SF-TPD415S90G645

User Manual

- **4K EO +1080P EO**
- **45mm focal-length 640×512 IR Thermal**
- **Support 7x and 9x digital zoom**
- **170ms Low latency RTSP code stream output**
- **TF card dual recording, network reading and writing TF card**
- **Network IP output**
- **Network,Serial,SBUS Control**

Publication instructions

The content of this manual is that SF-TPD415S90G645 is a three-light, two-axis stabilization small pod that integrates two visible light cameras, one with 8 million pixels and the other with 2 million pixels. 45mm focal length 640×512 thermal imaging module. It has the characteristics of high stability, small size, light weight and low power consumption; the system supports network RTSP code stream output, two video streams can be combined into picture-in-picture output, supports multiple picture-in-picture modes, local TF card dual-channel simultaneous recording and photo taking, one channel 4K, one channel 1080P. Serial port ①, network, and S.BUS can control the camera and PTZ, and support digital zoom. The focal lengths of visible light are 35mm and 6mm respectively.

In order to better exert the superior performance of this product, please read this manual carefully before use. Before the new manual is published, the use and maintenance of this equipment should be based on this manual, and other materials are for reference only. If any unit finds any problems during use, it is necessary to provide timely feedback for research and correction. Due to the rapid update of products, individual parameters and configurations of products change due to product upgrades. The company reserves the right to modify product parameters, performance and other information. If you have any questions, please contact us in time to obtain the latest information and technical support.

Contents

Warnings

Warning

- Before installing and using this product, please read the instruction manual carefully and keep it properly for future use;
- All warnings on the product and in the manual should be followed, and all operating instructions and usage instructions should be followed;
- It is strictly forbidden to use power supply voltage beyond the specified range;
- Any load contains electronic devices that are sensitive to static electricity. Avoid static electricity during use to avoid damage;
- Pay attention to the protection of the interconnection cables inside the gimbal camera and the cables connecting to the outside;
- There are no user-serviceable parts inside the gimbal camera. The casing cannot be opened without the company's permission. The user is responsible for all consequences caused by this.
- Before cleaning the pod, disconnect the power supply first. Do not use chemical solvents, thinners or spray cleaners. You can wipe the outer shell with a clean, soft, dry flannel or cotton.

Note

- Ensure that the interface definition on the airborne side is correct;
- Ensure that the supply voltage is within the given range.
- Under any circumstances, including when turning on or off, do not point the pod's thermal imager directly at the sun, carbon dioxide lasers, welders and other high-intensity radiation sources to avoid damaging the focal plane of the detector;

SF-TPD415S90G645
User manual

1、 Overview

1.1 Product purpose and scope of using

SF-TPD415S90G645 is a three-light, two-axis stabilization small pod that integrates two visible light cameras, one with 8 million pixels and the other with 2 million pixels. 45mm focal length 640×512 thermal imaging module. It has the characteristics of high stability, small size, light weight and low power consumption; the system supports network RTSP code stream output, two video streams can be combined into picture-in-picture output, supports multiple picture-in-picture modes, local TF card dual-channel simultaneous recording and photo taking, one channel 4K, one channel 1080P. Serial port ①, network, and S.BUS can control the camera and PTZ, and support digital zoom. The focal lengths of visible light are 35mm and 6mm respectively.

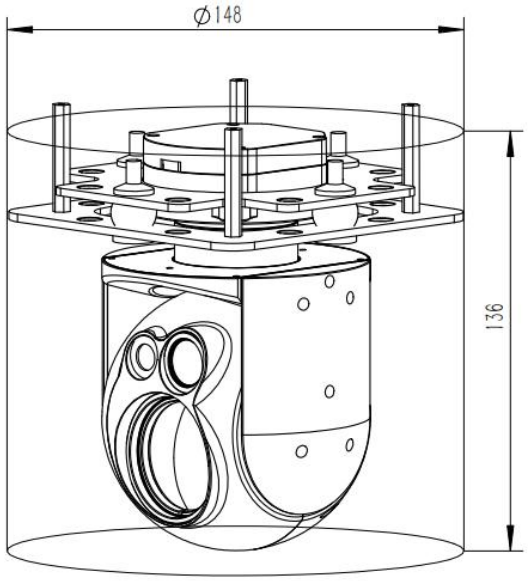


FIG. 1-1-1 Three-light integrated pan-tilt structure

SF-TPD415S90G645 integrated PTZ system can be widely used in public security emergency, fire rescue, power line inspection, military reconnaissance, field search and other industries. The system integrates optical zoom, video recording, photo taking, stabilization PTZ and control. Customer docking is simple, the airborne side is installed and fixed to the drone and other equipment, and after connecting the image transmission, the system can work after power supply. The ground-side software can directly display the video, and the buttons or mouse can realize the functions of zoom, focus, photo recording, PTZ control, etc.

1.2 Product main components and functions

The device consists of four parts: a 4K EO, a 1080P EO, a thermal imaging module, and a stabilized gimbal. The visible light video stream is stored inside the visible light movement, and the TF card recording is performed internally and encoded and output to the image transmission module. The image transmission module transmits real-time video to the ground receiving end, and at the same time receives ground control signals to control the gimbal and camera respectively. The system functional framework composition is shown in Figure 1-2-1:

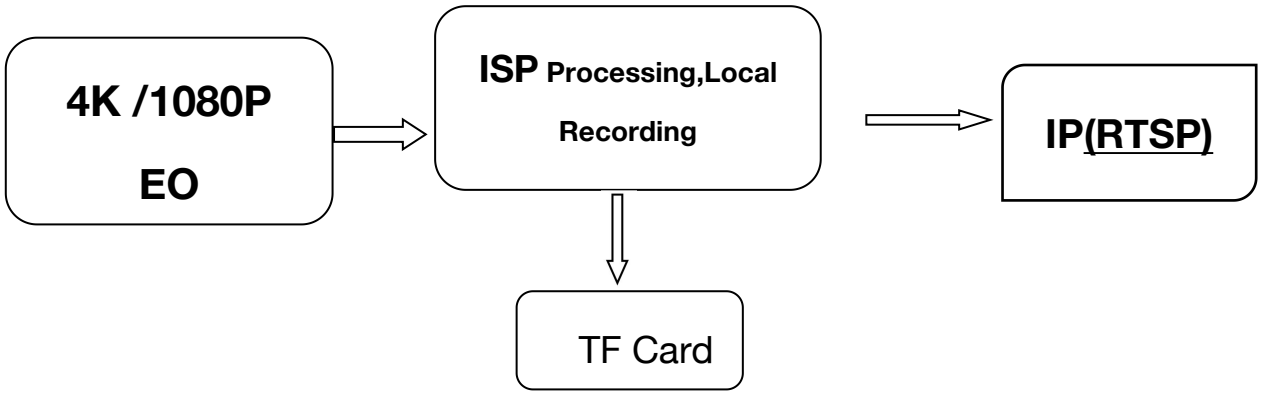


Figure 1-2-1 System functional framework

1.3 Using environment and working conditions

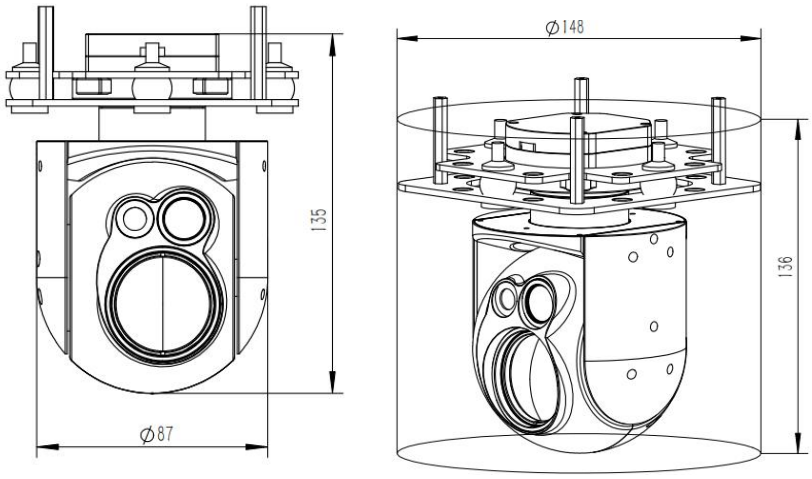
- Working environment：-10℃ to +55℃ / 20% to 80% RH
- Storage environment：-20℃ to +60℃ / 20% to 95% RH
- Transportability: After the gimbal is packaged, it can meet the transportation requirements of aviation, highway, railway and waterway.

2、Technical characteristics

- 1080P Camera parameters：
  - CMOS SENSOR Pixel：2M Pixel
  - Digital zoom：Support 9x digital zoom
  - Focal length：6mm
  - （FOV）：60°×43°
  - Image and video storage formats：
    - Image：jpeg format；Various pixels for option
    - Video：H.264 format；H.265 format ；1080P video stream
    - IP output：1080P 30fps /4K 30fps
- IR thermal parameters：
  - Resolution：640×512
  - Pixel size：12μm
  - Wavelength range：8～14μm
  - Type：Uncooled long-wave infrared thermal imaging
  - Thermal sensitivityNETD： ≤50mk@F1.0
  - Focal length：45mm，FOV：9.8 ° ×7.8 °
  - Measurement function (optional)：Supports real-time temperature measurement of the highest temperature, lowest temperature, and center point temperature; supports point-selected temperature measurement; supports saving of full pixel temperature information data;
  - Temperature measurement range：-20℃~150℃，Expandable 100℃~550℃
  - Temperature measurement accuracy：±3℃或±3%（Take the largest value）
- **Recognition and tracking**：
  - Min tracking target size: 16×16 pixels
  - Max tracking target size: 256×256 pixels
  - Target Memory Time : 2 seconds
  - Tracking speed : 50 Pixel/Frame max
  - Simultaneous detection qty: 100 targets max
  - Recognized categories: Human and Vehicle

- ❖ Min detection target size: 32×32 pixels

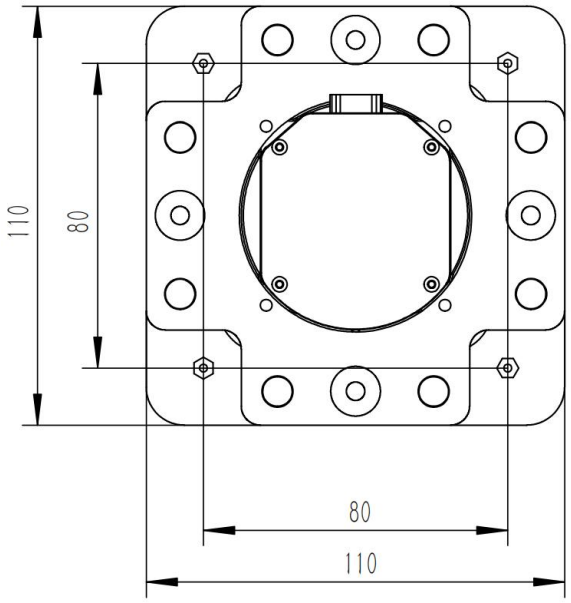
- ✧ Storage capacity: 32G-256G TF card (FAT32 format)
- ✧ Image output interface：Network H264 stream output
- ✧ Pitch angle action range：-20°～+180°
- ✧ Course angle action range：360° Rotation
- ✧ Control accuracy: Pitch and roll direction: ±0.02° Horizontal direction: ±0.03°
- ✧ Control method：
  - ❖ Ethernet control：The ground station can be controlled by mouse or touch screen, and supports wheel operation.
  - ❖ Support network IP , serial port SBUS , and PWM control
- ✧ System boot time：20s
  Voltage：DC 12V-26.2V
- ✧ Power：Dynamic 6.6w
- ✧ Weight：510g±10 克
  Size：φ:148mm H:136mm



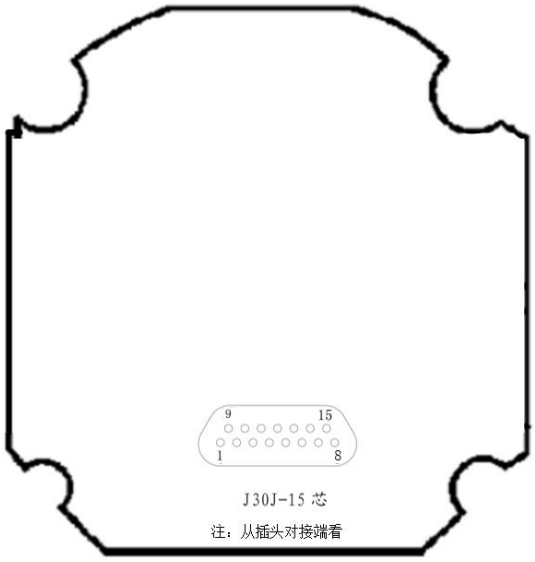
3、 Installation and commissioning

3.1 Installation holes and structure

Damping plate mounting hole spacing：80mm×80mm; Mounting hole size：M2.5



3.2 Electrical interface



NO.	Model	Interface type	Definition	Function
1	J30	Power	VCC	Positive power port (12V-26V)
2		Power	VCC	Positive power port (12V-26V)
3		Power	GND	Negative power port

4		Power	GND	Negative power port
5		Communication	TX	Serial port sending
6		Communication	RX	Serial port receiving
7		Communication	NC	Reserved interface
8		Communication	NC	Reserved interface
9		Communication	Rx+	Network
10		Communication	Rx-	Network
11		Communication	Tx+	Network
12		Communication	Tx-	Network
13		Communication	S.BUS	S.BUS
14		Communication	NC	Reserved interface
15		Communication	EGND	Signal GND

Model	Interface type	Function	Remarks
TF card interface	TF	Upgrade and store data	The memory card interface is on the sphere

***Due to product upgrades, the appearance/size/weight/power consumption may change slightly. Please contact sales for the latest data, please understand.**

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3.3 Communication

3.3.1 Serial port communication frame structure (optional function)

12 to 27

FH (frame header) (3char)	address bit (2char)	data length (1char)	control bit (1char)	label bit (3char)	Data1 (char)	。。。。 (char)	Data L (char)	Parity bit (2char)
#TP	U/M/D/I/E	L	w/r	$X_1X_2X_3$	D_1	。。。。	D_L	CRC

	/P							

Frame header:

#TP: fixed length command, with data length of 2;

#tp: variable length command, and the data length is determined according to the length bits;

Address bits:

Source address:

U: Uart command

M: Camera related commands;

D: System and image related commands;

I: Algorithm related commands;

E: Thermal infrared related commands;

P: PTZ related commands.

Target:

U: UART command

M: Camera related commands;

D: System and image related commands;

I: Algorithm related commands;

E: Thermal infrared related commands;

P: PTZ related commands.

Data length: number of data; Max F

Control bit: r - > query w- > control

Data: according to length

Identification bits: identification function

Data: data bits, according to the data length;

CRC: except for the beginning, the rest is converted to HEX, after the cumulative sum is done, and then the result is converted to ASC-II. Two bytes, high order first.

Serial port configuration: baud rate: 115200

Data bit: 8

Stop bit: 1

Check bit: None

Note: please ask for the specific serial communication protocol from sales.

3.3.2 Network control and display

Default network address and port number:

Video stream 192.168.144.108 (control IP is the same as video stream IP)

Control flow 192.168.144.108 (port number 9003)

App

Operation steps:

1. Click the setting button in the lower right corner to pop up the setting menu.

The default IP address is 192.168.144.108 (modify as needed). Enter the RTSP code stream address

rtsp://192.168.144.108:554/stream=0

Click PLAY, output: 4K, 1080P H.264 real-time stream. Control flow address, the same as the IP address. Available for settings

The video stream responds normally and a real-time image will appear

2: The mode button is used to display shortcut buttons and PTZ angle bars.

3: Three Tabs as below: Speed mode, Angle mode and Parameter Setting

A、The default is Speed mode, which can control: Zoom, Focus, Photo, Video, Picture In Picture, Pseudo Color Switching, PTZ motion, heading axis mode and One Key to return. (Note: the tracking function is not supported in this menu).

B、In the angle mode, can drag the slider to make the PTZ reach the specified angle (The roll axis is not supported currently).

C、Speed is the basic speed, and PTZ will adapt proportionally to this speed value based on the focal length;

Speed Mode Tab

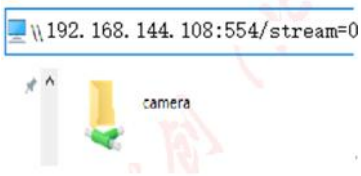
Angle Model Tab

Zoom+	Zoom-	Focus+	Focus-	Capture	Record	Ai Mode
变焦 +	变焦 -	对焦 +	对焦 -	拍照	录像	跟踪模式
Pseudo Color	Picture in Picture	IRcut	Track	Play	Set	Defog±
伪彩	画中画	日夜切换	跟踪	播放	设置	电子透雾±
Lock Mode	Follow Mode	Up	Down	Left	Right	Home
锁头模式	跟随模式	上	下	左	右	回中

Control button icon meaning

3.3.3 Network remote access to stored files

The files in the TF card can be accessed through network sharing. The access method is: Double backslash +IP Address, as shown in the following figure:

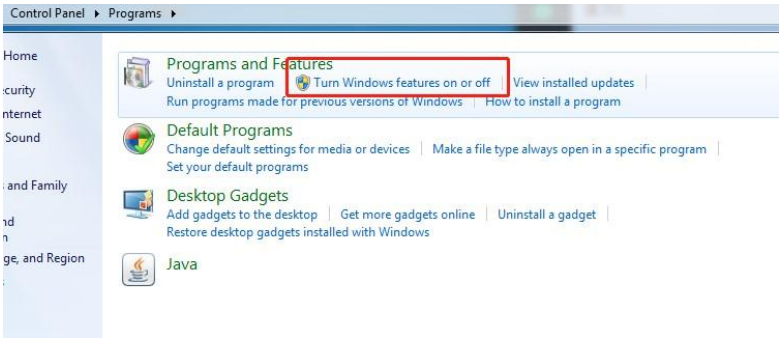


（Note: The host computer needs to support the SMB

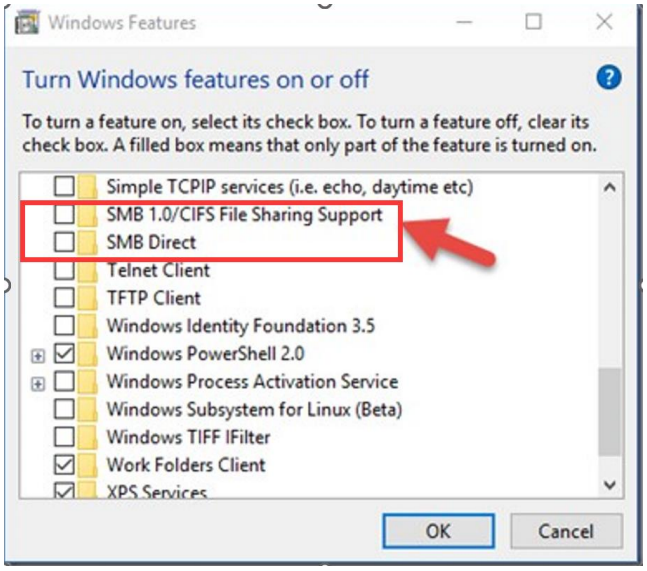
Windows10 startup mode：

1、ind the program in the control panel and open it。

2、Enter the menu, find the item “enable or disable windows features”.



3、Selected the box in front of enabling SMB protocol.



3.4 pod debugging

3.4.1 Boot image screen

After the pod is powered on, the power-on waiting time is no more than 20s. During these 20s, the gimbal and camera will be initialized. After the initialization is completed, it will wait for RTSP to establish a connection. The default display image is visible light, as shown in Figure 3-4-1-1:

3-4-1-1

After the ground station is opened, enter the correct RTSP stream address and the correct IP address. The default IP address is 192.168.144.108 (modify as needed). Enter the RTSP stream address:

rtsp://192.168.144.108:554/stream=0 Click PLAY, output: 1080P H.264

real-time code stream, open the network RTSP code stream, and com。

3.4.2 Visible light focusing

Visible light supports 9x ,7x digital zoom, which can be zoomed in and out through commands.。

3.4.3 Visible light photography

When the TF card exists, you can take photos by sending a photo command. You can also send a photo command to take a picture while recording, and the photo time is saved to the photo properties.

3.4.4 Recording

When the TF card exists, you can record by sending a recording command. The recording video resolution supports 4K, 1080P30fps H264 format, H265 format. Infrared and visible light can be recorded at the same time. Send it again to stop recording. The recording time is displayed in the middle on the right.

3.5 PTZ debugging and control

3.5.1 Gimbal centering

You can set the gimbal to work in the centered state through the control command. In this state, the gimbal will return and keep the camera looking directly in front of the nose.

3.5.2 Gimbal YAW Lock

The gimbal can be set to work in gimbal YAW lock mode through control. In this mode, the gimbal will not rotate with the rotation of the aircraft heading.

3.5.3 Gimbal YAW follow

The gimbal can be set to work in gimbal YAW follow mode through control. In this mode, the gimbal can maintain a fixed angle between the heading and the fuselage and rotate with the rotation of the aircraft heading.

3.5.4 Attitude control

The PTZ can be controlled to move at a certain angular rate in the heading and pitch directions through serial port commands, network commands, PWM signals, IBUS, and SBUS.

3.5.5 Speed control

When the gimbal rotates, the speed is adaptive based on the offset of the joystick and the multiple of the visible light camera. As shown in Table 3-5-5-1:

Speed Mode / Zoom	Low Speed	Medium Speed	High Speed
1x	10r/s	15r/s	20r/s
2x	6r/s	9r/s	12r/s
4x	4r/s	6r/s	8r/s

Table 3-5-5-1 PTZ rotation speed

(Note: The data is only used to explain the speed control logic and is not the actual speed)

3.5.6 Automatic calibration

When used for a period of time or when the ambient temperature changes drastically, the pod may drift by a large margin, causing the screen to tilt or manual control inconvenience, and it is necessary to use the automatic calibration command for calibration.

4、Use and operation

4.1 Preparation and inspection before using

① Check whether the hanging structure of the dual-optical gimbal is normal, whether there is obvious deformation or looseness;

② Check if there is any dirt on the lens, if there is dirt on the lens, wipe the lens with a lens cloth;

③After installing the pod, check whether the mechanical installation of the system is normal;

④ Check whether the electrical connection of the system is normal;

⑤ Check whether the imaging and functions of the pod are normal on the ground.

4.2 Safety protection, safety signs and instructions during using

During the use of the product, avoid the power supply voltage exceeding the allowable range, and avoid using it under environmental conditions that exceed the normal working load.

4.3 Operating procedures during using

After the system is normally powered on, various functions of the pod can be controlled through the buttons or joysticks on the UAV handheld terminal.

4.4 Inspection and recording during operation

Record the problems encountered during use and save the corresponding image data.

4.5 Operating procedures, methods and precautions after using

After the product is used, disconnect the system power first, separate the pod from the fuselage in a static-free environment, and store it in a dry and ventilated environment. It should be placed in the box if it is not used for a long time.

5、 Failure analysis and elimination

If the user encounters a failure when using this product, please follow the solutions shown in the following table to eliminate it. If the failure is not listed in this manual or the failure cannot be solved through the solutions in this manual, please contact the company's customer Contact the service department.

No.	Failure phenomenon	Reason	Solution

1	Completely unable to control the pod	①control command is invalid; ②Docking signal error	①Check the communication protocol carefully; ②Carefully confirm the definition of the docking signal
2	Sometimes there is no video, sometimes the control command does not respond	①Poor connection of docking cables; ②Broken external cable	①Re-plug and plug the connector; ②Re-wrap the cables
3	Image is blurred or image quality is degraded	①The observation target object is too close to the pod; ②Whether the optical focal length is at a clear point; ③The optical lens not clean ④Serious quality problems in optical lenses; ⑤other reasons.	①Adjust the observation distance and observe whether the image is clear; ②Re-focus the camera; ③Observe the imaging effect after cleaning the lens with cotton and alcohol; ④If there is no improvement, please contact the manufacturer.

6、 Maintenance

6.1 Daily maintenance

① During transportation, please place it in the factory packing box. If there is no packing box, please place the pod in a soft environment such as foam;

② After the pod is used, turn off the system power and unload the pod from the drone fuselage, which can extend the effective use time of the drone system;

③ When the pod is stored for a long time or is not working, it should be kept in a cool and dry environment as far as possible;

④ Do not use chemical solvents, thinners, etc. to scrub the pod casing, but use a clean, soft, and dry flannel;

⑤ The lens of the pod is an important optical component. During installation and use, avoid oil stains and various chemical substances from polluting and damaging the lens surface. After use, please clean the surface of the lens

with a special lens cloth in time, and also when storing it. Pay attention to protective measures;

⑥ When not in use for a long time, power on each function every week, check the function, mechanical interface, and electrical interface of the product every half month, clean the lens, and thoroughly check the product every month.

6.2 Maintenance procedures and methods

① Use a clean, soft and dry flannel to wipe off dust and other debris on the surface;

② The mission payload is correctly connected to the drone body, and after confirming that the connection is correct, power on and check;

③ After normal work, adjust and test each function through the drone handheld terminal, and make a detailed record of any problems;

④ If the fault cannot be eliminated through the method in this manual, please contact our company.

7、 Transportation and storage

7.1 Transportation

① After the product has passed the acceptance by the ordering party, the manufacturer shall assist the ordering party to transport it to the user and warehouse for storage in accordance with the provisions of the order contract;

② The quality of shipment and the safety requirements of the transportation process meet the relevant regulations of the international transportation management department;

③ Pay attention to the following items when loading and unloading products:

1. No matter what kind of loading and unloading method, it can ensure safety and reliability;

2. Strictly comply with the requirements of fireproof, waterproof, and moisture-proof regulations during shipment;

3. Do not transport in the same vehicle with flammable, explosive and corrosive items.

④ Avoid collision during transportation.

7.2 Storage

① Products that have passed the experience acceptance, if not shipped immediately, are stored in the finished product turnover warehouse of the contractor. The storage period does not exceed three months. The storage and maintenance of the product during the storage period shall be the responsibility of the contractor. When the ordering party stores for a long time, the product shall be energized and tested once every six months.

② The product is stored in a dry, ventilated, and non-corrosive environment with a temperature of -20℃ ~ +65℃ and a relative humidity of not more than 95%.

8. Other instructions

8.1 Packing list and precautions

When unpacking, pay attention to placing the instrument box steadily. Check the packing list one by one. The product packing list is shown in Table 8-1-1:

Item	QTY	Unit
Gimbal	1	pcs
Qualification	1	pcs
User Manual	1	Electronic version
Packing box	1	pcs

Table 8-1-1 Packing list

8.2 Quality Guarantee: 1 Year

For after- sale service, repairing, and if the product version needs to be upgraded or the functions are required to be changed, please feel free to contact us for further technical support。