# Tyke-L3 Thermal Imager

## Operation and Maintenance Manual

V1.0.2

IRay Technology Co.,Ltd.

## Release Note

This manual introduces the use and precautions of Tyke-L3 thermal imager ("imager" for short). For operator’ s safety, as well as reasonable and effective maintenance and use of the imager, you must read this manual carefully and strictly abide by the requirements specified therein before using the Imager.

Before the release of a new manual, you must follow this manual for the use and maintenance of the imager and take other documents only for reference.

If you find any problems in use, please report them in time for our study and modification.

## Warnings

①Keep the thermal imager away from strong light. Do not aim the thermal imager directly at the sun or laser, otherwise serious damage will be caused to the thermal imager.
②Before using, the thermal imager should be connected to the observation bracket, and the zero spot should be set.
③Keep the battery away from fire, and avoid violent impact or anode-cathode short circuit of the battery. Otherwise, it may cause an explosion.
④It is strictly forbidden to disassemble the thermal imager by yourself, or contact with corrosive substances such as acid and alkali.
⑤Before mounting the thermal imager, tiny particles and dust on the installation base surface and the base surface of the observation bracket connection base should be carefully cleaned to ensure the installation accuracy.
⑥If there is dust on the exposed optical surface of the thermal imager, it can be gently wiped off with the provided brush. Do not wipe it with fingers or dirty cloth.
⑦Protect the thermal imager from falling or severe impact.

## Cautions

①Please do not power the thermal imager to reduce battery energy consumption when it is not used temporarily or in the process of preparations.
②Please keep the lens hood closed when powering the thermal imager on.
③After the thermal imager is exposed to rain or moisture, the surface of the thermal imager should be wiped clean and dried in time.
④For long time storage, please take the battery out and put it back in the carrying case.

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# 1 Overview

Tyke-L thermal imager ("Imager") is mainly used to quickly observe and indicate living targets within 600m for day and night use.
The observation unit is composed of infrared system, image transmission system, etc. It is easy to operate and learn with HD OLED screen.

# 2 Features and Technical Specifications

## 2.1 Main Features

a.Brightness adjustment for screen display.
b.Wired and wireless image transmission.
c.Probability ranging.
d.Infrared image adjustment.
e.Manual and auto zeroing.
f.Manual reticle position adjustment
g. Reticle selection and adjustment.
h.Auto detection of faults.
i. Reverse polarity protection and over-discharge protection for battery.
j.Light leaking prevention.

## 2.2 Technical Specifications

The technical specifications of the thermal imager are shown in Table 1.

Table 1 Main Technical Parameters of Thermal Imager

| No. | Technical Parameters | | Models | | |
|---|---|---|---|---|---|
| | | | L325 | L335 | L635 |
| 1 | Imaging Components | Resolution | 384×288 | 384×288 | 640×512 |
| 2 | | Pixel size | 17μm | 17μm | 12μm |
| 3 | | Spectral Range | 8～14μm | | |
| 4 | | Frame Rate | 50Hz | | |
| 5 | | MRTD | 350mk | | |
| 6 | Objective Lens Components | Focal Lens | 25mm | 35mm | |
| 7 | | FOV | 14.9°×11.2° | 10.6°×8° | 12.5°×10° |
| 8 | | Imaging Distance | 30m～+∞ | | |
| 9 | | Focus Mode | Manual | | |
| 10 | Display Components | OLED | 800×600 | | |
| 11 | | Diopter Adjustment | -5～+3SD | | |
| 12 | | Eye Relief | 30mm | | |

| No. | Technical Parameters | | Models | | |
|---|---|---|---|---|---|
| | | | L325 | L335 | L635 |
| 13 | Physical Property | Power Supply | 18650 Lithium battery | | |
| 14 | | Battery life | ⩾8h | | |
| 15 | | Dimensions | 190×76×82mm | 193×76×82mm | 193×76×82mm |
| 16 | | Weight | ⩽450g | ⩽485g | ⩽485g |
| 17 | | Switch-on Time | ⩽10s | | |
| 18 | Device Property | Encapsulation | IP67 | | |
| 19 | | Recognition Distance | ⩾400m | ⩾600m | ⩾830m |
| 20 | | | ⩾600m | ⩾850m | ⩾1200m |
| 21 | | Reticle Adjustment Range | ⩾±15mil | | |
| 22 | Application Environment | Operating Temperature | -40°C～55°C | | |
| 23 | | Storage Temperature | -50°C～70°C | | |
| 24 | | Humidity | 95%±3% | | |
| 25 | | Altitude | ⩾5000m | | |

# 3 Package and Label

## 3.1 Package

The imager is packed in a special white packaging box, with black matte blister box as inner lining and foam at bottom, which is not easy to be damaged during transportation. For details, please take package list for reference.

## 3.2 Label

The label is attached to wire cover of the housing, indicating model, SN, and company information.

Figure 1 Label on Thermal Imager

# 4 Functional Components and Interface

Refer to figure 2 for detailed description of functional components and interfaces of the thermal imager.

1. Focus knob of objective lens
2. Power button
3. Aviation connector interface
4. Encoder
5. Diopter regulation knob


Figure 2 Imager Layout


## 4.1 Focus Knob

The focus knob is used to adjust the sharpness of the observation target, and realize the imaging adjustment from a close view to a distant view.

## 4.2 Power Button

The power button enables power-on, power-off, and image correction.

## 4.3 Encoder Aviation Connector Interface

The aviation connector interface is mainly used to connect external cables for outputting PAL videos, RS232 serial port debugging, etc.

## 4.4 Encoder

The encoder allows you to operate the thermal imager menu for function control, digital zoom, and image adjustment.

## 4.5 Diopter Regulation Knob

The diopter regulation knob is used to adjust the clarity of the display screen, which can be adapted to the observation of myopia and hyperopia glasses.

# 5 Installation & Connection

## 5.1 Battery Installation

As illustrated in figure 3, unscrew the battery cap which has the negative icon. Insert one 18650 battery and distinguish the positive and negative poles according to the icon (the button of the battery is positive and the cover of the battery is negative). Screw the battery cap to complete the battery installation.

Figure 3 Components for Battery Installation

## 5.2 Imager Connection

The thermal imager is directly connected to the Picatinny rail through the structure at the bottom of the shock-absorbing base, which can be completed by hand screwing.

## 5.3 Cable Connection

Insert the aviation cable into the interface of the imager

**Note: During cable connection, align the connector with the socket before inserting. The connection is done when there is a crisp sound, as shown in Figure 4. (The cable is an optional accessory; please contact the supplier for purchase)**

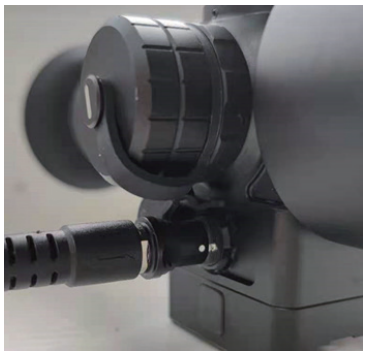


Figure 4 Cable Connection

# 6 Operation Instructions

## 6.1Power-On

After the battery is installed and can supply power normally, long press the power button for 5 seconds to get the thermal imager started. When the system is started, it will display the image and booting up information (product model), as shown in Figure 5.


Figure 5 Startup Picture

When the screen shows real time image and the startup picture disappears, the system is successfully started. Background calibration will be performed after booting up. Please do not open the objective lens cover before the background calibration (in case of misoperation, close the lens cover and then short press the power button for manual background calibration).

## 6.2 Button Functions

Functions and parameters can be set through the display screen as described below.

Long press the power button for 5s to start the system. When the system is working, long press for 3s to display the shutdown menu, and long press 10s to force shutdown. Settings are saved after shutdown.

Rotary operation and button operation can be performed for the encoder. Tap the rotary encoder to enter the menu interface. Rotate the encoder knob forward or backward to switch menu options (rotate the encoder clockwise and the cursor will go down), and click to select the menu options. In the display interface, you can zoom in or zoom out by rotating the encoder, the default value is 1 ×, the zoom range is 1 × to 4×, and the zoom information can not be saved after power off. During zooming, the infrared image will be zoomed around the center spot of the reticle, and the size of the reticle will be changed accordingly.

**Caution: it is not allowed to press the encoder during rotating.**

## 6.3 Operation Interface

### 6.3.1 Entering Operation Interface

The initial screen shows information about nine axes. The azimuth is shown in the upper center (the cursor moves in east, west, south, and north directions, without showing the angle value); the role angle is shown in the lower center (range: ±90°); the pitch angle is shown

on the right (range: ±90°). Respectively, the cursors in the top right-hand corner are the digital zoom ratio (on the main interface, turn the encoder clockwise unidirectionally to zoom the image in 1-2-3-4× increments, with the real-time zoom ratio shown in the top right-hand corner; in 4× mode, turning the encoder clockwise does not zoom the image but turning anticlockwise can zoom the image in 4-3-2-1× decrements; similarly, in 1× mode, turning the encoder anticlockwise does not zoom the image), wireless output (you can select image transmission mode on the system's main menu, as required), and battery level (detected by the system and shown in real time; when the battery is about to use up, the battery level box turns red; the thermal imager is automatically powered off if the battery is not sufficient for its operation, after a countdown prompt.)

Press and turn the encoder to enter the main menu, as shown in Figure 6.

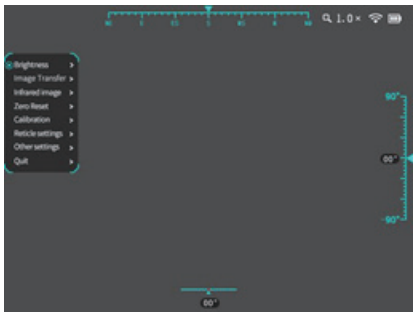


Figure 6 Main Menu

## 6.3.2 Operating Menu

You can turn the knob to choose different menu. Click the encoder to select the current menu (if there is a submenu, enter the submenu), you can adjust the parameters by turning the knob. After the operation is completed, tap the encoder to exit the menu and maintain the adjusted state. If there are parameters that need to be saved, there will be a prompt on the interface.

When the automatic blanking is turned on, the menu will automatically exit after 30s if you do not touch any button or knob under any menu. (The blanking function is invalid under reset preset and zero calibration mode).

## 6.3.3 Screen Brightness Adjustment

Brightness adjustment is performed for the whole screen and to suit the use 24/7 in all weathers, and in any scenario. This functionality does not involve the adjustment of parameters such as image contrast. The brightness is 5 by default and adjustable between 0–9 (0=dimmest; 9=brightest). Under the Screen brightness menu, turn the encoder roller to adjust the brightness. After getting the right brightness, short press the encoder to fix the device at the current brightness, as shown in Figure 7.

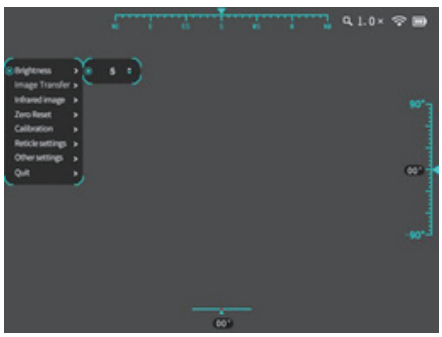


Figure 7 Screen Brightness Adjustment Menu

## 6.3.4 Image Transmission

Image transmission is to transmit the videos on a thermal imager to other devices, through a wired or wireless approach, for simultaneous observation, coordinated command, and quick directions.

It can be performed through head-mounted transmission, wireless transmission, or analog videos (disabled by default; must be enabled to use after the device is being powered on);

Head-mounted transmission: transmits images to head-mounted devices. This option currently supports Jerry-F products and can transmit videos on a thermal imager to a Jerry-F product in real time. For steps to connect to a Jerry-F product, see the user manual for Jerry-F. (Before connecting to a Jerry-F product, turn on its pairing switch. When the head-mounted transmission is switched on, the thermal imager pairs with the Jerry-F product. The process lasts 30 seconds. After that, operate by following the instructions on the thermal imager.)

Wireless transmission: transmits information on a thermal imager screen to cellphones, tablets, computers, or other devices with a Wi-Fi module (installation of the special app required) to facilitate observation and monitoring.

Connection steps for wireless transmission (cellphone as an example):

①Switch on the wireless transmission;

②Switch on the analog video;

③Turn on Wi-Fi on the cellphone. Search and connect to the Wi-Fi network with a name containing "WIFIV_" (the default password is "12345678" and you cannot change it);

When connected, find the special app, Cam802 , and open it to observe the real-time images in the thermal imager.

Analog video: is a switch for transmitting the videos on a thermal imager and must be switched on for head-mounted, wireless, or wired video transmission.

Connection steps for wired transmission (common display as an example):

①Switch on the analog video;

②Plug the special cable into the thermal imager as described in chapter 5.3;

③Plug the BNC connector of the cable into the video input port of the display;

④Adjust the display mode of the display so that images can be shown on the display properly;

The system can carry out automatic detection. When the battery is running low, the image transmission will not be enabled, and a prompt will appear on the display; when the temperature is relatively low, the operating voltage will go down, and the time of image transmission will be shortened due to battery performance.

Figure 8 shows the image transmission interface:

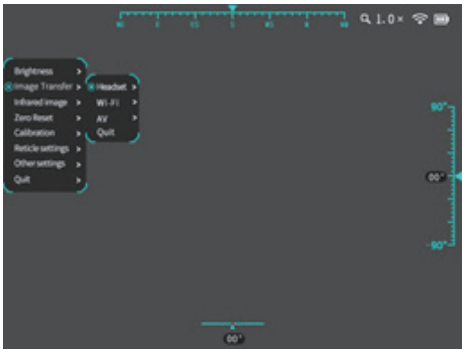



Figure 8 Image Transmission Adjustment

## 6.3.5 Infrared Image

Select the infrared image on the main menu and press the button to go to the infrared image submenu shown in Figure 9. The infrared image submenu provides the following functions:

①Calibration mode (Manual, Auto 0, and Auto 1)

Auto 0: This mode produces soft and refined images with moderate contrast and can automatically adapt to indoor, night, and other scenarios;

Auto 1: The mode produces images with higher contrast to present more details for easier discovery of long-distance, small targets and targets with small temperature differences.

Manual: In this mode, the brightness and contrast menus are opened for optional selection. You can manually adjust the image quality by setting the brightness and contrast according to the environmental conditions and usage requirements.

②Brightness (adjustable between 0–100, 0 by default)

Unlike the screen brightness adjustment function, this function is for adjusting the image brightness to fit with the surrounding environment brightness.

③Contrast (adjustable between 0–100, 0 by default)

Brightness and contrast: ranges between 0–100. Turn the encoder clockwise to increase the value, or anticlockwise to decrease the value. The value changes in 5 increments/decrements each time you turn the encoder. Brightness and contrast are only adjustable in manual mode.

④Palette (Black Hot, White Hot, Red Hot, Rainbow, and Red Face)

The Palette includes five modes: Black Hot, White Hot, Red Hot, Rainbow, and Red Face. Different palette highlights distinct target colors and suits different statuses. The default status is White Hot mode, but you can switch among different modes as required.

⑤Enhancement (default: On)

⑥Filter (default: On)

Enabling the image enhancement and filter can enhance image details, refining the image. The two functions are enabled by default.

①Default status refers to the status after the module is powered on.

②The image brightness and contrast cannot be changed until the calibration mode is changed to manual.

The default status is Auto 0, which can be adjusted manually.

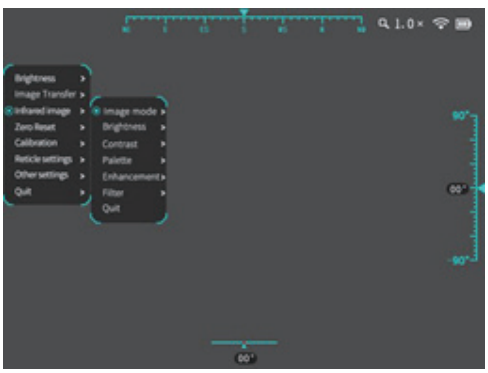



Figure 9 Infrared Image Submenu

## 6.3.6 Zero Calibration

Descriptions of Zero Calibration

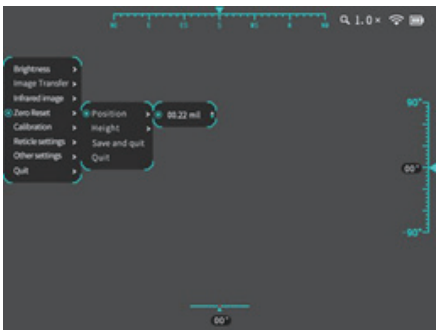
Position correction: You can move the reticle leftward or rightward on the screen by adjusting the position correction parameters. Turn the encoder clockwise to increase the values and move the reticle rightward, or anticlockwise to decrease the values and move the reticle leftward.

Height correction: You can move the reticle upward or downward on the screen by adjusting the height correction parameters. Turn the encoder clockwise to increase the values and move the reticle downward, or anticlockwise to decrease the values and move the reticle upward.

For the 25mm lens, the reticle moves 0.3142 mil each time; for the 35mm lens, the reticle moves 0.22038 mil each time. The change value of the azimuth is within ±20mil; please return to 1× display for the reticle adjustment.

Save and exit: to save the current correction values and exit to the first-level menu.

Exit: to exist to the first-level menu without saving the current correction values.



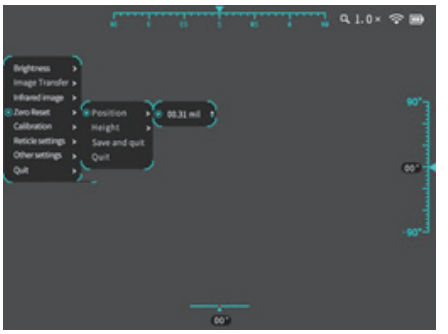




Figure 10 Zero Calibration

## 6.3.7 Reset Preset Menu

Reset preset is the correction between a known target and the zero position when target information and the zero drift are known.

Reset preset information is a supplementary correction for the zero position based on environmental conditions such as wind speeds, air pressure, and target elevation.

The Reset preset menu includes four options: Position correction, Height correction, Save and quit, and Quit. The values in reticle position under Zero Calibration and those in Reset preset determine the ultimate coordinates of the reticle. The total adjustment value of the zero position and the preset menu is within ±20mil, as shown in Figure 11.

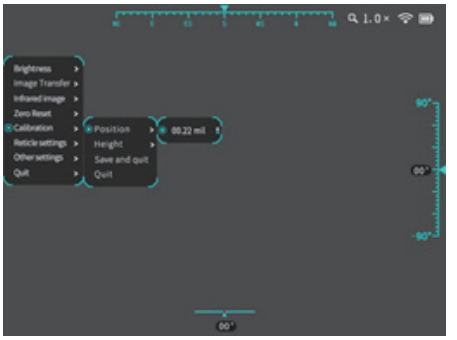



Figure 11 Reset Preset Menu

### 6.3.8 Reticle Setup

On the main menu, select Reticle setup. The submenu of Reticle setup is displayed, as shown in Figure 12.

The reticle setup includes five parts: Reticle type, Reticle brightness, Reticle color, Save and exit, and Exit. You can adjust the reticle by selecting the right reticle type and setting its color and brightness as required.

Reticle setup helps you point to a target position quickly in various application environments.

Reticle type: includes cross reticle and spot reticle. You can select the desired type (or customize it by communicating with the manufacturer).

Reticle brightness: cyclically changes from 1–3.Turn the encoder clockwise to increase the value, i.e., to make the reticle brighter (1=dimmest; 3=brightest). The default brightness value is 2. The setting is automatically saved when it is complete.

Reticle color: includes five modes, i.e., Red, Yellow, Green, B/W and Reverse. The default mode is Reverse. (In Reverse mode, the reticle color is adjusted according to the background color. The reticle is black against bright background and is white against dim background.)

Save and exit: Press OK to exit to the first-level menu if you are sure you need to save the current setting.

Exit: Press this button if you do not need to save the current setting.

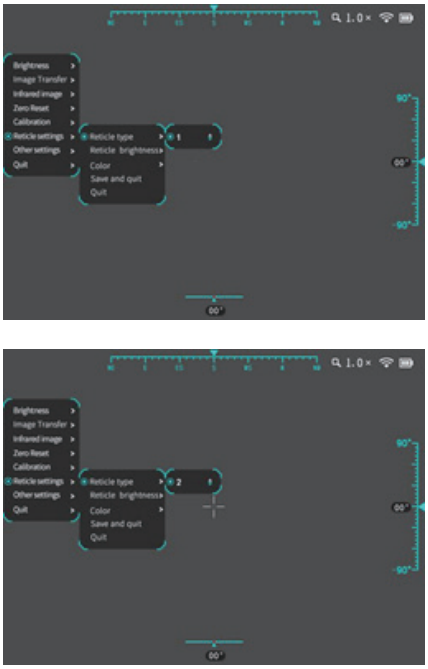



Figure 12 Reticle Setup Submenu

### 6.3.9 Other Settings

On the main menu, select Other settings. The Other settings submenu is displayed.

Battery Power Detection: When you go to this submenu, detection will be performed on battery power. When the detection is complete, the results will show on the screen.

Factory default: The system parameters of the thermal imager will reset to the factory default values (zero calibration and reset preset data will not be reset to default values).

Blanking menu: When turning on the switch for this submenu, you can choose to enable or disable the automatic blanking function. The system will automatically exit menu for 60 seconds of inactivity after it is enabled.

Select language: includes Chinese and

English options. You can select based on your language preference. (There will be cues for the separate language version, please contact the supplier for more language versions)
Angle display: enables you to enable or disable the display of azimuth, pitch angle, and roll angle. When angle display is enabled, the azimuth is displayed on the upper part of the screen, the pitch angle on the right part, and the roll angle on the lower part. The azimuth is not displayed with a specific value, while the pitch and roll angles are. When the angle display is disabled, the screen will not display any angle information.
Angle calibration: After a thermal imager is carried from the manufacturing site to a different place, due to influences of local magnetic field and gravity, angle calibration must be performed for its built-in angle module for a more accurate display of angles. After going to the Angle calibration menu, operate by following the instructions on the screen. After that, the system will perform angle calibration based on the collected information.

# 7 Common Faults and Troubleshooting

See Table 2 for common faults and troubleshooting methods.

Table 2 Common Faults and Troubleshooting Methods

| No. | Fault | Cause | Troubleshooting Method |
|---|---|---|---|
| 1 | No correct infrared image | No power supply | Check if the power supply of the module component is normal. |
| | | Damaged module component | Return to the factory for repair. |
| 2 | No serial communication available | No power supply | Check if the power supply of the module component is normal. |
| | | Improper serial cable connection | Check whether the serial communication-cable or interface connection is correct. |
| | | Damaged module component | Return to the factory for repair. |
| 3 | Polarity inversion failure | Abnormal serial communication | Check whether the serial communication is normal. |
| | | Damaged module component | Return to the factory for repair. |
| 4 | Failed self-inspection | Damaged module component | Return to the factory for repair. |
| 5 | "Enhancement" cannot be enabled or disabled normally | Abnormal serial communication | Check whether the serial communication is normal. |
| | | Damaged module component | Return to the factory for repair. |

| No. | Fault | Cause | Troubleshooting Method |
|---|---|---|---|
| 6 | Power-on failure | Power board fault | Confirm or replace the power board |
| 7 | No digital video | The video cable is not a twisted pair cable. | Check the video cable. |
| | | Failure of video switch chip | Check and replace the power board. |

Before using the thermal imager, users should read the Operation and Maintenance Manual carefully, and solve related faults following the instructions of Table 2. In case of any fault that cannot be solved, please contact the manufacturer for maintenance.

# 8 Transportation and Storage

## 8.1 Transportation

In the process of handling, take necessary anti-static and anti-impact measures for the product. Control such activities as handling, storage, packaging, protection, and delivery in accordance with the requirements to ensure that the product features will not be impaired and to deliver the product to the specified place safely.

When loading, storage boxes should be placed in a balanced manner and stacked neatly and securely. The stacking height and weight should not exceed the specified limit.

During road transportation, the vehicle speed should be controlled according to the road conditions.

Do not transport the thermal imager with the flammable, explosive, and corrosive goods in the same vehicle.

Pay attention to rain, dust, sunlight, impact, and fall prevention during transportation.

During shipment, if the module component is damaged, please notify the related department timely.

## 8.2 Storage

### 8.2.1 Requirements on Storage Environment

All facilities and stored items should be kept clean and tidy.

Storage places should have good lighting facilities.

The storage environment should be far from strong magnetic field.

Places with adequate facilities for earthquake prevention, fire prevention, ventilation, heat insulation, heat preservation, drainage, etc.

Do not place the imager near the source of heat radiation. Keep it at least 1.5 m away from the heat source. Do not place

it in a place directly exposed to sunlight for a long time.

Prohibit storing items that have a corrosive effect on the imager.

### 8.2.2Inspection during Storage

Take necessary anti-static and anti-shock measures for the product during storage. Control such activities as storage, packaging, and protection in accordance with the requirements to ensure that the product features will not be impaired.

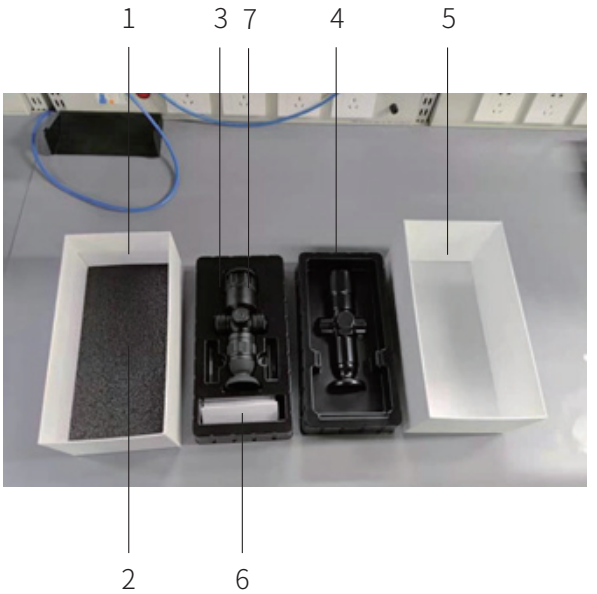
a) Before storage, check the completeness of the product. Ensure that the module component, packaging, and accessories are clean and dry;

b) Periodically inspect products during storage. In case of any problem, timely solve it.

# 9 Package List

Thermal imager (including the connecting socket, lens hood, and eye cup): 1SET

Operation and Maintenance Manual: 1PCS




1.Lower box cover; 2.Foam; 3.Lower blister cover; 4.Upper blister cover; 5 Upper box cover; 6.Manual; 7.Thermal imager;

## FCC Warning:

**§ 15.19 Labelling requirements.**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**§ 15.21 Information to user.**

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**§ 15.105 Information to the user.**

**Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

-Increase the separation between theequipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help.

Body Operation

This device was tested for typical body-operations. To comply with RF exposure requi rements, a minimum separation distance of 0 mm must be maintained between the user’s body and the device, including the antenna. Third-party belt-clips, holsters, an d similar accessories used by this device should not contain any metallic components . Body- accessories that do not meet these requirements may not comply with RF ex posure requirements and should be avoided. Use only the supplied or an approved a ntenna.