# SF-TPD30G635L50

# 3 light gimbal camera

# User Manual

- 270X Hybrid Zoom①
- 35mm focal length 640 thermal imaging
- 5000 meter laser ranging, video overlay
- AI Target Detection and Tracking (Tracking version)
- Ten false color patterns
- Network and serial port② synchronization control
- three-axis stabilization PTZ, built-in shock absorption
- TF dual-channel video recording , network operation TF card

NOTE①:270x Hybrid Zoom : 30x optical zoom+9x digital zoom
NOTE②： The serial port refers to: 3.3V LVTTL UART.

# Publication instructions

Thank you very much for using our products. The company is one of the professional optical zoom camera manufacturer in China which have technical team to research & development of optical zoom camera as the core technology. The concept of creating products with superior performance and the idea of serving customers, we are committed to providing customers with innovative products which are superior to others. There are 10 x, 18x, 20x, 30 x, 36x optical zoom series cameras to choose from. By taking Sunflaser integrating the topology camera as the drone load, drone company can use its optical zoom function to see the details of ground objects in the air, make the drone just like adding an adjustable telescope.

This user manual is used for SF-TPD30G635L50three light gimbal. This product is a zoom three-light integrated system integrating 30 times optical zoom camera +9 times digital zoom, 640*512 thermal imaging module, 5KM laser ranging high performance professional three-axis stability gimbal. It adopts network IP output, IP control, the gimbal camera adopts high-precision encoder FOC control scheme, with high stability, small size, light weight, low power consumption. The visible light camera takes a wide-motion SENSOR with an effective 2 mega pixels. Thermal imaging takes a vanadium oxide detector with a resolution of 640x512. The system supports network RTSP picture-in-picture code stream output, supports a variety of picture-in-picture modes, a variety of pseudo-color display, and supports global temperature measurement function. Both the serial port and the network can control the camera and the cradle head, and support the local TF dual-channel video recording and photography. The thermal lens has a focal length of 35mm.

In order to full display the superior performance of this gimbal, please read this manual carefully before use. Before the new manual come out, the using and maintenance of this equipment should be based on this manual, and other materials are for reference only. Each unit finds problems during using and needs timely feedback for 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. For more questions, please contact us to get the latest Information and technical support.

## Contents

# Warning

## Warning

- Before installing and using this product, please read this manual carefully, put it away in a safe place for future use.
- Should follow all warnings on the product and manual, and follow all operating instructions.
- Strictly forbidden for the power supply voltage to exceed the specified range (12v-26.2v.3s-6s).
- Strictly forbidden to use the gimbal in the environment exceed its environmental conditions.
- In any circumstances, including startup or shutdown status, do not look directly at the high-intensity radiation sources such as the sun, carbon dioxide laser and electric welding machine, so as not to damage the focal plane of the detector.
- Any load contains electric equipment of sensitive static electricity. To avoid any damage, please prevent static electricity during using;
- Pay attention to the protection of the internal interconnection of the gimbal and the external connection cable.
- It is not allowed to be repaired by the user, and the gimbal cannot be opened without the permission of our company. All consequences caused by repaired by yourself is the user's responsibility.
- Before cleaning the gimbal, disconnect the power first. Do not use chemical solvents, thinners or spray cleaners. You can wipe the shell with a clean, soft, dry flannel or cotton.

## Notice

- Ensure that the interface definition of the airborne terminal is correct;
- Ensure that the power supply voltage is within the given range （12-26.2v.3s-6s）.
- Do not let the gimbal thermal imager stare at directly to the sun or carbon dioxide laser, welding machine and other high intensity radiation sources at any circumstance including power on or off. To avoid damaging the focal plane of the detector. Do not shoot on the object on the distance less then 50 meters.

# SF-TPD30G635L50gimbal camera

# User Manual

# 1. Overview

## 1.1 Application

SF-TPD30G635L50is a zoom three-light integrated system integrating 30 x optical zoom camera, 640*512 thermal imaging module, 5KM laser ranging high performance professional three-axis stability enhancement gimbal. It adopts network IP, output, IP control, and high precision encoder FOC control scheme for the PTZ head. It has the characteristics of high stability, small size, light weight and low power consumption. The visible light camera adopts a low illumination SENSOR with an effective 2 mega pixels. Thermal imaging adopts a vanadium oxide detector with a resolution of 640x512. The system supports network RTSP picture-in-picture code stream output, supports a variety of picture-in-picture modes, a variety of pseudo-color display, and supports global temperature measurement function. Both the serial port and the network can control the camera and the cradle head, and support the local TF dual-channel video recording and photography. The thermal lens has a focal length of 35mm. The structure of the head is shown in Figure 1-1-1.

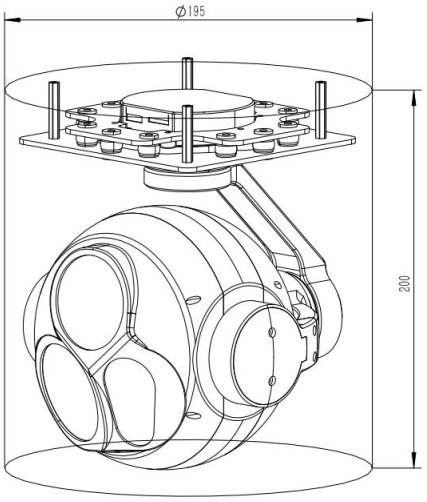



Figure 1-1-1 Structure of 3-light optical integrated gimbal camera head

SF-TPD30G635L50integrated gimhead system can be widely used in public security emergency, fire rescue, power line patrol, field search and other industries. System integration of optical zoom, video photography, stability of the head, control as one. Customer docking is simple, and the airborne side is fixed to the UAV and other equipment. After the connection diagram is transmitted, the system can work only with power supply. The ground side software can display the video directly. And the button or

mouse can realize the zoom, focusing, photographing and recording, and the control of the head.

## 1.2 Main components and functions of the product

The device is composed by 3 parts of zoom visible light movement, thermal imaging movement and stabilization head. Visible light and thermal imaging video streams are stored in the visible light movement seperately. TF card video is recorded inside, and encoded and output to the image transmission module. The image transmission module transmits the real-time video to the ground receiver, and receives the ground control signal to control the cradle head and the camera respectively. The functional framework of the system is shown in Figure 1-2-1:

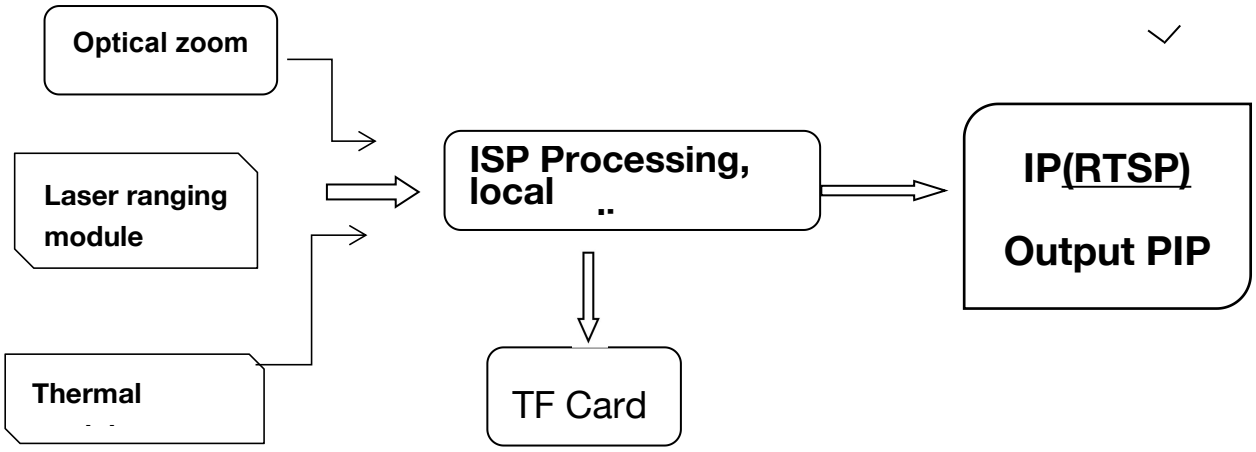



Figure 1-2-1 System functional framework

## 1.3 Using environment and working conditions

- Work environment: - 10 °C to + 55 °C / 20% to 80% RH
- Storage environment: - 20 °C to + 60 °C / 20% to 95% RH
- Transportation: gimbal in the carton box is well protected, can meet the requirements of air shipment, sea shipment, highway, railway et

# 2. Technical characteristics

Visible light camera parameters:

- SENSOR pixel: 2 mega pixels
- **SF-TPD30G635L50：**
  - **Field of view (FOV):**
    D : WIDE 67.8°±5% TELE 2.77°±5%
    H : WIDE 59.8°±5% TELE 2.34°±5%
    V : WIDE 40.5°±5% TELE 1.48°±5%
  - Optical zoom：30±5%
  - focal length：4.5±10%~135±5%mm
- Zoom mode: electric zoom and continuously adjustable
- Image and video storage format:
  - Image: jpeg format:multipixel can be choosed
  - Video：H264 format；1080P30FPS

✧ Laser ranging module parameter：

- Infrared Wavelength：1535nm eye safe wavelength laser
- Measuring range：50—5000m (Do not use the camera to shoot the on bject on less than 50m distance.)
- Precision/resolution：Accuracy±1m; Ranging resolution ≤ 40m

✧ Thermal infrared camera parameters：

- Detector resolution：640*512
- Pixel Size：12μm
- Wavelength coverage：8～14μm
- Type: the refrigeration long wave infrared thermal imaging
- Heat sensitivity NETD： ≤50mk@F1.0
- Field range：35mm lens，field angle：D:15.99° H：12.52°V:10.03°
- Measuring function(Optional)：Support the most high temperature, the lowest temperature, the center point temperature real-time temperature measurement. Support point temperature measurement, Support to save full pixel temperature information data.
- Measuring Range：-20°C~150°C，extend to 100°C~550°C
- Temperature measurement accuracy：±3°C or ±3%（to get the max 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

✧ Image processing function：

image display：Black heat, white heat, pseudo color (≥8 kinds)

Non-uniformity correction NUC.

Adaptive dynamic range compression AGC

EE enhance

Level of protection：IP54

Storage capacity: 16-128G TF Card；calss10 or above；fat32 format

Image output interface： RTSP 1080P30FPS Picture in picture output

Pitch action range：-30~+120° (Down is positive)

Roll angle action range：-45° to +45°

Yaw angle range of action：360° infinite rotation

Angular jitter： Pitch and roll direction：±0.02°

Pitch and roll direction：±0.03°

Control mode：

- ❖ SBUSControl (decoder board required)
- ❖ PWMSignal control (decoder board required)
- ❖ UARTcommand control (standard)
- ❖ Network UDP command (standard configuration)

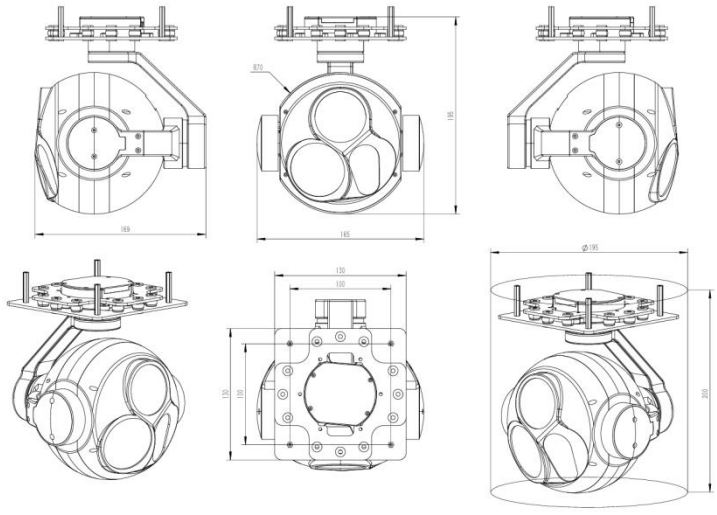
Network UDP command (standard configuration：18S

Power supply：DC12-26.2V（3S-6S）

Power Consumption：static state 7.5w, dynamic state 10w

Weight：1580±20g

Volume：W165mm*D169mm *H195mm



# 3. Installation and debugging

## 3.1 Installation [Screws and hole location]

See Figure 3-1-1 for installation dimension of external mechanical interface of 3- light gimbal, mounting holeM3,  holes spacing100*100mm

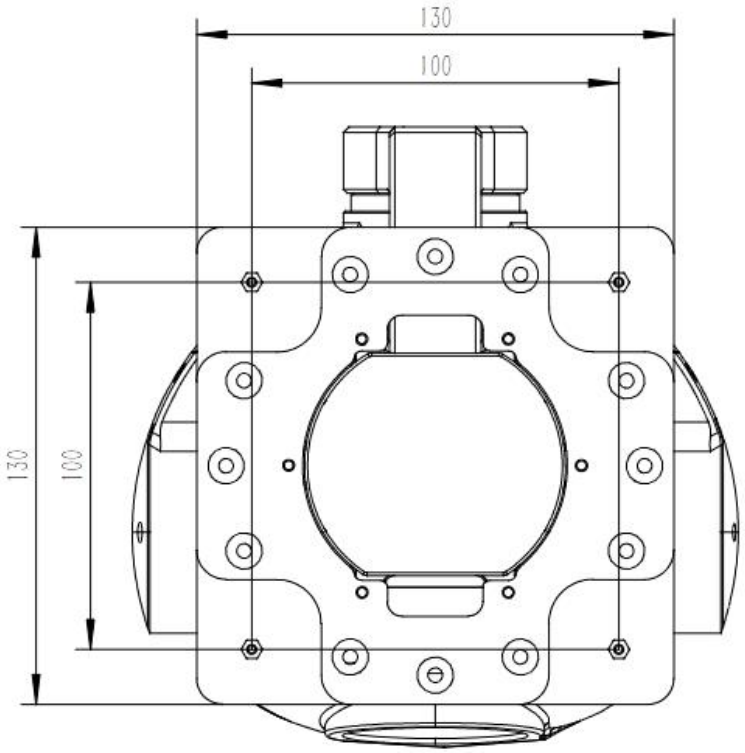
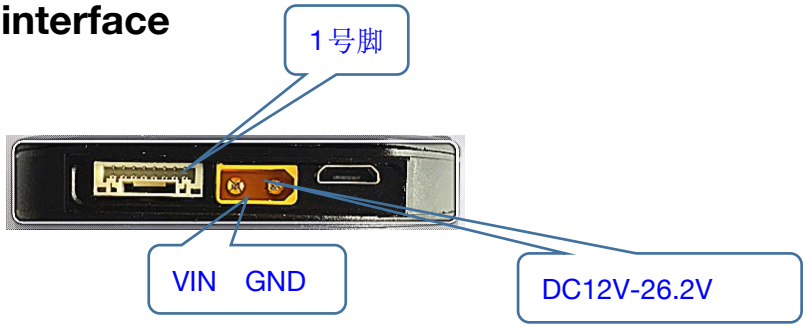



Figure 3-1-1

## 3.2 Electrical interface




| No. | Type | Interface part | Interface definition | Function |
|---|---|---|---|---|
| 1 | 8PIN slots | Power interface | GND | GND |
| 2 | | Power interface | 5V | +5V output |
| 3 | | Communication Interface | RxD4 | Serial port receiver |

| | | | | |
|---|---|---|---|---|
| 4 | | Communication Interface | TXD4 | Serial port sender |
| 5 | | Communication Interface | DB- | Network interface |
| 6 | | Communication Interface | DB+ | Network interface |
| 7 | | Communication Interface | DA- | Network interface |
| 8 | | Communication Interface | DA+ | Network interface |

## 3.3 Communication

### 3.3.1 Serial port communication frame structure（Optional）

12 to 27

| Frame header( 3char) | Address bit(2char) | Data length (1char) | Control bit (1char) | Identification (3char) | Data1 (char) | 。。。。 (char) | Data L (char) | Check bit(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 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 lens related commands
D: System and image related commands
I: Algorithm related commands
E: Thermal infrared related commands
P: PTZ related commands.
Object: U: UART command
M: Camera lens 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: by length
Identification bit: identification function
Data: data bits, according to the data length;

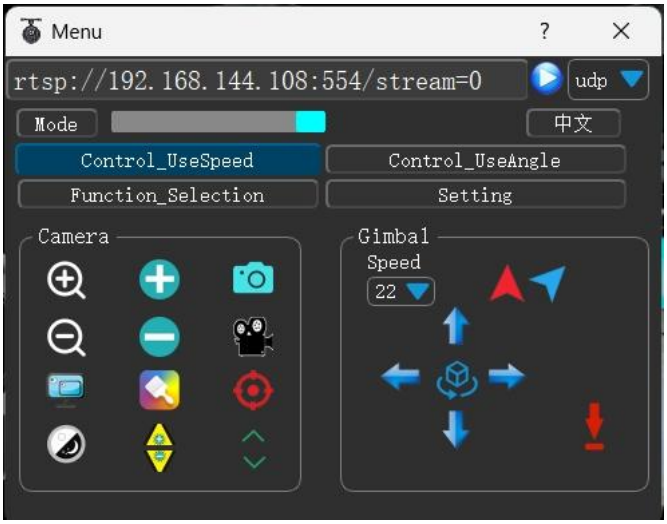
CRC: except for the beginning, the rest will be converted to HEX, and then the result will be converted to ASC-II. Two bytes, with the high bit first.
Serial port configuration: baud rate: 115200
Data bit: 8
Stop bit: 1
Check bit: None
**Note:** please ask for the specific serial port communication protocol from Sunflaser marketing salesman.

### 3.3.2 Network control and display

Default network address and port number:
Video stream 192.168.144.108 (control IP is the same with the video stream IP)
Control stream 192.168.144.108 (port number9003)

Startup screen of ground terminal

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** (modified as required), enter the RTSP code stream address:
**rtsp://192.168.144.108:554/stream=0** Click PLAY, output : 1080P H.264 RTSP code stream(Picturer in picturer)
**rtsp://192.168.144.108:554/stream=1** Click PLAY, output : 640*512 H.264 RTSP code stream(single thermal imagy)
The control stream address is the same as the IP address. Can be used to set.




The video stream response is normal, and a real-time picture will appear

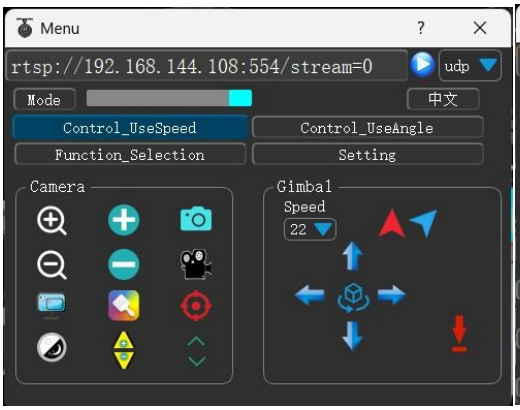
2. Mode button is used to display shortcut buttons and gimbal angle bar.

3. The four tabs: **Speed control**, **Angle control, function selection**, **Settings**;

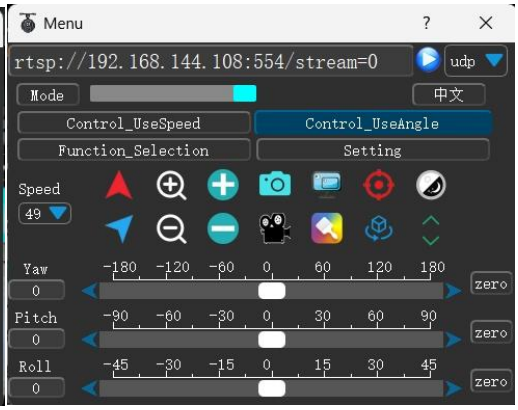
A. The default mode is speed mode, which can be controlled: zoom, focus, photographing, video recording, picture in picture, pseudo color switching, gimbal action, heading axis mode, one key centering, tracking (tracking version).

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

C. **Speed** is the base speed, and the gimbal will adapt to the speed value in proportion based on the focal length.




Speed Control tab

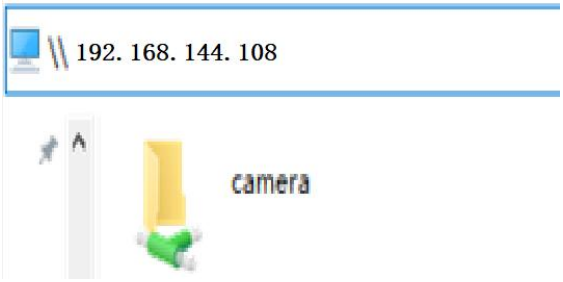



Angle Control tab

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 |

### 3.3.3 Network remote access storage files

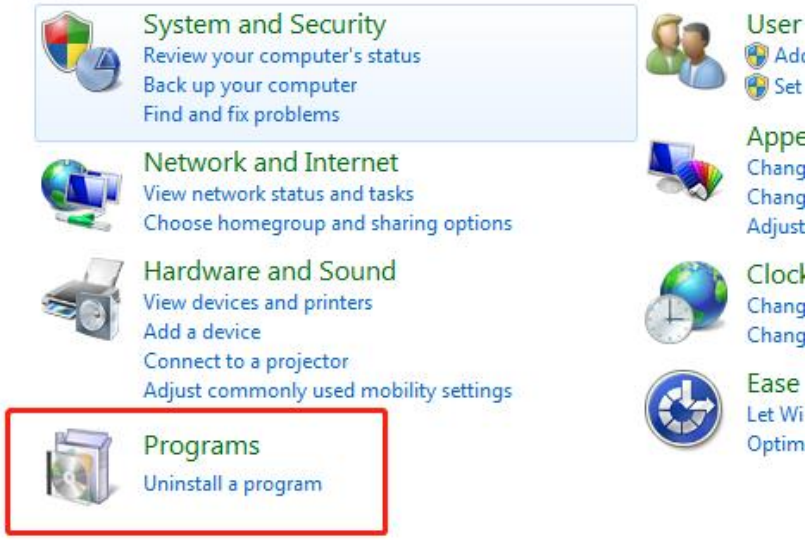
The files in the memory card can be accessed through network sharing. The access method is: Double backslash +ip, as shown in the following figure:



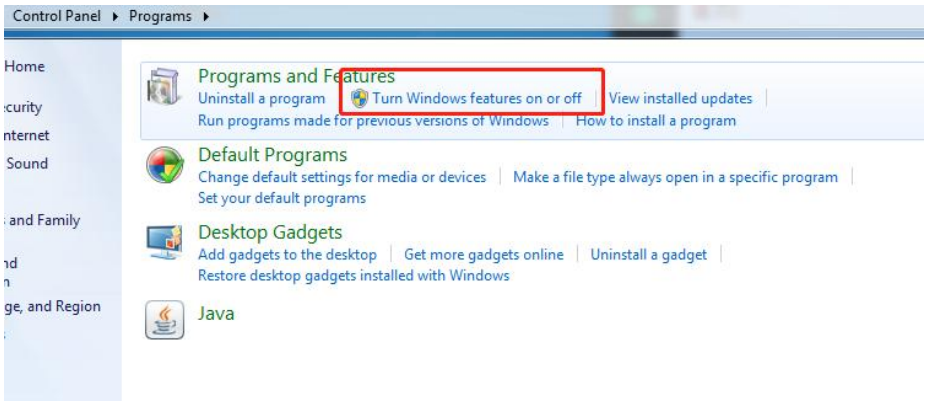

(Note: the upper equipment can support SMB protocol)

Windows10 opening mode

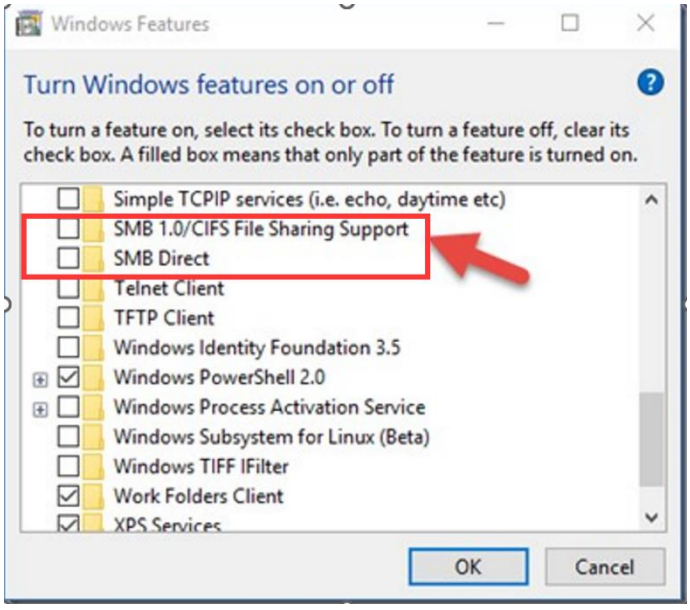
1. Find the program in the control panel and open it.




2. Go to the program menu and find out whether to enable or disable windows features.




3. Select the box before enabling smb.




## 3.4 Three-light gimbal debugging

### 3.4.1 Startup screen

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

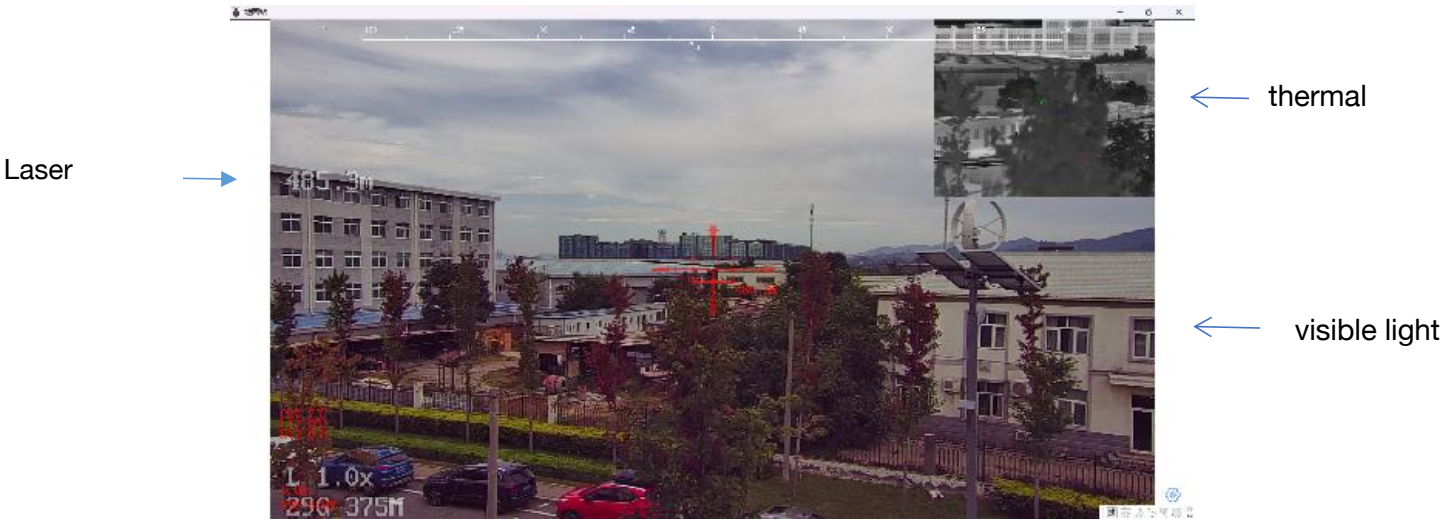



Image 3-4-1-1 Gimbal startup initialization screen

After the ground station is turned on, enter the correct **RTSP** code stream. Input the correct **IP** address, default **IP** address is 192.168.144.108(on-demand modification), Input **RTSP** code stream address:

**rtsp://192.168.144.108:554/stream=0** click **PLAY**, output: 1080P H.264 the real time stream code(picture in picture), to open network **RTSP** code stream to finished the initialization.

## 3.4.2 Picture-in-picture mode switching

The device supports 5 display modes:

1. Single visible light
2. Visible light (large image) + thermal infrared (small image)
3. Single thermal infrared
4. Thermal infrared (large image) + visible light (small image)

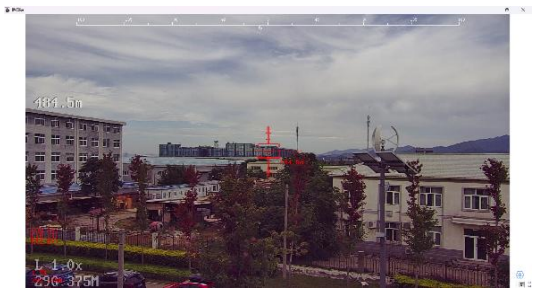


Figure 3-4-2-1 Visible light

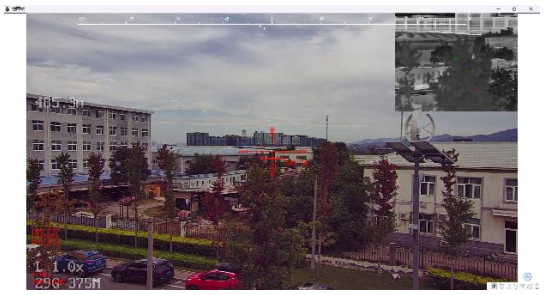


Figure 3-4-2-2 Visible Light +Thermal Infrared

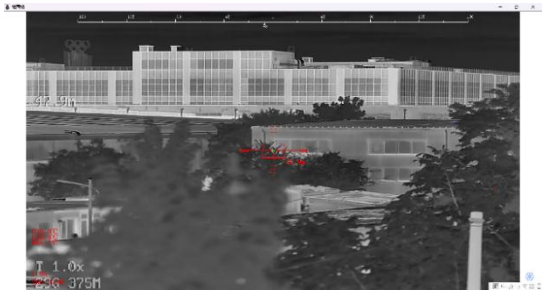


Figure 3-4-2-3 Thermal Infrared

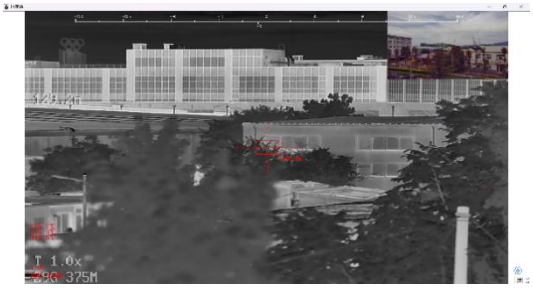
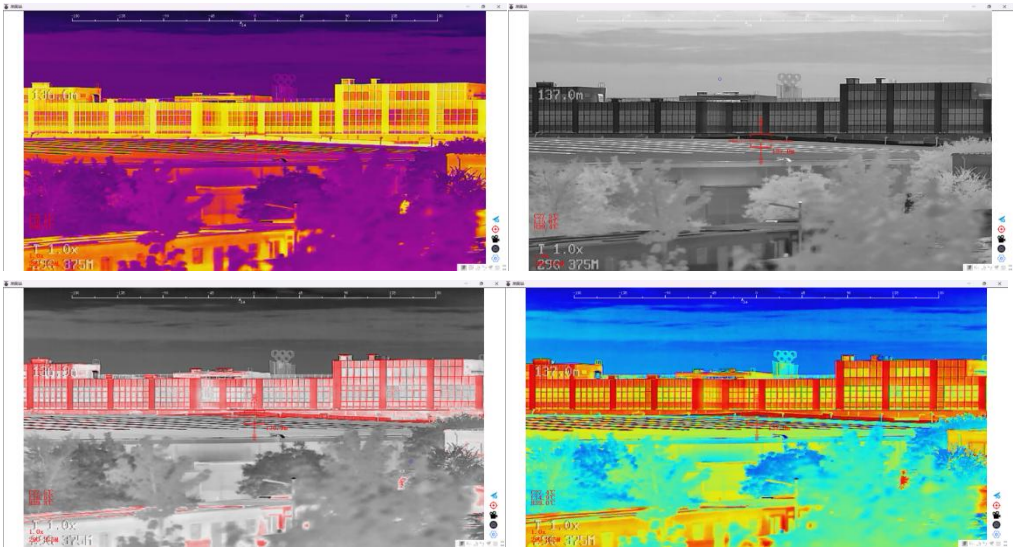


Figure 3-4-2-4 Thermal Infrared + Visible

## 3.4.3 Pseudo-color mode switching

The pseudo-color mode supports a variety of color switching (different products may have slightly different), which can be switched by control. Some mode display examples are shown in Figure 3-4-1:



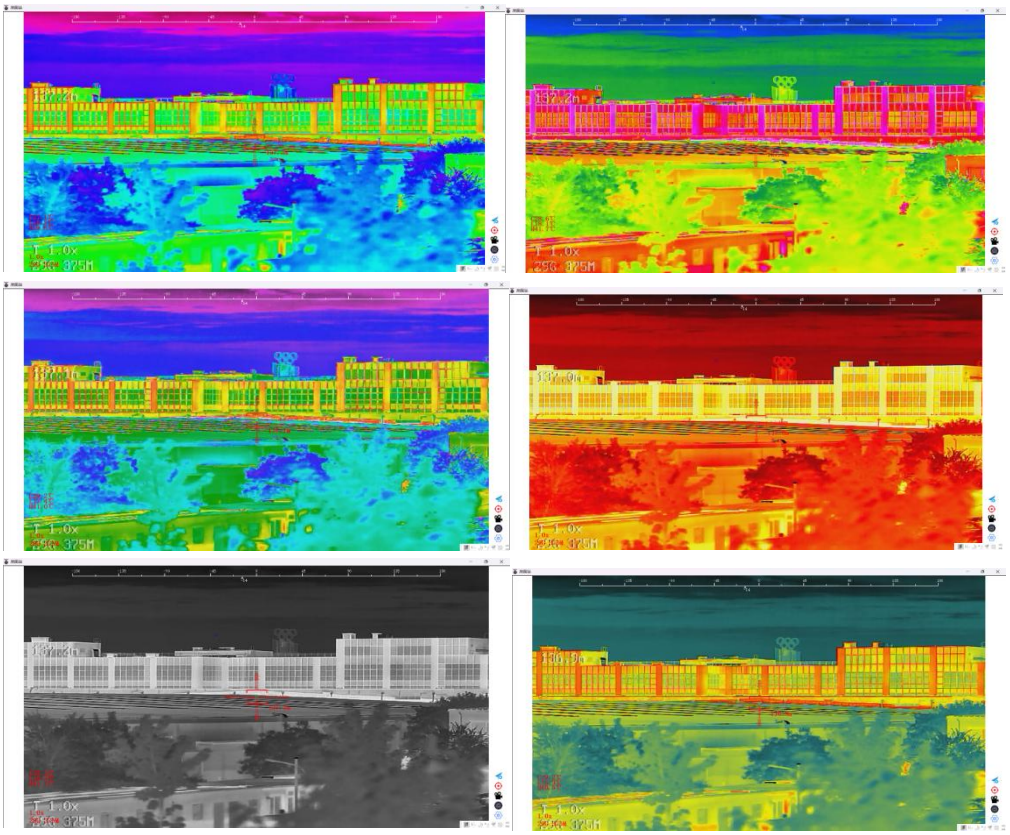


Figure 3-4-3-1 Pseudo color mode display

## 3.4.4 Zoom of visible light

Visible light has the function of continuous optical magnification. During the magnification, the multiples are displayed in the lower left corner and can be controlled by the magnification command.

## 3.4.5 Visible light focusing

In some special application scenarios (such as power line inspection), if the target object is too small, the target in the visible light image will not be in focus. At this time, the visible light manual focus command can be used to make the target object in focus.

### 3.4.6 Visible light and thermal imaging photography

When the TF card exists, you can send the command to take pictures, or send the command to capture pictures when recording, and save the photo time to the photo properties

**Caution**

The memory card does not support hot swap

.

### 3.4.7 Recording

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

## 3.5 Gimbal debugging and control

#### 3.5.1 Gimbal centering

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

#### 3.5.2 Gimbal YAW Lock

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

#### 3.5.4 Posture control

The gimbal 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

The gimbal head has two modes: high speed and low speed.The speed adaption is carried out based on the current speed mode and the multiple of visible light camera. See Table 3-5-5-1:

| Rotating Speed / Joysticks Deflection / Zoom | Low speed | Middle 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 gimbal 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

- Check whether the hanging structure of the three lightl-optical gimbal is normal, whether there is obvious deformation or looseness.
- Check if there is any dirt on the lens, if there is dirt on the lens, wipe the lens with a lens cloth.
- After installing the gimbal, check whether the mechanical installation of the system is normal.
- Check whether the electrical connection of the system is normal.
- Check whether the imaging and functions of the gimbal 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 gimbal 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 gimbal 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 service department.

| No. | Failure phenomenon | Reason | Solution |
|---|---|---|---|
| 1 | Completely unable to control the gimbal | ✧ Control command is invalid<br>✧ Docking signal error | ✓ Check the communication protocol carefully.<br>✓ Carefully confirm the definition of the docking signal |
| 2 | Sometimes there is no video, sometimes the control command does not respond | ✧ Poor connection of docking cables.<br>✧ Broken external cable | ✓ Re-plug and plug the connector.<br>✓ Re-wrap the cables |
| 3 | Image is blurred or image quality is degraded | ✧ The observation target object is too close to the gimbal.<br>✧ Whether the optical focal length is at a clear point.<br>✧ The optical lens not clea<br>✧ Serious quality problems in optical lens.<br>✧ Other reasons. | ✓ Adjust the observation distance and observe whether the image is clear.<br>✓ Re-focus the camera.<br>✓ Observe the imaging effect after cleaning the lens with cotton and alcohol.<br>✓ If 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 gimbal in a soft environment such as foam.

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

③ When the gimbal 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 gimbal casing, but use a clean, soft, and dry flannel.

⑤ The lens of the gimbal 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. To check the function, mechanical interface, and electrical interface of the product every half month. To 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 should 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°C ~ +65°C 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 | 1 | Page |
| Operation and maintenance manual | 1 | Book(electron version) |
| **Desiccant** | 1 | bag |
| Packaging box | 1 | pcs |

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 。**