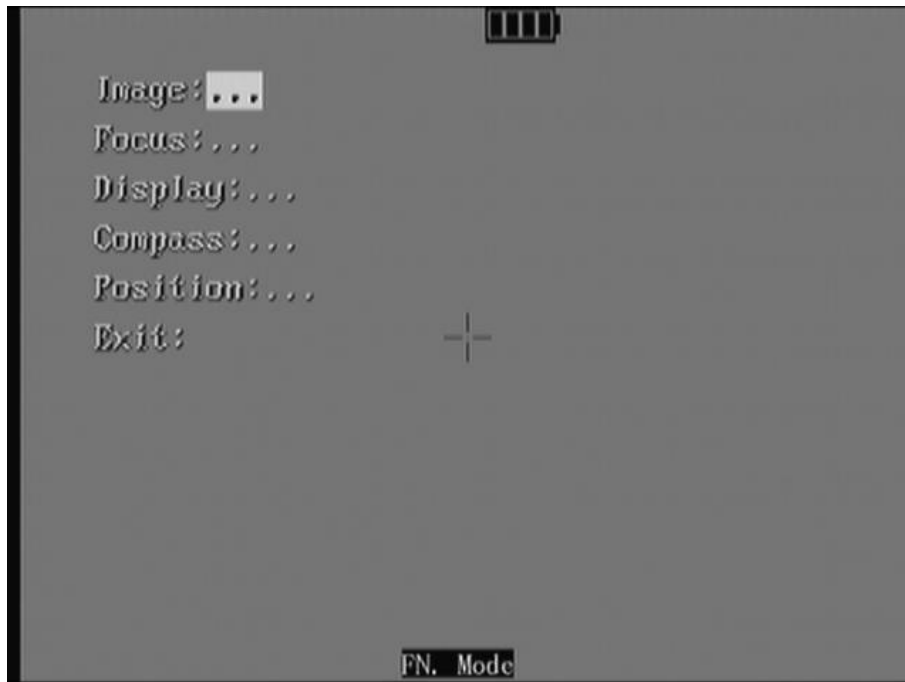


Fig.11 Main Menu Interface

Main menu function list

Menu Items	Operation Functions
Image: ...	Enter Image Menu
Focus: ...	Enter Focus Setup Menu
Display: ...	Enter Display Setup Menu
Compass: ...	Enter Compass Setup Menu
Position: ...	Enter Position Setup Menu
Exit:	Exit Main Menu

When activate the main menu, press “Mode/Menu” button again to move to the next menu item and activate the menu item; “Focus+” and “Focus-” buttons are used to activate present selected item or to change the item property values. When Menu move the last item, system will automatically save and close the menu by pressing “Focus+” or “Focus-” button.

3.2 Image Setup Menu Operation

When Activating “Image” Menu item, the following Image Setup Menu Interface will be displayed by pressing “Focus+” or “Focus-” button.

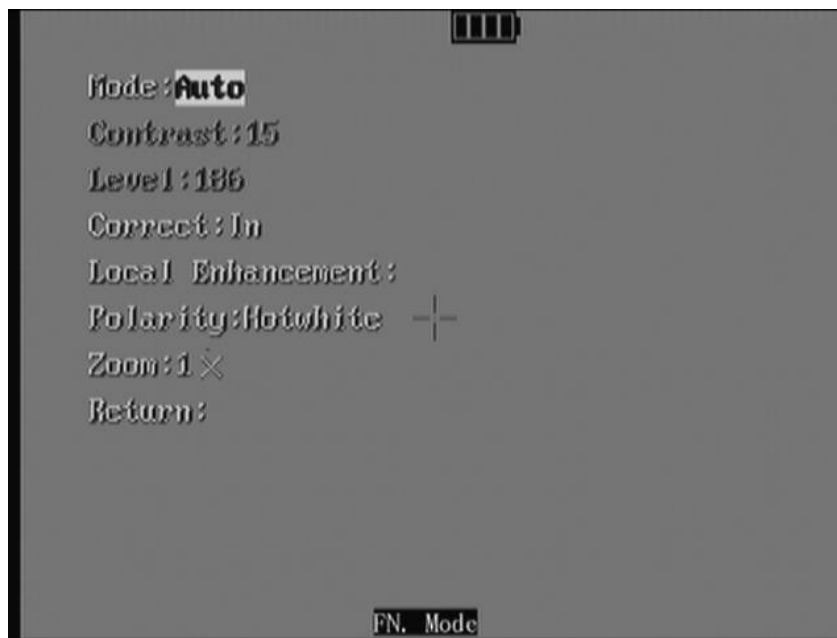


Fig.12 Image Setup Menu Interface

Image Setup Menu function list

Menu Item	Operation Functions
Mode: Auto/Manual	Chose image mode. The default mode is auto Auto: image contrast and level is automatic. Manual: image contrast and level can be adjust.
Contrast: XX	The contrast of image.
Level: XX	The brightness of image.
Correct: IN/OUT	Nuc-calibration .Default set is "IN" Correct: IN Short press "LRF/cal" button, do correct. Correct: OUT Close the lens cover ,Short press "LRF/cal" button, do correct. Then open the lens cover.
Local enhancement:	Press "Focus +", enter the local enhancement menu.
Polarity: WhiteHot/BlackHot	1. To change the image Polarity: 2. WhiteHot, white color shows high temperature zone, black color shows low temperature zone 3. BlackHot, black color shows high temperature zone, white color shows low temperature zone
Zoom:1x /2x	Electrical Zoom for 2x zoom
Return:	Back to superior menu

Press “Mode/Menu” button, menu move to the next menu item and activate the item; “Focus+” and “Focus-” buttons are used to activate present selected item or to change the item property values. When Menu move the last item, system will automatically save and return to superior menu by pressing “Focus+” or “Focus-” button.

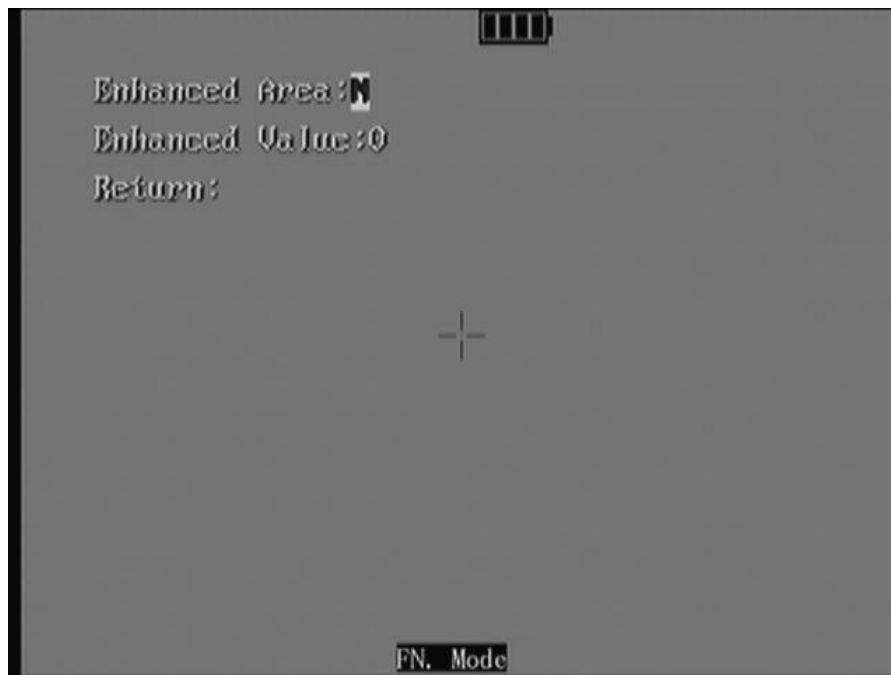


Fig.13 local enhancement Setup Menu

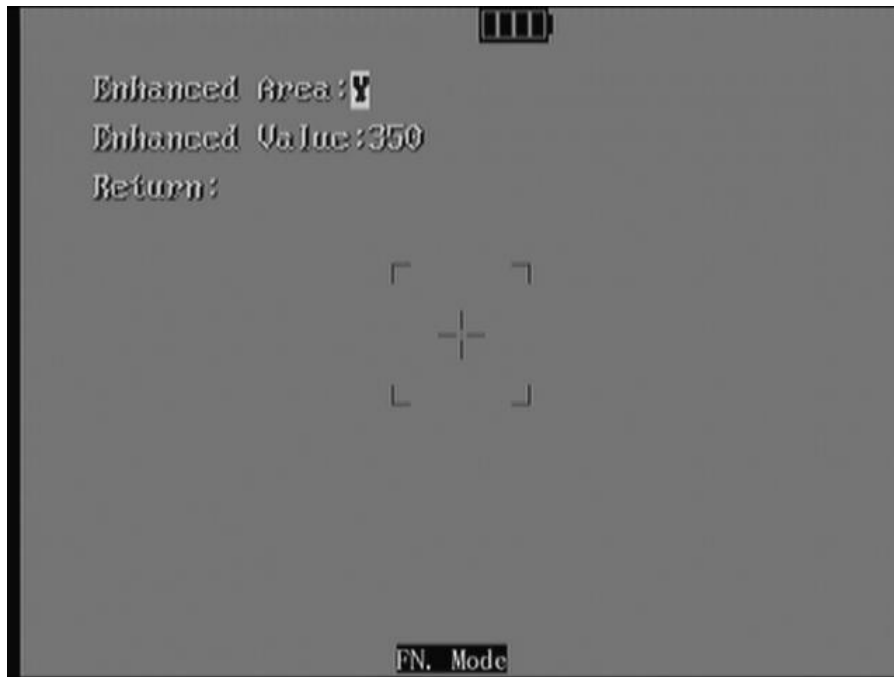


Fig.14 local enhancement turn on

3.3 Focus Setup Menu

When Activating “Focus” Menu item, the following Focus Setup Menu Interface will be displayed by pressing “Focus+” or “Focus-” button.

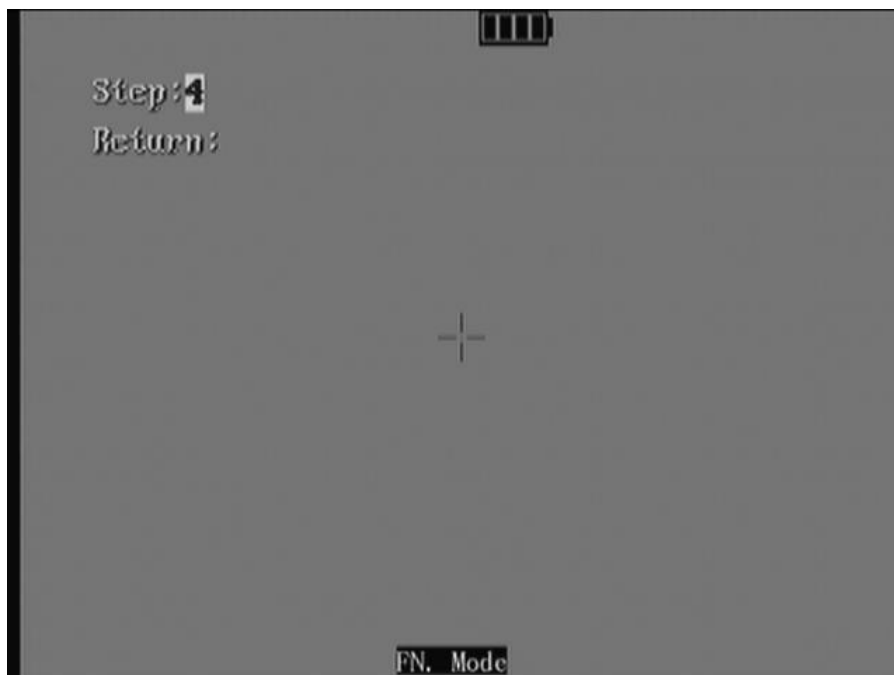


Fig.15 Focus Setup Menu

Focus Setup Menu function list

Menu Item	Operation Functions
Step: XX	Setup the steps of focus, setup Range 1-100
Return:	Back to superior menu

Press “Mode/Menu” button, menu move to the next menu item and activate the item; “Focus+” and “Focus-” buttons are used to activate present selected item or to change the item property values. When Menu move the last item, system will automatically save and return to superior menu by pressing “Focus+” or “Focus-” button.

3.4 Display Setup Menu Operation

When Activating “Display” Menu item, the following Display Setup Menu Interface will be displayed by pressing “Focus+” or “Focus-” button.

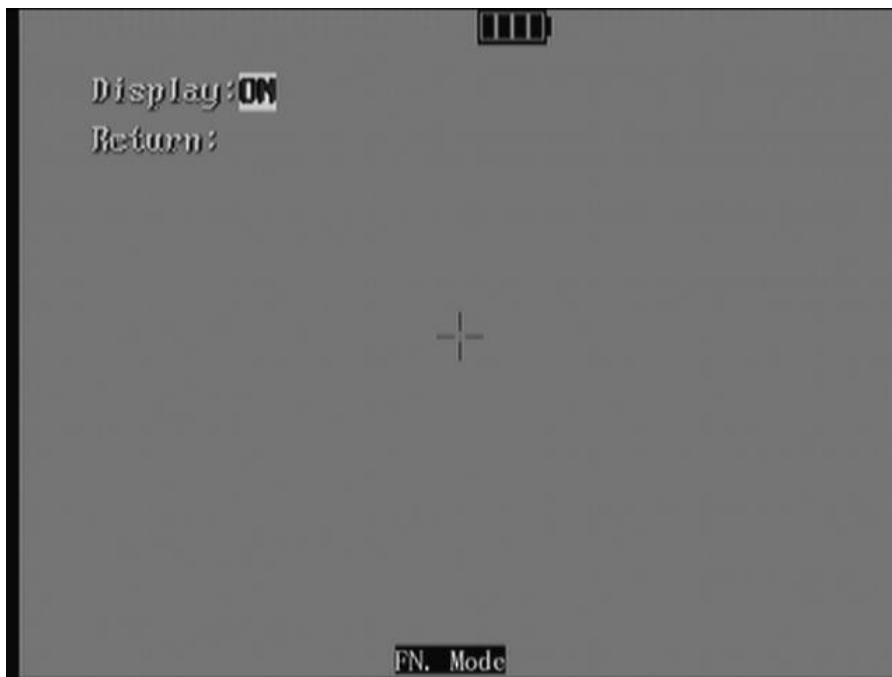


Fig.16 Display Setup Menu

Display Setup Menu function list

Menu Item	Operation Functions
Display: Sense/On	On: View Finder always on Sense: close to the View Finder, View Finder will be turned on; away from View Finder for 10s, View Finder will be turned off
Return:	Back to Superior menu

Press “Mode/Menu” button, menu move to the next menu item and activate the item; “Focus+” and “Focus-” buttons are used to activate present selected item or to change the item property values. When Menu move the last item, system will automatically save and return to superior menu by pressing “Focus+” or “Focus-” button.

3.5 Compass Setup Menu Operation

When Activating “Compass” Menu item, the following Compass Setup Menu Interface will be displayed by pressing “Focus+” or “Focus-” button.

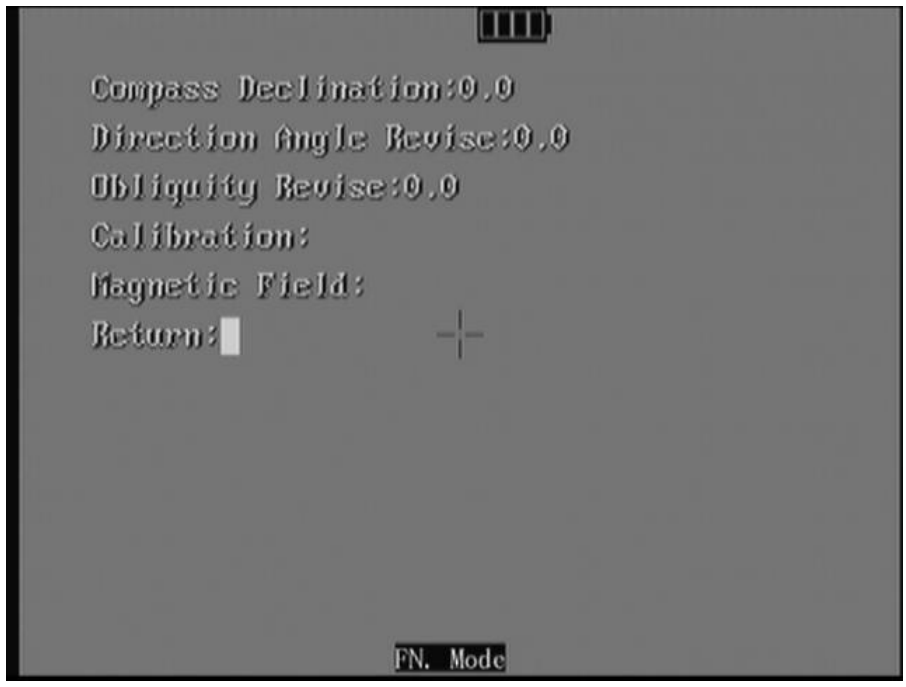


Fig.17 Compass Setup Menu

Compass Setup Menu function list

Menu Item	Operation Functions
Compass declination	Setup Compass declination parameter, setup range -99.9~99.9
Direction angle revise	Setup direction angle revise parameter, setup range -99.9~99.9
Obliquity revise	Setup obliquity revise, setup value -2.0~2.0
Calibration	Compass calibration menu
Magnetic Field:	Magnetic field setup menu.Fig.18. MX", "MY", "MZ" show the status of surrounding magnetic field, if the parameter "D" is "False", its acceptable. But if the parameter "D" is "True", It means the influence of surrounding magnetic field is unacceptable, change another location to use the compass.
Return	Back to superior menu

Press “Mode/Menu” button, menu move to the next menu item and activate the item; “Focus+” and “Focus-” buttons are used to activate present selected item or to change the item property values. When Menu move the last item, system will automatically save and return to superior menu by pressing “Focus+” or “Focus-” button.

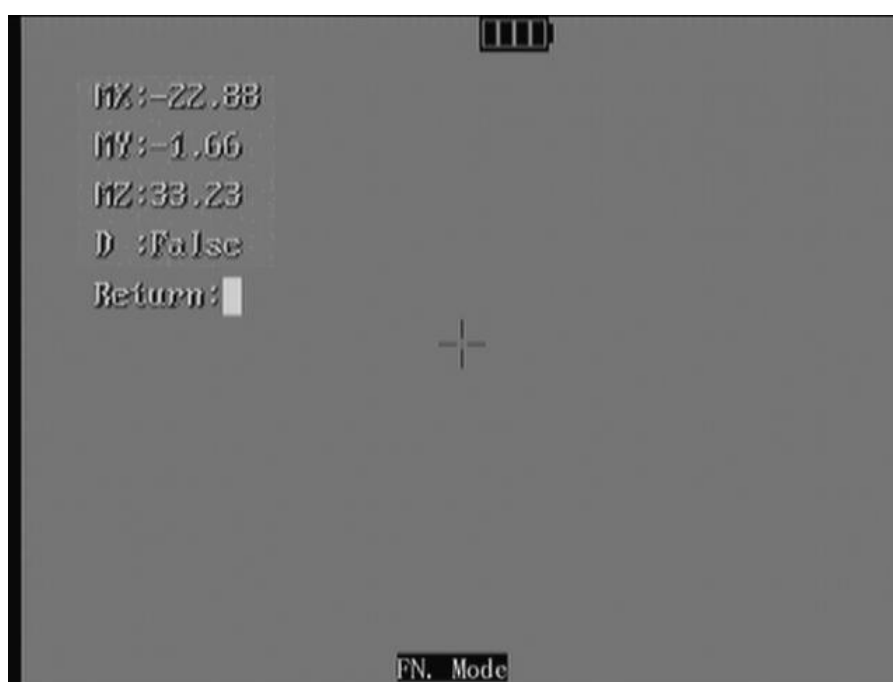


Fig.18 Compass Filed Menu

3.6 Position Setup Menu operation

When Activating “Position” Menu item, the following position Setup Menu Interface will be displayed by pressing “Focus+” or “Focus-” button.

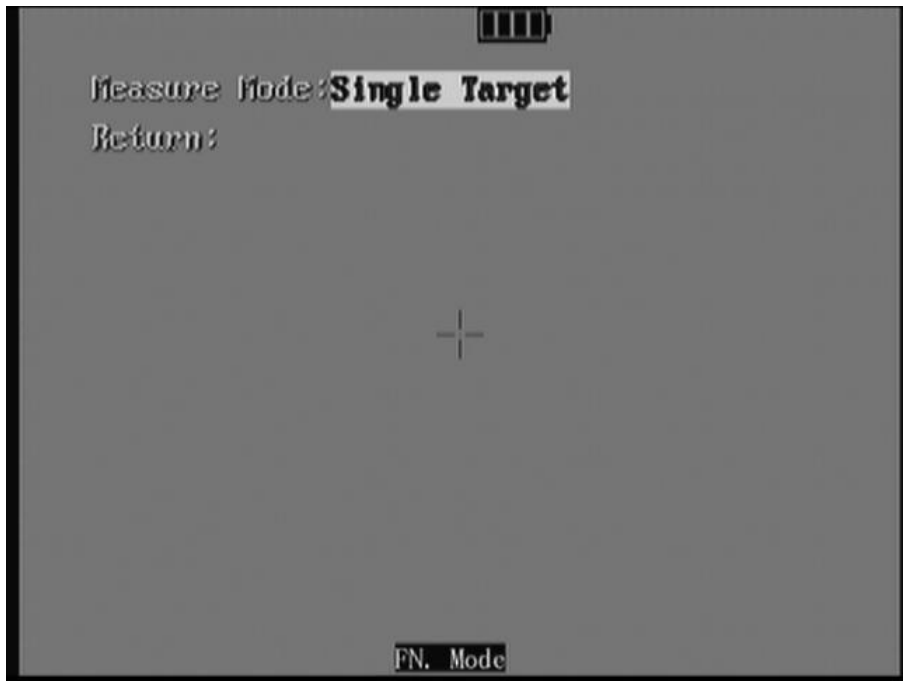


Fig.19 Measure mode Setup menu interface

Position Setup menu function list

Menu Item	Operation Functions
Distance measure mode: Multi target/ Single target	Set Ranging mode: Single target and multi target. Multi target mode: detect 3 targets at the same time.
Return:	Back to superior menu

Press “Mode/Menu” button, menu move to the next menu item and activate the item; “Focus+” and “Focus-” buttons are used to activate present selected item or to change the item property values. When Menu move the last item, system will automatically save and return to superior menu by pressing “Focus+” or “Focus-” button.

3.7 Compass calibration menu operation

When Activating “Calibration” Menu item, the following Calibration Setup

Menu Interface will be displayed by pressing “Focus+” or “Focus-” button.

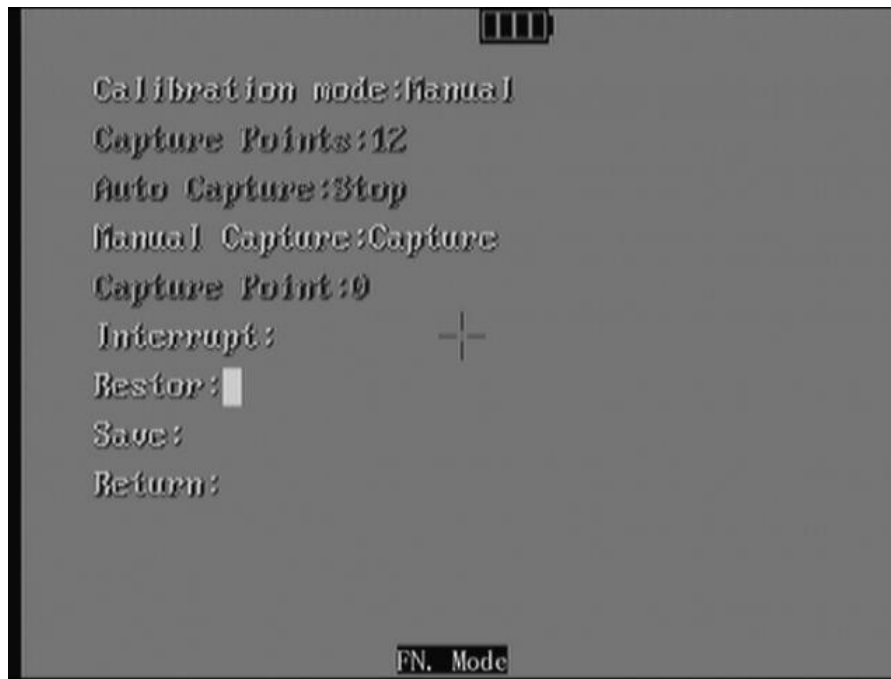


Fig.20 Compass Calibration Setup menu interface

Calibration Setup menu function list

Menu Item	Operation Functions
Calibration mode:	Calibration mode including manual type and auto type.
Capture points number: 12	Capture points number: 12.
Auto capture: Start/Stop	Set process of "Auto Capture"
Manual Capture	Capture point value
Capture point: X	Show the present calibrating point
Interrupt:	Compass calibration manual setup pause.
Restor:	Reset compass.
Save:	Save calibrated results
Return:	Back to Superior menu

Press "Mode/Menu" button, menu move to the next menu item and activate the item; "Focus+" and "Focus-" buttons are used to activate present selected item or to change the item property values. When Menu move the last item, system will automatically save and return to superior menu by pressing "Focus+" or "Focus-" button.

4. Process of Compass Calibration

4.1 Auto calibration mode:

Selecting “Start” item in the “Auto capture” menu, pressing “Focus+” or “Focus-” button to start auto calibration. The screen will display information of present capturing point. During auto calibration, one point will be capture and the “capture” point value will increase if rotating camera with different position and stopping for 2 or 3s.

24

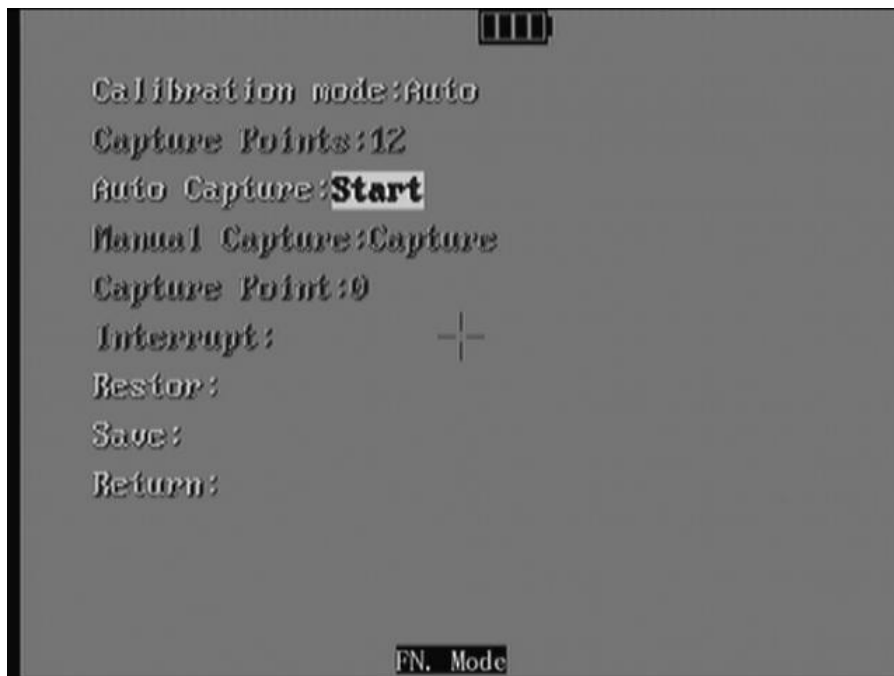


Fig.21 Compass Auto calibration interface

When Compass captures full 12 points, screen will automatically display the results and disappear after 3s.

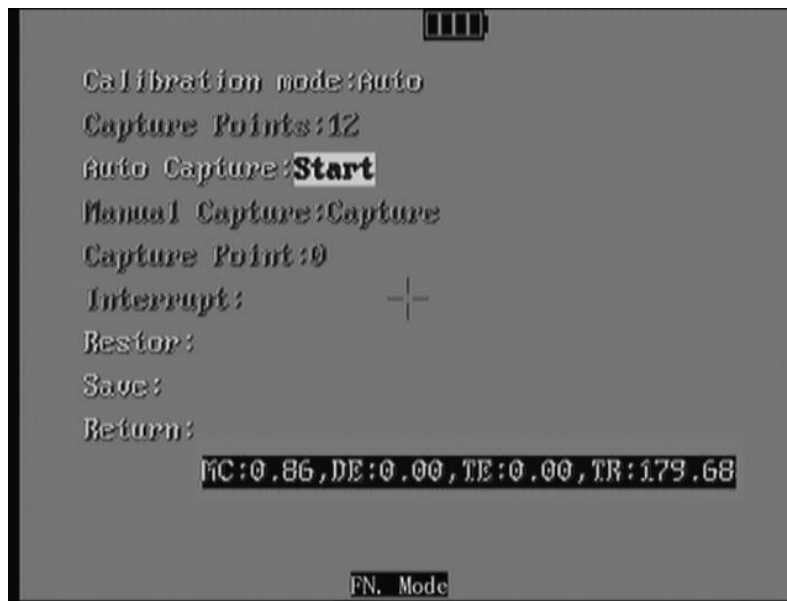


Fig.22 Compass calibration results interface

4.2 Manual calibration mode:

Selecting “Capture” item in the “Manual capture” menu, pressing “Focus+” or “Focus-” button to start manual calibration. Information of “Capture point” is developed to record the present capture points. During manual calibration, rotating camera with different position and stopping for 2 or 3s, information of one point will be captured by pressing “Focus+” or “Focus-” button, and its “Capture point” value will be increased in turn.

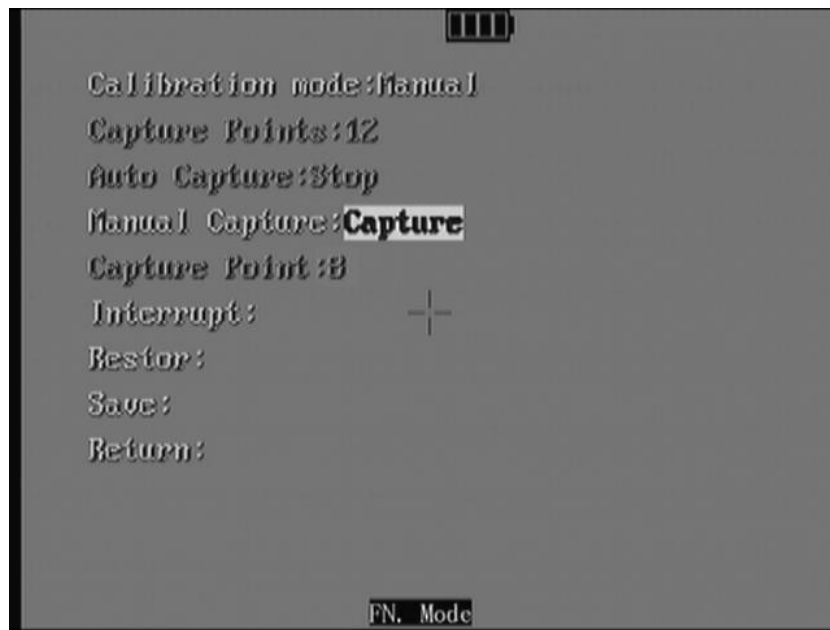


Fig.23 Compass Manual calibration interface

When Compass capture full 12 points, screen will automatically display the results and disappear after 3s.

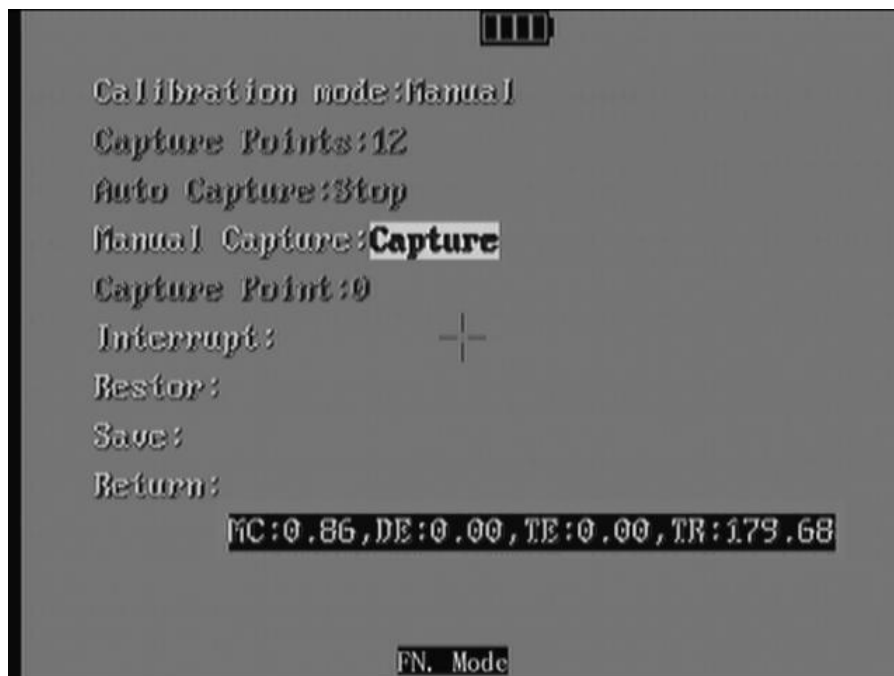


Fig.24 Compass calibration results interface

4.3 Calibration result analysis

MC (Mag CalScore)

Represents the over-riding indicator of the quality of the magnetometer calibration. Acceptable scores will be <1

DE (Dist Error)

Indicates the quality of the sample point distribution, primarily looking for an even yaw distribution. Significant clumping or a lack of sample points in a particular section can result in a poor score. The score should be <1

TE (Tilt Error)

Indicates the contribution to the CalScore caused by tilt or lack thereof, and takes into account the calibration method. The score should be <1 .

TR (Tilt Range)

This reports the larger of either half the full pitch range or half the full roll range of sample points. This parameter should be $<45^\circ$

If either parameter is too high, do the calibration again. If the calibration is acceptable, save the result

Note:

- 1. The best choice is to install the camera on the tripod When do the digital compass calibration.**
- 2. After 3 times calibration , the result is still not up to standard. Please do the calibration elsewhere.**

4.4 Direction and Attitude

The interval angle of 12 capture point is 30° .

There are three calibration attitudes:

Attitude1: Parallel to the ground

Attitude2: Elevation angle $20^\circ \sim 45^\circ$;

Attitude3: Depression angle $20^\circ \sim 45^\circ$

Every attitude has 4 direction (interval angle is 90°). For example:

Red arrows are attitude1, blue arrows group attitude2, black arrows are attitude3. Capture 4 points in attitude1, then capture another 4 points in attitude 2, then attitude3. Refer to the picture below,

Mark: Keep the camera stable when turn the revolution

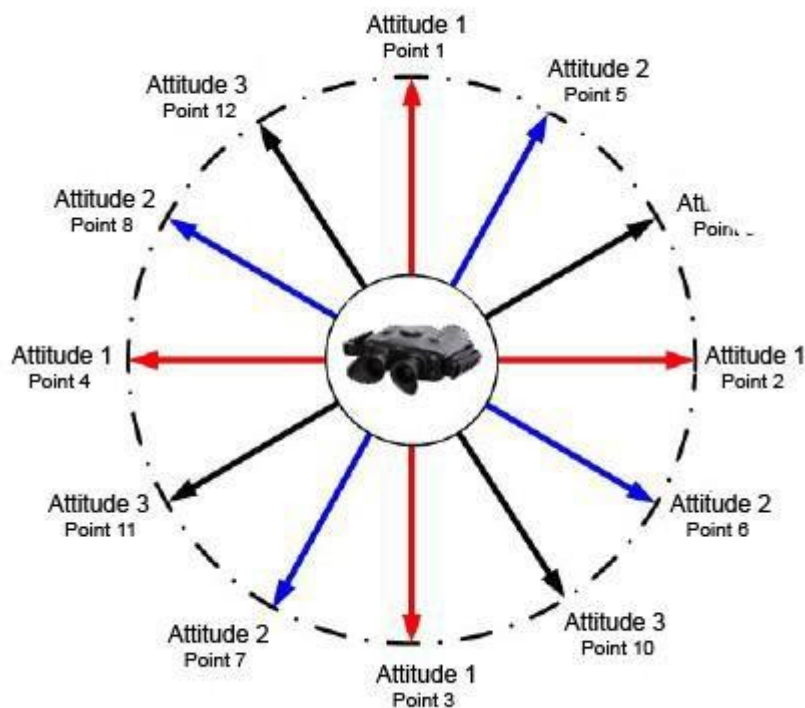


Fig.25 Direction and Attitude

5. Distance Measure Operation

In premise of operation state with “Full Function Mode” or “Distance Measure Mode”, operator could make laser range finder function. Under state of “Distance Measure Mode”, function of laser range finder is working without target position function.

5.1 Prepare for range finder

Keeping pressing “LFR/Calibration” button, right corner on screen displays “Loading” sentence, which indicates laser finder is under charging.

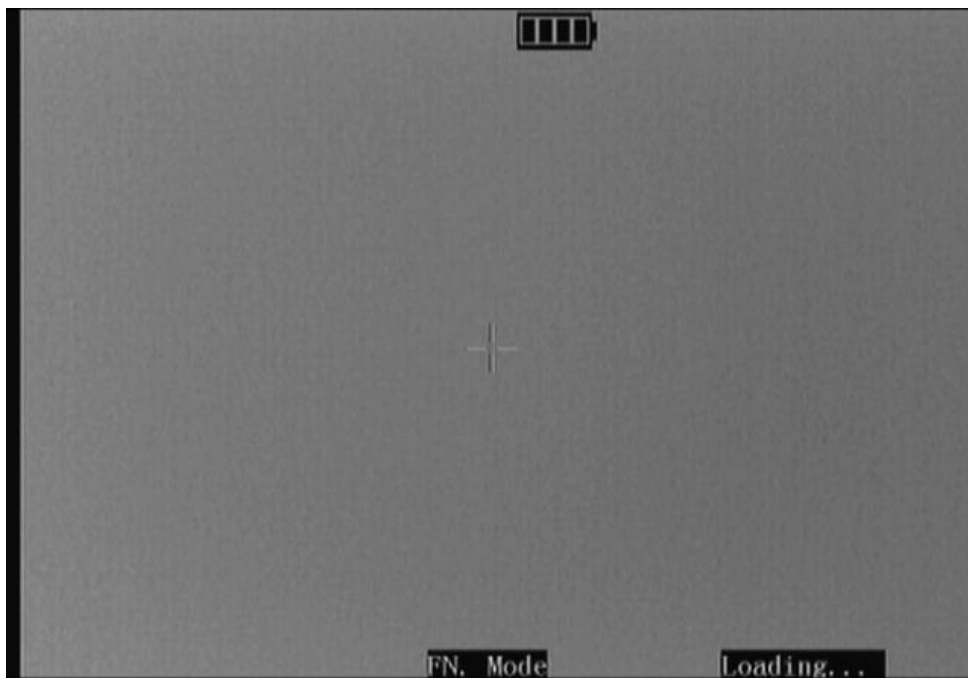


Fig.26 Laser Machine charging interface

5.2 Trigger the laser finder

Until the “Ready” characters displayed on right corner of screen, which indicate the laser finder complete charging processing and operator could release the “LFR/Calibration” button to start laser range finder function.

30



Fig.27 Full charging interface

5.3 Cancel range finder

If release the “LFR/Calibration” button before charging completed, screen will display the sentence of “Ranging cancel” as below picture shown.

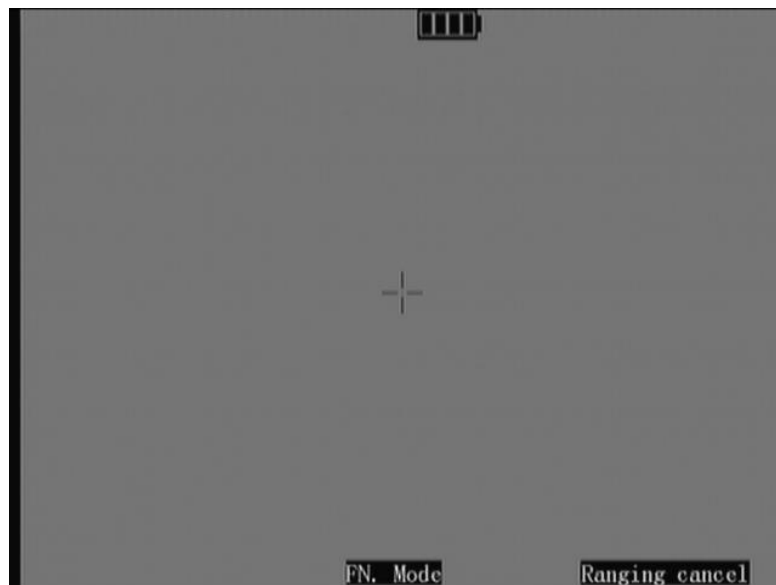


Fig.28 Ranging cancel interface

5.4 Range finder success

Once Ranging succeed, screen will display all measured information as below:



Fig.29 Target range success



Fig.30 Range mode Target range success

5.5 Range finder failed

If Ranging failed, the screen will display all related ranging information as below:



32

Fig.31 Range fail interface

5.6 Low power notice

If battery is low power, system will remind “Low power!” characters on screen under operation of pressing “Distance Measure/Calibration” button and system could not process laser ranging function.

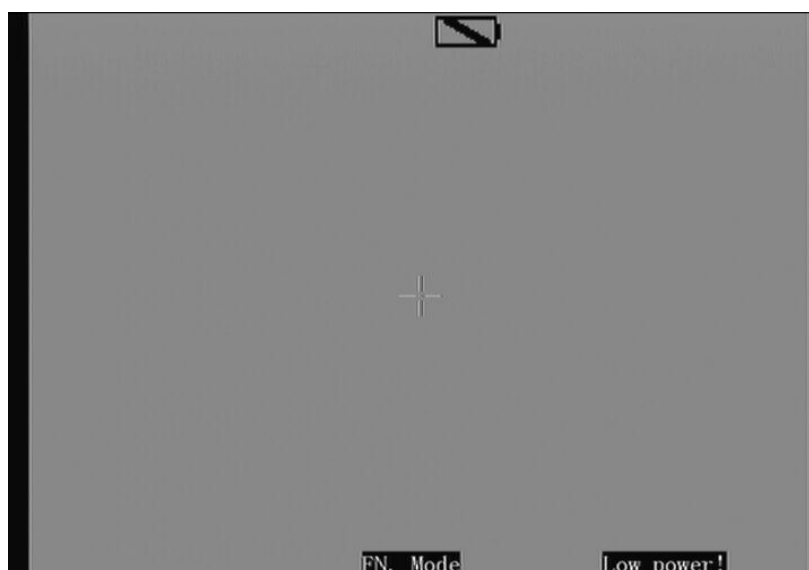


Fig.32 Low power notice

6. Video Camera Operation

6.1 Photo capture

Live thermal image mode, Press the "Capture" button to take photos and every time take one, video camera back to the original state after completion; When taking pictures, graphics shown on the left xxxx / xxxxx numbers, " /" in front of the number that the current document number and " /" after the number indicates the current camera TF card space remaining number of sheets.

As shown below:



Fig.33 Photo capture

6.2 Video record

Live thermal image mode, press the “record” button, enter the current state of the video screen, and press the “Video” button to look at the video or stop Video, graphics upper left corner shows xx: xx: xx / xx: xx: xx Digital, “/” in front of the number said that the current video length, the number corresponding to the interpreted as “ hours: minutes: seconds behind “,”/” digital SD card space that is currently recording the length of time, the number corresponding to the interpreted as “ hours: minutes: seconds.” As shown below:

34



Fig.34 Video record

6.3 Playback files

No video state, short press “playback ” button to enter the file browser state ,the document named “100COACH” , as shown below :



35

Fig.35 Files playback

Press “Record” button to perform image or video file list, press the “record” button to open the file you want to browse. When you in browse mode, press “Play” button to switch the “slide on” or “slide off”.

Press “capture” button to quit the browse mode.

Browse file list mode, short press “Play ” button down to switch the selected files , switch from one-way down. (Only one direction, up to down browse)

As shown below:

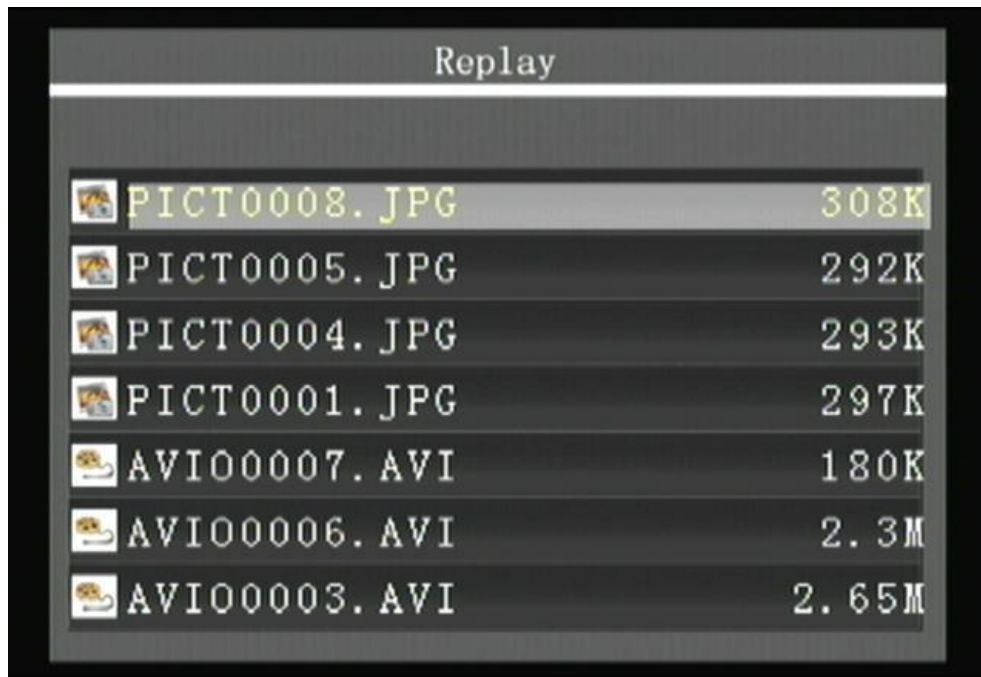


Fig.36 Files browse list

If you want to quit the video and picture browse mode, press “capture” button, enter the normal thermal image mode.

The camera save as two mode of files. The photo format is “.JPG”; the video format is “.AVI”.

NOTE:

ALL THE OPERATION OF DELETE FILES SHOULD BE CONNECT WITH COMPUTER.

6.4 USB flash mode:

When the camera is working, connect the camera to computer, the camera enter to USB flash mode. You can read, copy, and delete the files.

Now the camera is in flash mode, any button operation is not work.

7. Specifications

Items		<i>ThermalTronix TT-1750MS-NVBM</i>
Detector	Detector type	Uncooled FPA micro-bolometer
	Spectral range	8 - 14 μm
	Array size	384×288
	Pixel size	25 μm
Image characteristics	Lens	61mm/F0.8
	FOV	9°×6.75°
	NETD	≤80mk@30°C
	Focus	Motorized Focus
Image display	Display	Binocular OLED, 800×600
	Auto standby	Sensitive
Image storage	Storage card	Built-in flash memory
	Storage mode	Picture/Video
	File format	JPG/AVI
	Storage capacity	More than 1000 images/2 hours of video
Functions	Gain/Brightness	Manual/Automatic
	Calibration	Automatic when start-up time, manual
	Digital zoom	2X
	Polarity inversion	White/Black hot mode
	Noise reduction	Yes
	Image Enhancement	Yes
Laser finder	Spectral range	1.57 μm
	Accuracy	≤5m
	Measurement range	100m-5km
Electrical compass	Azimuth accuracy	±0.6°
	Elevation accuracy	±0.3°
GPS	Internal	

Power supply	Battery type	Li-Ion, Rechargeable
	Battery operating time	3 hours continuous operation (including 100 times of distance measurement)
	Charging system	Intelligent charger
	Power consumption	≤6W
Environment	Operating temp	-30°C ~ +55°C
	Storage temp	-40°C ~ +60°C
Physical	Weight	≤2.5KG
	Dimension	265 (L) mm x 210 (W) mm x 105 (H) mm
	Video out	CCIR/PAL
	Data transmission	USB
	Remote control	RS232
	Tripod mounting	1/4"-20-UNC

8. Error, fault and emergency recovery

After the laser shot or start later, you may encounter no information is displayed on the screen, and this is due to SPI communication failure caused by the liberation of the instrument is to restart the operation, to restore communication and normal operation.

9. News

If you encounter problems when using the infrared imaging camera, please use the following table to troubleshoot. If the problem persists, disconnect the power source and contact the company's maintenance department.

Problems	Causes and solutions
Infrared camera cannot start	<ul style="list-style-type: none"> ● No battery or battery installation is not accurate. → Insert the battery or re-install the battery. ● The battery is dead. → Replace the batteries. ● Infrared camera shutdown protection. → Wait 5 seconds to restart. ● Ambient temperature is too high.
Infrared camera automatic shutdown	<ul style="list-style-type: none"> ● The battery is dead. → Replace the batteries.
Battery power consumption is too fast	<ul style="list-style-type: none"> ● Ambient temperature is too low. ● Rechargeable battery is not fully charging. → Charging the battery to re-charging. ● The battery pack is completely exhausted and no longer charge. → Replace the battery pack.
No thermal imaging	<ul style="list-style-type: none"> ● The lens cover is not open. → Open the lens cover ● Eyes too far away from the proximity switch → And then close a bit.