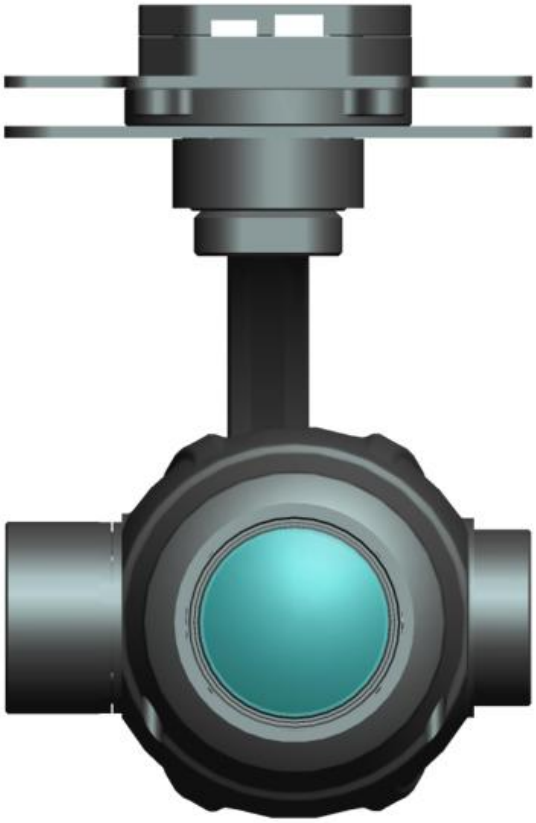
SF-TPD20S78 Starlight Night Vision Gimbal Camera User Manual



- **3-Axis stabilized PTZ**
- **140X Hybrid Zoom①**
- **AI Target Detection and Tracking (Tracking version)**
- **TF card video recording and photography**
- **4K,1080p video output**
- **HD night vision function**
- **Provide integrated ground station software, display and control**

NOTE①:140x Hybrid zoom:20x optical zoom+7x digital zoom

Publication instructions

Thank you for choosing our products and for your support to our company. Our company takes the research and development of optical zoom cameras as the core, takes the creating products with superior performance as the spirit, and takes the better service of customers as the faith, and is committed to providing you with the best quality and service to become your most loyal partners and friends. The company's products cover 10x, 18x, 20x, 30x, 36x optical zoom series cameras. By using the camera as the core of the drone, the drone company can use its optical zoom function to see the details of the ground objects in the air after integrating the topological joint creation zoom camera, just like adding an adjustable multiple to the drone Telescope.

This manual for the use and maintenance of SF-TPD20S78. This product is a drone payload system which integrate the 20x optical zoom camera, 7x digital zoom, Ethernet (RTSP) video output, and 3-axis stabilized PTZ. The ground receiving end outputs standard RTSP, and the ground software supports PTZ control and zoom camera control. The PTZ adopts high-precision encoder FOC control scheme, which has the characteristics of high stability, small volume, light weight and low power consumption. The camera adopts an effective pixel of 8 million STARVIS2, low-noise SENSOR.; Support 4K, 1080p local TF storage and RTSP code stream transmission. Network 2-way control.

In order to give full play to 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 find problems in use, pls timely feedback for our research and correction. As the product is updated quickly, and individual product parameters and configurations 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 for the latest updates Information and technical support.

Contents

Warning

Warning

1.Before installing and using this product, please read the manual carefully and keep it in a safe place for future use;
2.Should follow all warnings on the product and manual, and follow all operating instructions and instructions;
3.It is strictly prohibited for the power supply voltage to exceed the specified range (12v-26.2v, 3s-6s);
4.It is strictly forbidden to use the environment beyond the environmental conditions of the gimbal;
5.Any load contains electronic equipment sensitive to static electricity, prevent static electricity during use to avoid damage;
6..Pay attention to the protection of the internal interconnection of the gimbal and the external connection cable;
7. There are no parts in the gimbal that can be repaired by the user, and the case cannot be opened without the permission of the company. All consequences caused by this are the user's responsibility;
8. Before cleaning the gimbal, disconnect the power supply. Do not use chemical solvents, thinners or spray cleaners. You can wipe the shell with a clean, soft, dry flannel or cotton.

Notice:

1.Ensure the interface definition of the airborne terminal is correct;

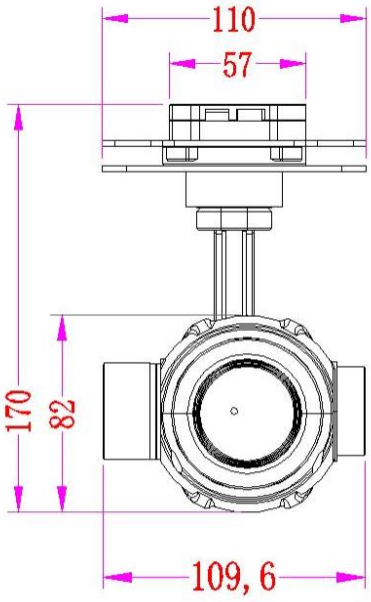
2.Ensure the power supply voltage is within the given range.

SF-TPD20S78 User Manual

1、Equipment Overview

1.1 Product usage and scope of use

This manual for the use and maintenance of SF-TPD20S78. This product is a drone payload system which integrate the 20x optical zoom camera, 7x digital zoom, Ethernet (RTSP) video output, and 3-axis stabilized PTZ. The ground receiving end outputs standard RTSP, and the ground software supports PTZ control and zoom camera control. The PTZ adopts high-precision encoder FOC control scheme, which has the characteristics of high stability, small volume, light weight and low power consumption. The camera adopts an effective pixel of 8 million STARVIS2, low-noise SENSOR.; Support 4K, 1080p local TF storage and RTSP code stream transmission. Network 2-way control.



The gimbal structure is shown in Figure 1-1-1

SF-TPD20S78 can be widely used in public security emergency, fire rescue, power line patrol, field search and other industries. The system integrates optical zoom, video photographing, stabilizing PTZ, control and display. The operation is simple. The onboard side is installed and fixed to the UAV and other equipment. After the connect video transmitter, as long as power supplied, the system can work immediately. The software on the ground side can directly display the video, and the button or mouse can realize zoom, focus, camera and video, PTZ control and other functions.

1.2 The main components and functions of the product

The device is composed of a zoom visible light movement, and a stabilized PTZ. The visible light video stream is stored inside the visible light movement, recorded by the TF card inside, and encoded and output to the image transmission module. The image transmission module transmits the real-time video to the ground receiving terminal and receives the ground control signal to control the PTZ and camera respectively. The composition of the system functional framework is shown in Figure 1-2-1:

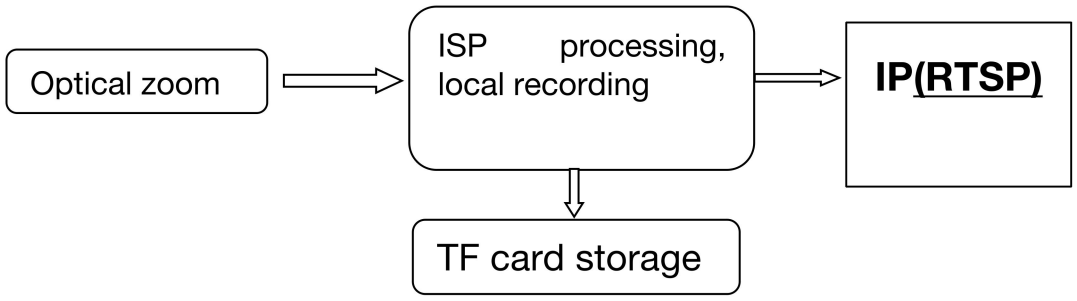


Figure 1-2-1 System Functional Framework

1.3 Use environment and working conditions

- **Working environment:** -10℃ to +50℃ / 20% to 80% RH
- **Storage environment:** -20℃ to +60℃ / 20% to 95% RH
- **Transportability:** The camera is well protected and packaged, it can meet the requirements of air, road, railway, and sea

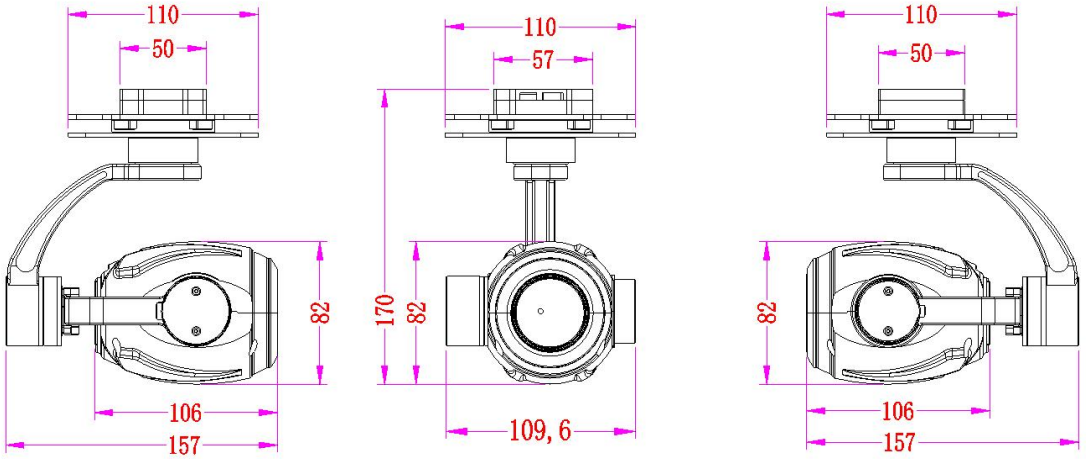
transportation.

2、Technical characteristics

- **Zoom Camera Parameters:**
  - CMOS SENSOR Pixel: 8 Mega pixels
  - Focal length: 6.7 ± 5% ~ 125 ± 5%mm
  - Field of view (FOV):
    - D : WIDE 66.6º±5% TELE 4.0º±5%
    - H : WIDE 59.6º±5% TELE 3.5º±5%
    - V : WIDE 35.7º±5% TELE 2.0º±5%
- Zoom: 20x optical zoom
- Zoom mode: electric zoom and continuously adjustable
- Image and video storage format:
  - Image：jpeg format; Multiple pixels for selection
  - Video：H.264 Network IP output 4K/1080P. Local TF card video stream recording
- **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-128G TF card (FAT32 format)
- **Image output interface:** network H.264 code stream output
- **Roll angle:** **-** 45 ° to +45 °

- **Pitch angle:** - 30 ° to +120 °
- **Yaw angle:** - 280 ° to +280°
- **Control accuracy:**

  Pitch and roll direction: ± 0.02 ° Horizontal direction: ± 0.03 °
- **Control mode:**
  - Network control: the ground station can be controlled by mouse and touch screen, and supports wheel operation.
  - Support network IP control and UART control (optional PWM control, external PWM decoding board is required)
- **System startup time:** 20s
- **Power supply:** 3S/6S (12V/26.2V)
- **Power consumption:** 6.72w
- **Weight:** 670± 10 g
- **Volume:** 110mm × 157mm × 170mm



3、Installation and debugging

3.1 Mounting hole and structure

The installation dimensions of the external mechanical interface is shown in Figure 3-1-1, which mounting hole is M3, and the hole spacing is 80×80

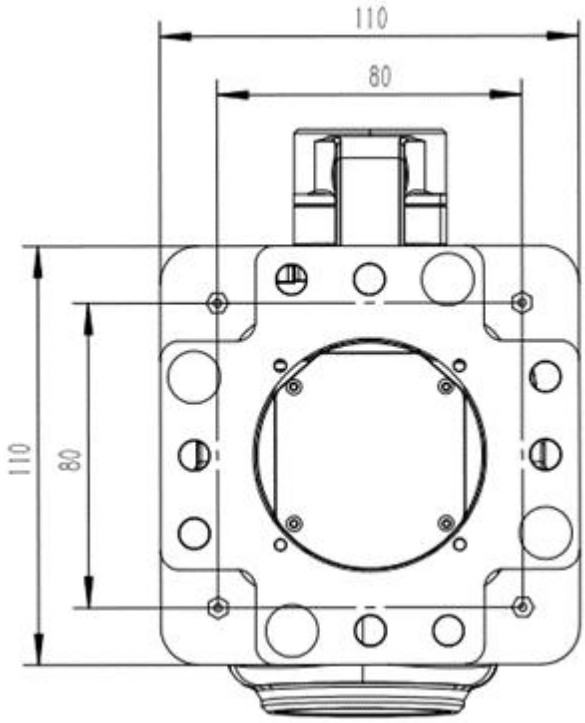
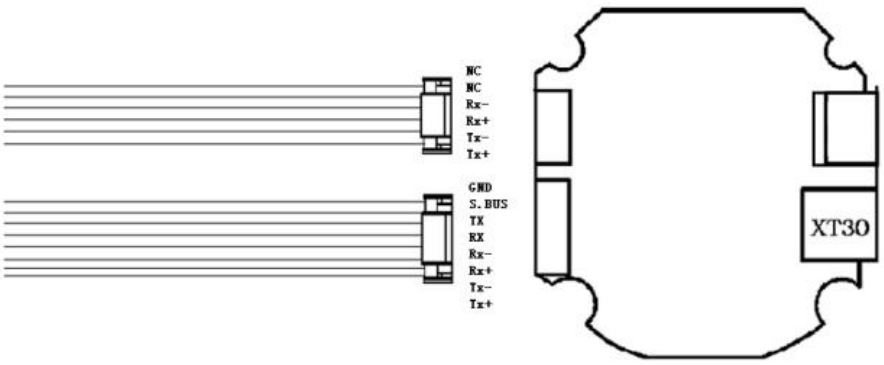


Figure 3-1-1 Dimension drawing

3.2 Electrical intface



No.	Name	Interface Type	Interface definition	Function
1	6PIN	communication interface	**485+**	485 Interface
2		communication interface	**485-**	485 Interface
3		communication interface	**Rx-**	Network interface
4		communication interface	**Rx+**	Network interface
5		communication interface	**Tx-**	Network interface
6		communication interface	**Tx+**	Network interface

No.	Name	Interface Type	Interface definition	Function
1	8PIN	communication interface	**GND**	GND
2		communication interface	**SBUS**	SBUS input
3		communication interface	**TXD3**	Serial port sending
4		communication interface	**RXD3**	Serial port receiving
5		communication interface	**Rx-**	Network interface
6		communication interface	**Rx+**	Network interface
7		communication interface	**Tx-**	Network interface
8		communication interface	**Tx+**	Network interface

Model	Interface Type	Function	Remark
TF card interface	Reserved port	Storage and upgrade	TF card interface is on the sphere

***Due to the product upgrade, the appearance / size / weight / power consumption may change slightly. Please contact the sales department for the latest data. Thank you for understand.**

3.3 Communication

3.3.1 Serial communication frame structure (optional function)

12 to 27

Frame	Address	Data	Control	Identifier	Data1	。。。。	Data	Check

Header (3char)	(2char)	Length (1char)	Byte (1char)	(3char)	(char)	(char)	L (char)	(2char)
#TP	U/M/D/I/E/P	L	w/r	$X_1X_2X_3$	D_1	。。。。	D_L	CRC

Frame Header:

#TP: Fixed length command, data length is 2;

#tp: Variable length command, the data length is determined according to the data length byte;

Address byte: 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: Commands related to PTZ.

Target:

U: Uart Command

M: Camera related commands;

D: System and image related commands;

I: Algorithm related commands;

E: Thermal infrared related commands;

P: Commands related to PTZ.

Data Length: numbers of data; Longest F

Control bit: r ->query w ->control

Data: according to length

Identification bit: identification function

Data: data bit, according to the data length;

CRC: Except for the beginning, the rest are converted to HEX,

accumulated and summed, and then converted to ASC-II. 2 bytes, with the high bit first.

Serial port configuration:

Baud rate: 115200

Data bits: 8

Stop bit: 1

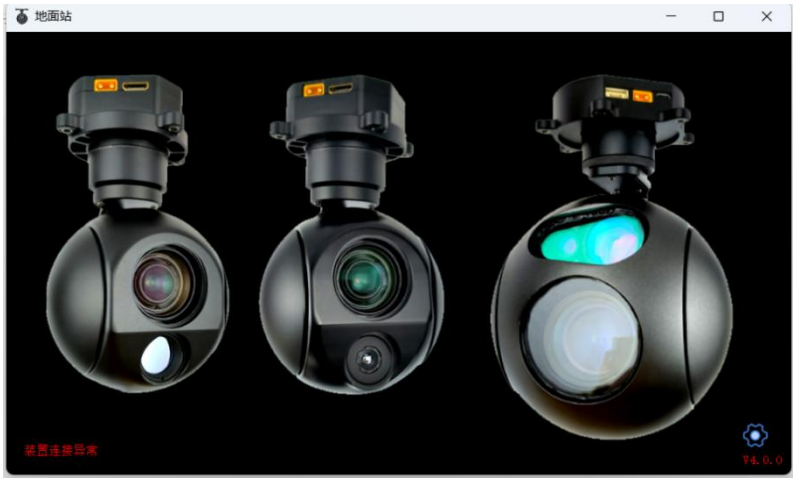
Check digit: None

*** Note: Please contact Sunflaser marketing personnel for specific serial communication protocol.**

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)



Operation steps:

1. Click the setting button at 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 1080P H.264 real-time code stream

The control flow address is the same as the IP address. Can be used to set.

The video stream responds normally, and the real-time picture will appear

2. mode button is used to display shortcut buttons and PTZ angle bar.

3. Four tabs below: **Speed mode, Angle mode, function selection, parameter setting;**

A. The default is the speed mode, which can control: zoom, focus, photographing, video recording, picture in picture, pseudo color switching, PTZ action, heading axis mode, one key back to center, tracking (tracking version).

B. In angle mode, you can drag the slider to make the PTZ reach the specified angle .

C. Speed is the basic speed, and the PTZ will adapt to the speed value proportionally base on the focal length;

Speed Mode Tab

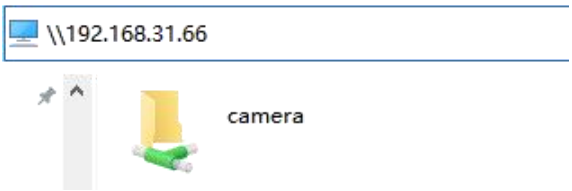
Angle Mode Tab

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

Meaning of control key icon

3.3.3 Network remote access to stored files

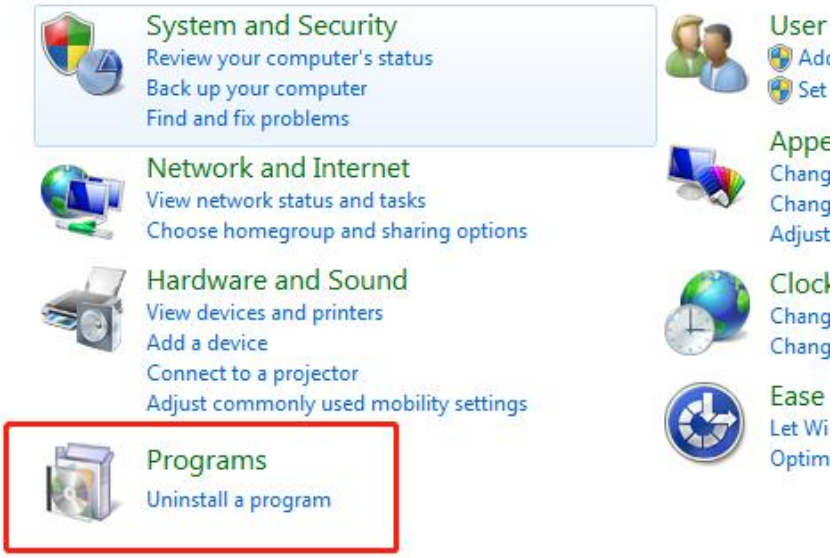
The files in the memory card can be accessed through the network share. The access method is: double backslash+ip, as shown in the following figure:



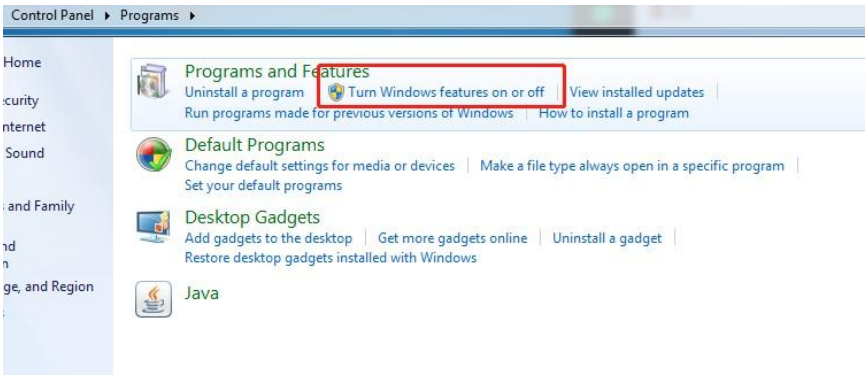
(Note: upper computer is required to support SMB protocol)

Windows10 startup mode:

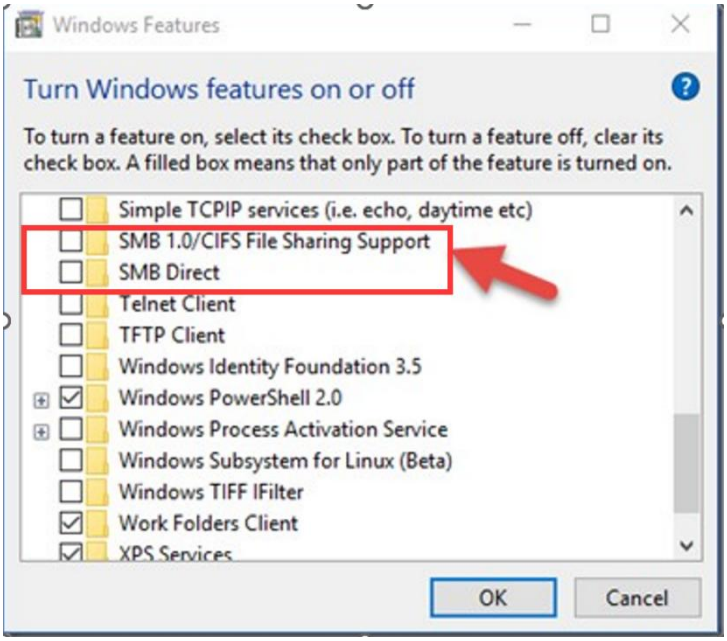
1. Find the program in the control panel and open it.



2、Under the program menu, find Startup or Close Windows Function, as shown below.



3、Check the box in front of Enable SMB protocol.



3.4 Gimbal debugging

3.4.1 Startup Initialization Screen

After the gimbal is powered on, the waiting time for power-on is not more than 20s. Within 20s, the PTZ and camera be initialized. After the initialization is completed, wait for the RTSP to establish a connection. The default display image is visible light, as shown in Figure 3-4-1-1:

Figure 3-4-1-1 Gimbal Startup Initialization Screen

After the ground station is opened, enter the correct RTSP address, and enter the correct IP address. The default IP address is 192.168.144.108 (modify as required). Enter the RTSP code stream address:
rtsp://192.168.144.108:554/stream=0 Click PLAY, output 1080P H.264 real-time code stream , open network RTSP code stream, and complete initialization.

3.4.2 Visible light focusing

In some special application scenarios (such as power line patrol), when the target object is too small, it will cause the target in the visible light image not to focus. At this time, you can use the visible light manual focus command to make the target object focus correctly.

3.4.3 Visible light photography

When the TF card exists, you can take pictures by sending the command to take pictures, or you can send the command to take pictures when recording, and the time of taking pictures is saved to the photo attribute.

3.4.4 Video recording

When the TF card exists, you can record by sending the recording command. The video resolution supports 1080P 30fps H264 format. The infrared and visible light can be recorded at the same time. Send again, stop recording, and the recording time is displayed in the middle of the right side.

3.5 PTZ debugging and control

3.5.1 PTZ One key back to home

You can set the PTZ to work in the centering state through the control command. In this state, the PTZ will return and keep the camera always looking straight in front of the handpiece.

3.5.2 PTZ YAW lock

The PTZ can be set to work in the PTZ YAW locking mode by control, and the PTZ will not rotate with the aircraft heading in this mode.

3.5.3 PTZ YAW follow

The PTZ can be set to work in the PTZ YAW following mode by controlling. In this mode, the PTZ 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 heading and pitching direction through serial port command and network signal. On the ground station, click and drag the PTZ to rotate.

3.5.5 Speed control

The PTZ has two modes: high speed and low speed. When the PTZ rotates, it performs speed adaptation based on the current speed mode and the multiple of visible light camera. As shown in Table 3-5-5-1:

Multiple Speed Mode	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 Rotation Speed of PTZ

（Note: The data is only used to explain the speed control logic, 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 use

- Check whether the hanging structure of the dual optical gimbal is normal and whether there is obvious deformation or looseness;
- Check whether there is dirt on the lens. If there is dirt on the lens, wipe the lens with lens cloth;
- After installing the gimbal, check whether the system mechanical installation is normal;
- Check whether the electrical connection of the system is normal;
- Ground check whether the imaging and function of the gimbal are normal.

4.2 Safety protection, safety signs and instructions during use

During the use of the product, the power supply voltage shall not exceed the allowable range, and the product shall not be used in the environment beyond the normal working load.

4.3 Operating procedures during use

After the system is powered on normally, the control operation is

carried out with the mouse or touch screen through the UAV ground station software.

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 use

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、Fault 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	① Check the communication protocol carefully; ②Carefully confirm the definition of the docking signal
2	Sometimes there	①Poor connection of	① Re-plug and plug the

	is no video, or the control command does not respond	docking cables; ②Broken external cable	connector; ② Re-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、Care and maintenance

6.1 Daily maintenance and maintenance

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

- 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

- Use a clean, soft and dry flannel to wipe off dust and other debris on the surface;
- The mission payload is correctly connected to the drone body, and after confirming that the connection is correct, power on and check;
- After normal work, adjust and test each function through the drone handheld terminal, and make a detailed record of any problems;
- If the fault cannot be eliminated through the method in this manual, please contact our company.

7、Transportation and storage

7.1 Transportation

- 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;

- The quality of shipment and the safety requirements of the transportation process meet the relevant regulations of the international transportation management department;
- Pay attention to the following items when loading and unloading products:
- No matter what kind of loading and unloading method, it can ensure safety and reliability;
  - 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.
- Avoid collision during transportation.

7.2 Storage

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.

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 Name	Quantity	Units
Gimbal	1	Set
Certificate of Compliance	1	Page
User Manual	1	File (E-edition)
Packaging carton	1	Box

Table 8-1-1 Product 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.

Version V1.0