Bi-Focus

10X Optical Zoom 320x240 IR Thermal Camera with 2-axis Gimbal

User Manual

V1.0 2019.08

FOXTECH

Content

Warning

Please read the instruction carefully before install and use this product, and keep it in a safe place.

Observe all warning operating instructions, and follow all operating instructions;

Do not allow the supply voltage to exceed the specified range;

Do not allow the the use environment beyond the environment condition of the pod;

Do not make the camera's thermal imager to look directly at high-intensity radiation sources such as the sun, carbon dioxide lasers, and electric welders including power on or off , in order to avoid damage to the focal plane of pod;

All loads(include SSD) are protected from static electricity during use to avoid damage;

Pay attention to the protection of the internal interconnection and the external connection cable;

There are no user-serviceable parts inside the pod. Do not open the pod without the company permission, or the consequences are the responsibility of the user;

Disconnect the power supply before cleaning the pod. Do not use chemical solvents, thinners, or spray cleaners.

· Ensure that the interface definition on the airborne side is correct;
· Ensure that the supply voltage in the given range 3S~6S.

Device Introduction

Foxtech Bi-Focus is a 2-axis high stabilized gimbal with a 10X optical zoom camera and a 320x240 thermal camera. Foxtech Bi-Focus has a small volume and light weight. The high precision 2-axis gimbal is based on FOC technology, which features high stability, accuracy and sensitivity.

Foxtech Bi-Focus is a functional camera and gimbal, supports 1080P 60fps video output, and 4 mega effective pixels. The resolution of thermal camera is 320*240. Dual sensors help pilot easily collect visible and thermal imaging data of the same picture in one flight. Bi-Focus supports dual-channel synchronous video recording, which is convenient for subsequent video analysis.

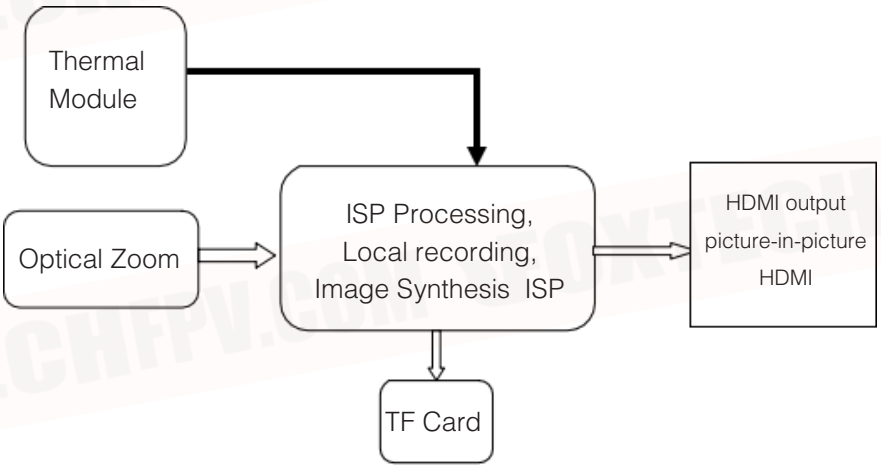
Bi-Focus supports multiple thermal imaging pseudo-color pattern, can switch from one pattern to another, and has temperature measuring and picture-in-picture function. Foxtech Bi-Focus supports Sbus control, supports TF card storage.

The structure of the gimbal:

Bi-Focus can be applied in fire fighting and searching, rescue,power line inspection, crop protection etc.

Main Components and Functions

The device consists of a thermal movement, a zoom visible light movement, and a stabilized gimbal. The visible and thermal video streams are stored separately in the visible light movement, and synthesize multiple picture-in-picture modes according to external control commands and output by HDMI.



Environment and Conditions of Working

· Working Environment -10 to +45 / 20% to 80% RH
· Storage environment -20 to +60 / 20% to 95% RH
· Transportation: After finish the package, the pod can meet the requirements of air, road, railway and waterway transportation.

Technical Characteristics

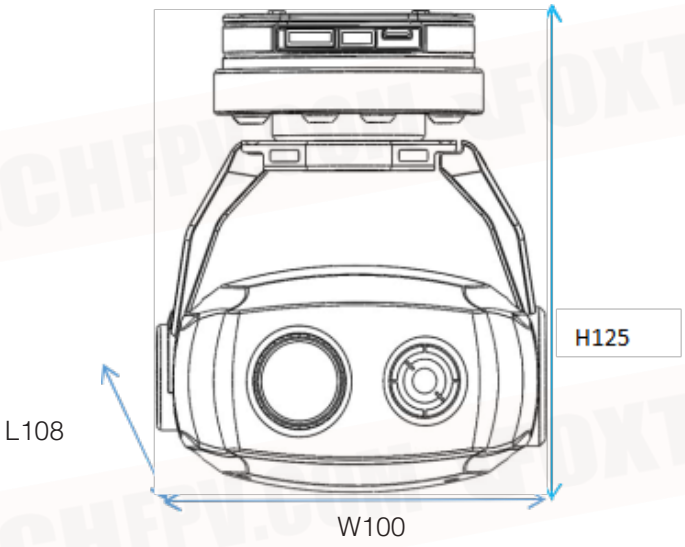
Visible camera parameters:

- SENSOR Pixel 400 million pixels
- Focal Length f= 4.9to49 mm ±5%
- Field of view FOV
  D : WIDE 66.6 ±5% TELE 7.2 ±5%
  H : WIDE 53.2 ±5% TELE 5.3 ±5%
  V : WIDE 399.8 ±5% TELE 4.2 ±5%
- Zoom: 10X electro-optical zoom
- Zoom mode: motorized zoom and continuously adjustable
- Image and video storage format
  Image jpeg format Can choose multiple pixels
  Video mp4 format Thermal infrared camera parameters can choose 1080P or 720P

- Detector resolution 320*240
- Pixel spacing 12μ m
- Wavelength range 8 14μm
- Type: Uncooled focal plane microbolometer
- Thermal sensitivity NETD -5 to 150 5% precision
- Field of view: 6.5mm lens, angle: 34.4 x 25.8
- Refresh frequency 9Hz
- Image and video storage
  image 320*240
  video 320*240

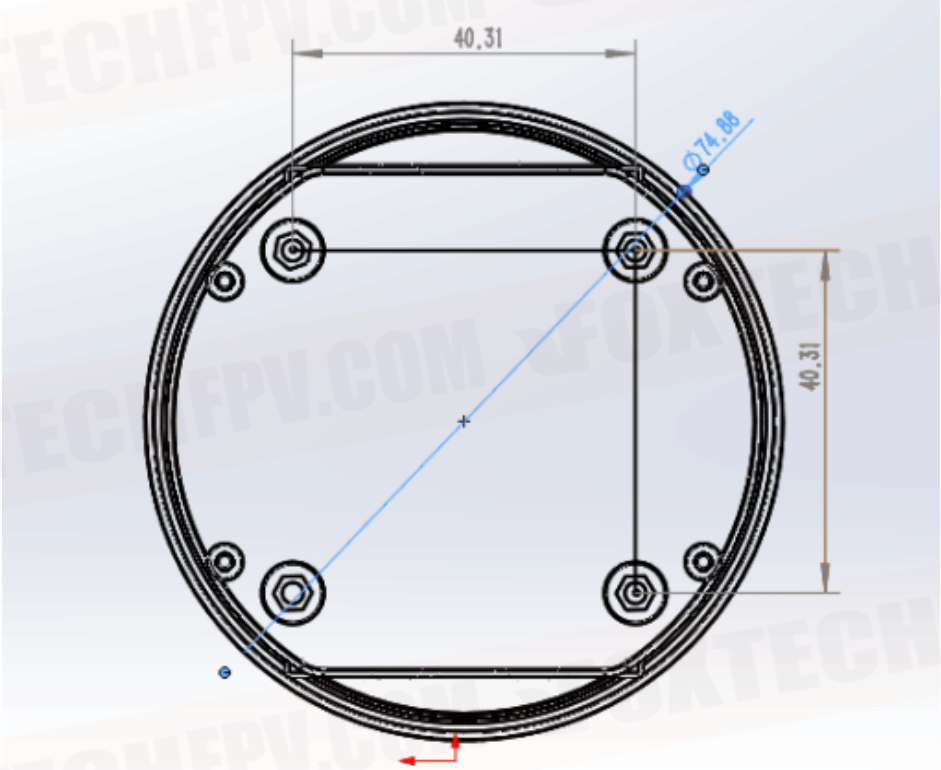
Measurement function: center point, highest temperature display temperature function; Over-temperature alarm

- Storage capacity: 128G TF card; calss6 and above
- Image output interface HDMI 1080P 60FPS Picture-in-picture output
- Video recording 1080P 30FPS H.264 compression
- Pitch angle range -20°to +180°
- Yaw angle range -150 °to +150 °Promise rotation
- Control Precision
  Pitch direction ±0.02°
  horizontal direction ±0.03°
- Control Method
  SBUS control
  IBUS control
- UART Command control system boot preparation time 21S
- Power supply 3S/6S
- Power consumption 10W
- Weight 480±10 gram
- Volume 108mm*100mm*125mm



Installment and Debugging

Install Screw



Electrical Interface

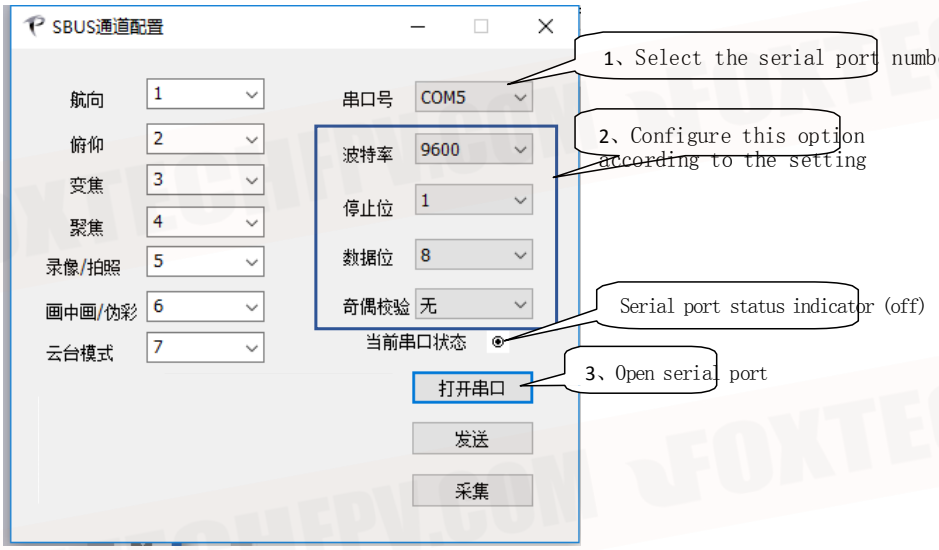
The external electrical interface of the device has four channels, which are power interface, communication interface (including SBUS communication and serial communication), HDMI video interface, and TF card interface. The video interface uses the HDMI type_C interface. The USB interface is used for debugging the pan/tilt stabilization parameters.

Serial Number	Model	Types of interface	Interface Definition	Features
1	8PIN socket	power interface	GND	GND
2		power interface	5V	+5V output
3		communication interface	S/I BUS	SBUS channels
4		communication interface	TXD4	UART4_Tx(Reserved)
5		communication interface	RXD3	Serial port reception
6		communication interface	TXD3	Serial port transmission
7		communication interface	DA-	Reserved
8		communication interface	DA+	Reserved

high 0x06A4(1700) middle 0x03E8(1000) low 0x012C (300)

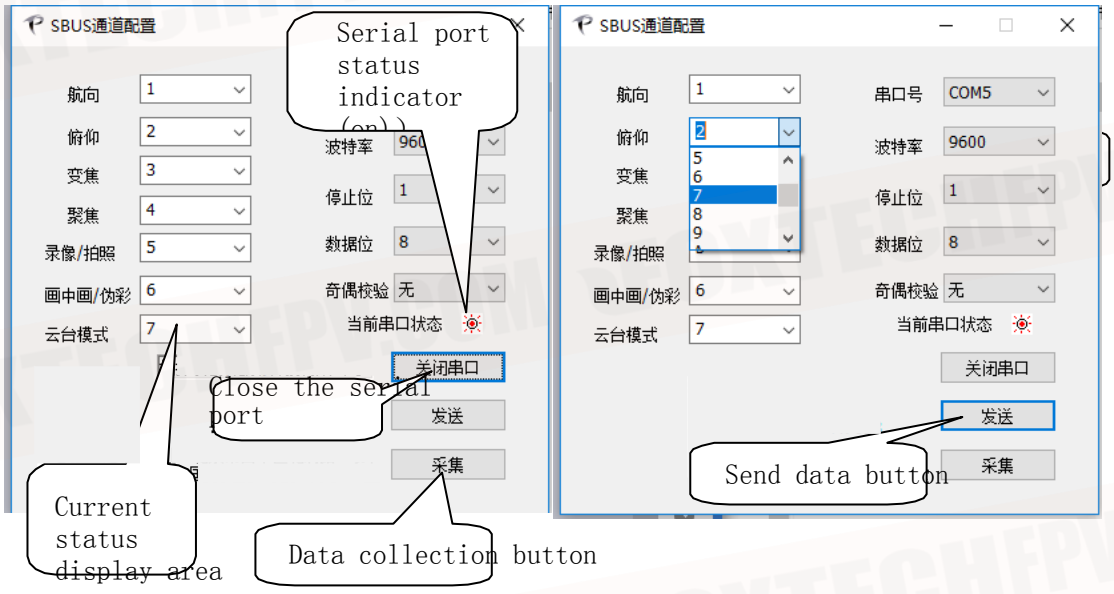
YAW	middle to low yaw right middle to high yaw right high and low to middle yaw stop
PITCH	middle to low pitch down middle to high pitch up high and low to middle pitch stop
ZOOM	middle to low ZOOM - middle to high ZOOM + high and low to middle ZOOM stop
FOCUS	middle to low FOCUS + middle to high FOCUS - high and low to middle ZOOM stop
RECORD CAPTURE	middle to low photograph middle to high video state switching
Picture_In_ Picture Pseudo_Color	middle to low thermal imager pseudo-color switching middle to high PIP switching
Gimbal Mode	middle to low switch between high speed mode and low speed mode middle to high switch between follow mode and lock mode
Digital ZOOM Some models support	middle to low ZOOM + middle to high ZOOM - high and low to middle ZOOM stop

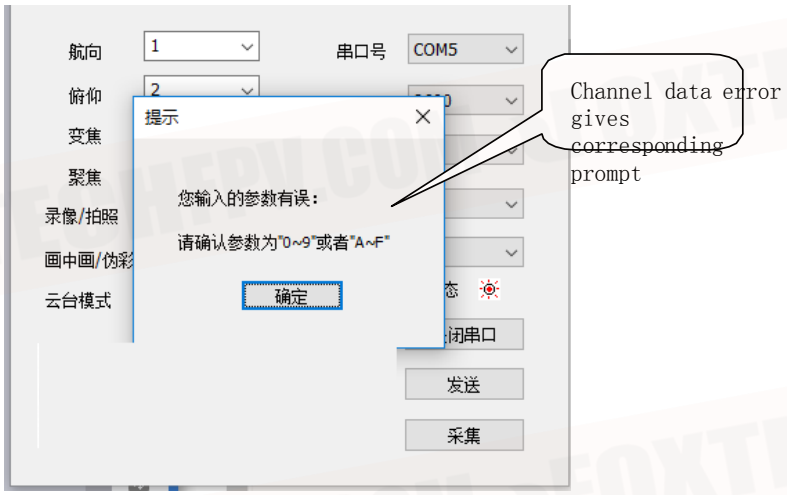
Channel configuration software instructions:
Setting com port



Baud rate 115200 Data Bit 8 Stop Bit 0 Parity No

Click the “Receive” button to get the current channel configuration status.
Click the “Send” button to write the configuration after manually setting the channel configuration.





Communication

Serial Communication

Frame Structure

12 to 27 char

Frame Header (3char)	Address Bit (2char)	Data Length (1char)	controlposition (1char)	Identificationposition (3char)	Data1 (char) D1	... (char)	Data L (char)	Check position (2char)
#TP	U/M/D/I/E/P	L	w/r	X1X2X3		...	DL	CRC

Frame Header

#TP Fixed-length command The data length is 2
#tp Variable-length command The data length is determined by the length bit.
Address bit

Source address U: Uart command M: Lens related commands; D: System and image related commands; I: algorithm-related commands; E: thermal infrared related commands; P: pan/tilt related commands..
Target: U: Uart command M: lens related command; D: system and image related commands;
Control position: r -- > query w -- > control data: according to the length

Identity bit: identity function

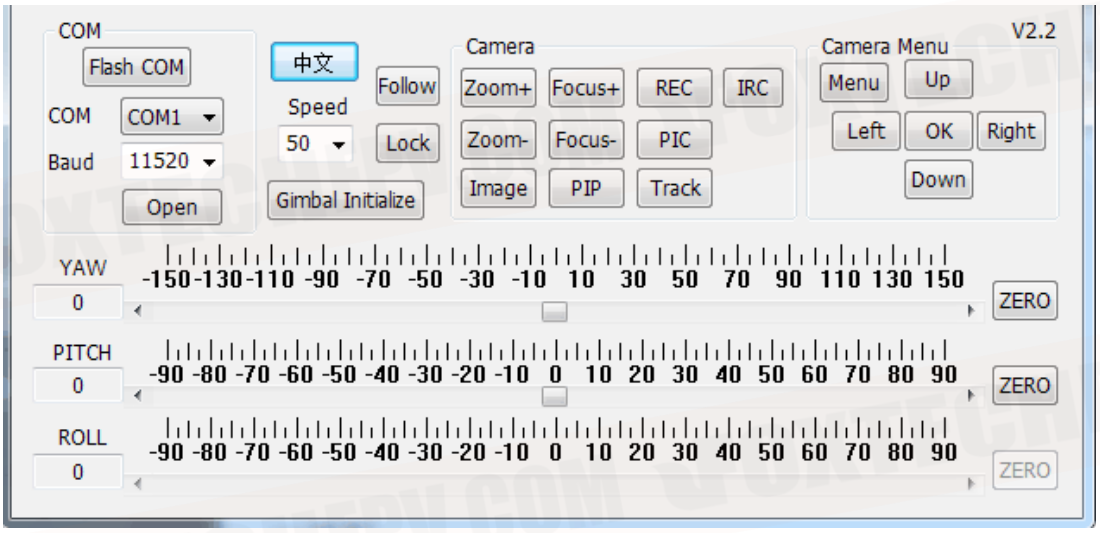
Data: Data bits, according to Data length;

CRC: convert the rest into HEX, add up, and convert the result into asc-ii, except for the beginning. Two bytes with the highest order in front.
Serial port configuration: baud rate: 115200, data bit: 8, stop bit: 1, check bit: none

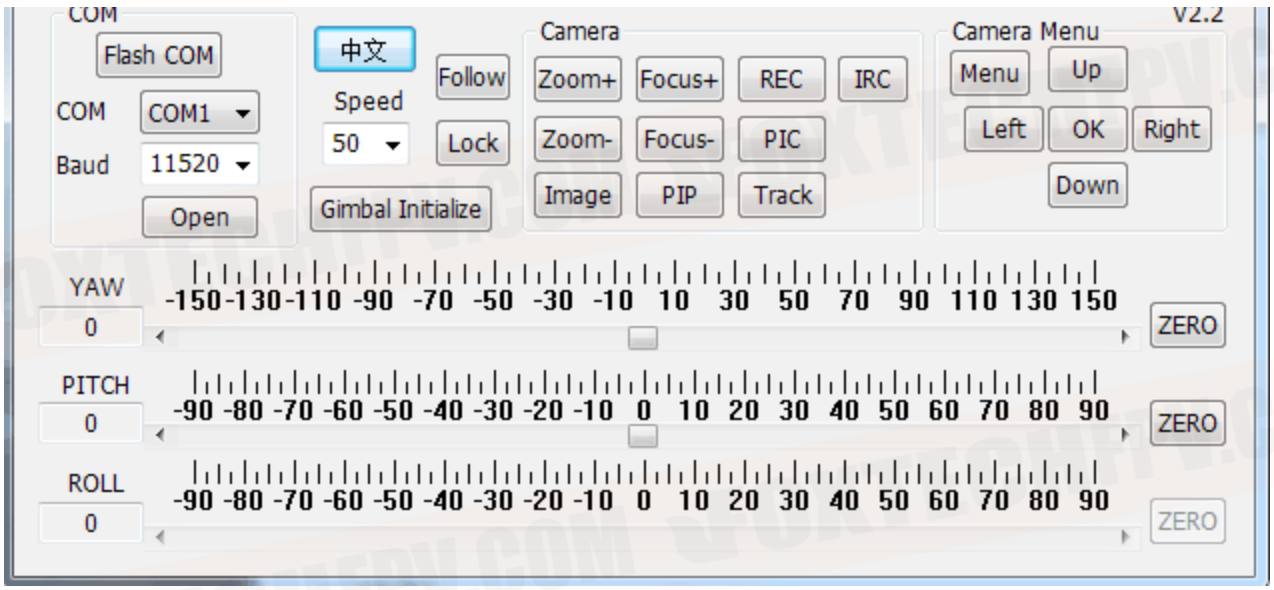
The serial port controls of the ground terminal as follows:

1. Gimbal angle control, camera control and camera parameter configuration.

2. Gimbal angle control and camera control.

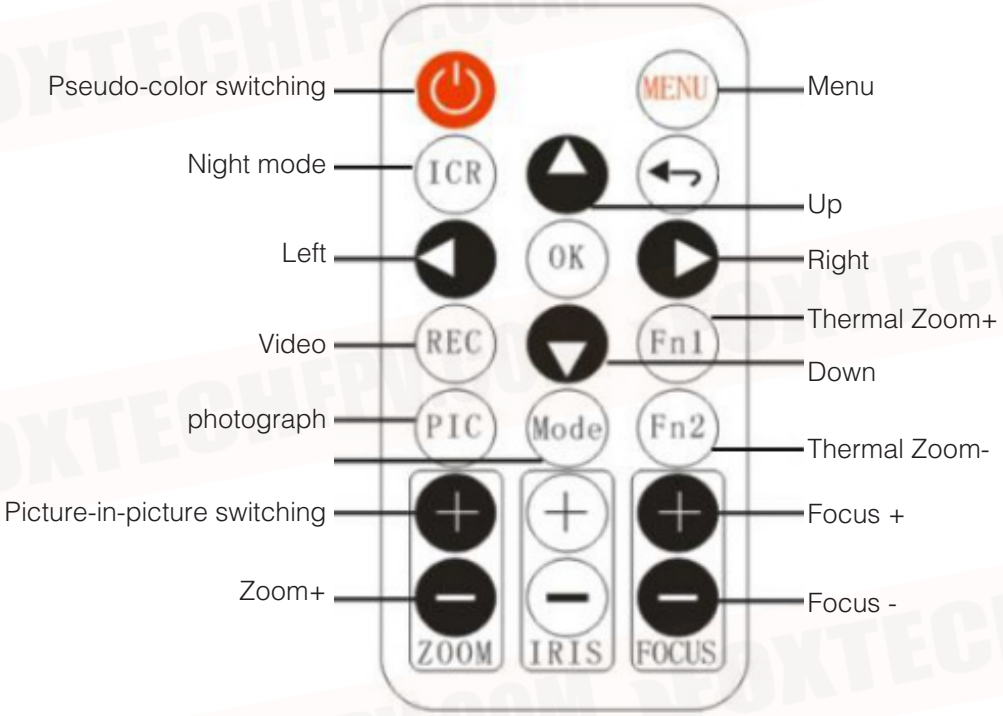


3. Gimbal speed control and camera control.



Infrared Remote Control

Gimbal movement supports infrared remote control.



Infrared Remote Control Button Function

Communication

Boot image screen

The HDMI output boot screen after the pod is powered on.

The boot screen duration no longer than 21s, during which the PTZ and camera are initialized. After the initialization, the image is displayed: visible light + thermal infrared

PIP mode switching

The device supports 5 modes

1 Single Visible light

2 Visible light larger one + Thermal image small one

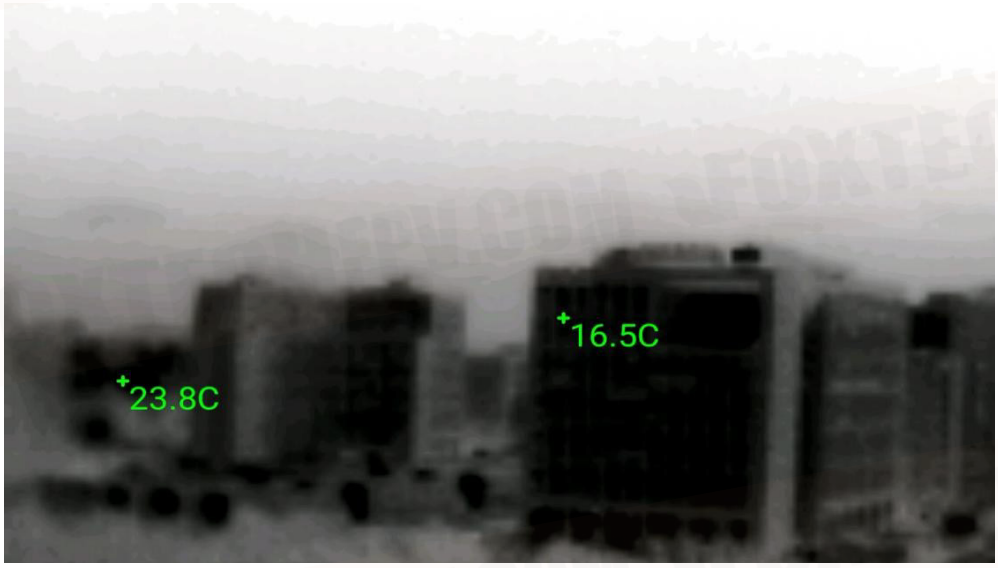
3 Single thermal infrared

4 Thermal infrared larger one + Visible light small one

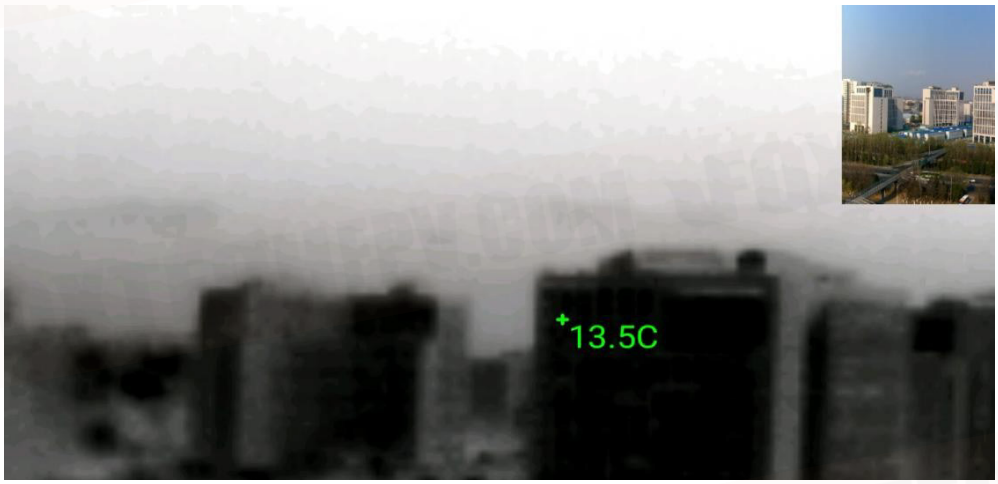
5 Visible light left + Thermal infrared right Split screen display

Visible light

Visible light + Thermal infrared



Thermal infrared

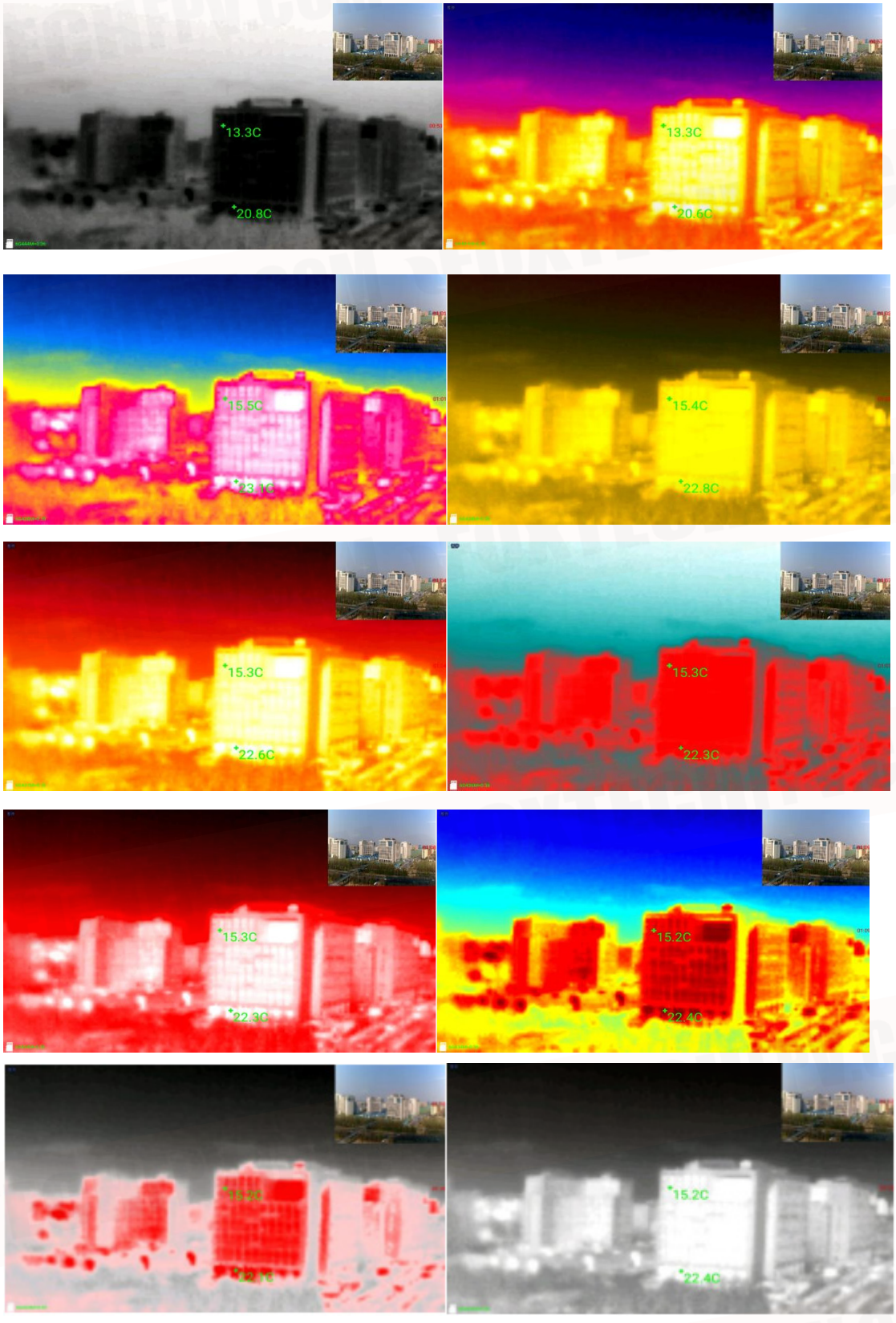


Thermal infrared + Visible light

Split screen display

Pseudo-color Pattern Switching

Pseudo color mode supports 10 color switching, which can be controlled by SBUS, serial port and infrared control switching, some mode displays in Figure:



Visible Light Zoom

Visible light camera supports 10X optical zoom,when zooming,the multiple is displayed in the lower right corner and can be controlled by the zoom command, as shown in Figure

Visible Light Focusing

In some special application scenarios (such as power line inspection), when the target object is too small, it will causes the target to be out of focus in the visible light image. At this time, the visible light manual focus adjustment command can be performed to make the target object focus properly.

Visible light and thermal imaging photo taking and capturing.

When there is a TF card, the camera can be photographed by sending a photographing command, or the photographing command can be sent during the recording, and the photographing pixels can be 400W, 800W, 1300W or 1600W,the photo-taking time is saved to the photo properties.

Memory card is not hot-swappable.

Video Recording

When there is a TF card, video recording can be performed by sending a video command.
video resolution 1080P and 720P are optional. Infrared and visible light can be recorded simultaneously, sent again, stop recording, and the recording time is displayed in the middle of the right side.

Gimbal Debbuging/Control

Gimbal back to center

The gimbal can be set to the centering state by the control command, and the gimbal will be in this state and keep the camera facing the front of the head.

Gimbal Yaw Locking

The gimbal can be set to work in YAW lock mode by controlling, in which the gimbal will not rotate with the rotation of the aircraft's heading.

Gimbal YAW Following

The gimbal can be set to work in YAW following mode by controlling.In this mode the gimbal is possible to maintain a constant angle between the heading and the fuselage and to rotate following the aircraft heading.

Attitude Control

The gimbal can be controlled by serial command, IBUS, SBUS moving at a fixed angular rate in the heading and pitch directions.

Speed Control

The gimbal has two modes: high speed mode and low speed mode. When the gimbal rotated, the speed is adaptive based on the current speed mode and the visible light camera multiple:

multiple/speed mode	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

The data are used to illustrate the speed control logic and not the actual speed.

Automatic Drift Correction

When used for a period of time or when the ambient temperature changes drastically gimbal will have large drift that causes screen tilt or manual control inconvenience, and requires an automatic drift correction command to calibrate.

Use and Operation

Preparation and inspection before using

-Check whether the structural parts of the gimbal are normal, whether there is obvious deformation or looseness;
-Check the if the lens is dirty, and wipe the lens with a lens cloth;
-Check if the mechanical installation of the system is normal after installing;
-Check if the electrical connection of the system is normal;
-Check if the camera imaging and function is normal.

Safety protection, safety signs and instructions during usage process

Avoid the supply voltage exceeding the allowable range during product using, and avoid using under excessive load working conditions.

Operating procedures during usage process

After the system is powered on normally, the various functions of the gimbal and camera are controlled by buttons or joysticks on the handheld terminal of the drone.

Detection and recording during operation

Record problems encountered during usage process and save the corresponding image data.

Operating procedures, methods and precautions after using

Disconnect the system power after using, and move the pod from the drone in a static-free environment. It should be stored in a dry and ventilated environment and should be placed in the box for long periods without using.

Failure Analysis and Elimination

If the user encounters a problem while using this product, please follow the solutions shown in the table below.
If the failure phenomenon is not in this specification or through the solution in this manual still unable to troubleshoot, please contact our customer service department.

order	failure phenomenon	reason	solution
1	can not control gimbal and camera	· instruction ignore/Docking signal error	Check the communication protocol carefully/Carefully confirm the docking signal definition
2	sometimes no video , control instructions sometimes do not respond	Poor contact of docking cable/ External cable damaged	Replug the docking plug-in/ Rewrap the cable
3	blurred or degraded image quality	the observed object is too close to the gimbal/Optical focal length at clear point/Optical lens has dirt/Serious quality problems with optical lenses/other reasons	Adjust observation distance,see if the image is clear/refocus the camera/observe the imaging effect after cleaning lens with cotton and alcohol/If there is no improvement, please contact the manufacturer.

Maintenance

Daily maintenance

-Please put it in the factory packing box during transportation. If there is no packing box, please put it in a soft environment such as foam;

-After the using of the gimbal and camera, turn off the system power and unload the gimbal from the drone to extend the effective using time of the drone system;

-When the gimbal is stored for a long time or not working, it should be kept in a cool and dry environment as much as possible;
-Do not use a chemical solvent, thinner to clean the gimbal case. It can be wiped with a clean, soft and dry flannelette;

-The lens of the camera is an important optical component, avoid oil stains and various chemical substances damaging the lens surface during installation and use. Please use the special lens cloth to clean the lens surface, and also take care to protect it when storing it.

- If not use for a long time, the function should be energized every week, and check the function, the mechanical interface and electrical interface of the product every half month, clean the lens, and thoroughly check the product every month.

Maintenance procedures and methods

-Use a clean, soft, dry flannel to remove dust and other debris from the surface;
-The task load is correctly connected to the drone, and after confirming that the connection is correct, power on and check again.
-After normal work, adjust and test function through the handheld terminal of the drone, and find the problem ,keep detailed records.
-If the problem cannot be solved by the method in this instruction manual, please contact us.

Transportation and Storage

Transportation

-After acceptance by the ordering party, the contractor shall assist the ordering party to transport it to the user and warehouse for storage according to the requirements of the order contract;

-The shipping quality and safety requirements of the transportation process are in compliance with the relevant regulations of the international transportation management department;

-Product handling should pay attention to the following items:

1. No matter what kind of loading and unloading method, it can be safe and reliable.
2. Strictly comply with the requirements of fire protection, waterproof and moisture proof during shipment;
3. It is not transported in the same vehicle as flammable, explosive and corrosive items.

-Avoid collisions during transportation.

Storage

Products that have passed the experience and are not shipped immediately will be stored in the finished product warehouse of the contractor. The storage period is no more than 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 is tested once every six months.

The product is stored in a dry, ventilated, non-corrosive atmosphere at a temperature of -20 ° C to +65 ° C and a relative humidity of no more than 95%.

This content is subject to change.

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